DOE-Wide Pollution Prevention Database

1182 records were found on Fri Jul 8 15:31:18 2005

Title: Solvent Substitution **Major Waste Type:** Hazardous Waste

PPOA ID Code: ANL-APS-B360-00 **Specific Waste Type:** Solvents

Date: 16-mar-1994 **Major Activity Type:** **Specific Activity Type:**

Description: Solvent substitution

Options:

Site: Argonne National Laboratory - East	
Site Coordinator: Jim Thuot	**Team Leader:** Jim Lange
Phone: 708-252-4911	**Phone:** 708-252-7021
Fax: 708-252-9642	**Fax:**
Email: jthuot@gmtpgate.anl.gov	**Email:**

Title: CP5 Decontamination & Decommissioning - Bldg 330 **Major Waste Type:**

PPOA ID Code: ANL-CP5-D&D-00 **Specific Waste Type:**

Date: 08-mar-1994 **Major Activity Type:** Environmental Restoration **Specific Activity Type:** Decommissioning

Description: The overall process consists of the decontamination and decommissioning of CP 5, including the decontamination of the containment building, demolition of the out-buildings, yard remediation and continuing surveillance and maintenance during the entire project.

Options:

Site: Argonne National Laboratory - East	
Site Coordinator: Jim Thuot	**Team Leader:** Ralph Ditch
Phone: 708-252-4911	**Phone:** 708-252-8057
Fax: 708-252-9642	**Fax:**
Email: jthuot@gmtpgate.anl.gov	**Email:**

Title: CS Oil/Water Separator **Major Waste Type:** Hazardous Waste

PPOA ID Code: ANL-CS-B363-01 **Specific Waste Type:** Oil

Date: 08-mar-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description: Equipment:Several metal working machines such as lathes, mills, bores, etc. which require cooling fluids consisting of an oil/water emulsion.Process Scope:The cooling fluids become contaminated with chips and dust of various metals and the additives which are intended to prolong the life of the fluids are eventually used up. The fluids are then stored in 55 gallon drums and ultimately disposed of by Waste Management. The total quantity of spent fluids is approximately 50 drums per year.Materials:A 2-5% emulsion of cooling fluids in watero CIMCOOL 400 with MSL, Cincinnati Milacrono UNIFLO, Universal Photonics, Inc.o TRIM SOL, Master Chemical Corp. (MSDSÕs available)Storage drums for the spent fluids

Options: Purchase of an oil/water separator can reduce the amount of waste for disposal by 90%. The cooling fluid emulsion is continuously passed through membrane filters to remove the oil component and allow the discharge of the water component to the sewer. This reduces the amount and therefore the cost of disposal.

Site: Argonne National Laboratory - East	
Site Coordinator: Jim Thuot	**Team Leader:** Paul Rumps
Phone: 708-252-4911	**Phone:** 708-252-5166
Fax: 708-252-9642	**Fax:** 708-252-9642
Email: jthuot@gmtpgate.anl.gov	**Email:**

Title: WT Paint Stripping **Major Waste Type:** Hazardous Waste

PPOA ID Code: ANL-PFS-WATER-TOWER **Specific Waste Type:** Paint

Date: 14-mar-1994 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Treatment

Description: The process entails the stripping of lead-based paints from the interior and exterior of several water tanks on site. The current practice is to sandblast the painted surfaces and collect the sand and leaded paint particles for disposal as hazardous material at a cost of approximately $520 per ton. This PPOA specifically addresses the process of stripping the interior of two elevated tanks by sandblasting, producing 90 tons of expended abrasive and leaded paint. The waste material was removed to a hazardous waste landfill at a cost of $30,000.

Options: An alternative treatment is to mix a proprietary material, called Blastox, with the sandblast material. This reduces the soluble lead in the paint to a TCLP effective level of 0 mg/l. The product material is considered special waste and can be disposed of at a reduced cost of $287/ton. This treatment does not reduce the amount of waste generated but it changes the character of the waste for more economical disposal costs.A second alternative is to use recoverable steel shot for blasting the interior of the tanks with sandblasting the exterior. This method reduces the amount of waste generated to approximately 1 ton of paint particles which will be disposed of as hazardous waste.The third alternative is to remove the paint using CO2 pellets as the stripping medium. The pellets expand on the painted surface and sublime, leaving only the paint particles to be disposed of as hazardous waste. The amount of waste generated is reduced considerably to approximately 5 tons of contaminated material thereby reducing the disposal cost to a minimum. The surface would then be sandblasted to prepare for painting which would result in additional waste to be disposed of as special waste at $300/ton.

Site: Argonne National Laboratory - East	
Site Coordinator: Jim Thuot	**Team Leader:** John Simon
Phone: 708-252-4911	**Phone:** 708-252-5316
Fax: 708-252-9642	**Fax:** 708-252-
Email: jthuot@gmtpgate.anl.gov	**Email:**

Title: Niobium Part Rinse **Major Waste Type:** Hazardous Waste

PPOA ID Code: ANL-PHY-203-01 **Specific Waste Type:** Acid

Date: 08-dec-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description: Niobium parts are electrolytically polished in a strong sulfuric and hydrofluoric acid solution. The parts are then rinsed in deionized water resulting in a rinse solution consisting of approximately 11% H2SO4, 0.9% HF, 0.1% HNO3 and 88% H2O. There is also a residual of 0.15 oz/gal of Niobium.

Options: The rinse solution generated by the ATLAS etching process contains 12% of mixed sulfuric, nitric and hydrofluoric acids and a residual of 0.15 oz/gal of Niobium. The addition of soda ash (sodium carbonate) in a sufficient quantity would raise the pH to 6 to 9 which produces a solution which can be disposed of into the sanitary sewer.

Site: Argonne National Laboratory - East	
Site Coordinator: Jim Thuot	**Team Leader:** Paul Rumps
Phone: 708-252-4911	**Phone:** 708-252-5166
Fax: 708-252-9642	**Fax:** 708-252-9642
Email: jthuot@gmtpgate.anl.gov	**Email:**

Title: Niobium Part Polishing **Major Waste Type:** Hazardous Waste

PPOA ID Code: ANL-PHY-203-02 **Specific Waste Type:** Acid

Date: 08-dec-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description: Niobium parts are electrolytically polished in a strong acid solution after manufacture. The solution consists of 83.3% H2 SO4, 6.0% HF and 10.7% H2O. The HF reacts with the surface of the parts and is partially consumed in the polishing process. The strong acid solution is used until the indicating recorder shows a reduction in the oscillating current at which time the solution is stored for ultimate disposal by WMO. The waste stream solution consists of 82% H2SO4 , 3% HF, 15% H2O and a residual of 0.86 oz/gal Niobium.

Options: The waste acid solution generated in the Niobium polishing process consists of 82% sulfuric acid, 3% hydrofluoric acid, 15% water and 0.86 oz/gal Niobium residual. The addition of soda ash (sodium carbonate) in a sufficient quantity would raise the pH to 6 to 9 which produces a solution which can be disposed of into the sanitary sewer.

Site: Argonne National Laboratory - East	
Site Coordinator: Jim Thuot	**Team Leader:** Paul Rumps
Phone: 708-252-4911	**Phone:** 708-252-5166
Fax: 708-252-9642	**Fax:** 708-252-9642
Email: jthuot@gmtpgate.anl.gov	**Email:**

Title: ATLAS - Dilute Acid Rinse Water Disposal for Physics Division **Major Waste Type:** Hazardous Waste

PPOA ID Code: ANL-PPOA-PHY1 **Specific Waste Type:** Acid

Date: 20-dec-1994 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Disposal

Description: The ATLAS project in the Physics division generates approximately 75 gallons of a rinse solution in the process of etching Niobium parts. The process consists of electrolytically etching the parts in a highly concentrated sulfuric and hydrofluoric acid solutions, then rinsing the parts with deionized water producing a dilute acid solution of the same acids. The rinse solutions are combined with a dilute nitric acid solution generated by etching of Copper parts from another part of the process. The dilute acid solutions are stored in five gallon containers and periodically sent to Waste Management Operations for disposal. The five gallon containers are typically packed, three containers to a drum, then disposed of through Laidlaw Environmental at a cost of $315 per drum. This amounted to a disposal cost of $7875 for CY 1993 for this dilute acid waste stream from this project.

Options: After the closure of the landfill, the only means of disposal left open to Vehicle Maintenance was to place the oil filter cartridges in the regular trash pick-up. The number and weight of the cartridges was not changed but the frequency of dumpster

fill-ups and therefore the pick-ups was reduced by the smaller volume of the crushed cartridges for disposal.

Site: Argonne National Laboratory - East	
Site Coordinator: Jim Thuot	**Team Leader:** Paul Rumps
Phone: 708-252-4911	**Phone:** 708-252-5166
Fax: 708-252-9642	**Fax:** 708-252-9642
Email: jthuot@gmtpgate.anl.gov	**Email:**

Title: Substitution of Vapor Degreaser **Major Waste Type:** Hazardous Waste

PPOA ID Code: ANL-SSD-CS1 **Specific Waste Type:** Solvents

Date: 14-sep-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The present process is a standard Perchloroethylene vapor degreaser to clean machined parts in the Central Shops operations. The degreaser is operated on a part-time basis on an as-needed schedule for approximately 2 to 3 hours, 2 to 3 times per week. The degreaser is covered when not operating and has not been cleaned for some time. The dirty solvent is not removed and the solvent is added as needed to replace solvent evaporated into the environment. The replacement is currently approximately 55 gallons per year.

Options: The vapor degreaser will be replaced by a detergent / water based cleaner thus eliminating the use of a chlorinated hydrocarbon entirely.

Site: Argonne National Laboratory - East	
Site Coordinator: Jim Thuot	**Team Leader:** Al Schneider
Phone: 708-252-4911	**Phone:** 708-252-7082
Fax: 708-252-9642	**Fax:** 708-252-
Email: jthuot@gmtpgate.anl.gov	**Email:**

Title: Vehicle Maintenance Garage **Major Waste Type:** Hazardous Waste

PPOA ID Code: ANL-VM-B46-001 **Specific Waste Type:** Solvents

Date: 08-apr-1994 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Vehicle

Description: The process described here is the maintenance procedure for the AC Freon usage in the vehicle fleet for ANL-E. The process has already been modified to recover and recycle the Freon. Past practice was not to recover or recycle the fluid but to fill and recharge the AC units as needed. There are 100 vehicles with AC, each containing approximately 2.5 pounds of Freon or a total of 250 pounds of Freon in the vehicles. Prior to recovery and recycle, approximately 90 pounds per year of Freon were purchased to replenish the Freon which had been emitted from the vehicles during the course of a year. This resulted in the 90 pounds per year of Freon being wasted with no recovery.

Options: Purchase of an AC Freon reclaimer will allow the recovery and reuse of the Freon material. It is estimated that use of the reclaimer will reduce the usage of Freon to 30 pounds per year resulting in a cost saving of approximately $520/year for a capital cost of $ 2500.

Site: Argonne National Laboratory - East

Site Coordinator: Jim Thuot	**Team Leader:** Paul Rumps
Phone: 708-252-4911	**Phone:** 708-252- 5166
Fax: 708-252-9642	**Fax:** 708-252-9642
Email: jthuot@gmtpgate.anl.gov	**Email:**

Title: Oil Filter Canister Crushing & Metal Recycle for Vehicle Maintenance **Major Waste Type:** Hazardous Waste

PPOA ID Code: ANL-VM3 **Specific Waste Type:** Oil

Date: 02-aug-1994 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Disposal

Description: Prior to the closure of the landfill, the oil filter cartridges were disposed of in the landfill without crushing. This method of disposal required inordinate amounts of space and depended on the slow deterioration of the steel cartridges in the environment. After the landfill was closed, the cartridges were disposed of through XL by filling a dumpster and removing periodically for metals reclamation. It is estimated that 90-95% of the metal is recovered and recycled. Vehicle Maintenance (VM) then purchased a QP-100 Oil Filter and Paint Can Crusher from Gray Automotive Products of St. Joseph, MO for $2500 and began draining the cartridges overnight, then crushing the canisters to approximately 15% of the original volume, reducing the number of pick-ups required for disposal.

Options: After the closure of the landfill, the only means of disposal left open to Vehicle Maintenance was to place the oil filter cartridges in the regular trash pick-up. The number and weight of the cartridges was not changed but the frequency of dumpster fill-ups and therefore the pick-ups was reduced by the smaller volume of the crushed cartridges for disposal.

Site: Argonne National Laboratory - East	
Site Coordinator: Jim Thuot	**Team Leader:** Paul Rumps
Phone: 708-252-4911	**Phone:** 708-252-5166
Fax: 708-252-9642	**Fax:** 708-252-9642
Email: jthuot@gmtpgate.anl.gov	**Email:**

Title: Vehicle Maintenance Garage **Major Waste Type:** Hazardous Waste

PPOA ID Code: ANL-VMB46AF002 **Specific Waste Type:** Antifreeze

Date: 18-apr-1994 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Vehicle

Description: The process described here is the maintenance procedure for the Anti- Freeze (AF) usage in the vehicle fleet for ANL-E. The process has already been modified to recover and recycle the Glycol based anti-freeze. Past practice was not to recover or recycle the fluid but to drain and refill the vehicle radiators as required. There are approximately 250 vehicles in the fleet, each containing approximately 6 gallons of anti-freeze. This amounts to 1500 gallons (14236 pounds) of anti-freeze on site in the vehicles at all times. Prior to recovery and recycle, approximately 660 gallons (6264 pounds) were purchased annually to replenish the fluid, most of which evaporates from the radiators in normal vehicle operation. Cost of the anti-freeze has been $240 per drum from vendors. Approximately 80 gallons per year of drained fluid are disposed of through Safety Kleen at a cost of $6.70/gal ($0.71/pound).

Options: Equipment is readily available to filter and clean the anti-freeze so that it can be reclaimed and reused in the vehicles. A small unit has been purchased from the XTend company to clean and recycle the anti-freeze thereby reducing the amount to be disposed of with Safety Kleen. This results in an annual savings of approximately $534.

Site: Argonne National Laboratory - East

Site Coordinator: Jim Thuot	**Team Leader:** Paul Rumps
Phone: 708-252-4911	**Phone:** x708-252-5166
Fax: 708-252-9642	**Fax:** 708-252-9642
Email: jthuot@gmtpgate.anl.gov	**Email:**

Title: SILVER-CONTAMINATED PHOTOGRAPHIC WASTE **Major Waste Type:** Hazardous Waste

PPOA ID Code: BNL-RM3320.93 **Specific Waste Type:** Metal, Precious

Date: 01-jan-1994 **Major Activity Type:** Service **Specific Activity Type:** Photographic Services

Description: IT Corporation in conjunction with Brookhaven National Laboratory (BNL) performed and completed the Silver-Contaminated Photographic Waste Process Waste Assessment (PWA) from October 1993 through January 1994. The scope of this activity was as follows: o To assess BNL's photographic operations and determine the optimum waste minimization option(s) for BNL's scenario o To perform the PWA and compile the report in a format that facilitates its use by other U.S. Department of Energy (DOE) facilities.BNL has fourteen photographic operations, located in Buildings 118 and 197B, which generate silver-contaminated photographic wastes. The PWA team evaluated these operations, which are divided between two organizations: o Graphic Arts and Computer Graphics (Graphics) o Technical Photography.During the assessment phase in October 1993, BNL anticipated generating and managing the following wastes in CY-93: o About 300 pounds of solid waste contaminated with silver o Approximately 3,800 gallons of containerized liquid waste contaminated with silver o About 1,356,000 gallons of potentially silver- contaminated rinse waters from its photoprocessing operations.Generating and managing this waste costs over $42,000 per year.During this PWA, twenty-two potential waste minimization options were identified. After an initial screening, certain options were not considered further. Others were simply documented because they were already implemented. The remaining nine options were ranked against a thirteen-element crit eria that was tailored specifically for BNL. This ranking resulted in the elimination of six additional options. The remaining options were reviewed with BNL representatives to verify that these options would be assessed in detail. The implementation of these three recommended options would impact BNL as follows: o Reduce and practically eliminate all of the 3,800 gallons per year plus 300 pounds per year of the Resource Conservation and Recovery Act (RCRA) hazardous waste generated within BNL's photographic operations o Cost about $19,000 to $21,000 for procurement of capital equipment o Potentially avoid spending about $15,000 to $20,000 per year related to managing BNL's silver-contaminated photographic wastes.

Options: The three options recommended for implementation are as follows: o Evaporation of photochemicals o Silver recovery from off-spec paper and excess film o Waste characterization, segregation, and reclassification.An air blower-based evaporation system is recommended for evaporating all of BNL's photographic wastes. This system uses an air blower to move a large volume of air across large liquid surfaces created by spraying liquid waste through spray nozzles in the system. This system requires less electrical energy than other systems and only generates silver-laden sludge that is sent off site for silver recovery. This option would manage the 3,800 gallons per year of containerized photographic wastes that are generated at BNL and classified as hazardous waste. The resulting sludge that would be sent off site for silver recovery would have a maximum volume of about 400 gallons per year. The PWA team also recommends that BNL send their waste photographic film and paper off site for silver recovery. This would impact about 300 pounds of solid hazardous waste per year.When choosing a recovery company to manage the sludge and/or waste film and paper, BNL should consider the following factors: o Some recovery companies require that the silver- contaminated wastes be segregated from the remaining wastes and evaporated separately. This segregation may decrease off-site costs but could increase on-site ones. o The facility should meet all compliance requirements and preferably should not generate any hazardous waste from the recovery process used . o The pricing for recovery should be evaluated using the same price per unit basis.The PWA team recommends waste characterization, segregation, and reclassification activities for the photographic containerized waste and wash waters. This activity would include thefollowing: o Collecting samples and analyzing the contaminants, specifically silver and chromium, in the containerized wastes and wash waters generated at BNL. o Segregating metal-bearing chemical wastes such as the chromium-based chemicals from the Houston Fearless system and the silver-contaminated wastes (if the evaporator is not implemented in the near future) from other photographic waste.This will allow BNL to determine if specific chemical wastes can be reclassified as nonhazardous wastes. Waste developer, for instance, accounts for over 40 percent of the photoprocessing waste generated. If this activity were implemented, some piping modifications could be needed.Finally, though photo imaging and digitization processing does not currently produce the required product resolution for several of BNL's applications, BNL should continue to monitor and reassess this potential option in the future because it is the only true source reduction option available for BNL's photoprocessing operations. In the future, BNL should reassess the possible discharge of effluent from electrolytic or metallic replacement options to the sanitary sewer. The sanitary sewage treatment facility is being upgraded and once it is fully

operational, BNL may be able to treat these discharges.

Site: Brookhaven National Laboratory	
Site Coordinator: Glen Todzia	**Team Leader:**
Phone: 516-282-7488	**Phone:**
Fax: 516-282-3223	**Fax:**
Email:	**Email:**

Title: Methanol Use in the Biodenitrification Towers (BDN) **Major Waste Type:** Low Level Waste

PPOA ID Code: FEMP-PPOA-94-001 **Specific Waste Type:** Solvents

Date: 24-jun-1994 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Treatment

Description: The purpose of this assessment is to evaluate methanol usage at the FEMP. The PPOA was performed on the use of methanol in the treatment of nitrate-nitrite containing waste waters through the Biodenitrification (BDN) Towers of the Waste Water Treatment System. Methanol is used as a carbon food source for bacteria in the removal of nitrogen-containing process waste waters. It is injected as needed into a pipeline carrying waste water for the Bio Surge Lagoon (BSL) to the BDN Towers. The methanol is used as a food source by denitrifying non-faculative Pseudonomas bacteria, for nitrate removal. Nitrate-Nitrite and methanol concentrations are monitored by lab analyzed samples taken at the BSL, prior to methanol injection, at the inflow to the BDN, at the discharge from the BDN, and at the discharge from the BDN-ETS (effluent treatment system). The waste water is discharged into the Great Miami River via manhole 175. When nitrate-nitrite levels are too high for NPDES discharge, the waste waster is internally recycled and re-treated. When uranium levels are above 15 ppm, it is externally recycled back to the BSL and re-treated. Nearly 92% of the methanol is consumed. It is suggested that the reduction of 51 mg/L to 32 mg/L is non-productive and caused by bacteria located in the inflow pipe. Investigations found that an average loss of 30% is due to bacteria in the inflow pipe.Equipment: Methanol Tank - cap. 54,000 gal; Flow Rate Meters -Black Iron Pipeline L=50 ft/D=3/4=1in.; Black iron pipeline L=100 ft/D=6in.

Options: 1.) Calibrating feed rate and tank instrumentation on a regular basis.2.) Stopping the flow of the methanol feed completely until the start-up of the UNH project and then using only what is necessary to complete the project.3.) Shutting down and removing the BDN when the UNH project is completed and treating waste water in the new Advanced Waste water Treatment System (AWWTS).4.) Installing an above ground methanol pipeline for leakage monitoring.5.) Installing pressure checking devices in the inflow pipe and the methanol pipeline for leakage monitoring.6.) Finding a vendor to recycle the UNH for its uranium content allowing the BDN to close at an earlier date.

Site: Fernald Environmental Management Project (FERMCO)	
Site Coordinator: Matt Frost	**Team Leader:** Jane L. Phend
Phone: 513-648-5685	**Phone:** 513-738-6358
Fax: 513-648-5701	**Fax:** 513-738-6958
Email: matt_frost@fernald.gov	**Email:**

Title: Methanol Use in the FEMP Laboratory **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: FEMP-PPOA-94-002 **Specific Waste Type:** Solvents

Date: 29-jul-1994 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Chemical

Description: This assessment evaluates the methanol usage in the laboratories at the FEMP and the management of the waste generated. The team found that in 1993 approximately 80% of the methanol was used for uranium determination (colorimetric

determination of uranium using an autoanalyzer); 10% was used for final rinsing/drying the glassware and filters; and the remaining 10% was used for other laboratory activities such as s sampling and analysis of the methanol used in the treatment of FEMP waste waters. The two waste streams produced by methanol use in the laboratory were composed of mixed waste of methanol/cyclohexane and small quantities of liquid methanol waste.

Options: Option 1 - Substitute ethanol for methanol in applicable analytical procedures, thereby reducing by 80% the methanol used in the laboratory.Option 2 - Substitute 2-propanol for methanol in the final rinsing/drying of glassware and filters thereby reducing by 10% the methanol used in the laboratory.Option 3 - Following adoption of 2-propoanol as the rinsing/drying agent, dispose of the 2-propanol by flushing into a standard drain for treatment through the Waste Water Treatment System.Option 4 - Dispose of approved liquid chemical wastes generated in the FEMP laboratories by flushing into a standard drain for treatment through the Waste Water Treatment System.

Site: Fernald Environmental Management Project (FERMCO)	
Site Coordinator: Matt Frost	**Team Leader:** Jane L. Phend
Phone: 513-648-5685	**Phone:** 513-738-6358
Fax: 513-648-5701	**Fax:** 513-738-6958
Email: matt_frost@fernald.gov	**Email:**

Title: Garage Processes **Major Waste Type:** Low Level Waste

PPOA ID Code: FEMP-PPOA-94-003 **Specific Waste Type:** Oil

Date: 20-oct-1994 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Vehicle

Description: This assessment evaluates the generation and management of the following wastes resulting from processes being performed in the FEMP garage: used oil and oil filters, oily rags and other absorbent materials, waste vehicle tires, and waste water. The garage mechanics are responsible for the vehicle planned maintenance, corrective maintenance, trouble shooting, and structural repair of mobile equipment and stationary internal combustion engines.water, mud, grease and/or other fluids may accumulate on the garage floor so, once per shift, a mechanic will clean the floor using adsorbent pads and/or a vacuum scrubber.The garage has already replaced 1,1,1-tricholorethane with a non-hazardous degreasing agent. If radiologically contaminated, the new compound can be managed as a low-level waste instead of a mixed waste. In another case, the detergents used to clean vehicles and scrub the floor s have been replaced with non-phosphate products that are low foaming and non-hazardous.

Options: Option 1: Manage oily rags and other adsorbent materials as low-level waste instead of mixed waste. This will save approximately $8000/year in burial costs. Evaluate the use of other adsorbent materials.Option 2: Minimize the waste generated from the use of disposable adsorbent pads and rags and purchasing reusable washable hand towels and rags. Purchase smaller adsorbent pads or cut the larger pads into smaller pieces and use only when necessary for incidental spills.Option 3: Manage tires as sanitary waste instead of low-level radioactive waste and initiate a recycling contract or landfill disposal contract. This will save FEMP approximately $19,300 in burial costs each year.Option 4: Drain the garage waste water through the Sewage Treatment Plant instead of holding in a portable water dumpster. This will reduce worker health and safety risks; reduce the amount of sampling and analysis, labor and time to manage the waste; and lower waste management costs. Decontaminate, clean, and unplug the sumps and floor drains leading to the sanitary sewer.Option 5: Evaluate the recycling of used oils and oil filters. Procedures used to do oil changes have been revised to include surveys that verify the used oils and oil filters meet the surface contamination limits for the unrestricted release of materials from the FEMP.Option 6: Wash Fire and Safety vehicles only when necessary.

Site: Fernald Environmental Management Project (FERMCO)	
Site Coordinator: Matt Frost	**Team Leader:** Jane L. Phend
Phone: 513-648-5685	**Phone:** 513-738-6358
Fax: 513-648-5701	**Fax:** 513-738-6958

Email: matt_frost@fernald.gov	**Email:**

Title: Removal Action 19 - Plant 7 Dismantling **Major Waste Type:** Low Level Waste

PPOA ID Code: FEMP-PPOA-94-004 **Specific Waste Type:** Concrete

Date: 01-oct-1994 **Major Activity Type:** Environmental Restoration **Specific Activity Type:** Decommissioning

Description: This assessment evaluates the generation and management of the following wastes resulting from the Plant 7 Dismantling Project. Plant 7 involved a 7-story, contaminated structure which would generate nearly 5,700 cubic yards of low-level waste. The FEMP, formerly the Feed Materials Production Center, is a DOE site that produced high-quality uranium metals for military defense. Various chemical and metallurgical processes at the facility have been used to manufacture uranium products for the defense complex. Plant 7 contained processes involved in the reduction of uranium hexafluoride to uranium tetrafluoride. The Plant 7 operated for approximately 2 years. In 1967 the reduction process was declared obsolete, and the majority of the equipment and process piping were dismantled and removed. Plant 7 was finally used to store drums of intermediate product. The removal action included all above ground surface structures and equipment down to the existing concrete slab at grade level. It included the following: structural steel and equipment, associated piping, asbestos-containing materials, HVAC ductwork, electrical equipment and substations, and above grade-level concrete. The dismantling activities occurred in three phases: phase 1 - the removal of existing inventories/materials and the general cleaning of the construction zone; phase 2 - removal of loose contamination, bird debris, relocation of stored materials, application of waterproof sealant, and high-pressure/low-volume water wash and the application of a lock-down agent; and phase 3 - removal of the interior ductwork, piping, conduit, equipment, interior transite and batting insulation, application of the lock-down, and dismantling of the exterior transite and structural steel down to grade level concrete slab.

Options: The target for incorporating waste minimization was in the project planning phase and in the actual operations phase. A Òproject teamÓ approach was utilized to ensure waste management and waste minimization was optimized during each task. The single, waste minimization point of contact catalyzed the level of success in waste avoidance. Of the primary waste generated, 60% was recycled and 10% was reused. Of the secondary waste generated, 30% was reused. Very little secondary waste was generated, only 7% of the total waste generated. This was due to careful project planning and evaluation during project implementation. Lessons learned include the future evaluation of recycling light gauge metal and glass in the next decommissioning project and the use of size reduction and compaction for increased bulking densities of containers. The areas with the greatest potential of having RCRA hazardous waste were identified based on historical use and process knowledge. This eliminated the need for extensive sampling and analysis. The inclusion of waste minimization techniques and procedures in the sub-contractor agreements and the pre-project training of sub-contractors on segregation techniques allowed assurances for efficient work processes during implementation. Training was also provided to project and design engineers, as well as waste management personnel on incorporating waste minimization principles and practices into remediation projects.

Site: Fernald Environmental Management Project (FERMCO)	
Site Coordinator: Matt Frost	**Team Leader:** Lisa A. Allmon
Phone: 513-648-5685	**Phone:** 513-738-6783
Fax: 513-648-5701	**Fax:** 513-738-6958
Email: matt_frost@fernald.gov	**Email:**

Title: Carpenter Shop **Major Waste Type:** Low Level Waste

PPOA ID Code: FEMP-PPOA-95-001 **Specific Waste Type:** Wood

Date: 01-mar-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Construction

Description: This assessment evaluated the generation and management of the following wastes resulting from processes being performed in the Carpenter Shop: excess wood and miscellaneous trash. The Carpenter Shop is located in the controlled area in Building 12. FEMP carpenters are responsible for supporting job-specific Remedial Support Operation tasks that require the

fabrication of wood, sheet metal siding, or plexiglass. They perform repair work on existing structures and construct scaffolding, shelving, and bracing. The following tools and equipment are used to fabricate the requested items and perform the necessary work: core drills, tile heaters, table and portable circular saws, joiners, belt and disk sanders, and various types of ladders. Waste generation is irregular and consists primarily of scrap wood, small amounts of scrap metal, contaminated trash, and clean trash.The use of metal tube scaffolding and aluminum walk boards in contamination areas has significantly reduced the volume of waste generated from activities in controlled areas that would normally require the use of wooden materials, because metal materials are decontaminated and reused. In locations where metal cannot be used, timber is used for scaffolding and planks are used for flooring. This wood is radiologically surveyed and if the surface contamination meets the limits of RC-DPT-019, it will be released from the contamination area and reused

Options: The use of metal tube scaffolding and aluminum walk boards in contamination areas has significantly reduced the volume of waste generated because metal materials are decontaminated and reused easier than wood. In locations where metal cannot be used, 4Ó x 4Ó timber is used for scaffolding and 2Ó x 10Ó planks are used for flooring. This wood is radiologically surveyed and if the surface contamination meets the limits of RC-DPT-019, it will be released from the contamination area and reused when possible. Approximately 10% of the materials fabricated in the carpenter shop become smaller pieces of scrap. 100% of the scrap materials are stored and reused on future projects or collected and transferred to LLW Packaging Support for use as packing material and shoring. In addition, a recommendation is made to reuse the excess plywood to fabricate wooden bins to organize and store clean anti-Cs.

Site: Fernald Environmental Management Project (FERMCO)	
Site Coordinator: Matt Frost	**Team Leader:** Jane L. Phend
Phone: 513-648-5685	**Phone:** 513-738-6358
Fax: 513-648-5701	**Fax:** 513-738-6958
Email: matt_frost@fernald.gov	**Email:**

Title: Paint Shop **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: FEMP-PPOA-95-002 **Specific Waste Type:** Solvents

Date: 01-mar-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Painting

Description: This assessment evaluated the generation and management of the following wastes resulting from processes being performed in the FEMP Paint Shop: paints and solvents, solvent contaminated rags, and empty paint cans. The painters are responsible for the replacement and glazing of windows, stenciling and making of signs, and maintenance painting and coating of all land lord surfaces (e.g. building walls and floors, piping, equipment, and machinery.) Latex paint is used on approximately 95% of the surfaces. The remaining 5% consists of oil-based paint which is used primarily on metal surfaces. Solvents, such as toluene, xylene, methyl isobutyl ketone, butanol, petroleum distillate, glycol ether, and butyl acetate are used to prepare specialized paints or coatings, thin paint, prep certain surfaces, and/or clean brushes (oil-based paint only.) Currently, the painters recycle the mineral spirits used to wash brushes and/or stencils. This is done by collecting it in a 5-gallon can and density separating the reusable product from the sludge.

Options: Option 1. Consolidate paint waste streams and manage under one Material Evaluation Form (MEF). Using MEF 1411 will allow for better data management of this waste stream and reduce errors due to poor record keeping. This will allow the FEMP painters and the Paint Shop Satellite Accumulation Area (SAA) to be used for consolidating compatible waste materials that have been identified for disposal.Option 2. Create a centralized paint SAA in the Paint Shop. A centralized paint waste stream SAA could provide the opportunity to better manage left over paint materials and provide a reuse outlet.Option 3. Identify less toxic product substitutions for paints and related materials. The Paint Shop uses products which contain toxic components that can cause worker health and safety risks. Rags saturated with these materials are managed as mixed waste in a SAA under MEF 396. The possibility of chemical substitutions such as mineral spirits, turpentine, or ethyl alcohol, could allow for the elimination of the mixed waste stream. This would also reduce the workers exposure to harmful chemicals.Option 4. Change waste management procedures for empty paint cans. A recommendation is made to remove the unused portion of paint from the paint cans and allow them to dry in the paint booth. According to RCRA regulations 40 CFR 261.7(b), the cans would be considered empty, allowing them to be placed in plastic bags and disposed in the contaminated dumpster. Waste from the contamination dumpster is volume reduced by a trash baler with a compaction ratio of 3:1. This will result in a 66% reduction in waste disposal costs.

Site: Fernald Environmental Management Project (FERMCO)	
Site Coordinator: Matt Frost	**Team Leader:** Jane L. Phend
Phone: 513-648-5685	**Phone:** 513-738-6358
Fax: 513-648-5701	**Fax:** 513-738-6958
Email: matt_frost@fernald.gov	**Email:**

Title: Expired Chemicals **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: HFD-222S-001 **Specific Waste Type:** Lab Packs

Date: 10-aug-1994 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Radiological

Description: Reagents, regardless of the quantity brought into the facility, may expire before being used up. During the process of reviewing and/or modifying a procedure, specific reagents may be exchanged for less hazardous ones. In some cases, a procedure is modified to use a smaller sample size, hence less reagents in an effort to minimize waste generation. Also some procedures are developed but never implemented, while others are superseded or inactivated. Unusable or expired solid reagents that can not be proven non radioactive need to be disposed of as mixed waste.Currently the laboratory has a program in which one individual orders all of the solid chemicals which are used in the analytical procedures in the 222-S Laboratory, Weather Station and WSCF Laboratories. This individual checks the current stock for the requested chemical before purchasing additional quantities. The WHC Chemical Exchange Program has been used a couple of times to save on cost of chemicals. However, for the most part, the Chemical Exchange Program deals with quantities too large to be purchased in these labs.

Options: Option 1 - Disposal through chemical exchange programCurrent Practice: Solid chemicals that expire or are no longer being used in the lab are packaged and disposed as mixed waste.Recommended Action: Use the chemical exchange program to dispose of chemicals. If the chemical has not expired, other labs can utilize it.Option 2 - Store Chemicals outside of SCACurrent Practice: Solid chemicals are stored in room 1-P-1 which is in the surface contamination are (SCA) of the lab. Since they are in the radiation zone, the chemicals must be disposed of as mixed waste.Recommended Action: Store the chemicals in storage building. This building will become available, December 1994. If the chemicals expire while in the storage shed they can be disposed of as hazardous waste.Option 3 - Train the employees in Pollution PreventionCurrent Practice: Currently there is no specific pollution prevention employee awareness/incentives/training program at either facility of the site level. Employees receive only a brief introduction to pollution prevention during Hanford General Employee Training (HGET).Recommended Action: Implement a pollution prevention awareness/incentives/training program for Analytical Services facilities that will model the national award winning program at the DOE site at Oak Ridge, TN. The program may also be conducted on a site-wide campaign.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Robert Nielson
Phone: 509-376-9773	**Phone:** 509-373-2458
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Off-Site Sample Returns **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: HFD-222S-002 **Specific Waste Type:** Lab Packs

Date: 16-aug-1994 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Radiological

Description: The 222-S Laboratory currently receives unused sample portions from off-site laboratories for disposal. Contracts exist with these laboratories stating that the samples will be returned to Westinghouse Hanford. It is believed that this was

written in the contracts in response to DOE Order 5820.2A which deals with radioactive waste management. The order says that DOE low-level waste shall be disposed of on the site that it is generated, including waste that contains non-radioactive hazardous waste components (mixed waste). This order may or may not apply to the waste in question. It is believed that this order is being revised to allow exemptions for analytical laboratory work.Coolers containing returned samples are brought into the radiation zone, unpacked and the liquid dumped down the decon hood in room 2B which drains to Tank 101. When the tank is near capacity the waste is transferred to a treatment and storage tank where the pH is adjusted. It is then transported to tank farms via a tanker truck. AT the beginning of this P2OA, it was estimated that the volume contributed to the 219-S waste stream from this activity was 80-90% if the total or about 6360 gallons per year. Low-level waste consisting of glass, poly bottles, bubble wrap, tape, and vermiculite is also produced contributing about 26 cubic meters per year to this waste stream.

Options: Option 1 - Bulk samples outside radiation zoneCurrent Practice: The coolers and/or drums containing returned samples are unpacked in the radiation zone. The packing materials and sample containers are disposed of as low level waste.Recommended Action: Bulk the samples together outside of the radiation zone. The container used for bulking could be reused. The packing material and sample containers would be disposed of as sanitary waste.Option 2 - Send to 616 FacilityCurrent Practice: The unused sample portions and packaging are currently brought into the lab and disposed of as mixed waste and low level waste respectively.Recommended Action: Bulk samples together and sample for total alpha and beta. If it is below the release limit send to the 616 Nonradioactive Dangerous Waste Storage Facility for disposal as hazardous. Shipping materials would become sanitary waste.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Cindy Jurgensmeier
Phone: 509-376-9773	**Phone:** 509-373-7409
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Analytical Procedures **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: HFD-222S-003 **Specific Waste Type:** Metal Debri

Date: 20-sep-1994 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Radiological

Description: One of the main purposes of the laboratory is sample analysis. Many different procedures are used to perform all of the required analyses. Due to the radioactive nature of many of the samples, disposable materials/containers are used for sample preparation and analysis. These include such things as plastic vials, pipette tips, and beakers. In some cases, glass beakers and flasks are also disposed of after sample preparation. The procedures require that the work areas be thoroughly clean, not only for radiation concerns, but to reduce the risk of contamination of non-radioactive analytes when performing trace metal analyses. Cleaning requires the use of various paper products such as: paper towels, kim-wipesTM, kotexTM and maslin cloth. In addition, all work that is performed in a hood requires the use of a second pair of gloves. To reduce the risk of smearable contamination outside of the hood the outer pair of gloves may be removed each time the individual is finished working in the hood. This outer pair of gloves must be disposed of as mixed waste if they have become contaminated. Any material that is radioactive or has come into contact with a listed waste is considered mixed waste, and must be disposed of as such.

Options: Option 1 - Ultrasonic Radioactive DecontaminationCurrent Practice: Items to be radiologically decontaminated for reuse are washed, in a solution of detergent and water. If contamination is found on an alcohol smear sample after washing, the item is rinsed with nitric acid and water until alcohol smears show no surface contamination.Recommended Action: Decontaminate items using an ultra-sonic cleaning devise and a chemical decontamination solution that can be reused until it becomes saturated. This chemical is known as E51-600. The item is alcohol smeared after treatment to verify the removal of surface contamination. The spent solution is concentrated, solidified, and disposed of.Option 2 - Change Management Policy for Solid Mixed Hood WasteCurrent Practice: All waste that is compactible that originates from laboratory hoods is currently being managed as mixed waste due to the Òderived fromÓ rule in RCRA.Recommended Action: Several items are suggested in order of complexity:1. Separate hoods that generate listed waste from those that donÕt. Manage these wastes separately.2. Enhance technical training and allow waste not contaminated with chemicals to be disposed of as low level waste.3. Prepare and execute plan to use Òcontained inÓ and ÒdebrisÓ rule to exit regulations for this waste.4. Prepare fact sheets for all procedures.Option 3 - Change Waste Disposal MethodCurrent Practice: When the waste containers in the hoods become full, they are double

bagged for disposal. The waste containers have a bag on the inside, while in the hood and then the container is placed in two additional bags.Recommended Action: Use only one plastic bag to place hood waste containers in for disposal.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Rob Nielson
Phone: 509-376-9773	**Phone:** 509-373-2458
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Hot Cell Activities **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: HFD-222S-004 **Specific Waste Type:** Lead

Date: 21-sep-1994 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Radiological

Description: Some work in the laboratory requires that samples be handled in a hot cell. Due to the risk of radioactive contamination in the hot cell environment, all waste coming out of the hot cell is considered mixed waste. This may include any of the following materials: paper, plastic, glass, and metal (tools).

Options: Option 1 - Ultrasonic Radioactive DecontaminationCurrent Practice: Items to be radiologically decontaminated for reuse are washed, in a solution of detergent and water. If contamination is found on an alcohol smear sample after washing, the item is rinsed with nitric acid and water until alcohol smears show no surface contamination.Recommended Action: Decontaminate items using an ultra-sonic cleaning devise and a chemical decontamination solution that can be reused until it becomes saturated. This chemical is known as ESI-600. The item is alcohol smeared after treatment to verify the removal of surface contamination. The spent solution is concentrated, solidified, and disposed of.Option 2 - Change Management Policy for Solid Mixed Hood WasteCurrent Practice: All waste that is compactible that originates from laboratory hoods is currently being managed as mixed waste due to the Òderived fromÓ rule in RCRA.Recommended Action: Several items are suggested in order of complexity:1. Separate hoods that generate listed waste from those that donÕt. Manage these wastes separately.2. Enhance technical training and allow waste not contaminated with chemicals to be disposed of as low level waste.3. Prepare and execute plan to use Òcontained inÓ and ÒdebrisÓ rule to exit regulations for this waste.4. Prepare fact sheets for all procedures.Option 3 - Change Waste Disposal MethodCurrent Practice: When the waste containers in the hoods become full, they are double bagged for disposal. The waste containers have a bag on the inside, while in the hood and then the container is placed in two additional bags.Recommended Action: Use only one plastic bag to place hood waste containers in for disposal.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Rob Nielson
Phone: 509-376-9773	**Phone:** 509-373-2458
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Liquid Hood Waste **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: HFD-222S-005 **Specific Waste Type:** Chemicals

Date: 28-nov-1994 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Radiological

Description: Currently samples are disposed of down the laboratory hood drains by different individuals. When the waste containers in the hoods become full, the person who is working in the hood at that time may dispose of the waste. There is no way to track the amount of waste that is going to the tank system. Worksheet 2 of this P2OA can not be completed.

Options: Option 1 - Develop a barcoding systemCurrent Practice: There is no method of tracking the amount of waste that liquid hood waste contributes to the tank system. When the waste containers become full they are disposed of by different groups who do not record how much they are disposing of.Recommended Action: Develop a barcoding system. All waste containers in the laboratory will be barcoded. When the material in the container needs to be disposed of, the containerÕs barcode will be scanned. This will allow laboratory personnel to know what was in the container and how much.Option 2 - Designate a group to dispose of hood wasteCurrent Practice: There is no method of tracking the amount of waste that liquid hood waste contributes to the tank system. When the waste containers become full they are disposed of by different groups who do not record how much they are disposing of.Recommended Action: Designate a group to dispose of waste when the containers become full or material needs to be disposed of . This one group will be responsible for tracking how much waste is poured into the drains.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Cindy Jurgensmeier
Phone: 509-376-9773	**Phone:** 509-373-7409
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Inductively Coupled Plasma (ICP) **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: HFD-222S-006 **Specific Waste Type:** Wastewater

Date: 01-dec-1994 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Radiological

Description: Two ICPs are used in the laboratory to analyze samples. Atomic spectra are obtained by converting the components of a sample into gaseous atoma by heat treatment. The emission of the gaseous mixture serves for determination of one or more of the elements present in the sample. Water is used to keep the detector cooled and the waste water goes to the tank system as waste.

Options: The water that is used to cool the ICPs is the only waste that goes to the tank system. After reviewing the system with the scientist in charge, it was determined that the 80L of water used can not be reduced.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Cindy Jurgensmeier
Phone: 509-376-9773	**Phone:** 509-373-7409
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Compactible Waste Stream **Major Waste Type:** Low Level Waste

PPOA ID Code: HFD-222S-007 **Specific Waste Type:** Personal Protective Equipment

Date: 06-mar-1995 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Radiological

Description: The solid low level compactible waste stream consists of paper, cloth, soft plastics, and used surgical gloves that have not come in contact with a hazardous substance. It is accumulated in plastic bags in 55 gal drums in the laboratory. Once full, the plastic bags are staged in returnable overpacks and shipped to the 100N compactor for segregation and compaction.

Options: Option 1 - Dispose of gloves and booties as sanitary waste.Current Practice: Before exiting a rad zone, employees survey their gloves and booties for contamination. If there is none, the gloves and booties are disposed of as low level

waste.Recommended Action: If the self survey performed by the employee shows no signs of contamination, dispose of the gloves and booties as sanitary waste.Option 2 - Purchase wipe boardsCurrent Practice: Paper is used to write notes or messages on while in the lab. Then the information written is no longer needed it is thrown away. If the information is needed outside of the lab, the paper must be surveyed out.Recommended Action: Purchase more wipe boards to use in the labs for notes, rather than using paper to be thrown away. Notes can be written on wipe boards and then transferred to a computer to be sent to an office outside the lab.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Johnetta R. Pittman
Phone: 509-376-9773	**Phone:** 509-373-7369
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Analytical Procedures - 222S Laboratory **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: HFD-222S_10 **Specific Waste Type:** Chemicals

Date: 20-sep-1994 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Chemical

Description: One of the main purposes of the laboratory is sample analysis. Many different procedures are used to perform all of the required analyses. Due to the radioactive nature of many of the samples, disposable materials/containers are used for sample preparation and analysis. These include such things as plastic vials, pipet tips, and beakers. In some cases, glass beakers and flasks are also disposed of after sample preparation. The procedures required that the work areas be thoroughly clean not only for radiation concerns, but to reduce the risk of contamination of non-radioactive analytes when performing trace metal analyses. Cleaning requires the use of various paper products such as: paper towels, kim-wipesTM, kotexTM and maslin cloth. In addition, all work that is performed in a hood requires the use of a second pair of gloves. To reduce the risk of smearable contamination outside of the hood, the outer pair of gloves may be removed each time the individual is finished working in the hood. This outer pair of gloves must be disposed of as mixed waste if they have become contaminated. Any material that is radioactive or has come into contact with a listed waste is considered mixed waste, and must be disposed of as such.

Options: Option 1 - Ultrasonic Radioactive DecontaminationCurrent Practice: Items to be radiologically decontaminated for reuse are washed in a solution of detergent and water. If contamination is found on an alcohol smear sample after washing, the item is rinsed with nitric acid and water until alcohol smears show no surface contamination.Recommendation: Decontaminate items using an ultrasonic cleaning devise and a chemical decontamination solution that can be reused until it becomes saturated. This chemical is know as E51-600. The item is alcohol smeared after treatment to verify the removal of surface contamination. The spent solution is concentrated, solidified, and disposed of.Option 2 - Title Change Management Policy for Solid Mixed HoodsCurrent Practice: All waste that is compactible that originates from laboratory hoods is currently being managed as mixed wasteÊdue to the Òderived fromÓ rule in RCRA.Recommendations: 1. Separate hoods that generate listed waste from those that donÕt. Manage these wastes separately. 2. Enhance technical training and allow waste not contaminated with chemicals to be disposed of as low level waste. 3. Prepare and execute plan to use Òcontained inÓ and ÒdebrisÓ rule to exit regulations for this waste. 4. Prepare fact sheets for all procedures.Option 3 - Change Waste Disposal MethodCurrent Practice: When the waste containers in the hoods become full, they are double bagged for disposal. The waste containers have a bag on the inside, while in the hood and then the container is placed in two additional bags.Recommendation: Use only one plastic bag to place hood waste containers in for disposal.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Robert Nielson
Phone: 509-376-9773	**Phone:** 509-373-2458
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Hot Cell Activities - 222S Laboratory **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: HFD-222S_11 **Specific Waste Type:** Chemicals

Date: 21-sep-1994 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Chemical

Description: Some work in the laboratory requires that samples be handled in a hot cell. Due to the risk of radioactive contamination in the hot cell environment, all waste coming out of the hot cell is considered mixed waste. This may include any of the following materials: paper, plastic, glass, and metal (tools).

Options: Option 1 - Ultrasonic Radioactive DecontaminationCurrent Practice: Items to be radiologically decontaminated for reuse are washed in a solution of detergent and water. If contamination is found on an alcohol smear sample after washing, the item is rinsed with nitric acid and water until alcohol smears show no surface contamination.Recommendation: Decontaminate items using an ultrasonic cleaning devise and a chemical decontamination solution that can be reused until it becomes saturated. This chemical is know as E51-600. The item is alcohol smeared after treatment to verify the removal of surface contamination. The spent solution is concentrated, solidified, and disposed of.Option 2 - Title Change Management Policy for Solid Mixed HoodsCurrent Practice: All waste that is compactible that originates from laboratory hoods is currently being managed as mixed wasteÊdue to the Òderived fromÓ rule in RCRA.Recommendations: 1. Separate hoods that generate listed waste from those that donÕt. Manage these wastes separately. 2. Enhance technical training and allow waste not contaminated with chemicals to be disposed of as low level waste. 3. Prepare and execute plan to use Òcontained inÓ and ÒdebrisÓ rule to exit regulations for this waste. 4. Prepare fact sheets for all procedures.Option 3 - Change Waste Disposal MethodCurrent Practice: When the waste containers in the hoods become full, they are double bagged for disposal. The waste containers have a bag on the inside, while in the hood and then the container is placed in two additional bags.Recommendation: Use only one plastic bag to place hood waste containers in for disposal.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Robert Nielson
Phone: 509-376-9773	**Phone:** 509-373-2458
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Liquid Hood Waste - 222S Laboratory **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: HFD-222S_12 **Specific Waste Type:** Chemicals

Date: 28-nov-1994 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Chemical

Description: Currently samples are disposed of down the laboratory hood drains by different individuals. When the waste containers in the hoods become full, the person who is working in the hood at that time may dispose of the waste. There is no way to track the amount of waste that is going to the tank system.

Options: Option 1Current Practice: There is no method of tracking the amount of waste that liquid hood waste contributes to the tank system. When the waste containers become full they are disposed of by different groups, who do not record how much they are disposing of.Recommendation: Develop a barcoding system. All waste containers in the laboratory will be barcoded. When the material in the container needs to be disposed of, the containerÕs barcode will be scanned. This will allow laboratory personnel to know what was in the container and how much.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Cindy Jurgensmeier
Phone: 509-376-9773	**Phone:** 509-373-7409

Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Inductively Coupled Plasma (ICP) - 222S Laboratory **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: HFD-222S_13 **Specific Waste Type:** Chemicals

Date: 01-dec-1994 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Chemical

Description: Two ICPs are used in the laboratory to analyze samples. Atomic spectra are obtained by converting the components of a sample into gaseous atoms by heat treatment. The emission of the gaseous mixture serves for determination of one or more of the elements present in the sample. Water is used to keep the detector cooled and the wastewater goes to the tank system as waste.

Options:

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Cindy Jurgensmeier
Phone: 509-376-9773	**Phone:** 509-373-7409
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Compactible Waste Stream - 222S Laboratory **Major Waste Type:** Low Level Waste

PPOA ID Code: HFD-222S_14 **Specific Waste Type:** Solid Waste

Date: 06-mar-1995 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Chemical

Description: The solid low level compactible waste stream consists of paper, cloth, soft plastics, and used surgical gloves that have not come in contact with a hazardous substance. It is accumulated in plastic bags in 55 gallon drums in the laboratory. Once full, the plastic bags are staged in returnable overpacks and shipped to the 100N compactor for segregation and compaction.

Options: Option 1 - Dispose of gloves and booties as sanitary wasteCurrent Practice: Before exiting a rad zone, employees survey their gloves and booties for contamination. If there is none, the gloves and booties are disposed of as low level waste.Recommendation: If the self survey performed by the employee shows no signs of contamination, dispose of the gloves and booties as sanitary waste.Option 2 - Purchase wipe boardsCurrent Practice: Paper is used to write notes or messages on while in the lab. When the information written is no longer needed it is thrown away. If the information is needed outside of the lab, the paper must be surveyed out.Recommendation: Purchase more wipe boards to use in the labs for notes, rather than using paper to be thrown away. Notes can be written on wipe boards and then transferred to a computer to be sent to an office outside the lab. This will probably not save a significant amount of money or reduce the volume of waste streams by any measurable quantity. However, it should encourage a culture of pollution prevention.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Johnetta Pittman
Phone: 509-376-9773	**Phone:** 509-373-7369
Fax: 509-376-2195	**Fax:**

Email: Donna_S_Merry@rl.gov	**Email:**

Title: Liquid Mixed Waste - 222S Laboratory **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: HFD-222S_7 **Specific Waste Type:** Chemicals

Date: 05-jul-1995 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Radiological

Description: Liquid mixed waste generated at 222-S is either organic or aqueous. Organic liquid mixed waste includes organic phase waste from radiochemical separation processes, discarded samples, and expired reagents. Organic liquid mixed waste is accumulated in bottles in satellite accumulation areas. Once full, the bottles are packaged in labpacked drums and eventually shipped to Central Waste Storage Complex.Aqueous liquid mixed waste includes aqueous phase waste from radiochemical separation processes, discarded samples, expired reagents, and liquid decontamination waste. This waste is transferred to the 219-S Waste Handling Facility tanks.

Options: Option 1 - Recycle Methylene ChlorideCurrent Practice: Methylene chloride is used to extract organic compounds from environmental/tank samples. Currently the used/waste methylene chloride is labpacked and sent to the Central Waste Complex as mixed waste for storage.Recommendation: Recycle the used methylene chloride solvent by distillation.Option 2 - Semi-Micro ExtractionCurrent Practice: The laboratory receives samples for characterization. Various extraction methods are used.Recommendation: Develop more efficient organic sample prep techniques using semi-micro extraction apparatus that will minimize waste by at least 5-fold.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Johnetta Pittman
Phone: 509-376-9773	**Phone:** 509-373-7369
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Expired Chemicals - 222S Laboratory **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: HFD-222S_8 **Specific Waste Type:** Chemicals

Date: 10-aug-1994 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Radiological

Description: Reagents, regardless of the quantity brought into the facility, may expire before being used up. During the process of reviewing and/or modifying a procedure, specific reagents may be exchanged for less hazardous ones. In some cases, a procedure is modified to use a smaller sample size, hence less reagents in an effort to minimize waste generation. Also some procedures are developed but never implemented, while others are superseded or inactivated. Unusable or expired solid reagents that can not be proven non-radioactive need to be disposed of as mixed waste.Currently the laboratory has a program in which one individual orders all of the the solid chemicals which are used in the analytical procedures in the 222-S laboratory, Weather Station and WSCF Laboratories. This individual checks the current stock for the requested chemical before purchasing additional quantities. The WHC Chemical Exchange Program has been used a couple of times to save on cost of chemicals. However, for the most part, the Chemical Exchange Program deals with quantities too large to be purchased in these labs.

Options: Option 1 - Disposal Through Chemical Exchange ProgramCurrent Practice: Solid chemicals that expire or are no longer being used in the lab are packaged and disposed as mixed waste.Recommendation: Use the chemical exchange program to dispose of chemicals. If the chemical has not expired, other labs can utilize it.Option 2 - Non-Rad Storage BuildingCurrent Practice: Solid chemicals are stored in room 1-P-1 which is in the surface contamination area (SCA) of the lab. Since they are in the radiation zone, the chemicals must be disposed of as mixed waste.Recommendation: Store the chemicals in storage building. This building will become available, December 1994. If the chemicals expire while in the storage shed they can be disposed of as hazardous waste.Option 3 - Train employees in Pollution Prevention (P2)Current Practice: Currently there is no specific pollution prevention employee awareness/incentives/training program at either the facility or the site level. Employees receive

only a brief introduction to P2 during Hanford General Employee Training.Recommendation: Implement a P2 Awareness/Incentives/Training program for Analytical Services facilities that will model the national award winning program at the DOE site at Oak Ridge, TN. The program may also be conducted on a site-wide campaign.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Robert Nielson
Phone: 509-376-9773	**Phone:** 509-373-2458
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Off-Site Sample Returns - 219S Liquid Waste **Major Waste Type:** Low Level Waste

PPOA ID Code: HFD-222S_9 **Specific Waste Type:** Chemicals

Date: 16-aug-1994 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Radiological

Description: The 222-S Laboratory currently receives unused sample portions from off-site laboratories for disposal. Contracts exist with these laboratories stating that the samples will be returned to Westinghouse Hanford. It is believed that this was written in the contracts in response to DOE Order 5820.2A which deals with radioactive waste management. The order says that DOE low-level waste shall be disposed of on the site that it is generated, including waste that contains non-radioactive hazardous waste components (mixed Waste). This order may or may not apply to the waste in question. It is believed that this order is being revised to allow exemptions for analytical laboratory work.Coolers containing returned samples are brought into the radiation zone, unpacked and the liquid dumped down the decontamination hood in room 2B which drains to Tank 101. When the tank is near capacity the waste is transferred to a treatment and storage tank where the pH is adjusted. It is then transported to tank farms via a tanker truck. At the beginning of this PPOA, it was estimated that the volume contributed to the 219-S waste stream from this activity was 80-90% if the total or about 6360 gallons per year. Low-level waste contributing about 26 cubic meters per year to this waste stream.

Options: Option 1 - Bulk Samples Outside Radiation ZoneCurrent Practice: The coolers and/or drums containing returned samples are unpacked in the radiation zone. The packing materials and sample containers are disposed of as low level waste.Recommendation: Bulk the samples together outside of the radiation zone. The container used for bulking could be reused. The packing material and sample containers would be disposed of as sanitary waste.Option 2 - Send to 616 FacilityCurrent Practice: The unused sample portions and packaging are currently brought into the lab and disposed of as mixed waste and low level waste respectively.Recommendation: Bulk samples together and sample for total alpha and beta. If it is below the release limit send to the 616 Non-radioactive Dangerous Waste Storage Facility for disposal as hazardous. Shipping materials would become sanitary waste.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Cindy Jurgensmeier
Phone: 509-376-9773	**Phone:** 509-373-7409
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Lubricant Used in Process Equipment **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-300Ef_3 **Specific Waste Type:** Oil

Date: 12-apr-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Equipment

Description: Use of lubricant known as Mobil 600W oil. This product is regulated in the State of Washington as a dangerous waste due to the asphalt content. This oil is used at TEDF. The purpose of this assessment is to find out where this oil is used and to determine if an effective substitute product is available.

Options: Option 1 - Use non-regulated oilCurrent Practice: Use regulated oil in equipment in TEDF. When oil becomes waste, it is regulated as a persistent waste in Washington State due to asphalt content.Recommendation: Identify equivalent product which is not regulated as waste.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Earl Wright
Phone: 509-376-9773	**Phone:** 509-372-0612
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: TEDF Sludge Packaging - 310 TEDF **Major Waste Type:** Low Level Waste

PPOA ID Code: HFD-300Ef_4 **Specific Waste Type:** Sludge

Date: 12-apr-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Disposal

Description: Investigate alternative methods for packaging/disposal of TEDF sludge, using containers with volumes greater than 55-gallon drums.

Options: Option 1 - Use larger self-dumping bins to package sludgeCurrent Practice: Currently use painted-steel 55-gallon drums to package Treated Effluent Disposal Facilities (TEDF) sludge for disposal in the Low Level Burial Grounds. Each drum has a calculated capacity of 0.22 m3, occupies 0.26 m3, and weighs 19 kgs. The TEDF output of sludge is about 700 drums per year. The sludge density is about 740 kg/m3.Recommendation: Purchase and use 2 cubic yard self-dumping bins which can be moved with a forklift. The filter press was designed to allow large collection containers to be used. Selected container should be able to be handled by existing equipment and must reduce the amount of labor involved with packaging and disposal.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Lisa Berneski
Phone: 509-376-9773	**Phone:** 509-376-4427
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Eliminate Liquid Discharges to Environment - 300 Effluent **Major Waste Type:** Sanitary Waste

PPOA ID Code: HFD-300Ef_5 **Specific Waste Type:** Wastewater

Date: 20-sep-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Utilities

Description: Steam condensate from the 340 Waste Handling Facility.

Options: Option 1 - Replace HVAC componentsCurrent Practice: Steam heat is currently utilized at the 340 Waste Handling Facility (340 Facility). The steam condensate generated from this practice is approximately 12,000 cubic meters per year (3.1 million gallons) which is discharged to the sanitary sewer, a French drain, and the ground. This release of industrial wastewater to the sanitary sewer and the environment has environmental as well as potential legal implications. In addition, daily operations in the vicinity of aging steam lines with clogging steam traps and failing insulation is a distinct safety issue. Continued use of

this steam system will require extensive maintenance and/or upgrades.Recommendation: Procure and install replacement heating, ventilation, and air conditioning (HVAC) components to replace the units utilizing steam. This project will reduce the 340 Facility environmental discharge by 12,000 cubic meters per year. The abandoned steam lines will be removed, disposed of, and the 340 Facility steam will be capped at the supply point.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Heather Knotek
Phone: 509-376-9773	**Phone:** 509-373-7528
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Generation of Oil-Contaminated Condensate - 300 Effluent **Major Waste Type:** Sanitary Waste

PPOA ID Code: HFD-300Ef_6 **Specific Waste Type:** Solid Waste

Date: 20-sep-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Equipment

Description: The compressed-air delivery system at Treated Effluent Disposal Facilities (TEDF) generates condensate that contains trace amounts of dissolved oil. This waste water cannot be treated in the TEDF treatment drain so it must be absorbed and disposed as a solid sanitary waste. Mechanical means of separating the oil/water mixture are equally as expensive but do not reduce the other solid waste streams associated with the operations and maintenance of oil-lubricated compressors.

Options: Option 1 - Purchase small oil-free compressorsCurrent Practice: The main compressors at TEDF are used for supplying compressed air to various plant loads. The compressors consume oil due to their design (rotary screw). The compressor capacity was based on maximum load expected. The maximum load occurs once every two years and lasts for a duration of approximately 1 hours. During the two years, the compressors operate at a small fraction of their design capacity. This leads to several waste streams that would be significantly reduced by using other compressed air sources.Recommendation: Purchase a small capacity oil-free air compressor pack (dual air compressors). The compressors contain absolutely NO oil. All bearings are sealed and the pistons use teflon piston rings, providing self-lubrication. This will completely eliminate all oily waste from air compressors. The new air compressors have an extremely low maintenance schedule with each period consisting of only a few hours. Due to the extraordinarily low air load at TEDF 95 scfm), the new air compressors are expected to require minor maintenance about once per year. This contrasts with the current maintenance schedule on once every two weeks for the present air compressors. It should be noted that the old compressors would not be removed since their large capacity will be needed every two years. The operating plan will be to run the new compressors and rely on the old compressors to supplement the load on an infrequent basis and reduce the associated maintenance accordingly.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Dave Schermerhorn
Phone: 509-376-9773	**Phone:** 509-373-7525
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Demonstration Project for Excavation - 100BC1 Excavation **Major Waste Type:** Sanitary Waste

PPOA ID Code: HFD-BHI_4 **Specific Waste Type:** Soil

Date: 29-jun-1995 **Major Activity Type:** Environmental Restoration **Specific Activity Type:** Remediation

Description: Removal of a French drain (116-B-4) and crib (116-B-5) to learn about construction detail. Knowledge of

construction detail will be used to improve remedial designs for other similar facilities.

Options:

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:**
Phone: 509-376-9773	**Phone:**
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Pump and Treat - 200-UPI Pump and Treat GW **Major Waste Type:** High Level Waste

PPOA ID Code: HFD-BHI_5 **Specific Waste Type:** Resins

Date: 27-jul-1995 **Major Activity Type:** Environmental Restoration **Specific Activity Type:** Remediation

Description: Groundwater is extracted and passed through ion exchange columns where Uranium and Technicium are removed. The water is returned to the aquifer. 228 gallons of spent resin are generated from every 700,000 gallons (4-5 weeks) of water treated.

Options: Option 1 - Void Space FillerCurrent Practice: Use clean purchased material for filler.Recommendation: Use spent filler for void filler in burial boxes.Option 2 - Field ScreeningCurrent Practice: Analysis at 222-S Laboratory.Recommendation: Field screening to reduce sampling and lab waste.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Michael Baker
Phone: 509-376-9773	**Phone:** 509-372-9677
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: D&D of N-Basins - BHI-P2 **Major Waste Type:** High Level Waste

PPOA ID Code: HFD-BHI_6 **Specific Waste Type:** Resins

Date: 28-jul-1995 **Major Activity Type:** Environmental Restoration **Specific Activity Type:** Remediation

Description: Remove radioactive/hazardous-contaminated water, sludge, and debris from basin and put in safe shutdown condition awaiting future.

Options:

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Ken Johnson
Phone: 509-376-9773	**Phone:** 509-376-0845
Fax: 509-376-2195	**Fax:**

Email: Donna_S_Merry@rl.gov	**Email:**

Title: Remediate Cooling Water Basins - BHI-P2 **Major Waste Type:** Low Level Waste

PPOA ID Code: HFD-BHI_7 **Specific Waste Type:** Soil

Date: 28-jul-1995 **Major Activity Type:** Environmental Restoration **Specific Activity Type:** Remediation

Description: Operations and handling of soil related to environmental remediation. This information developed from the DQO of 116-C-1, but the decision criteria will be used for multiple tasks.

Options: Start, if less than 15 feet andÊcleanup standards not met, take a lift, if cleanup standards met, and no expectation that contamination below present depth exceeds GW/river protection standards, stop.If less than 15 feet, and cleanup standards not met or there is expectation that contamination with

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Steve Weil
Phone: 509-376-9773	**Phone:** 509-375-4665
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Carpenter Shops **Major Waste Type:** Sanitary Waste

PPOA ID Code: HFD-KHP2OA1.wd **Specific Waste Type:** Wood

Date: 10-mar-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Construction

Description: ICF KH carpenter shops build a variety of structures to support site construction activities. Carpenter shop products include forms, stairs, pallet boxes, burial boxes, greenhouses, and other structures for new construction. These structures are constructed out of a variety of wood materials, including plywood, dimensional lumber, masonite, chipboard, and fire/pressure treated lumber. A byproduct of carpenter shop building activities is the generation of scrap wood. Much of this scrap wood ends up being disposed to the Hanford Central Landfill.

Options: Option 1 - Wood ChipperCurrent Practice: ICF KH carpenter shop activities generated an estimated 1,651,000 kg of wood waste in 1994. The current practice is to collect scrap wood in bins outside the carpenter shops until the wood either becomes unusable or the bins get too full. At this point, wood scraps are thrown into dump trucks with the rest of the sanitary waste and driven to the Hanford Central Landfill for disposal. Many of these wood scraps are sizable pieces of lumber, including 2 to 4 -ft sections of dimensional lumber and 1/4 to 1/3 sheets of plywood. In addition to wood scraps, the carpenter shops generate wood waste in the form of sawdust, pallets, and bad/defective lumber material.Recommended Action: WHC has contracted with Boise Cascade to chip Hanford wood waste and transport it offsite for use in the manufacture of corrugated cardboard and as boiler feed stock (i.e., hog fuel). It is recommended that ICF KH carpenter shops segregate their clean wood waste from treated wood waste. To facilitate this segregation, a lugger would be provided to each carpenter shop for the collection of clean wood waste. Full luggers would then be transported and dumped at the wood chipper laydown area in the 3000 Area. Empty luggers would be returned to the respective carpenter shops for the continued collection of clean wood waste.Boise Cascade plans to chip wood waste once every four to eight weeks (whenever enough wood waste accumulates to fill 20 truck loads). The chipper is not very portable; therefore, wood in the laydown area either needs to remain in luggers or be placed on pallets to enable the wood to be moved close to the chipper during chipper operations. Wood cannot be merely dumped to the ground and pushed to the working face of the chipper because of the strict cleanliness acceptance criteria mandated by Boise Cascade. Each carpenter shop generates two to four luggers of scrap wood each month. To avoid having to leave full luggers at the laydown area (and thus having to provide each carpenter shop with up to eight luggers), it is recommended that a concrete pad be poured in front of the chipper for holding loose wood scraps. This would allow wood to be pushed to the working face of the chipper during chipper operations without contaminating the wood with dirt and gravel

debris.Option 2 - Wood Chipper - Alternate LocationRecommended Action: WHC has contracted with Boise Cascade to chip Hanford wood waste and transport it offsite for use in the manufacture of corrugated cardboard and as boiler feed stock (i.e., hog fuel). It is recommended that ICF KH carpenter shops segregate their clean wood waste from treated wood waste. To facilitate this segregation, a lugger would be provided to each carpenter shop for the collection of clean wood waste. Full luggers would then be transported and dumped at the wood chipper laydown area in the 3000 Area. Empty luggers would be returned to the respective carpenter shops for the continued collection of clean wood waste.The current location of the wood chipper laydown area would require construction of a concrete pad to prevent wood from becoming soiled when dumped to the ground. to avoid the cost of constructing a new pad (see Option 1), the wood laydown area for the chipper can be relocated to another location where a concrete pad already exits. One such location has been identified in the 400 Area just outside the fence of the FMEF. A 50 by 100-ft pad exists near the 4726 building that would be suitable for wood chipper use. Currently, the pad is used by the 400 Area carpenter shop for temporary storage of burial boxes prior to shipment. However, two smaller concrete pads located just west of the 50 by 100-ft pad could be used by the carpenter shops for storage of burial boxes. Another advantage of this location is that it is situated near the proposed Hanford Recycling Center. Centralizing the wood waste at this location will facilitate future efforts to find other recycling markets for wood waste.Option 3 - Wood Recycling ContractRecommended Action: Subcontract wood recycling/reuse to an offsite contractor to sort the wood waste and find appropriate reuse markets. The price of lumber continues to rise as the sources for virgin lumber diminish and the need to preserve the forests that remain becomes more critical. In the wake of this need, many new markets for reused wood products have cropped up. Many of these markets are lucrative enough to make it worthwhile for an outside company to handle our wood waste.The current contract with Boise Cascade for chipping wood for hog fuel pays $16 per bone dry unit (BDU). For comparison, the reconstituted panelboard industry pays $35 to $55 per BDU, wood meeting pulp and paper specifications pays $60 to $120 per BDU, and wood meeting biofuel (e.g., wood pellets) pays $80 to $160 per BDU. In addition, several nonchip markets exist for recycling wood pallets, refurbishing lumber, reusing molding/trimming, and others. the prices offered by these nonchip markets vary due to market fluctuations, but it is safe to assume that each market would pay better than the hog fuel market. An outside contractor with knowledge of the markets available for scrap wood and time to perform the necessary segregation would likely be able to find a niche for the wood waste generated by the carpenter shops in each of the above-identified wood waste markets.One potential wood recycling contractor is Pallet Recycling Associates of North America (PRANA). PRANA is expanding its operations and plans on operating out of the Spokane area within the next three months. Depending on the nature of the contract, PRANA would either take the wood for free or negotiate a fee depending on the quality of the wood provided. They would spot a trailer at a central location on the Hanford Site and pick up the wood whenever the trailer fills up. In turn, PRANA would do all the necessary segregation and marketing of the wood waste. Although the name implies that they are primarily interested in pallets, an initial phone conversation also indicated interest in the types of scrap wood generated by the carpenter shops. Further research would likely identify several other companies in our area that could provide this service. Such a contract would not only benefit the carpenter shops but everyone onsite who generates wood waste. From the perspective of ICF KH, such an arrangement would be low-cost and low-maintenance. The only effort required would be getting the wood to the pickup trailer.It would also be good for community relations to make a portion of the scrap wood waste available for reuse by the community. Initial conversations with two nonprofit organizations -- Columbia Industries and Hospice Center -- show an interest in use of our wood waste.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Ron Del Mar
Phone: 509-376-9773	**Phone:** 509-376-1967
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Construction/Demolition -- Wood Waste **Major Waste Type:** Sanitary Waste

PPOA ID Code: HFD-KHP2OA2.wd **Specific Waste Type:** Wood

Date: 05-mar-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Construction

Description: ICF KH construction subcontractors perform a variety of activities throughout the site that generate wood waste. Activities include new construction, remodeling, and demolition.

Options: Option 1 - Segregate Wood/Rewrite Contract LanguageCurrent Practice: Wood waste generated by construction/demolition activities is thrown away with the rest of the sanitary waste and dumped to the Hanford Central Landfill.

Some reuse of good lumber occurs; however, the majority of the wood waste goes to the landfill. The Environmental Protection Section of the ICF KH Construction Guide Specification is vague in its requirements for waste minimization and recycling. For example, the specification calls for scrap lumber Òresulting from demolitionÓ to be segregated for recycling However, no provisions are given for how this is to occur and there does not appear to be any enforcement of this construction specification segregation requirement.The specification also states that ICF KH will Òdesignate a placeÓ for the collection of scrap lumber, and that the recycling will be Òaccomplished by others.Ó At present, the site does not have a workable program in place to facilitate wood recycling by construction subcontractors of ICF KH construction forces. Enforcement of this wood segregation requirement of the construction specification cannot occur until ICF KH is set up to receive, transport, and recycle/reuse wood waste.Recommended Action: First, ICF KH needs to pursue a workable solution for recycling of construction/demolition wood waste. WHC has contracted with Boise Cascade to chip wood waste for use as hog fuel. However, the current requirements for using the wood chipper are not user friendly in terms of the nature of construction/demolition activities. The current program requires wood to be cut to size and banded to a pallet. It is not practical to assume that ICF KH would require its construction forces and subcontractors to go to such lengths to recycle their wood waste. Subcontractors would pass the cost of preparing the wood for recycling on to ICF KH -- the net result would likely exceed the cost benefit of not sending the wood to the landfill. In a previous assessment of wood waste generated by ICF KH carpenter shop activities (KHP2OA.WD), ICF KH recommended several practical, low-cost solutions for wood waste recycling/reuse. Implementation of any of the options recommended in KHP2OA1.WD would also facilitate recycling of construction/demolition wood waste.Once a practical vehicle for receiving and recycling wood waste is established, ICF KH can begin to enforce the construction specification requirements for segregating wood waste. This would apply to both ICF KH construction forces and subcontractors. Wood can be collected on the ground, loaded onto dump trucks, and delivered to a wood laydown area. Many subcontractors currently hire another company to pick up and dispose of their waste. Wood collection and delivery to the wood laydown area can be handled under the same contract arrangement.Contract language for wood segregation should be expanded from Òscrap lumber resulting from demolitionÓ to include all wood waste from all types of construction/demolition activities. Contract language should also be made more specific to include required preparation activities (e.g., removing large bolts and metal hardware, separating wood from sheet rock, etc.), how wood is to be segregated, where wood is to be delivered, etc. The specifications should also address pollution prevention issues like source reduction, inventory control, and good housekeeping.Option 2 - Boise Cascade Wood ChipperCurrent Practice: Wood waste generated by construction/demolition activities is put in trash bins with the rest of the sanitary waste and dumped to the Hanford Central Landfill. Some reuse of good lumber occurs; however, a majority of the wood waste is thrown away.Recommended Action: WHC has contracted with Boise Cascade to chip Hanford wood waste for use as hog fuel. Wood waste generated by construction/demolition activities can be segregated and transported to the wood chipper wood laydown area in the 3000 Area. Boise Cascade will transport their own chipper to the site once every four to eight weeks (whenever enough wood accumulates to fill about 20 trucks). If a proposal recommended in P2OA1. WD is implemented, wood can be merely dumped to a concrete pad located near the wood chipper work area.Not all wood waste generated by construction/demolition activities would be accepted by Boise Cascade. A secondary segregation would have to occur at the job site to meet the acceptance criteria. This criteria is as follows:¥ Unpainted¥ Untreated¥ Clean (i.e., less than 1% dirt, sand, rock)¥ Less than 1/2% metals¥ Less than 2% laminatesWood not meeting the above acceptance criteria would still go to the landfill.In addition to Boise Cascade acceptance criteria, WHC requires the following administrative controls for each load of wood:¥ Declaration of Excess¥ Radiological release¥ Inspection by an organizational property specialist or a recycling specialist¥ Coordination through WHC Excess, Surplus, Sales, and ShippingOption 3 - Chip at LandfillRecommended Action: Model the program to chip construction/demolition wood waste after a similar program operated successfully by INEL for the past two years. INEL chips all wood waste at the landfill and has reduced the volume of wood waste in its landfill by 90%. The INEL site is too remote to attract outside businesses to take its wood waste; however, the site has identified four uses for its chipped wood onsite:1) Combine the chipped wood with paper and cardboard to make wood pellets to be used as a substitute for coal to fuel onsite power plants.2) Spread chipped wood over rangefire areas to stabilize soil for reseeding.3) Spread chipped wood over dirt roads for dust control.4) Use chipped wood to firm up/stabilize soil during rainy seasons in areas of heavy equipment use.Wood chips that cannot be used elsewhere are used as landfill cover material in place of soil.INEL does not segregate its wood waste; all wood is chipped, as long as it meets the requirements of RCRA, Subtitle C. This includes chipping wood containing nonregulated paint, formoil, and other treatments. INEL chipper operators do not worry about removing excess dirt concrete, metal, etc. They claim these types of materials are removed in the process of chipping and very little ends up in the final chipped product.A similar wood chipper program can be implemented at the Hanford Central Landfill. Hanford could likely find uses for chipped wood similar to INEL, resulting in the same waste volume reductions. At the very least, even if all chipped wood ended up being returned to the landfill, a significant volume reduction would be achieved. INEL officials estimate the volume reduction ratio achieved through chipping to be about 10 to 1. Such a program would also eliminate some of the added costs associated with secondary segregation, wood preparation, transportation, and administrative controls, as required by the current WHC chipper program using Boise Cascade.The wood chipper currently owned by WHC may not be available to ICF KH. WHC recently signed an agreement with the City of Richland to lease the chipper to the Richland Landfill. If the WHC chipper is not available, ICF may need to accumulate wood at a laydown area at the Hanford landfill and contract with an outside wood chipper contractor to chip wood three to four times a year. Another option is to work out a swap with INEL to share their wood chipper. INEL only uses their chipper four days a month; the rest of the time, the chipper is idle. Assuming transportation costs are not prohibitive, ICF KH may be able to work out an agreement with INEL to bring their chipper onsite 3 or 4 times a year to chip wood. Option 4 - Wood Recycling ContractRecommended Action: Award a contract to an outside vendor to pick up our

wood waste and segregate for reuse/recycling. Many contractors will perform this service for free, in exchange for the revenue they receive from the wood waste.Preliminary contracts have been made with several wood recycling contractors. One of these contractors, Cascade Pallets, has a wood laydown are in Pasco. They would pick up the wood at no cost at a predetermined laydown area onsite. Cascade Pallets is primarily interested in refurbishing pallets, but would take all wood waste. What they cannot use for pallets they chip and sell to Boise Cascade. The contractor would take responsibility for disposing of unchippable wood. Preliminary conversations with Cascade Pallets indicate that such a contract would require no secondary segregation of wood waste. They would pick up all wood and segregate at their laydown area. All types of wood normally going to the landfill would be accepted, including treated wood, painted wood, concrete wood, and wood with nails.The only effort required by ICF KH would be to segregate wood from other debris and haul the wood to a predetermined wood laydown area. No containers would be required; wood could be dumped to the ground. It is possible that two or three central laydown areas could be established to make the program efficient, no matter where the construction activities occur onsite.Conversations are ongoing with other wood recycling contractors to see what other options are available.Option 5 - Training/P2 AwarenessCurrent Practice: The construction specifications contain vague language requiring recycling, waste minimization, and waste segregation. However, no formalized training is available to heighten awareness and facilitate pollution prevention activities among ICF KH construction forces and subcontractors.Recommended Action: Make a formal pollution prevention presentation at the start of each major construction project. These presentations can be coordinated to occur as part of regularly scheduled safety reviews. These presentations should address the regulatory requirements and benefits of pollution prevention, as well as some practical ideas for how to apply pollution prevention to the respective jobs. For wood waste, this would include what program the site has available for wood reuse/recycling, the requirements of that program, what items are recyclable, and guidance on source reduction, inventory control, and good housekeeping. Awareness can be reinforced periodically by bringing up pollution prevention issues during the regularly scheduled safety meetings.At least one key individual from every major project should be trained to perform Pollution Prevention Opportunity Assessments. For those jobs predicted to generate significant volumes of wood waste, a P2OA can be performed to specifically look at how to minimize the wood waste stream, with specific emphasis placed on source reduction, inventory control, and good housekeeping.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Ron Del Mar
Phone: 509-376-9773	**Phone:** 509-376-1967
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: 200-West Paint Shop Oil-Based Paint Brush Wash **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-KHP2OA3.Pnt **Specific Waste Type:** Solvents

Date: 20-mar-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Painting

Description: The 200-W Paint Shop uses a combination of used and fresh solvents in its brush wash station for oil-based paints. The station is located outdoors and consists of four separate covered metal bins. Each bin represents a different stage of the brush wash system. Dirty brushes and other painting tools and equipment are cycled through the four bins into progressively cleaner solvent solutions. The solvent is cycled in the reverse direction and reused until it reaches the initial wash bin. The spent solvent is then transferred to a distillation unit in an adjacent building to recover solvent for reuse.A 300 cfm-capacity exhaust collection system is used to exhaust solvent fumes away from personnel and out a stack into the atmosphere. The fan pulls fumes from all four stations simultaneously, regardless of how many of the four bins are in use.

Options: Option 1 - Alternate Secondary ContainersCurrent Practice: 200-W Painters use 1-gallon buckets inside the metal brush wash bins to soak brushes in solvent. Thee buckets cannot be covered, because the handles of brushes and other equipment extend above the lip of the buckets. The exhaust system is turned on whenever a painter opens the metal lid of any of the four bins. The system exhausts solvent fumes away from painters and out a stack. However, the exhaust system draws air from all four bins simultaneously, thus significantly increasing the rate of solvent vaporization. This results in an estimated 30% solvent loss due to vaporization, based on painter process knowledge.Recommended Action: Replace the 1-gallon buckets with containers that can be covered while inside the metal wash bins. This will reduce the rate of solvent vaporization by at least 75%, as the fan would only be able to draw fumes from the bin where the work is occurring. Having covered secondary containers will also reduce the rate of vaporization during inactive times.This option would add the cost of buying some type of suitable secondary container. The container would not only have to fit the dimensions of the inside of the brush wash bins, but

would also have to be made of a suitable material (e.g., polyurethane) to withstand the rigors of brush wash activities and the corrosive nature of solvents. Currently, this is not a concern because the 1-gallon buckets are recycled from regular painting activities and they can be changed out as often as needed. The brush wash bins are not deep enough to hold 5-gallon buckets.Option 2 - Redesign Brush Wash System (without fan)Current Practice: The exhaust system used to redirect solvent fumes away from painters and out a stack during brush wash activities currently pulls fumes from all four brush wash bins simultaneously, even if only one bin is open. This results in an estimated 30% loss to solvents to vaporization.Recommended Action: Replace the current brush wash system at 200-W with a simplified system similar to the brush wash station at the 1208 Building in the 3000 Area. The 3000 Area system consists of a single bin, roughly 4 feet long, 1 1/2 feet wide, and 2 feet deep. The bin has a metal lid operated by a foot pedal. Four five-gallon buckets are placed inside the bin, each representing a different stage of brush wash activities (similar to the 200-W system). The advantage of this system is that lids can be placed over the five-gallon buckets while soaking brushes and other equipment. This eliminates solvent loss during inactive times and reduces solvent loss by at least 75% during brush wash operations because only the solvent in the bucket where work is occurring is exposed to the atmosphere. Eliminating the exhaust system and the extra air it creates over the containers would reduce emissions by an additional estimated 50%.The disadvantage of this system is that it would require respirators to be worn during brush washing activities.Option 3 - Redesign Brush Wash System (with fan)Recommended Action: This option is identical to option 2, except that the existing exhaust system would be modified for use with the new brush wash system. The fan would have to be retrofitted to meet the air flow requirements of a smaller brush wash station. Option 4 - Maintenance/Administrative ChangesCurrent Practice: The brush wash system was originally designed with two stages of dampers to regulate fan air flow away from bins that are not being used. Manual dampers are located in the ductwork leading into each brush wash bin. Additionally, each brush wash bin has a rubber damper attached to the base of its lid. These dampers are supposed to seal off the bins from the air intake system when the lids are closed.The manual ductwork dampers are currently left in the open position at all times. Painters either consider the system too cumbersome to use, or have not been adequately instructed on how to use the manual dampers. Some of the rubber dampers over the fan air intakes are either missing or have deteriorated to the point where they no longer provide an adequate seal. Another problem is that the current brush wash system loses solvent through vaporization even when the exhaust system is not operating because the lids to the metal bins do not provide tight seals.Recommended Action: According to the engineer who designed the brush wash station, the manual dampers are designed to cut off 90% of the fan exhaust to inactive bins. the integrity of these dampers needs to be checked to verify that they still perform as designed. Painters need to be trained to use the manual dampers. Simple operating procedures can be written and posted at the brush wash station.Damaged and/or missing rubber dampers inside the brush wash bins need to be replaced. Thee rubber dampers are designed to reduce airflow to inactive bins by an additional 90%. Regular maintenance and/or replacement of these rubber dampers may need to occur annually. Over time, solvent buildup inside the metal bins will prevent the rubber dampers from sealing correctly.Some type of rubber seal can also be placed around the container lids to provide better seals when the bins are closed. Again, these seals may need to be maintained and/or replaced periodically to assure seal integrity.Another good maintenance activity would be to check all joints and connectors associated with the brush wash station and exhaust system for possible leaks. Leaks can be stopped using appropriate gaskets and materials.Option 5 - Install Heat ShieldCurrent Practice: The back side of the brush wash station currently faces south to an open courtyard. During the summer months, the brush wash station can be exposed to direct sunlight during certain times of the day. This generates additional heat inside the metal brush wash bins and significantly increases the rate of solvent vaporization.Recommended Action: MEK and other solvents used in the brush wash station are highly volatile. The rate of vaporization increases at higher temperatures. A conservative estimate of the effects of sunlight bearing down on the metal bins is that it will raise the temperature inside the bins by 15oF. This is calculated to increase the rate of vaporization by 20% in hot summer months and 5% the rest of the year. Over 50% of painting activities occur in the summer. The year-round effect of direct sunlight hitting the bins will be assumed to be 12%.This increased vaporization can be avoided by installing a corrugated metal heat shield along the back side of the brush wash station to shield the brush wash bins from direct sunlight.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Ron Del Mar
Phone: 509-376-9773	**Phone:** 509-376-1967
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: 200-W Paint Shop Latex Brush Wash **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-KHP2OA4.Pnt **Specific Waste Type:** Wastewater

Date: 24-mar-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Painting

Description: Painters at the 200-W Paint shop use water to wash latex paint out of brushes and other painting tools. Dirty tools are soaked in a five-gallon bucket of water; any scraping or scrubbing necessary to clean tools occurs within the buckets of water. Dirty water is collected in 55-gallon drums. Prior to disposal, latex brush wash drums must be sampled to assure they do not contain traces of regulated materials. Nonregulated drums are solidified using an absorbent (kitty litter) and sent to the Hanford Central Landfill. Regulated drums must be managed and disposed of as hazardous waste. Estimated costs for sampling/disposal of nonregulated latex brush wash is $700 a drum ($500 sampling, $200 management/disposal). If any trace of a regulated substance is found in the brush wash, the entire drum must be managed as hazardous waste. Disposal cost for regulated drums is about $1,300 a drum ($500 sampling, $800 management/disposal).

Options: Option 1 - Administrative ControlsCurrent Practice: Painters collect spent latex paint brush wash from brush washing operations in 55-gallon drums in a satellite accumulation area. Full drums are shipped to the batch plant. The latex brush wash process generates about one 55-gallon drum of waste a month. All drums are sampled for hazardous constituents prior to disposal. Painters estimate that one drum a year fails sampling and must be disposed of as hazardous waste. Paint manufacturers claim their latex paint products do not contain any regulated materials. The contaminants, therefore, appear to result from improper segregation latex paint brushes from oil-based paint brushes. Currently, there are no administrative controls in place to ensure that painters do not use the same brushes for both latex and oil-based or regulated latex paint operations.Recommended Action: Painters are provided two types of brushes; one for latex paint and one for oil-based paint. Some sort of administrative control needs to be implemented to ensure that painters follow the prescribed uses of these brushes and donÕt mix applications. This control may need to be proceduralized to provide foreman with something in writing that they can enforce. Procedures will require follow-up training and employee awareness to educate painters as to the problems and costs associated with contaminating nonregulated products with regulated products. Such training can be provided as part of regularly scheduled safety meetings to avoid incurring added training costs.Once such controls are in place and verified through sampling to be effective, sampling can be discontinued. Periodic random sampling may need to occur to verify that the latex brush wash continues to be untainted.Option 2 - Brush Wash DistillationCurrent Practice: Latex paint brush wash is collected in 55-gal drums in the 200-W Paint Shop Satellite Accumulation Area. Full drums are sampled to ensure they do not contain regulated substances. Nonregulated drums are solidified and sent to the landfill for disposal. Estimated cost for sampling/disposal of nonregulated latex brush wash is $700 a drum.Recommended Action: Most of the costs ($500) associated with latex brush wash disposal is for sampling. A prerequisite to consideration of this option is that administrative controls be implemented at the paint shop to preclude contaminating latex paint brush wash with regulated materials and, therefore, eliminate the need for sampling (see Option 1).Once such controls are in place and proven to be effective, a distillation system can be purchased for latex paint brush wash. Clean water recovered from the distillation process can be reused for brush washing. Solids can be disposed to the landfill as sanitary waste.According to one distillation system vendor, traditional solvent distillation units can be used for water-based latex brush wash. However, since water has a much higher boiling point than solvents, considerable more energy would be required to distill water vapors. One vendor suggested adding an extra heater to the distillation unit to compensate for the energy drain. This added feature is included in the price quote provided below for a distillation system.Option 3 - Brush Wash FiltrationRecommended Action: Most of the cost ($500) associated with latex brush wash disposal is for sampling. A prerequisite to consideration of this option is that administrative controls be implemented at the paint shop to preclude contaminating latex paint brush wash with regulated materials and, therefore, eliminate the need for sampling (see Option 1).Once option 1 has been implemented and proven to be effective, the paint residue can be filtered out of the latex brush wash. Solids can be disposed to the landfill; water can be dumped down the drain or reused for brush washing.A bag and strainer filter system can be used. Bag filters are inexpensive and easy to change out. According to the vendor, filter life is about 200 gallons of effluent. However, for best filter efficiency, the vendor recommended replacing the filter once a month.Brush wash would continue to be collected in 55 gallon drums. Once a drum is full, the brush wash would have to be treated with a chemical to turn soluble components into filterable granular components. The brush wash would then be piped, either using a low-capacity pump or by gravity flow, to the bag filter housing. The filter would remove paint solids. Recovered water could either be routed down a drain or collected in another 55-gallon drum for brush wash reuse. Option 4 - 300 Area TEDFRecommended Action: Most of the cost ($500) associated with latex brush wash disposal is for sampling. A prerequisite to consideration of this option is that administrative controls be implemented at the paint shop to preclude contaminating latex paint brush wash with regulated materials and, therefore, eliminate the need for sampling (see Option 1).Once Option 1 has been implemented and proven to be effective, use of the 300 Area TEDF for treatment of the latex paint brush wash can be pursued. The 300 Area TEDF currently receives a similar waste stream from ICF KH painters in the 300 Area. The Ecology permit for operating that facility would have to be amended to include the 200-W paint shop as an approved waste stream. The facility has separate funding and would not charge the paint shop for treating the brush wash.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Ron Del Mar
Phone: 509-376-9773	**Phone:** 509-376-1967

Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: 200-West Paint Shop Oil-Based Paint Brush Wash **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-KH_10 **Specific Waste Type:** Solvents

Date: 14-jul-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Painting

Description: The 200-W Paint Shop uses a combination of used and fresh solvents in its brush wash station for oil-based paints. The station is located outdoors and consist of four

Options: Option 1 - Alternate Secondary ContainersCurrent Practice: 200-W Painters use 1-gallon buckets inside the metal brush wash bins to soak brushes in solvent.Recommendation: Replace the 1-gallon buckets with containers that can be covered while inside the metal wash bins.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Ronald Del Mar
Phone: 509-376-9773	**Phone:** 509-376-1967
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Construction/Demolition Wood Waste **Major Waste Type:** Sanitary Waste

PPOA ID Code: HFD-KH_11 **Specific Waste Type:** Wood

Date: 14-jul-1995 **Major Activity Type:** Environmental Restoration **Specific Activity Type:** Demolition

Description: ICF Kaiser construction subcontractors perform a variety of activities throughout the site that generate wood waste. Activities include new construction, remodeling, and demolition.

Options: Option 1 - Segregate Wood/Rewrite Contract LanguageOption 2 - Boise Cascade Wood ChipperOption 3 - Chip at LandfillOption 4 - Wood Recycling ContractOption 5 - Training/P2 Awareness

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Ronald Del Mar
Phone: 509-376-9773	**Phone:** 509-376-1967
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Carpenter Shops **Major Waste Type:** Sanitary Waste

PPOA ID Code: HFD-KH_12 **Specific Waste Type:** Wood

Date: 10-mar-1995 **Major Activity Type:** Manufacturing **Specific Activity Type:** Construction

Description: ICF Kaiser carpenter shops build a variety of structures to support site construction activities. Carpenter shop products include forms, stairs, pallet boxes, burial boxes, greenhouses, and other structures for new construction. These structures are constructed out of a variety of wood materials, including plywood, dimensional lumber, Masonite, chipboard, and fir/pressure treated lumber. A byproduct of carpenter shop building activities is the generation of scrap wood. Much of this scrap wood ends up being disposed to the Hanford Central Landfill.

Options: Option 1 - Wood ChipperCurrent Practice: ICF Kaiser carpenter shop activities generated an estimated 1,651,000 kg of wood waste in 1994. The current practice is to collect scrap wood in bins outside the carpenter shops until the wood either becomes unusable or the bins get too full. At this point, wood scraps are thrown into dump trucks with the rest of the sanitary waste and driven to the scraps are thrown into dump trucks with the rest of the sanitary waste and driven to the Hanford Central Landfill for disposal. Many of these wood scraps are sizable pieces of lumber, including 2 to 4-foot sections if dimensional lumber and 1/4 to 1/3 sheets of plywood. In addition to wood scraps, the carpenter shops generate wood waste in the form of sawdust, pallets, and bad/defective lumber material.Recommendation: WHC has contracted with Boise Cascade to chip Hanford wood waste and transport it offsite for use in the manufacture of corrugated cardboard and as boiler feed stock (i.e., hog fuel). It is recommended that ICF KH carpenter shops segregate their clean wood waste from treated wood waste. To facilitate this segregation, a lugger would be provided to each carpenter shop for the collection of clean wood waste. Full luggers would then be transported and dumped at the wood chipper laydown area in the 3000 Area. Empty luggers would be returned to the respective carpenter shops for the continued collection of clean wood waste.Boise Cascade plans to chip wood waste once every four to eight weeks (whenever enough wood waste accumulates to fill 20 truck loads). The chipper is not very portable; therefore, wood in the laydown area either needs to remain in luggers or be placed on pallets to enable the wood to be moved close to the chipper during chipper operations. Wood cannot be merely dumped to the ground and pushed to the working face of the chipper because of the strict cleanliness acceptance criteria mandated by Boise Cascade. Each carpenter shop generates two to four luggers of scrap wood each month. To avoid having to leave full luggers at the laydown area (and thus having to provide each carpenter shop with up to eight luggers), it is recommended that a concrete pad be pushed to the working face of the chipper during chipper operations without contaminating the wood with dirt and gravel debris.Option 2 - Wood Chipper/Alternate LocationRecommendation: WHC has contracted with Boise Cascade to chip Hanford wood waste and transport it offsite for use in the manufacture of corrugated cardboard and as boiler feed stock (i.e., hog fuel). It is recommended that ICF KH carpenter shops segregate their clean wood waste from treated wood waste. To facilitate this segregation, a lugger would be provided to each carpenter shop for the collection of clean wood waste. Full luggers would then be transported and dumped at the wood chipper laydown area in the 3000 Area. Empty luggers would be returned to the respective carpenter shops for the continued collection of clean wood waste.The current location of the wood chipper laydown area would require construction of a concrete pad to prevent wood from becoming soiled when dumped to the ground. To avoid the costs of constructing a new pad (see Option 1), the wood laydown area for the chipper can be relocated to another location where a concrete pad already exists. One such location has been identified in the 400 Area just outside the fence of the FMEF. A 50 by 100-foot pad exists near the 4726 building that would be suitable for wood chipper use. Currently, the pad is used by the 400 Area carpenter shop for temporary storage of burial boxes prior to shipment. However, two smaller concrete pads located just west of the 50 by 100-foot pad could be used by the carpenter shops for storage of burial boxes. Another advantage of this location is that it is situated near the proposed Hanford Recycling Center. Centralizing the wood waste at this location will facilitate future efforts to find other recycling markets for wood waste.Option 3 - Wood Recycling ContractRecommendation: Subcontract wood recycling/reuse to an offsite contractor to sort the wood waste and find appropriate reuse markets. The price of lumber continues to rise as the sources for virgin lumber diminish and the need to preserve the forests that remain becomes more critical. In the wake of this need, many new markets for reused wood products have cropped up. Many of these markets are lucrative enough to make it worthwhile for an outside company to handle our wood waste. The current contract with Boise Cascade for chipping wood for hog fuel pay $16 per bone dry unit (BDU). For comparison, the reconstituted panelboard industry pays $35 to $55 per BDU, wood meeting pulp and paper specifications pays $60 to $120 per BDU, and wood meeting biofuel (e.g. wood pellets) pays $80 to $160 per BDU. In addition, several nonchip markets exist for recycling wood pallets, refurbishing lumber, reusing molding/trimming, and others. The prices offered by these nonchip markets vary due to market fluctuations, but it is safe to assume that each market would pay better than the hog fuel market. An outside contractor with knowledge of the markets available for scrap wood and time to perform the necessary segregation would likely be able to find a niche for the wood waste generated by the carpenter shops in each of the above-identified wood waste markets.One potential wood recycling contractor is Pallet Recycling Associates of North America (PRANA). PRANA is expanding its operations and plans on operating out of the Spokane area within the next three months. Depending on the nature of the contract, PRANA would either take the wood for free or negotiate a fee depending on the quality of the wood provided. They would spot a trailer at a central location on the Hanford Site and pick up the wood whenever the trailer fills up. In turn, PRANA would do all other necessary segregation and marketing of the wood waste. Although the name implies that they are primarily interested in pallets, an initial phone conversation also indicated interest in the types of scrap wood generated by the carpenter shops. Further research would likely identify several other companies in our area that could provide this service. Such a contract would not only benefit the carpenter shops but everyone onsite who generates wood waste. From the perspective of ICF KH, such an arrangement would be low-cost and low-maintenance. The only effort required would be getting the wood to the pickup trailer.It

would also be good for community relations to make a portion of the scrap wood waste available for reuse by the community. Initial conversations with two nonprofit organizations -- Columbia Industries and Hospice Center -- show an interest in use of our wood waste.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Ronald Del Mar
Phone: 509-376-9773	**Phone:** 509-376-1967
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Construction/Demolition Wood Waste **Major Waste Type:** Sanitary Waste

PPOA ID Code: HFD-KH_13 **Specific Waste Type:** Wood

Date: 05-mar-1995 **Major Activity Type:** Environmental Restoration **Specific Activity Type:** Demolition

Description: ICF Kaiser construction subcontractors perform a variety of activities throughout the site that generate wood waste. Activities include new construction, remodeling, and demolition.

Options: Option 1 - Segregate Wood/Rewrite Contract LanguageCurrent Practice: Wood waste generated by construction/demolition activities is thrown away with the rest of the sanitary waste and dumped to the Hanford Central Landfill. Some reuse of good lumber occurs; however, the majority of the wood waste goes to the landfill. The Environmental Protection Section of the ICF KH Construction Guide Specification is vague in it requirements for waste minimization and recycling. For example, the specification calls for scrap lumber Òresulting from demolitionÓ to be segregated for recycling. However, no provisions are given for how this is to occur and there does not appear to be any enforcement of this construction specification segregation requirement. The specification also states that ICF KH will Òdesignate a placeÓ for the collection of scrap lumber, and that the recycling will be Òaccomplished by others.Ó At present, the site does not have a workable program in place to facilitate wood recycling by construction subcontractors or ICF KH construction forces. Enforcement of this wood segregation requirement of the construction specification cannot occur until ICF KH is set up to receive, transport, and recycle/reuse wood waste.Recommendation: First, ICF KH needs to pursue a workable solution for recycling of construction/demolition wood waste. WHC has contracted with Boise Cascade to chip wood waste for use as hog fuel. However, the current requirements for using the wood chipper are not user friendly in terms of the nature of construction/demolition activities. The current program requires wood to be cut to size and banded to a pallet. It is not practical to assume the ICF KH would require its construction forces and subcontractors to go to such lengths to recycle their wood waste. Subcontractors would pass the cost of preparing the wood for recycling onto ICF KH -- the net result would likely exceed the cost benefit of not sending the wood to the landfill. In a previous assessment of wood waste generated by ICF KH carpenter shop activities, ICF KH recommended several practical, low-cost solution s for wood waste recycling/reuse. Implementation of any of the options recommended in this assessment would also facilitate recycling of construction/demolition waste.Once a practical vehicle for receiving and recycling wood waste is established, ICF KH can begin to enforce the construction specification requirements for segregating wood waste. This would apply to both ICF KH construction forces and subcontractors. Wood can be collected on the ground, loaded onto dump trucks, and delivered to a wood laydown area. Many subcontractors currently hire another company to pick up and dispose of their waste. Wood collection and delivery to the wood laydown area can be handled under the same contract arrangement.Contract language for wood segregation should be expanded from Òscrap lumber resulting from demolitionÓ to include all wood waste from all types of construction/demolition activities. Contract language should also be made more specific to include required preparation activities (e.g., removing large bolts and metal hardware, separating wood from sheetrock, etc.), how wood is to be segregated, where wood is to be delivered, etc. The specifications should also address pollution prevention issues like source reduce , inventory control, and good housekeeping.Option 2 - Boise Cascade Wood ChipperCurrent Practice: Wood waste generated by construction/demolition activities is put in trash bins with the rest of the sanitary and dumped to the Hanford Central Landfill. Some reuse of good lumber occurs; however, a majority of the wood waste is thrown away.Recommendation: WHC has contracted with Boise Cascade to chip Hanford wood waste for use as hog fuel. Wood waste generated by construction/demolition activities can be segregated and transported to he wood chipper wood laydown area in the 3000 Area. Boise Cascade will transport their own chipper to the site once every four to eight weeks (whenever there is enough wood accumulated to fill about 20 trucks). If a proposal recommended in P2)A1.WD is implemented, wood can be merely dumped to a concrete pad located near the wood chipper work area. Not all wood waste generated by construction/demolition activities would be accepted by Boise Cascade. A secondary segregation would have to occur at the jobsite to meet the acceptance

criteria. This criteria is as follows: Unpainted, Untreated, Clean (i.e., less than 1% dirt, sand, rock), Less than 1/2% metals, and Less than 2% laminates.Wood not meeting the above acceptance criteria would still go to the landfill. In addition to Boise Cascade acceptance criteria, WHC requires the following administrative controls for each load of wood. Declaration of Excess Radiological release Inspection by an organizational property specialist or a recycling specialist Coordination through WHC Excess, Surplus, Sales, and Shipping

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Ronald Del Mar
Phone: 509-376-9773	**Phone:** 509-376-1967
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Spent Cathodic Protection Equipment **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-KH_14 **Specific Waste Type:** Metal Debris

Date: 16-may-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Disposal

Description: ICF Kaiser located three crates (24Ó X 27Ó X 70Ó) of abandoned cathodic protection equipment near the U Tank Farm in the 200W Area. The Environmental Coordinator for the TWRS Division investigated the origin of the equipment and discovered that it had originally purchased for Project W-020H in 1989. The equipment has never been used and has been sitting outside in its original shipping crates for 4 to 6 years.The equipment consists of reference electrodes, which are used to protect underground piping and tanks from corrosion. The electrodes are made up of copper sulfate reference cells packaged in bentonite to maintain moisture contact and cell stability. Several feet of copper wire are attached at the top of each reference cell and extend outside the bentonite packing. According to the original procurement records, Project W-020H received three shipments of these reference electrodes. The first shipment contained 125 electrodes, the second 166, and the third 54. From visual inspection, it appears that the three crates of abandoned electrodes are the second shipment of 166. Each electrode package weighs 25 pounds (11 kg); total weight of all three crates is about 4,150 pounds (1,900 kg).According to ICF KH electricians, the electrodes have exceeded their shelf life and cannot be used for their original purpose. The reference cell portion of the electrodes contain cupric sulfate, which is regulated in Washington State as a toxic substance. Therefore, if declared a waste, the entire shipment must be disposed as hazardous waste.

Options: Option 1 - Recycle Copper WireCurrent Practice: All three crates of reference electrodes must be disposed as hazardous waste because the reference cells contain cupric sulfate, which is regulated in Washington State as a toxic waste.Recommendation: Cut off the copper wire from the package containing the bentonite and reference cell prior to disposal. The wire can be excessed through the WHC metal recycling program.Option 2 - Remove Electrodes from Bentonite PackingCurrent Practice: All three crates of reference electrodes must be disposed as hazardous waste because the reference cells contain cupric sulfate, which is regulated in Washington State as a toxic waste.Recommendation: Remove the reference cells from the bentonite packing. The bentonite is regulated as non-dangerous and can be disposed to the landfill. The reference cells containing the cupric sulfate are housed in PVC cylinders that are about 1 1/4 inches in diameter and 9 inches long. The integrity of these housings appears to be sound; therefore, direct handling of these electrodes should not present any health risks to workers.Option 3 - Reuse BentoniteCurrent Practice: All three crates of reference electrodes must be disposed as hazardous waste because the reference cells contain cupric sulfate, which is regulated in Washington State as a toxic waste.Recommendations: Instead of sending the bentonite to the landfill, find a reuse for this material. Bentonite has several industrial uses, including: oil emulsifier, paster base, pharmaceutical suspending agent, trench liner material, thickener in lubricating greases and fireproofing compositions, decolorizing agent, ceramic filler, cement slurry for oil-well casings, and asphalt modifier. The relative small quantity of this material may restrict community for some of the smaller-scale applications. The bentonite can be drummed and stored onsite while WHC Excess attempts to find an interested user. One option is to store the bentonite at the new Centralized Consolidation/Recycling Center at 400 Area. They would charge a flat storage fee of $9.25 per square foot. If no user is found, the bentonite can still be landfilled. Since the bentonite is not hazardous waste, there should be no time limit dictating its disposal. The copper wire would be removed and recycled per option 1.

Site: Hanford Site

Site Coordinator: Donna Merry	**Team Leader:** Ronald Del Mar
Phone: 509-376-9773	**Phone:** 509-376-1967
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Liquid Paint Waste **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-KH_15 **Specific Waste Type:** Paint

Date: 31-may-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Disposal

Description: ICF Kaiser disposed of over 2,600 kg of paint-related liquids as hazardous waste in 1994. This constituted 14 drums of waste; at an average cost of $3000 a drum, the paint-related liquid waste stream cost the company about $42,000.A drum containing paint-related liquids can include a variety of materials besides leftover paint. Roughly one-third of the materials disposed as paint-related liquids in 1994 was paint (about 860 kg) -- the rest was brush wash, rinseate, paint thinner, paint stripper, solvents, adhesives etc. At an average drum weight of 190 kg, this correlates to 5 drums of excess paint in 1994. Disposal costs for a drum of liquid hazardous waste is about $3000; the cost for five drums was $15,000.The primary reasons for leftover paint waste are: 1) the product exceeds its shelf life; 2) the product begins to harden or develop a surface skim during use because of inadequate lid replacement; and 3) paint is not completely used up and leftover paint is thrown away.

Options: Option 1 - Centralized InventoryCurrent Practice: ICF KH Construction Forces manage paint shops in the 3000, 200-E, 200-W, and 100 Areas of the Hanford Site. Little coordination occurs between the different shops and little inventory control occurs within each respective paint shop. This often results in a product sitting unused on the shelf of one paint shop until it expires while another paint shop continues to order and use the same product.Recommendation: Conduct a complete inventory of paint supplies at each paint shop. These inventories can be consolidated into a centralized database and be made available over HLAN for access by painters at all four paint shops. The database will be kept up-to-date to provide information on product life, usability, substitution potential, exchange, etc. Having this information readily available will offer many advantages. Painters will know exactly which products are nearing shelf life well in advance of the actual expiration date. This will allow painters to either find a use for the product at their shop, advertise its availability at other paint shops, or excess the material as usable product. Another advantage is that painters will be able to consult the database for excess products before ordering new products. In the long run, tight inventory control at each paint shop will reduce the supply of excess materials, provide greater control/flexibility in procurement, and reduce the amount of waste generated.Option 2 - Excess Unused PaintCurrent Practice: Partially full paint cans left over after a job are often disposed as waste. The paint is drained into a liquid barrel and the can is rinsed to sanitary waste specification and disposed to the Hanford Central Landfill.Recommendation: Collect the leftover paint as reusable product in two drums at each paint shop; one drum for oil-based paints, the other for water-based paints. Full drums can be excessed through the Centralized Consolidation/Recycling Center. Oil-based paints and waster-based paints would each be collected in common drums; i.e., different colors would be mixed together. The paint would still be good as undercoat materials or for applications where color is not important (e.g. painting over graffiti). The advantage of mixing the paint together as opposed to excessing each can of paint individually is that common containers will minimize handling and management costs, both at the paint shops and the Consolidation/Recycling Center. Only unopened containers would be excessed in the original containers.Option 3 - Product SubstitutionCurrent Practice: Specific hazardous products are often specified in the design stage of a project. Sometimes nonhazardous substitutes are available but painters have little authority to make substitutions.Recommendations: Painters know paint products better than anybody else and have the most up-to-date information on nonhazardous product substitutions. Therefore, painters should have some input into the specifying of paint products. This can be accomplished by 1) designating ad painter as a point-of contact for engineers any time paint products are specified, 2) putting a painter on the review list for all specifications that call out paint products, 3) having painters establish and maintain an up-to-date substitution list for use by engineers, and 4) providing more training to engineers on product substitution. Training can be as simple as a one-time presentation to introduce a product substitution list to engineers and explain the rationale for minimizing calling out hazardous paint products. Also, procedures needs to be revised to allow painters to make substitutions in the field when a hazardous product has been specified and a nonhazardous product is available that will do the same job.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Ronald Del Mar

Phone: 509-376-9773	**Phone:** 509-376-1967
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Oil/Diesel Spill Cleanup **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-KH_16 **Specific Waste Type:** Petroleum

Date: 24-may-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Handling

Description: Routine spills of petroleum-based products from construction vehicles are a common occurrence. In 1994, 146 spills were reported; 104 of these spills were to the ground and 42 to hard surfaces (e.g. shop floors, parking lots, roadways.)The average spill in 1994 was about 7 liters. (Note: This average is based on the total volume of spilled material divided by the total number of spills. A typical spill is probably much less (i.e., 2-3 liters); however, the average is inflated by a few very large spills). Most of these spills designate as nondangerous. For larger spills to the ground, the affected dirt is removed, put in barrels, and sent to landfill. Smaller spills (10 kg or less) are bagged and thrown in trash dumpsters. Sorbents are used for spills to hard surfaces.In 1994, about 240, 55-gallon drums of oil/diesel contaminated soil/sorbent were sent other Hanford Central Landfill (total weight of 33,400 kg). In addition, about 90 kg of soil/sorbent were put into plastic bags and thrown into trash dumpsters for disposal to the landfill.

Options: Option 1 - Bioremedial AbsorbentCurrent Practice: Sorbents are used to absorb spills to hard surfaces, such as shop floors, parking lost, and roadways. The absorbent is applied directly onto the spill area. Once the spill has been absorbed, the sorbent is swept up and disposed either in drums or in trash dumpsters, depending on the size of the spill. It takes about 20 lbs. (9 kg) of kitty litter to absorb 1 gallon of a petroleum product spill. Of the 42 spills to hard surfaces in 1994, 18 had to be drummed. Drumming adds to the cost of disposal through added paperwork, record keeping, monitoring, transportation, and cost of drums.Recommendation: Use a bioremedial-type of absorbent to clean up spills to hard surfaces. One such product, Oil Grab, is available from a local vendor. The adsorbent properties of Oil Brad are nearly 10 times that of sorbent; i.e., it only takes 2.5 lbs to adsorb 1 gallon of a petroleum product. According to vendor literature, Oil Grab actually encapsulates the petroleum, rather than just absorbing it, which prevents the petroleum product from leaching to the ground. The product contains millions of microbes which digest the hydrocarbons and leaves behind a natural urea-based soil nutrient which is supposed to be totally harmless to the environment. The increased absorption capacity of Oil Grab will significantly reduce the volume of waste and spill that need to be drummed. This will enable most spills to be bagged and thrown right into a trash dumpster, thus avoiding most of the costs associated with putting the waste in a drum.Option 2 - LandfarmCurrent Practice: Currently, drums containing oil/diesel-contaminated sorbent are disposed to the Hanford Central Landfill. The landfill will close during FY1996. The site will then begin using the Richland Landfill. However the Richland Landfill does not accept drummed waste containers. Drummed spill cleanup waste will, therefore, need to be shipped to another landfill. The exact location of this landfill has not yet been determined. The next closest landfill is in Pasco. Shipping drummed waste to Pasco would double, if not triple the transportation time required to dispose of this waste stream.Recommendation: Transport the petroleum-contaminated soil to a central ÒlandfarmÓ location where it can be treated with a bioremedial type material. Hydrocarbon-degrading bacteria should be able to reduce TPH levels down to the regulatory cleanup limit of 200 ppm within 30 to 90 days. TPH test kits can be used to verify degradation of hydrocarbons. The soil can then be used onsite as fill material or topsoil. Two such landfarms can be set up to minimize transportation time; one north of the Wye Barricade and one south of the Wye Barricade. Implementation of Option 1 in conjunction with Option 2 would allow the absorbent material (e.g. Oil Grab) from hard surface cleanup to also go to the landfarm.Option 3 - In-Place BioremediationCurrent Practice: Affected soil from spills to the ground is bagged or drummed and sent tot he landfill for disposal.Recommendations: Instead of removing oil/diesel-contaminated soil, bioremediate and monitor the soil in place until the soil reaches acceptable TPH levels (i.e. 200 ppm). The affected soil would have to be kept moist and aerated (i.e. turning soil) for the bioremediation bacteria to thrive. This option would incur added costs to management area during the bioremediation process, but would eliminate the effort of physically moving the affected soil into drums.Option 4 - Spill PreventionCurrent Practice: Most spills are the result of human error or equipment failure. The ICF KH spill countermeasures program focuses primarily on management of a spill once it occurs. There is little effort placed on spill awareness and prevention.Recommendation: Design a comprehensive spill awareness and prevention program. Such a program should include appropriate spill analysis, prevention, and preparedness measures. Specific aspects of such a program should include routine equipment inspection, administrative controls, personnel training, and mistake-proofing operations (e.g. provide overfill prevention devices, use drip pans during preventative maintenance).ICF KH should develop a procedure to outline the specific steps of the spill awareness and prevention program. The aspects of this procedure can be incorporated into waste management training already provided to contractors.Option 5 - Project L-044 Soil CellCurrent Practice: Spills to the ground are

cleaned up by removing the affected soil and either drumming the soil or putting it in plastic bags and throwing it in the trash, depending on the size of the spill. It is estimated that for every 2 gallons of spilled oil, one 55-gallons drum of soil must be removed. For diesel spills, the ratio is about 1 gallon per 55-gallon drum. Currently, drums containing oil/diesel-contaminated sorbent are disposed to the Hanford Central Landfill. The landfill will close during FY1996. The site will then begin using the Richland Landfill. However, the Richalnd Landfill does not accept drummed waste containers. Drummed spill cleanup waste will, therefore, need to be shipped to another landfill. The exact location of this landfill has not yet been determined. The next closest landfill is in Pasco. Shipping drummed waste to Pasco would double, if not triple the transportation time required to dispose of this waste stream.Recommendation: This option is identical to Option 2 except that instead of construction of new landfarm pits, spill waste would be dumped to an existing soil treatment cell constructed for Project L-044 just north of the 300 Area. The Project L-044 cell area was constructed for treatment by aeration of diesel-contaminated soil resulting from the removal of underground storage tanks. The cell was constructed for a capacity of 710 cubic meters. The cell is bermed and lined with a 20 mill HDPE liner. Six-inch layers of sand lie underneath and above the KDPE liner.The Washington State Department of Ecology has given Project L-044 approval to treat diesel-contaminated soil through aeration in the soil cell. The project is nearing completion, and project personnel indicate that the soil cell can handle an additional 450 cubic meters of soil. It is possible that a section of this reserve capacity can be sectioned off for use to treat spill-contaminated soil and sorbent. ICF KH needs to investigate use of this soil cell to see if the exemption granted Project L-044 can be extended for other uses. A precedent for other projects using this cell is already set, as the Corps of Engineers has received approval to dump soil to this cell. Spills generated only 19 cubic meters of contaminated soil/sorbent in 1994; this is only a fraction of the reserve capacity available in the Project L-044 soil cell.Project L-044 has elected not to use microorganisms to digests the hydrocarbons in the soil. Instead, they plan to rely on natural degradation through aeration and moisture/nutrients. Project personnel estimate this natural degradation will occur in about a year. It is recommended that bacteria still be used for spill-contaminated soil, as this will speed up the natural degradation process allow treated soil to be taken out of the treatment cell sooner, thus freeing up more space for future remediation. Some type of barrier needs to be designed to keep spill soil separate from other soil in the treatment cell.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Ronald Del Mar
Phone: 509-376-9773	**Phone:** 509-376-1967
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Underground Storage Tank Removal **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-KH_17 **Specific Waste Type:** Petroleum

Date: 30-jun-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Disposal

Description: ICF KH recently finished work on Project L-044. The scope of this project was to remove underground storage tanks at several Hanford facilities. A total of 27 tanks were removed between February 1994 and June 1995. These tanks contained a variety of petroleum products, including gasoline, diesel, waste oil, aviation fuel, and wash residue. Tank removal activities occurred within several Hanford areas, including 100-B, 200-E, 200-W, 300, 400, and 1100.The first stage of the tank removal process is to pump all remaining product out of the tanks so the fuel can be put back into service. After pumping, a residual of 20 to 30 gallons typically remains in the tank.Once all usable product is removed, the tanks are turned over to the tank removal contractor. The contractor flushes out the tanks with a water/degreaser mixture (i.e., Ripper II) to clean the inside of the tanks. The waste water residue is then pumped out of the tanks into 55-gallon drums and disposed as hazardous waste. The tanks are then removed and salvaged as scrap metal.A contractor recently removed the final four tanks of that Project L-044 from a service station in front of the 1171 Building in the 1100 Area. Two of the tanks were used for gasoline and two for diesel fuel. The tank rinsing process of these four tanks generated 21 drums (55-gallon capacity) of waste.This P2OA will look at pollution prevention/waste minimization opportunities specific to the last four tank removed by Project L-044. Some of the opportunities identified in this P2OA may be too late to implement on Project L-044. However, information recorded in this P2OA should serve as Òlessons-learnedÓ for future tank removal operations.

Options: Option 1 - High-Pressure Water RinseCurrent Practice: The contractor in charge of removing the final four tanks at 1100 Area accomplished the tank rinseout process without using a degreaser. Other contractors at other L-044 job sites used a water/degreaser solution to clean out tanks. Use of the degreaser (i.e. Ripper II) contaminates the rinse solution and

automatically designates the rinseate as a hazardous waste (corrosive - D002), thus avoiding any possibility of reuse or recycling of the rinseate solution.Recommendation: Use high-pressure water to clean out inside of tanks and avoid use of Ripper II as much as possible. The contractor in charge of removing the last four tanks in the 100 Area proved that it is possible to clean most tanks with just water. Ripper II should only be used as a last resort.Option 2 - Re-refine Rinseate SolutionCurrent Practice: Once all usable product is removed from the tank, high-pressure water is used to rinse out the inside of the tank. The rinseate solution is then pumped out of the tanks into 55-gallon drums. The rinseate is comprised of two components; one is a product/water mixture, the other is a product/water/sludge mixture. Of the 21 drums of waste generated in the 1100 area, 10 contained a product/water mixture and 11 contained a product/water/sludge mixture. The product/water ratio varied from 90% product down to 30% product. The current process is to handle all rinseate solution as hazardous waste.Recommendation: Pump the product/water component of the rinseate into alternate containers and combine with product going to the siteÕs re-refined oil contractor. The contractor has already provided a verbal agreement tot take gas/diesel rinseate from underground storage tank removal operations. This action will not only eliminate a large portion of the waste stream, but will avoid the contamination of new drums.Option 3 - Re-refine SludgeCurrent Practice: The inside of the tanks are rinsed out to loosen and dilute sludge to a point where it can be pumped out of the tank. Sludge/water solution is disposed as hazardous waste.Recommendations: In addition to the product/water solution (option 2), send the sludge/water solution offsite for re-refining. The siteÕs re-refined oil contractor has verbally agreed to take gas/diesel sludge. Sludge can be used in the manufacture of asphalt.This option needs further regulatory review before it can be implemented. The first step is to see if the sludge designates as hazardous waste. This can be determined either through sampling or process knowledge gained from the oil industry. A negative designation would free the sludge for shipment to the re-refining contractor without assurance from the refinery that all TSD requirements are met. IF not, the next step would be to approach Ecology with the proposed solution and to receive concurrence to re-refine the sludge as a best management practice.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Ronald Del Mar
Phone: 509-376-9773	**Phone:** 509-376-1967
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Construction Cardboard Waste **Major Waste Type:** Sanitary Waste

PPOA ID Code: HFD-KH_18 **Specific Waste Type:** Cardboard

Date: 30-jun-1995 **Major Activity Type:** Service **Specific Activity Type:** Construction

Description: The Hanford Central Landfill received 30,600 cubic meters of sanitary waste in 1994. Landfill records indicate that 36% of this waste was paper products including cardboard. During the first 6 months of 1995, the percentage of paper products in the landfill has jumped to 49%. Based on visual inspection, this assessment estimates that 50% of the paper category is cardboard. Therefore, the total volume of cardboard disposed to the landfill in 1994 was 5,500 cubic meters (i.e. 30,600 x 0.36 x 0.5). This assessment will assume that 50% of cardboard going to the Hanford Central Landfill is generated by ICF KH construction activities (i.e. 2,750 cubic meters). (Note: Waste cardboard from the WHC Central Stores disposed to the Richland Landfill.)The Hanford Site has a cardboard recycling program; however, the method of collection is left up to the individual facility or activity. Collected cardboard must be flattened, stacked, and banded to a pallet. Smaller loads can be taped together and do not need to be attached to a pallet. The Hanford Site has prepared a ÒblanketÓ Declaration of Excess document to use for cardboard recycling. This document must accompany all shipments of recycled cardboard. Facility or field personnel must then arrange transportation to the 1163 building where cardboard from throughout the site is collected for the recycling vendor.Cardboard from construction activities continues to go to the Hanford Central Landfill. Most construction sites do not have access to banding equipment or forklifts to move pallets. Until recently, it was not widely known that smaller loads could be taped together. However, this knowledge may not have made a big difference. The process of breaking down cardboard boxes, stacking them, taping them together, filling out the required excess documentation, and driving the load to the 1163 building is labor-intensive, and at least perceived as being more cost-effective.Cardboard recycling is part of the paper recycling program. As such, it generates the same revenue as recycling paper (i.e. about 7 cents/lb). This is another factor that has discouraged efforts at Hanford to increase the volume of recycled cardboard. On the open market, cardboard only generates 2 to 3 cents per pound. The paper recycling vendor has not been too eager to increase cardboard recycling, while continuing to pay a single rate for both cardboard and paper.WHC recycling is taking steps to simplify the cardboard recycling program and remove some of the roadblocks to participation. First, the program will be separated from the paper recycling efforts and a separate

recycling contract will be awarded. This will allow a price to be negotiated specific to cardboard . Second, the recycling vendor will provide cardboard recycling bins at several locations throughout the site and service these bins on a regular basis. This will make it much easier for construction personnel to recycle cardboard. Several recycling bins will be located at strategic locations in each area. Construction personnel will need to segregate cardboard from the rest of their waste, flatten the cardboard, and dump the cardboard in the nearest a recycling bins. The new cardboard recycling containers will eliminate having to band or tape the cardboard together, prepare the required excess documentation (all excess documentation will be handled by WHC Recycling instead of by individual generators), and arrange for transportation to the 1163 building.Another factor that will affect cardboard recycling at construction facilities is the scheduled closing of the Hanford Central Landfill in March of 1986. Use of the Richland Landfill will significantly increase driving time for most contractors. This should provide an added incentive to minimize the frequency of trips to the landfill and recycle as much of the waste as possible.This P2OA will examine how facilities and projects related to ICF KH construction activities can effectively integrate their operations to take full advantage of the proposed recycling contract. Additionally, other cost-effective solutions will be expanded.

Options: Option 1 - Recycling ContainersCurrent Practice: Cardboard from construction activities is combined with the rest of the sanitary waste and disposed to the Hanford Central Landfill.Recommendation: Segregate cardboard from the rest of the construction waste. The cardboard will be flattened or otherwise broken down to maximize volume capacity within the recycling containers. Depending on the amount of cardboard waste generated and the location of the nearest recycling container, cardboard can either be collected on the construction site for a short time, or taken directly to the nearest recycling container.The recycling vendor will supply 4 cubic-yard capacity containers at all key fixed facilities within each area (e.g., 300, 300-E, 200-W, 1100, 100). In addition, one larger container (30 to 40 cubic yards) will be provided in each area in a central location convenient to all construction contractors. This assessment will assume that a recycling container will be located within a five-minute drive from all construction sites.Option 2 - Reusable Shipping TotesCurrent Practice: Equipment and materials purchased for ICF KH construction forces are delivered to the ICF KH Receiving and Distribution warehouse in 200-E. From here, equipment is delivered to the appropriate job sites. The equipment/materials remain in their original shipping containers (i.e., cardboard) when delivered to the job sites. Cardboard containers subsequently end up in the trash.Receiving and Distribution only service ICF KHÕs own construction forces. Subcontractors bring their own materials/equipment onsite through other channels.Recommendation: Remove all material/equipment from their original corrugated cardboard containers at Receiving and Distribution. Receiving and Distribution is a more central location to collect cardboard for recycling, thus guaranteeing a higher percentage of recovery. Materials/equipment can be delivered to the jobsite in reusable shipping totes. WHC recently purchased about 40 reusable shipping totes to use at the Central Warehouse. However, these containers have never been used. It may be possible to transfer these reusable totes to ICF KH to supplement new purchases of totes for the Receiving and Distribution warehouse. Depending on the size, reusable totes cost between $5 and $10 a piece. Several different sizes and configurations are needed to handle a variety of equipment/materials. This option would increase labor at the Receiving and Distribution warehouse, but it would eliminate disposal and any extra effort to recycle cardboard into the field.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Ronald Del Mar
Phone: 509-376-9773	**Phone:** 509-376-1967
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Building Demolition/Removal **Major Waste Type:** Sanitary Waste

PPOA ID Code: HFD-KH_19 **Specific Waste Type:** Wood

Date: 22-jun-1995 **Major Activity Type:** Environmental Restoration **Specific Activity Type:** Demolition

Description: Many unused, outdated, and unneeded buildings on the Hanford Site are scheduled for demolition over the next several years as part of the siteÕs cleanup mission. Demolition activities will generate large volumes of sanitary waste, some hazardous waste, and minor quantities of radioactive and mixed waste. This P2OA will evaluate building demolition options for the next three buildings scheduled to be removed; the 1252, 1240, and 1241 Buildings in the 3000 Area.Much of the information provided in this P2OA on market value and volume of recyclable/salvageable material is based on preliminary assumptions. A Request for Proposal for a salvage/demolition contract will be issued in July 1995, to evaluate true market value of these buildings. This P2OA will be revised accordingly when this information becomes available.Background. Over the next 10 years, 115 Hanford buildings will be demolished. Roughly 10% to 15% of these buildings are wood structures. Five of these wood

buildings contain large timbers; the rest are mostly small office-type buildings containing a variety of fixed and removable equipment with salvage value. In the past, the preferred method of removing wood structures on the Hanford Site has been to burn the structures down or to demolish the buildings and landfill the resulting debris.The main benefits of burning over the traditional demolition/landfill method are: (1) it reduces volume of waste going to the landfill by about 90%; (2) it is much quicker (a building can be burned to the ground in just a few hours); and (3) it provides live fire training to Hanford and community fire departments. The Hanford Fire Department has claimed the value of fire training to be about $90,000 per burn. This number is based on the cost of providing equivalent training at an out-of-state facility.However, from a P2/environmental perspective, burning the buildings as a best management practice is highly debatable. It is very low on the EPAÕs Waste Management Hierarchy. Burning releases pollutants to the atmosphere (primarily particulate matter and carbon monoxide). In the past, the Benton County Clean Air Act Authority has granted the site a waiver from some CAA emission requirements based on the training exemption. However, the county recently notified the site that a permit fee of up to $8.50 per cubic yard of burned material will now be charged for each building burned, regardless of whether or not the building is used by the Fire Department for fire training exercises. The reason for the fee is that demolition is perceived as the primary reason for burning, with training only a secondary benefit.Another environmental concern is disposal of the ash that results from the burning. Currently this ash is disposed to the siteÕs inert landfill. However, there is a move underway by Ecology to begin requiring these landfills to be permitted. If this happens, ash will not likely meet the permit criteria of ÒinertÓ waste. Concerns over leachate of this ash from the inert landfill raises future liability issues and may compound costs in the future. The Hanford Central Landfill is also not a long-term option, as it is slated to close permanently in March 1996.Still another issue that must be considered is public perception. The recent burning of the 1250 buildings generated controversy among employees and the public. The Yakima Indian Nation specifically expressed concern in a NEPA review of a demolition landfill that recycling/reuse options were not considered.

Options: Option 1 - Demolition/LandfillCurrent Practice: Current practice is to either burn the buildings or tear them down and landfill the resulting construction debris.Recommendation: The recommended action under this option is the current practice of demolition and landfill.Option 2 - BurningCurrent Practice: Refer to background information. Burning has been one of the preferred practices for removing wood structures at the Hanford Site. However, a recent decision by the county to impose a permit fee of $8.50 per cubic yard of burned material may affect the cost-effectiveness of this option.Recommendation: Continue to burn wood structures and pay the permit fee to the county. Environmental impacts and P2 hierarchy need to be considered in tandem with cost advantages of this option.In the past, burning has been justified on the basis of firefighter training. The Hanford Fire Department has placed a value of $90,000 for this training per bulking burned. The dollar estimate is based on the costs of providing equivalent training at an out-of -state facility. However, live fire training is also available in North Bend, Washington, which may bring the cost down. Although live fire training is recommended for fire fighters, it is not a regulatory requirement. Such training is a convenience and an added benefit to local firefighters.Building 1252 is the only real burning candidate. Building 1241 is a wood structure with metal siding, and Building 1240 contains too many painted structures and fixed equipment (e.g. overhead crane railings) to make burning practical. However, for valid cost comparison, burning costs will be estimated for all three buildings.Option 3 - Dismantling/Salvage ContractRecommendation: Award a contract to have the buildings dismantled for salvage. A preliminary survey by a salvage expert concluded that at least 80% of the materials in these buildings have recycling/reuse potential. The demolition contractor needs to be experienced in the mechanics of dismantling buildings for purpose of reusing timbers and gaining the highest percentage of recyclability possible for the remaining material. A previous obstacle to this option was the right-of-first-refusal provision granted to onsite plant forces. However, plant forces have already refused this work, leaving the door open to pursue salvage contracts outside the Hanford Site.Timbers can be reused in new commercial or private construction. The rest of the wood can be chipped and sold as reconstituted panelboard fodder. Metal and metal equipment can be either reused or sold as scrap. However, this assessment assumes all metal will be sold as scrap, a likely underestimate of true metal value. A contractor familiar with construction demolition recycling markets will likely also be able to find markets for other materials, such as insulation, roofing material, asphalt, etc. The contract will be awarded onto he basis of cost and credit given for reuse/recycling initiatives.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Jack Mizner
Phone: 509-376-9773	**Phone:** 509-376-9081
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Concrete Waste **Major Waste Type:** Sanitary Waste

PPOA ID Code: HFD-KH_21 **Specific Waste Type:** Concrete

Date: 12-jul-1995 **Major Activity Type:** Environmental Restoration **Specific Activity Type:** Demolition

Description: ICF KH is in the process of demolishing and removing four old buildings in the 3000 Area. One building was burned; the remaining three buildings will be dismantled for salvageable materials. All four buildings have concrete slab foundations that will need to be removed as the final phase of demolition.Two of the buildings (Building 1250 and 1252) were warehouse-type facilities constructed on 4-foot-high concrete slabs. The other two buildings (Buildings 1240 and 1241) are constructed at ground level on 1/2-foot-thick concrete slabs. In addition, Building 1240 has a full-height concrete wall running through the center of the building. The total volume of concrete from these four buildings is about 1,300 cubic meters (1,700 cubic yards). Total weight is about 3,250,000 kg.The standard practice at Hanford has been to break up the concrete onsite into 2 to 3-foot chunks, load it onto dump trucks, and dispose of it to one of the siteÕs demolition/inert landfills. Contractors are not directly charged for using these landfills; landfill costs are absorbed by all projects as part of an overhead pool for site maintenance costs. This ÒfreeÓ dumping, coupled with the abundant availability of raw aggregate materials in the mid-Columbia region, has historically provided little incentive to look into concrete recycling options. This in spit of the fact that concrete is specifically identified in the Construction Guide Specifications as an item to be segregated for recycling.Concrete recycling is standard practice in Western Washington, where contractors are faced with $90/ton landfill fees and a shortage of raw aggregate. Crushed concrete makes good construction fill material, primarily for use in road construction. The Hanford Site has the tools to recycle concrete. Bechtel has a concrete crusher and is currently stockpiling crushed concrete aggregate at 100-B for future use as roadway base material.This P2OA will compare the cost-effectiveness of recycling concrete from the four buildings being demolished at 3000 Area to the present practice of disposing the concrete to one of the siteÕs demolition/inert landfills.

Options: Option 1 - Recycle OffsiteCurrent Practice: Concrete is pulverized onsite into 2 to 3-foot sections, loaded onto a truck, and dumped to one of the site inert/demolition landfills.Recommendation: Several local concrete manufacturing companies will accept concrete for recycling at no cost if delivered to the site. One of these local companies, Central Premix, is located along the Columbia River in West Pasco, which would be a convenient trip form the 3000 Area.The advantages of this option are avoiding the costs and effort of ICF KH crushing the concrete, keeping the concrete out of the landfill, and conserving the raw resources by reusing the crushed aggregate.The disadvantages of this option are the longer travel distance for hauling the concrete, the loss of the crushed aggregate for reuse by ICF KH projects, and the loss of the salvage metal revenue for the rebar in the concrete.Option 2 - Concrete CrusherRecommendation: Bechtel has a machine that will crush the concrete down to aggregate size while removing the rebar for recycling. This machine represents a major capital investment for the Hanford Site that is being underutilized. The concrete crusher and Bechtel services are available for hire. ICF KH can contract with Bechtel to crush the concrete onsite and haul aggregate to an aggregate stockpile area at 100-B. Bechtel is stockpiling this aggregate for future use on a road construction project.Advantages of this option include keeping the concrete out of the landfill, avoiding the purchase of equivalent new aggregate, receiving some scrap metal revenue for he rebar, and making use of a piece of equipment that is otherwise underutilized.Disadvantages include increased transportation costs to get material to 100-B and increased costs to rent crusher and Bechtel services to operate the crusher. Another disadvantage is that by stockpiling aggregate at a Bechtel facility, aggregate may not be available for reuse by ICF KH in the future.Option 3 - Stockpile at LandfillRecommendation: Continue to take broken up concrete to the landfill. Keep the concrete separate from other waste at the inert/demolition landfill and stockpile the concrete at one location at the landfill for future use. This should add no costs or effort to the current method of disposal at the inert/demolition landfills. Costs to crush the concrete would be incurred by a future project. The future project would also reap the benefits of the recycled value of the aggregate and rebar.An advantage of this option is that it would incur no added costs or mandate any major changes to current demolition practices. Other ICF KH demolition/construction projects can also stockpile concrete at this same location. The bigger the stockpile, the more cost-effective it will be to crush the concrete as opposed to buying new aggregate.A major disadvantage to this option is that there is no guarantee that the concrete would ever be recycled. Future projects may elect not to crush the concrete either due to cost or inconvenience. The concrete would then end up being buried in the landfill, thus wasting potential resources and taking up landfill space.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Ronald Del Mar
Phone: 509-376-9773	**Phone:** 509-376-1967
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Preconstruction P2 **Major Waste Type:** Sanitary Waste

PPOA ID Code: HFD-KH_22 **Specific Waste Type:** Construction Debri

Date: 20-jul-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Construction

Description: ICF KH received funding from DOE-HQ in 1995 to perform 25 P2OAs for construction activities. The justification for this funding was that the unique nature of construction activities warranted a different approach than the traditional P2OA approach geared toward facilities. Construction activities are non-routine, waste generation is non-routine, and job locations and personnel change from job to job.As of the writing of this P2OA, 17 of 25 construction P2OAs planned for FY95 are complete. These P2OAs have identified over $1M in potential savings; however, actual implementation of many of these P2OAs presents an entirely different challenge. Often, the P2OA process occurs too late in the project life to have any realistic potential for cost savings or waste minimization. Construction projects are not ongoing activities, but have a finite beginning and end. Once construction starts, it is almost impossible to change the process, especially if a subcontractor is involved. Schedule and budget constraints take precedence, and any effort to change the work process will meet stiff resistance. A smarter approach to conducting P2OAs for construction projects is required. P2/WMin ideas must be identified before a project goes out for bid and included in the original scope of work.This P2OA looks at several ideas for getting the P2OA process involved in the life of a project at an earlier stage. Waste generation data is based on 1994 waste shipment records.

Options: Option 1 - Upfront P2 PlanningCurrent Practice: Construction P2OAs are not scheduled or performed until after construction work begins. Once a contract is in place, it is near impossible to implement changes suggested in the P2OA without major disruption to budget and schedule. Many construction projects have only a short duration. By the time an assessment is performed, research is conducted, opportunities are identified, and an idea proposed to management for implementation, the job may be complete or nearly complete.Recommendation: The Environmental Coordinators in each construction division can screen all projects in their respective divisions prior to construction for P2 potential. Projects with P2 potential can be reviewed with ICF KH P2 personnel. Lessons-learned information can be applied to more straight-forward projects and appropriate P2 guidance can be added to the construction contract. If a unique situation or process is encountered, a P2OA can be performed to identify specific P2 opportunities. If a P2OA is required, the project can write into the contract that the contractor participate in the P2OA before any work gets underway.Option 2 - Product Substitution ReviewCurrent Practice: During the design phase of a project, engineers often call out hazardous materials in construction specifications. The engineer calling for the material may or may not be aware of alternate products available on the market that are either less hazardous or nonhazardous.The Material Safety Data Sheets (MSDS) of all products are reviewed by Industrial Safety and Health (IS&H) as part of the job safety analysis review. IS&H reviews the MSDS for key words, such as acutely hazardous, carcinogen, etc. Based on this review, IS&H will recommend that project personnel look into using products that are less hazardous. The IS&H review will screen out many hazardous products prior to use. However, IS&H personnel review solely from a personnel exposure perspective and not from a waste management perspective. As a result, hazardous products that are neither acutely hazardous nor carcinogenic are not reviewed for product substitution.Recommendation: Expand the prejob IS&H review process to include a P2 product substitution review. This review can be performed in conjunction with the IS&H review by the Environmental Coordinator for the division under which the project falls. The basis for this review should be the sitewide predetermination list for approved nonhazardous products. Any product called out in a job that is not on the predetermination list should be reviewed by an Environmental Coordinator for possible product substitution.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Ronald Del Mar
Phone: 509-376-9773	**Phone:** 509-376-1967
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Waste Segregation/Collection **Major Waste Type:** Sanitary Waste

PPOA ID Code: HFD-KH_23 **Specific Waste Type:** Construction Debri

Date: 26-jul-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Handling

Description: ICF KH Construction Guide Specifications specifically require construction contractors to segregate Òbroken asphalt, broken concrete, scrap ferrous metal, scrap non-ferrous metal, scrap wood, batteries, non-PCB ballasts, aerosol cans, used petroleum products, fluorescent light tubes, tires, cardboard, and paper at worksite locations designated by ICF KH.Ó However, this provision of the Guide Specifications has never been enforced because ICF KH has not specifically designated locations to segregate and collect many of these materials.The site has programs in place to handle most of the materials listed in the Guide Specifications. The Centralized Consolidation/Recycling Center operated by ICF KH in the 400 Area will accept batteries, fluorescent tubes, aerosol cans, and non-PCB ballasts. ICF KH Fleet Maintenance has contracts in place to take used petroleum products and tires. WHC has contracts with outside vendors to take scrap metal (ferrous and non-ferrous), wood, cardboard, and paper. The only waste streams identified in the Guide Specifications for which the site does not have recycling programs are asphalt and concrete.In spite of the established recycling programs mentioned above, many of the materials identified for recycling in the Guide Specifications (particularly the nonhazardous materials) continue to be disposed to the Hanford Central Landfill.

Options: Option 1 - Recycling Staging AreasCurrent Practice: In spite of contract requirements to recycle concrete, asphalt, cardboard, paper, wood, and metal, much of this waste continues to be disposed to the landfills. ICF KH has not designated a place for subcontractors to collect recyclable waste.Recommendation: ICF KH need to designate a location for the collection of the recyclable waste streams identified in the Guide Specifications to allow for enforcement of this contract recycling requirement. This can best be accomplished by setting up a single staging area for the collecting of all recyclable sanitary waste. At a minimum, this area should include a wood laydown yard, a place to stockpile broken asphalt and concrete, luggers for non-ferrous and ferrous metal, and recycling bins for cardboard and paper. Eventually, as markets are identified recycling bins can be established for other wastes not outlined in the Guide Specifications, such as plastic, and glass. The staging area can also be set up to handle non-routine recyclable wastes, such as used carpet. The staging area should be located somewhere near the 1100 or 300 Areas just off Stevens Drive. This location will make it convenient for construction contractors to drop off their recyclables at the end of each day.The Hanford Central Landfill will close permanently in March 1996. Contractors will then be forced to haul their sanitary waste to the Richland Landfill. Locating the recycling staging closer to most siteÕs than the Richland Landfill will promote recycling by making it more convenient and less time-consuming than dumping.The recycling staging area can either be managed by the sample people who currently manage the Hanford Central Landfill, or management can be out-sourced with proceeds from recyclable materials going to the private contractor. Privatization may create some conflicts with existing site recycling programs; however, the end result (i.e. reducing waste from construction activities going to the landfill) would likely far exceed the successes of existing programs.Option 2 - Recycling LuggersRecommendation: Purchase recycling luggers for use by construction contractors for segregation and collection of recyclable waste at the jobsites. ICF KH will provide each contractor with an appropriate number of luggers at the start of work. These luggers will remain with the contractor for the duration of the job. Following the job, ICF KH will retrieve the lugger(s) for reassignment to another contractor. Luggers can be used for segregation and collection of metal (ferrous and non-ferrous), wood, paper, and cardboard.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Ronald Del Mar
Phone: 509-376-9773	**Phone:** 509-376-1967
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: 200-West Paint Shop Oil-Based Paint Brush Wash **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-KH_24 **Specific Waste Type:** Solvents

Date: 20-mar-1995 **Major Activity Type:** Service **Specific Activity Type:** Painting

Description: The 200-W Paint Shop uses a combination of used and fresh solvents in its brush wash station for oil-based paints. The station is located outdoors and consists of four separate covered metal bins. Each bin represents a different stage of the brush wash system. Dirty brushes and other painting tools and equipment are cycled through the four bins into progressively cleaner solvent solutions. The solvent is cycled in the reverse direction and reused until it reaches the initial wash bin. The spent solvent is then transferred to a distillation unit in an adjacent building to recover solvent for reuse.A 300 cfm-capacity exhaust collection system is used to exhaust solvent fumes away from personnel and out a stack into the atmosphere. The fan pulls fumes from all four stations simultaneously, regardless of how many of the four bins are in use.

Options: Option 1 - Alternate Secondary ContainersCurrent Practice: 200-W Painters use 1-gallon buckets inside the metal brush wash bins to soak brushes in solvent. These buckets cannot be covered, because the handles of brushes and other equipment extend above the lip of the buckets. The exhaust system is turned on whenever a painter opens the metal lid of any of the four bins. The system exhausts solvent fumes away from painters and out a stack. However, the exhaust system draws air from all four bins simultaneously, thus significantly increasing the rate of solvent vaporization. This results in an estimated 30% solvent loss due to vaporization, based on painter process knowledge.Recommendation: Replace the 1-gallon buckets with containers that can be covered while inside the metal wash bins. This will reduces the rate of solvent vaporization by at least 75%, as the fan would only be able to draw fumes from the bin where the work is occurring. Having covered secondary containers will also reduce the rate of vaporization during inactive times. This option would add the costs of buying some type of suitable secondary container. The container would not only have to fit the dimensions of the inside of the brush was bins, but would also have to be made of a suitable material (e.g. polyurethane) to withstand the rigors of brush wash activities and the corrosive nature of solvents. Currently, this is not a concern because the 1-gallon buckets are recycled from regular painting activities and they can be changed out as often as needed. The brush was bins are not deep enough to hold 5-gallon buckets.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Ronald Del Mar
Phone: 509-376-9773	**Phone:** 509-376-1967
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: 200-West Paint Shop Latex Brush Wash **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-KH_25 **Specific Waste Type:** Wastewater

Date: 24-mar-1995 **Major Activity Type:** Service **Specific Activity Type:** Painting

Description: Painters at the 200-W Paint shop use water to wash latex paint out of brushes and other painting tools. Dirty tools are soaked in a five-gallon bucket of water; any scraping or scrubbing necessary to clean tools occurs within the buckets of water. Dirty water is collected in 55-gallon drums. Prior to disposal, latex brush wash drums must be sampled to assure they do not contain traces of regulated materials. Nonregulated drums are solidified using an absorbent (kitty litter) and sent to the Hanford Central Landfill. Regulated drums must be managed and disposed of as hazardous waste. Estimated costs for sampling/disposal of nonregulated latex brush was is $700/drum ($500 sampling, $200 management/disposal). If any trace of certain listed substances are found in the brush wash, the entire drum must be managed as hazardous waste. Disposal costs for regulated drums are about $1300 a drum ($500 sampling, $800 management/disposal.)

Options: Option 1 - Administrative ControlsCurrent Practice: Painters collect spent latex paint brush wash from brush washing operations in 55-gallon drums in a satellite accumulation area. Full drums are shipped to the batch plant. The latex brush wash process generates about one 55-gallon drum of waste a month. All drums are sampled for hazardous constituents prior to disposal. Painters estimate that one drum a year fails sampling and must be disposed of as hazardous waste. Nonhazardous drums are solidified using an adsorbent and transported to the Hanford Central Landfill. Paint manufacturers claim their latex paint products do not contain any regulated materials. The contaminants, therefore, appear to result from improper segregation of latex paint brushes from oil-based paint brushes. Currently, there are no administrative controls in place to ensure that painters do not use the same brushes for both latex and oil-based or regulated latex paint operations.Recommendation: Painters are provided two types of brushes; one for latex paint and one for oil-based paint. Some sort of administrative control needs to be implemented to ensure that painters follow the prescribed uses of these brushes an donÕt mix applications. The same rules apply to other paint-related equipment, such as funnels. Recommended controls include color-coding equipment, applying appropriate labels, and posting signs at the respective scrub wash stations. These controls may need to be proceduralized to provide foreman with something in writing that they can enforce. Procedures will require follow-up training and employee awareness to educate painters as to the problems and costs associated with contaminating nonregulated products with regulated products. Such training can be provided as part of regularly scheduled safety meeting to avoid incurring added training costs. Once such controls are in place and verified through sampling to be effective, sampling can be discontinued. Periodic random sampling may need to occur to verify that the latex brush wash continues to be untainted.Option 2 - Brush Wash DistillationCurrent Practice: Latex paint brush wash is collected in 55-gallon drums in the 200-W Paint Shop Satellite Accumulation Area. Full drums are sampled to ensure they do not contain regulated substances. Nonregulated drums are solidified and sent tot he landfill for disposal.Recommendation: Most of the costs ($500) associated with latex brush wash

disposal is for sampling. A prerequisite to consideration of this option is that administrative controls be implemented at the paint shop to preclude contaminating latex paint brush wash with regulated materials and, therefore, eliminate the need for sampling. Once such controls are in place and proven to be effective, a distillation system can be purchased for latex paint brush wash. Clean water recovered from the distillation process can be reused for brush washing. Solids can be disposed to the landfill as sanitary waste. According to one distillation system vendor, traditional solvent distillation units can be used for water-based latex brush wash. However, since water has a much higher boiling point then solvents, considerable more energy would be required to distill water vapors. One vendor suggested adding an extra heater to the distillation unit to compensate for the energy drain. This added feature is included in the price quote.Option 3 - Brush Wash FiltrationRecommendation: Once option 1 has been implemented and proven to be effective, the paint residue can be filtered out of the latex brush wash. Solids can be disposed to the landfill; water can be dumped down the drain or reused for brush washing. A bag and strainer filter system can be used. Bag filters are inexpensive and easy to change out. According to the vendor, filter life is about 200 gallons of effluent. However, for best filter efficiency, the vendor recommended replacing the filter once a month. Brush wash would continue to be collected in 55 gallon drums. Once a drum is full, the brush wash would have to be treated with a coagulant-type chemical to turn soluble components into filterable granular components. According to a representative from NALCO Chemical, the suitable chemical is a polyaluminum chloride with an EPI-DMA coagulant. This chemical is approved by the National Sanitation Foundation for potable water use. The brush wash would then be piped, either using a low-capacity pump or by gravity flow, to the bag filter housing. The filter would remove paint solids. Recovered water could wither be routed down a drain or collected in another 55-gallon drum for brush wash reuse.Option 4 - 300 Area TDEFRecommendation: Once option 1 has been implemented and proven to be effective, use of the 300 Area TEDF for treatment of the latex paint brush wash can be pursued. The 300 Area TEDF currently receives a similar waste stream from ICF KH painters in the 300 Area. The Ecology permit for operating that facility would have to be amended to include the 200-W paint shop as an approved waste stream. The facility has separate funding and would not charge the paint shop for treating the brush wash.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Ronald Del Mar
Phone: 509-376-9773	**Phone:** 509-376-1967
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Tank Farm Trench Shoring **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: HFD-KH_26 **Specific Waste Type:** Wood

Date: 10-apr-1995 **Major Activity Type:** Nuclear Facility Operations **Specific Activity Type:** Construction

Description: Wood is used to shore pipe trenches for tank farm upgrade projects. Because of the potential for radioactive contamination, tank farm trench shoring wood cannot be released from tank farm areas. Upon completion of a trench shoring job, reusable wood is loaded into a conex trailer. This trailer is then surveyed out of the tank farm area and transported to a radiation zone laydown yard for reuse of the wood shoring. With proper care, wood shoring can last up to 20 years.* Eventually, wood shoring must be disposed as low-level waste.This P20A looks at Project W-030, Ventilation Upgrade, as an example of a project that uses wood shoring. The scope of Project W-030 is to install new ventilation piping at the AY and AZ tank farms. The average depth of Project W-030 ventilation piping trenches is 6 to 8 feet. Trench width is about 3 feet. The project excavated 1,183 linear feet of trench, and purchased 15,167 ft2 of wood shoring material.Opportunities identified in this P20A may be applicable to future tank farm ventilation or

Options: ICF KH construction forces are using wood to shore trenches dug for the installation of new ventilation piping at the AY and AZ tank farms. Upon project completion, reusable wood will be loaded into a conex trailer and surveyed out to another radiation zone area for possible reuse. Unusable wood will be disposed as low-level waste. It is estimated that with proper care, some of the wood can be reused for up to 20 years.For future projects requiring trenches in tank farm areas, use light- weight aluminumtrench shields instead of wood. These trench shields can be assembled into trench boxes meeting OSHA regulations. Trench boxes appear to be the industry standard for trench shoring.Trench shield panels are 4 feet high and can be ordered in lengths from 5 to 12 feet. Boxes ran be assembled in minutes using spreaders at each corner. These spreaders can be ordered in lengths ranging from 20 inches to 95 inches.Up to three trench boxes can be stacked on top of each other, making these trench boxes usable down to depths of 12 feet. According to the manufacturer, these trench shields are light weight enough for one person to lift a box in and out of a trench; two people can lift a stacked assembly of two boxes. A wheel kit is available that

attaches at ground level on top of the trench box to make it easier to maneuver the box from inside the trench.Initial conversations with V-IHC health physics technicians (HPTS) indicate that it would not be a problem to release aluminum shoring material from a tank farm area. Being able to release this material would save in disposal costs and make the shoring available for use outside tank farm areas. This assessment assumes that 20% of aluminum shoring material will become contaminated and still have to be disposed as low-level waste.One potential problem with using trench boxes is underground interferences. Workers may have trouble lowering trench boxes in and out of any trench area intersecting existing underground piping or utility lines. Interferences would also make it more difficult to move trench boxes along the inside of the trench. Interference areas may need to continue to be shored with wood.Another potential problem is the length of time the trenches are left open. Trench boxes work best in areas uncovered for only a short period. Due to the nature and extent of thetrench work occurring in tank farm areas, trenches might be left open for several weeks. Trench boxes only provide shoring in the immediate area where work is occurring. Without permanent shoring along every foot of trench area, some sections of the trench may cave in.Although some reuse of wood shoring may occur for up to 20 years, the exact quantity of wood actually reused and future disposal costs are difficult to predict. This assessment assumes 100% disposal of wood shoring at 1995 low-level waste disposal costs.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Ronald Del Mar
Phone: 509-376-9773	**Phone:** 509-376-1967
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Project C-018 Ammonium Sulfate Reuse **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-KH_27 **Specific Waste Type:** Chemicals

Date: 01-jan-1996 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Treatment

Description: The 200 Area Effluent Treatment Facility, Project C-018, is conducting test runs with chemical mixtures to determine whether the plant operates as designed. Output from test runs is a dry solid chemical mixture of ammonium sulfate and trace concentrations of phosphate. The expected quantity of spent ammonium sulfate mixture from test runs is 54,000 pounds (24,490 kg). Ammonium sulfate is regulated as a Washington State dangerous waste (WT02).

Options: Option 1 - NAP ProposalCurrent Practice: The 200 Area Effluent Treatment Facility (ETF), Project C-018, recently completed construction. The facility is currently completing test runs with chemicals to determine if the plant will operate as designed. The chemicals for the test runs were supplied by Northwest Agricultural Products Incorporated (NAP Chemical). The supplied chemicals were ammonium hydroxide (NH4OH), ammonium sulfate (NH4SO4), and small volumes of tributyl phosphate (C12H27PO4) and sulfuric acid (H2SO4). These chemicals were dissolved into a solution of deionized water and processed through the 200 Area ETF as a simulated waste. The 200 Area ETF is designed to remove chemicals from waste water using a variety of methods (e.g., reverse osmosis, U.V. decomposition filtration, ion exchange, dewatering using a filter press, etc.). The resulting waste is a dry residue (about 40% moisture) of primarily NH4SO4, with trace concentrations of phosphate. These removed chemicals are collected in 55-gallon drums. It is estimated that the entire testing process will generate 131 drums of waste material. NH4SO4 designates as a Washington dangerous waste under WT02 and requires management and disposal as a dangerous waste. The other chemicals do not designate at the concentrations being generated.Recommended Action: The test run chemicals are identical in composition to agricultural fertilizer. Upon completion of the 200 Area ETF test runs, the recovered chemicals will have undergone the same type of mixing used by the agricultural industry. However, because the exact concentration of nitrogen and sulfur are unknown, the chemicals cannot be resold as commercial fertilizer. However, they can be given away.WAC 173-303 provides exemptions from the dangerous waste designation if the chemical is 1) Òapplied to land and that is their ordinary manner of useÓ and 2) the chemical can be reused as an Òeffective substitute for commercial products.Ó ICF KH Environmental Programs and Integration performed a regulatory review of the chemicals and determined that if reused as an effective fertilizer (soil amendment), the product would be exempted from state dangerous waste regulations.NAP Chemical has proposed to buy back the ammonium sulfate test output product for about $280 a drum. NAP would, in turn, give the product to local farm operations for use as fertilizer. This proposal would avoid disposal of the chemicals as dangerous waste. Part of the NAP proposal is to triple-rinse all 55-gallon drums and return empty drums to the 200 Area ETF for reuse onsite.Option 2 - Excess Through WHCRecommended Action: This option is identical to Option 1, except that the chemical would be excessed through WHC Excess (for free give-away) instead of being

sold back to NAP Chemical. WHC Excess would advertise the availability of the fertilizer onset and with other DOE sites. If no government agency is interested, Excess would attempt to locate an interested off site customer. Sample jars are already available to supply to potential customers. Once a customer is found, Excess would coordinate pickup of the chemical. WHC Excess personnel say the time and effort involved in finding a customer for the chemicals would be minimal.C-018 project personnel would have to generate the appropriate Excess Documentation. Otherwise, this option would not incur any additional costs. The costs associated with drumming and labeling the barrels are not included because they would be incurred no matter which option is selected for disposal/reuse.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Ronald Del Mar
Phone: 509-376-9773	**Phone:** 509-376-1967
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Project L-047, Asphalt Recycling **Major Waste Type:** Sanitary Waste

PPOA ID Code: HFD-KH_28 **Specific Waste Type:** Asphalt

Date: 26-apr-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Utilities

Description: The scope of Project L-047 is to install new underground electrical and HLAN utility lines in the 300 Area. Trenches for these utility lines are about 4 feet wide and four feet deep. Many of these trenches must cross or run directly beneath existing roads in the 300 Area. Roughly 2,380 cubic meters (3,000 cubic yards) of asphalt must be removed from affected 300 Area roads. Asphalt is cut out of the roads and loaded into a dump truck. Full trucks are dumped to ;the nearest inert/demolition landfill (Pit 10) located just north of 300 Area.

Options: Option 1 - Asphalt RecyclingCurrent Practice: Old asphalt is loaded into a dump truck and driven to the nearest inert/demolition landfill (Pit 10). Dumping at the inert/demolition landfill is free. Projects are assessed a fee for landfill maintenance as part of the cost of paying for other site services, such as road maintenance, courier service, etc. The fee is included as part of an adder for all projects; therefore, disposal costs are not directly budgeted. The overall ICF KH 1994 budget for maintenance of all three of its inert/demolition landfills was $71,000.Recommended Action: Transport the asphalt to a local asphalt company to be recycled rather than dumping it in the landfill.Closer evaluation of this option revealed several problems. First, only one local asphalt company (A&B Asphalt) will accept used asphalt. A&B is located in Benton City and charges $4/ton for used asphalt. At this time, A&B does not use the old asphalt as aggregate for new asphalt but merely stockpiles it for possible future use. Therefore, ICF KH would basically just be paying a dumping fee, with no guarantee the material would ever be recycled.A second problem is the manner in which the excavated asphalt is collected. Asphalt is cut from a small section, loaded into a truck, and hauled off for dumping. The cleared area is then excavated, utilities are installed, the trench is refilled, and new asphalt is applied. This approach of excavation, utility installation, and asphalt patching does not allow for complete removal of the asphalt at one time. This makes the prospect of recycling the asphalt more difficult, time-consuming, and costly.A third problem is the extra travel time. Currently, roundtrip to the landfill is about 20 minutes. A&B Asphalt is located in Benton City. Delivering excavated asphalt to Benton City would increase driving time at least four times to 1.25 hours.Since the contractor is currently not charged to dump asphalt in the inert/demolition landfill, the added cost of recycling makes this option cost-prohibitive.Option 2 - Add Recycling to Paving ContractRecommended Action: For future projects, include recycling of the old asphalt in the bid proposal for new paving work. According to a representative from the Asphalt Paving Association, this would add about $5 a cubic yard to the price of the contract. The added cost is because it is currently more expensive for local contractors to make asphalt with used aggregate than it is to make asphalt using virgin aggregate.One problem with this option is that recycling is generally better suited to projects where old asphalt is planed off rather than removed in chunks. Normally, these types of projects involve very large sections of asphalt, such as repaving a highway or large parking lot. As mentioned in Option 1, none of the local contractors are currently set up to recycle asphalt chunks; however, at least two local contractors can recycle asphalt which has been planed.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Ronald Del Mar

Phone: 509-376-9773	**Phone:** 509-376-1967
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Office Paper Recycling **Major Waste Type:** Sanitary Waste

PPOA ID Code: HFD-KH_29 **Specific Waste Type:** Paper

Date: 24-apr-1995 **Major Activity Type:** Office **Specific Activity Type:** Recycling

Description: The Hanford Site has a contract with a local recycling vendor to pick up office paper and newspaper at several locations throughout the site for recycling. The vendor picks up paper for recycling from 380 different work locations throughout the Hanford Site. About 693 tons (629,000 kg) were recycled site wide in 1994.In spite of this highly successful paper recycling initiative, paper continues to be a major source of waste going to the Hanford Central Landfill. Paper recycling efforts have targeted office facilities, but not construction activities. As a result, many construction trailers, craft shops and subcontractor facilities do not recycle paper. In 1994, 36% of all waste sent to the Hanford Central Landfill was paper products (including cardboard). This amounted to nearly 14,500 square yards, or about 3,300,000 kg of waste. About 50% of this waste was cardboard, the other half was paper. It is estimated that 70% of the paper waste was office-type paper that could have been recycled. This amounts to about 1,155,000 kg of potentially recyclable paper waste.Without detailed waste generation records for sanitary waste, it is impossible to identify who generated this paper waste. This assessment will assume that 50% of this waste came from construction facilities that do not recycle paper (i.e., 577,500 kg). The remaining 50% came from facilities where paper recycling is available, but where full participation does not occur. This assessment assumes that ICF KH construction facilities are responsible for 20% (i.e., 115,000 kg) of the latter source of paper waste generation.

Options: Option 1 - Office Paper RecyclingCurrent Practice: The Hanford Site has about 380 pickup points for paper recycling. Most of these locations are office facilities. Many construction trailers, craft shops, and subcontractor facilities currently do not participate in the site paper recycling effort, resulting in a significant amount of paper waste still ending up in the garbage.Recommended Action: Survey all ICF KH construction work locations to see whether or not they are recycling paper. When a facility is identified that does not recycle paper, talk to facility personnel about the paper recycling initiative and assign a contact person for that facility. Forward the name of the facility, contact person, and phone number to WHC Recycling so that the facility can be added to the siteÕs regular paper recycling pickup route. The recycling vendor will then supply that facility with the appropriate paper recycling receptacle. Depending on the amount of paper waste generated by that facility, the vendor will either include the facility in its regular biweekly pickup run, or pick up paper on as-needed basis.Until ICF KH performs a survey of all construction facilities, the exact number of buildings not participating in the paper recycling program will not be known. This assessment assumes that at least 50 ICF KH construction buildings currently do not recycle paper. In addition, ICF KH can have up to 50 subcontractors on site on any given day. This assessment will assume the addition of 100 buildings to the siteÕs paper recycling program.Once all buildings that need paper recycling receptacles are identified, implementation costs are very minimal. An HPT must first verify that the building will not generate contaminated paper products. Once this is verified, WHC Recycling adds the building to the pickup schedule and forwards the new schedule to the recycling vendor. WHC Recycling estimates the administrative cost for adding facilities into the current paper recycling program to be about $50 a building.Option 2 - Add Facilities on Ongoing BasisRecommended Action: This option is identical to Option 1, except that instead of a single survey to identify all nonparticipating facilities, each construction divisionÕs environmental coordinator will add facilities as they become aware of them during the regular course of their work. During any 6-month period, the environmental coordinators will visit every facility in their division at least once. When the environmental coordinators encounter a facility that does not recycle paper, they can explain the program, sign up a contact person for that facility, and forward the information to the ICF KH Pollution Prevention group. This information will, in turn, be transmitted to WHC Recycling so that the facility can be added to the siteÕs paper recycling program.The benefit of this option is that it will avoid the cost and effort of conducting a survey of all facilities. This becomes especially important as reduced staffing levels at ICF KH will add demands on the remaining work force. Another benefit of this option is that adding buildings on an incremental basis will make implementation easier for WHC Recycling and the recycling vendor.The downside to this option is that it will take longer to get all facilities involved, meaning that some paper will continue to be disposed to the landfill in the interim.Option 3 - Education/EnforcementCurrent Practice: The Hanford Site has about 380 pickup points for paper recycling. Many of the offices of ICF KH construction personnel are included in this paper recycling initiative and have been provided with paper recycling receptacles. However, participation is poor in many locations, as some people continue to throw paper away even when recycling receptacles are conveniently located nearby. Such nonparticipation is estimated to account for 50% of the office paper still going to the landfill.Recommended Action: Target those facilities where participation is poor with

educational material, posters, staff meeting presentations, etc. to explain the problem, the benefits of recycling, and the need to keep as much waste as possible out of the Hanford Central Landfill. Such presentations can include tips for making the program more convenient, such as keeping an empty box in the office next to the garbage can for accumulating recyclable paper, thus reducing trips to the recycling receptacle. Recycling paper will become especially critical next year when the Hanford Central Landfill closes and the site will have to begin using the Richland Landfill. Closing the siteÕs landfill will raise tipping fees and transportation costs.To encourage recycling, some communities have adopted landfill bans of recyclable materials. In some instances, garbage collectors refuse to pick up the trash from households who continue to throw away large quantities of recyclable material. The ICF KH janitorial staff should implement a similar procedure for paper waste. If trash cans contain large quantities of paper and recycling is available to that facility, the janitors should refuse to empty that trash can until the recyclable paper is removed. This type of enforcement will encourage recycling and increase the level of participation.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Ronald Del Mar
Phone: 509-376-9773	**Phone:** 509-376-1967
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Janitorial Waste **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-KH_30 **Specific Waste Type:** Cleaning Supplies

Date: 15-may-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Cleaning

Description: ICF KH Custodial Services (CS) provides janitorial services to 334 facilities on the Hanford Site. CS recently performed a detailed pollution prevention analysis of its cleaning supplies. Through product substitution, CS eliminated all hazardous products, while reducing its inventory from roughly 170 to 40 products. The CS pollution prevention effort included extensive product testing to verify that all new products perform as well as the products they replaced. Other aspects of the pollution prevention effort were rag laundering, container return, prediluted products, and bulk packaging and distribution. Overall, the CS pollution prevention effort has saved $160,800, reduced dangerous waste disposal by 3.4 cubic meters (equivalent to 16 55-gallon drums), eliminated the disposal of another 70 cubic meters of sanitary waste to the landfill, and reduced product costs. A copy of a paper outlining the CS effort is attached for reference as an addendum to this P2OA.

Options: Option 1 - Product InventoryCurrent Practice: ICF KH construction janitors operate independently from each other. They report to the respective labor foremen for the areas they work in. Janitors are responsible for their own inventory of cleaning supplies, including the purchase of new and/or replacement products. An inventory of all ICF KH chemicals performed in 1994 did not include janitorial supplies. At present, there is no central clearinghouse for assimilating and tracking the inventory of janitorial supplies. In fact, there is not even any central record to identify who the individual janitors are.Recommended Action: The first step is to identify the individuals who perform janitorial services at ICF KH construction facilities. This information can be obtained through two sources; Mike Beck (376-5835) is the Labor Foreman for facilities south of the Wye Barricade and Larry Lingor (372-0381) is the Labor Foreman for facilities north of the Wye Barricade.Once the specific janitors are identified, each janitor will inventory their janitorial supplies. Copies of these inventories will be supplied to the respective environmental coordinators. Inventory sheets will include the following information: product name, manufacturer, use, quantity, MSDS #, date of MSDS#, whether or not the product is usable, whether or not the product is regulated, and possible product substitutions. The janitors can supply the information on product, manufacturer, use, MSDS# and date, and product usability. The environmental coordinators will complete the rest of the information.Option 2 - Chemical ExchangeCurrent Practice: Construction facility janitors work and order materials independent of each other. This results in a wide diversity of products ordered for the same applications. Another problem is lack of inventory coordination. One janitor may have an excess supply of a certain product, while another janitor continues to purchase the same product.Recommended Action: The inventories of the various janitors need to be coordinated and controlled. Once this is accomplished, a chemical exchange program can be set up between the various janitors. The goal is to use up the current inventory as quickly as possible so that all hazardous products can be replaced by nonhazardous products the next time they need to be reordered (Option 3). The key is communication. If one janitor has a large inventory of a certain product, this material should be made available to all janitors to enable the product to be used up as soon as possible.Once the janitorial supply inventories are completed (Option 1), the respective environmental coordinators will work with the janitors to identify excess and/or unusable products. Excess chemicals will be recorded on a central list which will be made available to all janitors. Janitors will consult this list prior to

ordering new materials. If a needed product is on the excess list, the janitor will obtain the excess product in favor of ordering new materials. If the product is not on the list, the janitor will consult a list of preferred product substitutions (Option 3) to order new materials. Unusable (i.e., unneeded) products will be excessed to other DOE sites or the community through the WHC Excess program.Option 3 - Product SubstitutionCurrent Practice: Custodial Services on the operations side of the company recently completed a detailed assessment of janitorial supplies. The result of this effort was to replace all hazardous materials with nonhazardous substitutes. Extensive field testing was performed prior to adopting all substitutes to assure that the new products perform as required. The results of this assessment effort have not been made available to the janitors on the construction side of the company. As a result, hazardous materials continue to be used, creating not only a potential safety hazard to janitors using the products, but also a potential liability issue with improper disposal.Recommended Action: Custodial Services will be asked to provide a complete inventory of the nonhazardous substitutes currently being used. This information will be provided to all construction janitors. Janitors will be instructed to consult this list to ordering any new materials.Shirley Cook and Rick Funderburg from Custodial Services will make a presentation to construction janitors to explain the product substitution effort and answer specific questions. Such a presentation with all construction janitors present is important to obtaining buy-in from the janitors to eliminate use of all hazardous materials. This presentation will also provide an opportunity to discuss safety issues and regulatory implications associated with use of hazardous materials, while establishing a needed link between the construction janitors and CS and fostering ongoing interaction.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Ronald Del Mar
Phone: 509-376-9773	**Phone:** 509-376-1967
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Sandblasting **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-KH_33 **Specific Waste Type:** Paint

Date: 04-aug-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Sand Blasting

Description: ICF KH construction forces operate paint shops in the 400, 200-W, 200-E, and 100-N areas of the Hanford Site. Each of these paint shops has an outdoor area for sandblasting. These sandblasting areas are open and uncontained. Roughly 90-95% of sandblasting is performed to remove mill scale and rust from metals prior to fabrication and painting. However, painters sometimes also use sandblasting to remove old paint coatings.Current sandblasting practices present several problems in terms of waste management and pollution prevention. In addition to aesthetic problems, several potential noncompliance issues exist concerning the management of the sandblast areas.1. No procedures exist to preclude mixing non-paint blast debris with paint blast debris. Paint chippings may contain chromium and lead. Depending on the dilution factor, blast debris with paint chippings may be regulated waste. Without an adequate characterization, all blast debris must be assumed to be regulated until proven otherwise through sampling. (Note: Analysis results of samples recently taken from the 3000 Area blast yard indicate that blast debris from current operations is not regulated.)2. Blasting occurs outdoors without any means to contain the blast medium. During blasting operations, blast debris can migrate 30 to 50 meters from the blast site before settling to the ground. In addition, wind can pick up the blast debris and further spread contamination.3. Sandblast debris is not managed as a waste. Blast debris is left to accumulate on the ground around the blasting equipment. About once every two to three years, somebody decides to clean up the blast area. The blast debris is then sampled, removed, and taken to a landfill.The 400 Area paint shop does most of the sandblasting for ICF KH construction activities. This paint shop was recently consolidated with a former paint shop from the 3000 Area. This P2OA will look at several options for setting up a new sandblast area at the 400 Area to eliminate potential noncompliance issues, reduce waste generation, and reduce operating costs.The data generated in this P2OA is based on several assumptions:1) Painters blast an average of 2 days a week (50 weeks a year).2) The new blasting process at the 400 Area will require some type of containment of the blast medium.3) Cleanup of blast debris will be required after every day of blasting. This will preclude the mixing of mill scale/rust debris with potentially contaminated paint debris.4) All blast debris is non regulated and can be disposed to a sanitary waste landfill.5) Total volume of blast debris (i.e., metal/paint dust is 15 metric tons a year. This assumption is based on a 95% to 5% ratio between blast medium and blast debris waste.

Options: Option 1 - Chain link Fence in Open EnvironmentCurrent Practice: Sandblasting is performed in an open environment on a ground surface. No provisions are provided for containment of debris. Cleanup of the blast debris occurs infrequently. New company policy will require some form of containment to allow for regular cleanup an disposal of blast debris to one of the

siteÕs inert/demolition landfills.Garnet is used as the blast abrasive. Daily usage of garnet is about 2.72 metric tons (based on 6 hours of blasting). Painters blast on the average 2 days a week. This equates to a yearly garnet usage of 272 metric tons.Recommended Action: Locate blast area on a 15-by 30-meter concrete pad in the 400 Area. Construct a 2.5-meter-high chain link fence around the perimeter of the concrete pad. Install aluminum slats in the chain link fencing to contain blast debris. Use existing blast equipment and abrasive media (i.e., garnet).The advantages of this option include:1) Low implementation cost.2) Use of existing equipment.3) Little change in current operations.4) Fast cleaning rate.Disadvantages include:1) High cleanup costs.2) High material costs.3) Lack of weather protection precludes reuse of garnet.4) Chain link fence not 100% efficient at containing blast debris.5) No control of fugitive emissions.6) PPE requirements.Option 2 - Enviroscreen Containment StructureRecommended Action: Locate blast yard on a fenced concrete pad, identical to what is described under Option 1. Construct a 10-by 12-meter wood and pole structure with a roof height of 6 meters. Install an ÒEnviroscreenÓ along the top 3.5 meters of the structure. The Enviroscreen is a tough nylon mesh material with small holes that allow for air passage while blocking out blast debris. Debris will bounce off the Enviroscreen and drop to the floor, from where it can be swept up at the end of ;the shift. The bottom 2.5 meters of the structure can be either wood or metal solid construction with rubber bumper padding along the inside to protect the walls from the abrasive blast material.The enclosure will provide the needed weather protection to allow for recycling of the blast medium. A portable reclaim system can be purchased to separate out recyclable blast debris from blast debris dust. Garnet can be reused 2 to 3 times, thus saving in material costs and disposal fees. Cleanup time should also be reduced due to the smaller blast area.Advantages of this option include:1) Use of existing blast equipment2) Little change in current operations3) Fast cleaning rate4) Less cleanup5) Maximum retrieval of garnet for reuse.6) Reduced disposal cost7) Simple containment structure for full containment of blast media8) Requires no special ventilation equipmentDisadvantages include:1) Garnet breaks down relatively fast compared to other media (e.g. steel, plastic)2) Startup capital required to maximize media recycling3) PPE requirements4) Longer setup timeAn enclosure would not totally eliminate outdoor blasting. Occasionally, large and heavy items need to be blasted that require crane manipulation. The enclosure described in this option would not be set up with a crane support structure. Therefore, these larger items will need to continue to be blasted outdoors, outside of the containment structure. A fence will be constructed around the concrete pad outside the containment structure to contain blast debris from outdoor blasting activities. This assessment will assume that larger items needing to be blasted outdoors account for 10% of yearly garnet usage (i.e., 27 metric tons). This leaves 245 metric tons of garnet that is potentially recyclable.Option 3 - Enviroscreen Containment Structure with Steel GritRecommended Action: This option is identical to Option 2, except that garnet is replaced by cracked steel grit as the blast media. Existing blast equipment can still be used. Cracked steel is 2 to 3 times more expensive that garnet; however, it can be reused up to 150 times before it breaks down. Initial conversations with Industrial Hygiene indicate that use of steel grit will not increase PPE requirements.Similar to Option 2, this option assumes that 10% of the items to be blasted are too large and heavy to be moved without a crane. These items will continue to be blasted outdoors using garnet.Advantages of this option include:1) Significant reduction in amount of blast media required due to recycling potential of steel grit.2) Use of existing blast equipment3) Little change in current operations4) Fast cleaning rate5) Less cleanup6) Maximum retrieval of steel grit for reuse7) Minimal disposal costs8) Simple containment structure for full containment of blast media9) Requires no special ventilation equipmentDisadvantages include:1) Some startup capital required to maximize media recycling2) Higher cost of steel grit3) Longer setup timeOption 4 - Blast RoomRecommended Action: Purchase a blast room with a fully automatic reclaim system and ventilation system. Use steel grit as the blast medium. Blast area would have to be moved indoors because most blast rooms are not weather tight. As discussed previously under Options 2 and 3, some items will need to continue to be blasted outdoors. This option assumes 90% of the work will be performed within the blast room.Advantages of this option include:1) Minimal cleanup2) Significant reduction in amount of blast media required due to recycling potential of steel grit3) Use existing blast equipment4) Fast cleaning rate5) Maximum retrieval of steel grit for reuse6) Minimal disposal costs7) Full containment of blast mediaDisadvantages include:1) Large capital investment2) Must be located within a weather-tight structure3) Higher cost of steel gritOption 5 - Armex Acustrip SystemRecommended Action: Switch over to a baking soda-based cleaning and coating removal system. The ARMEX Acustrip system meters small amounts of the baking soda abrasive (i.e., sodium bicarbonate) into a compressed air and water stream. Concentrations of the abrasive and the flow rates of the water and air streams can be controlled specific to the required removal applications. According to the vendor literature, the system is tough enough to remove rust and mill scale. Mill scale removal will require a 375 cfm-capacity air compressor.Average blast media consumption is 0.9 kg/minute. Yearly consumption is 48,600 kg. Cost of blast media is about 90 cents per kg.Advantages of this option include:1) No containment structure required.2) Minimal PPE requirements beyond standard ear and eye protection; considered only a nuisance dust.3) Baking soda is a rust inhibitor which will protect metal from rerusting prior to painting.4) More versatile than sandblasting. Can be used in hard-to-reach places.5) System is portable; can be used in remote locations.6) No masking required. Will only remove coatings in direct line of spray. Overspray is no problem.7) Minimal cleanup.8) Minimal capital investment when compared to other options.Disadvantages include:1) May not be effective at removing heavy mill scale.2) New system; painters will need to be retrained.3) High cost of baking soda medium.4) Slower cleaning rate than sandblasting (250 to 300 ft2/hr).5) Possible permit costs associated with discharge of the spent blast media.Blast debris (i.e., metal/paint dust) can be swept up for landfill disposal. However, disposal of the spent sodium bicarbonate blast media remains a big question. According to vendor literature, spent blast media can be washed down a drain. The sodium bicarbonate is nonhazardous with a pH of 8.2. In a septic tank setting, the sodium bicarbonate acts as a buffering agent and is actually beneficial. However, initial conversations with WHC indicate that the discharge would probably not be allowed into the septic system at 400 Area.Two other options are available. One would be to discharge the spent media to a percolation pond in the 400 Area. WHC is currently

investigating proximity of the proposed blast location to the existing percolation pond drainage system. A second option would be to construct an infiltration trench at the blast yard. The blast media discharge media would likely fit within infiltration trench parameters; i.e., 3 liters/minute or 570 liters instantaneous discharge. However, either option would likely add permit costs to the implementation of this option.Option 6 - Vacuum Blast MachineRecommended Action: Switch over to a Vacuum Blast Machine. These machines are totally self-contained units that would minimize PPE and setup requirements and eliminate all cleanup costs. Steel grit is compressed out of a large blasthead directly onto the surface of the metal. The blasthead incorporates a vacuum system that pulls out the used steel grit and dust as it is generated. The system automatically pulls out the steel grit for reuse and disposes the dust into an attached drum.Steel grit consumption is about 40 kg for every 3 hours of blasting. Daily consumption would be 80 kg. Yearly consumption of steel grit would be about 8 metric tons. Steel grit sells for about 80 cents/kg.Advantages of this option include:1) No containment structure required.2) Minimal PPE requirements beyond standard ear and eye protection.3) Fully automated system; eliminates all cleanup time.4) Semi-portable; up to three blast heads and two needle guns can be operated simultaneously.5) No masking required.6) Eliminates all time involved with cleanup and recycling blast debris.Disadvantages include:1) Large capital investment2) New system; painters will need to be retrained.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Ronald Del Mar
Phone: 509-376-9773	**Phone:** 509-376-1967
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Excess Chemicals **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-KH_34 **Specific Waste Type:** Chemicals

Date: 07-aug-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Sand Blasting

Description: ICF KH purchases a variety of chemical materials to support its construction operations. These products often become waste when they can no longer be used onsite.The TWRS and Transition Project divisions recently identified about 2,000 kg of surplus asbestos encapsulants, surfactants, and spray adhesives. Most of these chemicals are regulated materials with limited shelf life. One material in particular, Certane 2000, requires certain temperature storage conditions and will probably spoil before winter.All 2,000 kg of the identified surplus materials are no longer needed by the current owners.

Options: Option 1 - Chemical ExchangeCurrent Practice: The TWRS and Transition Project divisions have identified over 2,000 kg of chemicals as surplus. Many of these chemicals will not survive the winter months and will become hazardous waste.Recommended Action: Institute a chemical exchange-type program to locate onsite users for the surplus chemicals. Distribute a complete list of the surplus chemicals via ccMail to all ICF KH Environmental Coordinators and material coordinators. Include in the list the product name, manufacturer, quantity, container sizes, location, MSDS number, and shelf life expiration. Those receiving the list will contact appropriate individuals in their respective organizations to see if anybody can use the surplus materials. If no home for the products can be found within ICF KH, then WHC Excess can be contacted to help find users within other contractors.Those in need of the surplus materials will contact the Environmental Coordinator and arrange for transfer for the materials to their respective facilities. This process will not only minimize waste and save money by avoiding disposal of these materials, but will avoid the purchase of equivalent materials by the organizations taking the materials.An MSDS will be provided for each product transferred to another organization or company. Materials will be shipped per DOT regulations as required by ICF KH.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Todd Boucher
Phone: 509-376-9773	**Phone:** 509-374-3456
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Receiving and Distribution **Major Waste Type:** Sanitary Waste

PPOA ID Code: HFD-KH_35 **Specific Waste Type:** Packaging Materials

Date: 11-aug-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Packaging

Description: The ICF KH Receiving and Distribution Warehouse at 200-E is the central distribution point for all materials ordered by ICF KH construction forces. During the first 6 months of 1995, the Receiving and Distribution Warehouse handled 2,526 UPS shipments, 655 freight deliveries, and 836 vendor deliveries. Most of the freight is delivered in cardboard boxes; larger pieces of equipment arrive banded to wood pallets.All shipments are inspected at the Receiving and Distribution warehouse to assure that the shipments match their respective orders. Materials are then repackaged in their original boxes and delivered to the appropriate field locations. At the field locations, most of the cardboard packaging is thrown away. Most of the wood pallets are recycled through WHC; however, broken pallets are often discarded as waste.This P2OA will look at ways to minimize the generation of packaging waste (i.e., cardboard boxes and wood pallets) that results from Receiving and Distribution operations.

Options: Option 1 - Recycling BinsCurrent Practice: Materials arriving in cardboard boxes are inspected and repackaged at the Receiving and Distribution warehouse. The materials are then delivered to the appropriate field locations. Cardboard packaging ends up being thrown away and goes to the Hanford Central Landfill.Recommended Action: Roughly 80 to 90 percent of all shipments go to one of six central ICF KH construction craft locations -- 100-N, 200-E Plant, 200-E A-Farm, 200-W Kaiser Hill, 200-W Z-Plant, and 300 Area. Provide each of these locations with a bin for cardboard recycling and include these locations on the regular pickup route of the siteÕs cardboard recycling contractor. (A proposal for a cardboard recycling contract is currently out for bid and should be in place by the beginning of FY96. While details of the contract are not yet known, the proposal called for the contractor to supply recycling bins at several locations throughout the site and service these bins on a regular schedule.) Each of these locations has a single point-of-contact for garbage collection and disposal. Contact these individuals for input on where to locate cardboard recycling bins. Once these bins are available, retrieval of all cardboard waste from these craft locations should be fairly simple.Option 2 - Recycle Broken PalletsCurrent Practice: Wood pallets that are in good condition are reused or shipped to the WHC Central Warehouse for reuse. However, damaged and broken pallets are taken apart and thrown in trash dumpsters. In addition, an estimated 130 m3 of miscellaneous scrap wood is generated by other construction activities.Recommended Action: WHC has a contract with a pallet recycling contractor (i.e., Cascade Pallets) to refurbish old pallets and sell some back to the site for reuse. As part of this effort, the contractor has agreed to take all scrap wood generated onsite. The contractor will use the scrap wood to refurbish broken pallets. Wood that cannot be reused in pallet refurbishment will be chipped and sold to Boise Cascade as feed stock for cardboard manufacturing.Broken and damaged pallets can be collected at each of the six construction craft locations. Luggers can be provided at each of these locations for collection of scrap wood. Full luggers can be picked up and delivered to a wood laydown yard in the 3000 Area for pickup by Cascade Pallets. The advantage of this option is that it will not only allow for the recovery of broken/damaged pallets, but also other scrap wood waste generated at these construction craft locations.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Ronald Del Mar
Phone: 509-376-9773	**Phone:** 509-376-1967
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Designated Use of Hazardous Materials **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-KH_37 **Specific Waste Type:** Chemicals

Date: 02-oct-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Packaging

Description: Hazardous products are designated in design and construction without consideration for less hazardous or non-hazardous products. Some of these products are later replaced with non-hazardous substitutes when Industrial Hygiene (IH), Environmental Services (ES), or Environmental Programs and Integration (EP&I) personnel become aware of them at the

jobsite or through purchase requisitions. However, substitution at this stage in a project can result in an Engineering Change Notice; which is an additional cost to the project. No mechanism or procedure exists for a subject matter expert to review specified or procured products for non-carcinogen, less hazardous, or non-hazardous product substitutions form design stage through eventual procurement. Submittal of MSDS and work processes are not reviewed by IH, ES, or EP&I prior to construction.

Options: Option 1 - Review Requisitions Prior to ProcurementCurrent Practice: Requisitions containing hazardous materials, either specified in design or by field personnel, are neither stamped ÒhazardousÓ, nor are they consistently reviewed by IH, ES, or EP&I. No procedure or system is in place to indicate that requisitions with hazardous or less hazardous products. The procurement department for ICF KH construction is the construction portion of WHC Procurement.Recommended Action: ICF KH Construction will continue to use the construction side of WHC procurement. However, prior to sending requisitions to procurement, the designated IH or EC for each division will review the requisition for possible carcinogens or other hazardous products. Substitute materials that are non-carcinogens and non-hazardous will be identified when available. The review will also include the use of the Predetermination List for preferred products, and a review of existing ÒexcessÓ products available onsite.Procedures ENV 1A and IH-1 will be revised to designate IH and EC review of purchase requisitions prior to submittal to Procurement. P2/WMin will be incorporated into ENV5.Option 2 - Design SpecificationsCurrent Practice: Design specifications designate hazardous products (including carcinogens) for specific job applications without looking at possible substitutions for non-hazardous or less hazardous products.Recommended Action: Bob Newell, Environmental Engineering, will incorporate pollution prevention and waste minimization items from DOE Order 6430.1A into a checklist and develop the checklist into a company engineering standard. Engineering procedures will be identified for revision or incorporation of P2/Wmin language.Bob Newell and Jack Mizner will conduct awareness training at ETTS division staff meetings and at Manpower meetings held within ETTS. This training will include utilization by design engineers of software databases for product substitution.Bob Evans, Industrial Hygiene, will issue a letter to all engineers on the ÒQ ListÓ referencing IH-1 and IH-9. IH-1 stipulates engineeringÕs responsibility to incorporate into design the minimization of exposure to harmful environmental factors (Section 2.25.6). IH-9 provides a list of hazardous agents (physical, chemical, and biological) that need to be identified in the prejob planning documents (Section 2.8).Jack Mizner will incorporate pollution prevention/waste minimization requirements for design engineering in ENV 10, Rev. 1.Engineering personnel will be provided with a list of contact people, such as Environmental Coordinators and IH and EP&I personnel, who can provide product substitution guidance during the design stage.Option 3 - Submittal ProcessCurrent Practice: Several procedures are in place (KAP 7.4, Guide Spec 1130, etc.) that identify the submittal process without identifying specific requirements for pollution prevention/waste minimization.Recommended Action: EP&I, ES and ECs will revise Guide Spec. 1130 to address P2/WM requirements prior to construction activity.Environmental Services North/South will conduct an awareness meeting with Field Engineers (who are responsible for following the requirements in KAP 7.4) on the requirements of P2/WM.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Robyn Morgan
Phone: 509-376-9773	**Phone:** 509-376-2435
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Plastic End Caps for Piping **Major Waste Type:** Low Level Waste

PPOA ID Code: HFD-KH_38 **Specific Waste Type:** Plastic

Date: 02-oct-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Waste Management, Disposal

Description: ICF KH will install about 600 meters of new underground ventilation piping at the AY and AZ tank farms in the 200-E Area. Prior to installation of the piping inside trenches, the insides of the piping must be protected from debris, moisture, rodents, etc. ICF KH purchased about 750 plastic end caps, ranging in diameter size from 10 cm to 36 cm, to place over the ends of the piping prior to installation to provide the needed protection. These end caps are made of a high-density polyethylene (HDPE) plastic, and suffer virtually no degradation during their use. Pipe installation occurs inside a radiation area; therefore, the plastic end caps must be disposed as low-level waste at job completion.This P2OA will look at reuse and recycling options for the plastic end caps to minimize or eliminate generation of this waste stream.

Options: Option 1 - Release and LandfillCurrent Practice: At the end of the job, the plastic end caps are disposed as low-level

waste.Recommended Action: Release the plastic end caps from the radiation area and dispose as sanitary waste. WHC Health Physics Technicians (HPT) at A Farm say the material is releasable and should not pose any problems. According to HPTs, a conservative estimate for the time required to smear, monitor, and release the material is five minutes per end cap. In actuality, additional HPT costs to release the material will be much lower because the project pays for HPT service whether or not they do work. Low-level waste burial costs are 1,900 per m3, as compared to sanitary landfill costs of $18 per m3.Option 2 - Reuse End Caps OnsiteRecommended Action: Release the material from the radiation area, as described in Option 1. Instead of land filling the end caps, stockpile them onsite in a lugger for reuse by future pipe installation projects. Most pipe has to be protected from debris/weather degradation before installation. Often, plastic bags are used to cover the ends of the pipe. However, these plastic bags are not very durable and need to be monitored carefully and replaced often. Reuse of the plastic end caps will alleviate this concern. The plastic end caps are made of a high-density, high-durability material and will be available for many future projects.Option 3 - Recycle PlasticRecommended Action: Release the material from the radiation area, as described under Option 1. Recycle the material through a plastics recycler. Among other products, recycled HDPE plastic is used in the manufacture of office and curbside recycling bins, plastic motor oil containers, and orange juice jugs. The closest plastic recycler of HDPE material is Rainier Plastics in Yakima. Initial conversations with Rainier Plastics indicates that they would pay about 4 cents/pound (9 cents/kilogram) for the HDPE material.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Ronald Del Mar
Phone: 509-376-9773	**Phone:** 509-376-1967
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Empty Hazardous Material Containers **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: HFD-KH_39 **Specific Waste Type:** Containers

Date: 02-oct-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Disposal

Description: The Hanford Central Landfill crushes about 6 drums a week of empty 208 L (55-gal) containers. Most of these containers held some type of hazardous material, such as methyl ethyl ketone, toluene, mineral spirits, etc. Crushed drums are then disposed in one of the landfill trenches. An estimated one third of these containers originated at ICF KH construction facilities, for an annual generation of about 100 empty drums.Empty containers of hazardous materials are not hazardous waste as long as they meet the criteria for empty delineated in WAC 173-303-160. For non-acutely hazardous materials, the criteria for empty is when less than one inch of waste remains at the bottom of the container or inner liner, or the volume of the waste remaining in the container or inner liner is equal to one percent of the container's total capacity... (whichever is less). All drums disposed to the Hanford Central Landfill meet this definition of empty, and are therefore exempt from WAC regulations.Federal regulations require empty containers of hazardous materials to be shipped according to Department of Transportation (DOT) shipping requirements. According to 49 CFR 173.29P empty packaging containing only the residue of a hazardous material shall be offered for transportation and transported in the same manner as when it previously contained a greater quantity of that hazardous material. Federal regulations allow empty containers to be reused as long as they do not show a reduction in integrity, and meet other criteria spelled out in 49 CFR 173.28.Currently, empty containers of hazardous materials are managed as waste. Empty containers are delivered to a 90-day storage pad to await handling by a Hazardous Material Specialist. A Hazardous Material Specialist will mark a nd label the drum at the 90-day pad for shipment according to DOT requirements. Empty drums are then delivered to the batch plant. Empty drums are stored at the batch plant until enough drums accumulate to justify a trip to the landfill.The Hanford Central Landfill charges about $3.50 per drum to crush and dispose of the drums. The Hanford Central Landfill will close for operation permanently by the beginning of calendar year 1996. Hanford sanitary waste will then go to the City of Richland landfill; however, the City of Richland will not accept drums. Current plans are to ship the empty containers as full containers to Waste Management in Kennewick for disposal.This P20A will look at the current process for managing empty hazardous material containers and investigate option for reducing or minimizing this waste stream.

Options: Option 1Many of the hazardous materials are used in some type of paint or coating application. The empty containers can be returned to the manufacturer for reuse. According to conversations with ICF KH painters, it is standard practice in private industry to return empty containers after use. Generally, a deposit fee of $20 to $25 for return of the containers is included upfront in the price for the product. Many of the hazardous material products, such as MEK, are purchased through WHC Stores via a painting contract with Gary's Paint Supply in Kennewick.Arrangement for return of the containers can be

made through WHC Procurement. Most products are delivered to the site through the ICF KH Receiving and Distribution Center at 200-E. Arrangements can be made with the vendor to pick up empty containers from the Receiving and Distribution Center when new products are delivered. This will not only eliminate needless disposal of a reusable product, but will avoid the management of the containers as waste from the 90-day pad to the landfill. The containers can beshipped back to the vendor as a product, rather than a waste. According to 49 CFR173.29, empty containers are not subject to the shipping paper requirements (of173.29) when collected and transported by a contract or private carrier forreconditioning, remanufacture, or reuse. Appropriate shipping labels and marking would probably still be required to deliver the empty containers from the field locations to Receiving and Distribution.Another area for reducing costs is to eliminate the radiation survey currently performed on each drum prior to release for disposal. Most of these containers never leave the respective craft shops where they are used. Therefore, they are never exposed to radioactive contamination. Instead of paying for a Health Physics Technician to physically survey every single drum prior to release, the Hazardous Material Specialist can fill out and sign a Non-RMMA Waste Certification Form for each drum to certify that the drum is not radioactively contaminated.Option 2Reuse the containers onsite for packaging of other types of waste materials. The containers are not regulated as long as they meet the WAC definition for being empty (i.e., less than one inch or less than 1%). ICF KH has considered this option in the past but elected to use only new drums because of potential integrity problems with used drums. This problem can be partially offset through administrative controls to avoid rough handling of the drums during transportation after they are empty.Containers can only be reused to handle compatible materials. For example, empty MEK containers can be used to hold reclaimed solvent, spent solvent, used paint etc. In many cases, reuse can occur without having to move the drum from its original location.Similar to Option 1, this option will assume that an HPT survey will not be required, since most containers are generated at exempt facilities. The Hazardous Material Specialist will fill out and sign a Non-RMMA Waste Certification Form.Option 3Crush the empty containers onsite and recycle them as scrap metal. The site scrap metal vendor will accept crushed drums. Crushing the drums should exempt the empty containers from DOT shipping for transport requirements. A recycling lugger can be purchased for permanent placement at the drum crusher location.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Ronald Del Mar
Phone: 509-376-9773	**Phone:** 509-376-1967
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Radiography Laboratory **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-KH_41 **Specific Waste Type:** Chemicals

Date: 02-oct-1995 **Major Activity Type:** Laboratory **Specific Activity Type:** Photographic Services

Description: As part of ICF KH's, nondestructive examination (NDE) quality control program, radiography is used to take pictures of completed welds to verify weld integrity. ICF KH develops its radiography film in a photography laboratory in the 1209 Building in the 3000 Area. The 3000 Area is being vacated as the site prepares to sell the land to the City of Richland or a private developer. Consequently, the radiography laboratory must be relocated, or alternate arrangements must be made to develop radiography film.Film developer and fixer used in the radiography lab are hazardous materials. Although the yearly generation is relatively small, ICF KH expends much time and energy in fulfilling the regulatory requirements associated with managing this waste stream.This P20A investigates options for managing the radiography process and minimizing the waste stream associated with it. Recommended options and estimated savings are compared to current practices, and do not account for additional savings that company will realize by not setting up a radiography laboratory at another location.

Options: Option 1:WHC operates a Nondestructive Examination Laboratory in the 300 Area (206Building).The laboratory uses an automatic film developer. The developer is an enclosed system that automatically feeds film through all the required developing steps and develops a sheet of film in about 12 minutes. The correct amount of chemicals are applied at each step and spent materials are automatically packaged for disposal. Sheets of film can be fed through the developer one after another. The finished product is dried, fully developed, and ready for use.ICF KH can utilize this laboratory to develop its radiography film. This would avoid all the costs associated with managing the waste stream at the 1209 Building. Contribution to the overall waste stream at the WHC NDE laboratory will be negligible. Developer/fixer are switched out on a time-interval basis; the small volume of ICF KH work should not significantly contribute to chemical usage.Option 2:Instead of using the WHC facility, use a private radiography lab to develop radiography film. Once such facility, X-Ray Laboratories, is located in Pasco. There may be

some labor issues to resolve, but this option may prove to be the most cost-effective.Option 3:Relocate the radiography laboratory to the 200-E Area and continue to operate per current practices. The radiography laboratory can be set up near the office of the QC staff to eliminate travel time for film developing.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Ronald Del Mar
Phone: 509-376-9773	**Phone:** 509-376-1967
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Laboratory and Sample Vacuum Pump Preventative Maintenance Procedures **Major Waste Type:** Low Level Waste

PPOA ID Code: HFD-PNL-95-01 **Specific Waste Type:** Oil

Date: 01-apr-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Equipment

Description: The existing laboratory vacuum and laboratory sample vacuum pumps used in various PNL facilities are oil lubricated. Proper maintenance of these lubricated vacuum pumps require monthly preventative maintenance procedures that involve the change out of oil and oil filters. The spent oil, oil filters, rags and other associated solid wastes are presently being disposed of as low level waste. A viable means to reduce or eliminate this waste oil stream is being sought in the performance of this Pollution Prevention Opportunity Assessment.The following information is given for the existing oil lubricated vacuum pumps: Building No. of Vacuum Pumps Type of System 314 2 Lab vacuum and Lab Sample 331H 2 Lab vacuum only 3708 2 Lab vacuum and Lab Sample 3745 1 Lab sample only 3746A 1 Lab sample onlyTOTAL 8

Options: Option 1 - Replace existing lube pumps with oil-less pumpsCurrent Practice: Preventative Maintenance schedules require the change out of oil and oil filters every thirty days for both sample and lab vacuum pumps. The spent oil, oil filters, rags, and other associated solid waste are presently being disposed of as low-level radioactive waste.Recommended Action: Remove existing pumps and replace with oil-less pumps. These new pumps require no oil and are only serviced every ninety days. Accordingly, liquid waste would be eliminated and solid waste would be reduced by two-thirds. Laboratory sample vacuum pumps must be replaced with a redundant system to comply with updated sampling requirements.Option 2 - Synthetic Oil SubstitutionCurrent Practice: Preventative Maintenance schedules require the change out of oil and oil filters every thirty days for both sample and lab vacuum pumps. The spent oil, oil filters, rags and other associated solid wastes are presently being disposed of as low-level waste. Conventional mineral oil (AW-ISO-100 Turbine Oil) is currently being used in all of the vacuum pumps in question.Recommended Action: Substitute the use of conventional oil with that of synthetic oil. Since synthetic oils generally exhibit a longer life span than their conventional counterparts, PM schedules could be extended. This would result in subsequent cost savings associated with reductions in waste generation and labor. As this option was investigated further, the pump manufacturer was contacted. Suggested manufacturers PM schedules are 500 hours for conventional oils and 750 hours for synthetic oils. Currently, the pumps are already being continuously run, which equates to a 750 hour service interval. Since the pumps are already being operated at extended PM schedules recommended for synthetic oils, nothing would be gained by changing to synthetic oils. The only way to extend the PM schedule beyond the manufacturers recommendations of 750 hours is to periodically sample and test oil from each pump. This option was ruled out during the brainstorming session. It is therefore recommended that this option not be pursued further.Option 3 - Manage/Segregate oils to prevent contaminationCurrent Practice: Preventative Maintenance schedules require the change out of oil and oil filters every thirty days for both sample and lab vacuum pumps. The spent oil, oil filters, rags and other associated solid waste are presently being disposed of as low-level radioactive waste. The current waste management practice may be to mix some non-contaminated waste oils with potentially radioactive contaminated oils. The management of this waste stream will be examined to determine if bests management practices are being incorporated.Recommended Action: Segregate radioactive contaminated waste oils from non-contaminated oils to prevent cross-contamination and to facilitate the recycling of the used oil. It was determined that Craft Services does currently segregate potentially contaminated oils from non-contaminated oils. Collection drums are kept locked to demonstrate control and to eliminate the possibility of unknown additions. Crafts personnel place only potentially non-contaminated, maintenance related oils into the collection drums. Since this practice has already been implemented, this opportunity will not be pursued further.

Site: Hanford Site

Site Coordinator: Donna Merry	**Team Leader:** Thomas E. Davis
Phone: 509-376-9773	**Phone:** 509-376-2752
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Laboratory and Sample Vacuum Pump Preventative Maintenance **Major Waste Type:** Low Level Waste

PPOA ID Code: HFD-PNL_1 **Specific Waste Type:** Oil

Date: 30-jun-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Equipment

Description: The existing laboratory vacuum and laboratory sample vacuum pumps used in various PNL facilities are oil lubricated. Proper maintenance of these lubricated vacuum pumps require monthly preventative maintenance procedures that involve the change out of oil and oil filters. The spent oil, oil filters, rags and other associated solid wastes are presently being disposed of as low level waste. A viable means to reduce or eliminate this waste oil stream is being sought in the performance of this Pollution Prevention Opportunity Assessment.

Options: Option 1:Remove existing pumps and replace with oil-less pumps. These new pumps require no oil and are only serviced every ninety days. Accordingly, liquid waste would be eliminated and solid waste would be reduced by two-thirds. Laboratory sample vacuum pumps must be replaced with a redundant system to comply with updated sampling requirements.Option 2:Substitute the use of conventional oil with that of synthetic oil. Since synthetic oils generally exhibit a longer life span than their conventional counterparts, PM schedules could be extended. This would result in subsequent cost savings associated with reductions in wastegeneration and labor. As this option was investigated further, the pump manufacturer was contacted. Suggested manufacturers PM schedules are 500 hours for conventional oils and 750 hours for synthetic oils. Currently, the pumps are being continuously run, which equates to a750 hour service interval. Since the pumps are already being operated at extended PM schedules recommended for synthetic oils, nothing would be gained by changing to synthetic oils. The only way to extend the PM schedule beyond the manufacturers recommendations of750 hours is to periodically sample and test oil from each pump. This was option was ruled out during the brainstorming session. It is therefore recommended that this option not be pursued further.Option 3:Segregate radioactive contaminated waste oils from non-contaminated oils to prevent cross-contamination and to facilitate the recycling of the used oil. It was determined that Craft Services does currently segregate potentially contaminated oils from noncontaminated oils. Collection drums are kept locked to demonstrate control and to eliminate the possibility of unknown additions. Crafts personnel place only potentially non-contaminated, maintenance related oils into the collection drums. Since this practice has already been implemented, this opportunity will not be pursued further.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Thomas Davis
Phone: 509-376-9773	**Phone:** 509-376-2752
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Sanitary Solid Waste Generation **Major Waste Type:** Sanitary Waste

PPOA ID Code: HFD-PNL_2 **Specific Waste Type:** Office Trash

Date: 30-jun-1995 **Major Activity Type:** Office **Specific Activity Type:** Waste Management, Disposal

Description: As part of the daily activities and normal operations associated with business at the Environmental Technology Building (ETB), sanitary solid waste is generated. This waste is generated in offices, copy centers, lunch rooms and rest rooms throughout the building and conveyed daily to two large dumpsters at the dock area outside of the building. This waste stream consists of cardboard, paper, plastic, glass, metal, food waste, etc. A viable means to reduce or eliminate this waste stream is

being sought in the performance of this Pollution Prevention Opportunity Assessment. Since the ETB is representative of most other PNL facilities with respect to this waste stream, this assessment can be applied to sanitary solid waste generating activities at these other facilities.

Options: Option 1Current Practice:Sanitary solid waste is generated on a daily basis as part of normal business operations at the Environmental Technology Building (ETB). Except for office paper, which is being recycled, all other materials are being discarded in two 6 cubic yard dumpsters that are owned and serviced daily by the City of Richland.Recommended Action:It is recommended that a recycling program be developed to recycle the following materials: newsprint, magazines, mixed paper, consumer cardboard, corrugated cardboard, tin, glass, aluminum, and plastic. With the exception of corrugated cardboard, these materials will be collected at three indoor recycling stations. These stations will consist of a number of small bins for material collection and a bulletin board for communications purposes. Volunteers from the building will be solicited to maintain the stations and to convey the materials on a regular basis to larger collection bins located in the receiving area. A local recycler will be contracted to regularly service these collection bins in exchange for the value of the commodities collected. Aluminum will be recycled by the janitorial staff. Corrugated cardboard will be collected in a la specially marked cardboard collection dumpster sited at the dock area. This bin will b provided by the vendor and will be serviced weekly.Option 2Current Practice:Sanitary solid waste is generated on a daily basis as part of normal business operations at the Environmental Technology Building (ETB). Except for office paper, which is being recycled, all other materials are being discarded in two 6 cubic yard dumpsters that are owned and serviced daily by the City of Richland.Recommended Action:The ETB's two 6 cubic yard dumpsters are emptied by the City of R ichland daily, five days a week. At the time of this writing, a pilot project has been underway at the ETB for one month. Except for corrugated cardboard, recyclable materials are collected in bins located inside the building. In addition, a test was conducted to see if the building could be adequately serviced by only one dumpster. All corrugated cardboard was placed in one dumpster and all other refuse placed in the other. Data was obtained which supported the decision to remove one dumpster and replace it with a cardboard collection bin provided and serviced by a recycling vendor. Corrugated cardboard recycling will be conducted under the same recycling contract discussed in P20 #PNL-95-02-1.Option 3Current Practice:Sanitary solid waste is generated on a daily basis as part of normal business operations at the Environmental Technology Building (ETB). Except for office paper which is being recycled, all other materials are being discarded in two 6 cubic yard dumpsters that are owned and serviced daily by the City of Richland. Staff s knowledge concerning what is actually discarded is very limited.Recommended Action:Conduct a solid waste survey to characterize the solid waste stream generated at the ETB. One dumpster of refuse generated in one day will be sorted, weighed and measured. In conjunction with P20 #PNL-95-02-1, this will help identify what materials can be recycled and in what amounts. The data will be used to generate graphics for the bulletin boards to raise employee awareness and to solicit increased support for the proposed recycling program. It will also be used to provide justification in support of this P20A for the proposed expansion of this recycling program to all PNL facilities.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Robyn Rodgers
Phone: 509-376-9773	**Phone:** 509-375-6444
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Pipe machining: Fluids, Turnings and Metal MMH-002 **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA-1 **Specific Waste Type:** Oil

Date: 14-apr-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Machining

Description: Pipe, sheeting and misc. equipment pieces are cut, turned, lathed, and polished for maintenance activities within the Hanford site. As a result, a variety of small metal fines, turnings, and fluids are generated.Waste Cutting Fluids - Rigid Nuclear Grade Cutting FluidWaste Oils - Metal Magic, Liquid TapThe fluids are changed out as they become visibly contaminated by metal fines and particulate. Often all wastes are treated as hazardous due to the metal and organic toxicity of the turnings/fluid matrix. Rigid fluid is recycled as soluble oils.Scrap metal is surveyed and released for excess or recycle.

Options: Current Practice: Most Facilities currently recycle metal scrap, and recycle soluble oil, when possible. All cutting fluids, metal turnings, and absorbents are disposed of as hazardous waste due to TCLP toxicity designations (toxic/organic).Option 1 - Recycle used cutting fluids through in house filtration system.Option 2 - Use Hazardous Material Management Plan and Material Life Cycling analysis to evaluate all procurement.Option 3 - Recycle all scrap metals through

stores.Option 4 - Use Cinnstar type cutting fluid rather than organic (Kansas City/Allied Signal Example, water based--doesnÕt spoil, and is recyclable).Option 5 - Rinse Metal Turnings prior to disposal.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** C. S. Barr
Phone: 509-376-9773	**Phone:** 509-373-1921
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Batteries **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA-10 **Specific Waste Type:** Batteries

Date: 27-jul-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Surveillance & Maintenance

Description: Used batteries are generated from a wide variety of sources. One of the single largest contributors to the battery waste stream is the large number of used alkaline batteries from PNLÕs portable radiation survey equipment. Other batteries entering the waste stream include ni-cad batteries from portable radios; batteries (carbon zinc, alkaline) from flashlights, and lithium batteries from computers. Lead acid batteries from automobiles and heavy equipment also contribute to this waste stream.

Options: Current Practice: PNL currently recycles lead acid batteries and gel cell batteries through Westinghouse Hanford Company (WHC) excess. PNL has also investigated recycling/reclaiming ni-cad, alkaline, lithium, and carbon zinc batteries. To date there is no cost-effective method to recycle these batteries. The battery manufacturers were also contacted to check on any return/reclaim programs they might have. To date, the battery manufacturers contacted will not accept any used or depleted batteries for reclamation.Option 1 - Investigate using rechargeable batteries.Option 2 - Investigate PM schedules to determine if usable life can be extended.Option 3 - Contract with vendors to take back spent batteries.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Eric Hauth
Phone: 509-376-9773	**Phone:** 509-376-5631
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Fluorescent Tubes **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA-11 **Specific Waste Type:** Fluorescent Lamps

Date: 27-jul-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Building

Description: PNL regularly purchases fluorescent tubes for replacement in existing facilities or installation in new facilities. Tubes are replaced as needed when they burn out. Used tubes are then crushed to minimize volume and then disposed of as Washington State dangerous waste.

Options: Current Practice: In December, 1991 PNL contracted with an independent testing laboratory to perform an analysis of the mercury hazard of crushed fluorescent tubes. This analysis revealed mercury concentrations for crushed tubes and crusher filter slightly greater than the regulatory Maximum Contaminant Levels. PNL, therefore, decided to manage this waste stream as Washington State dangerous waste under WAC 173-303.No waste minimization activities have been conducted for this waste stream.Option 1 - Product Substitution: Replace T-12 tubes with higher efficiency T-8 tubes.Option 2 - Use electronic ballasts in

conjunction with higher efficiency tubes.Option 3 - For new facilities/renovations of existing facilities, explore energy efficient design schema incorporating energy efficiency ballasts, lamps, and fixtures (e.g. parabolic troffers).Option 4 - Install motion sensor/infra red light switches.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Candice Marple
Phone: 509-376-9773	**Phone:** 509-376-1168
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Used Oil **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA-12 **Specific Waste Type:** Oil

Date: 27-jul-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Equipment

Description: Used oil is generated from change out of oils in motors, refrigeration units, compressors, vacuum pumps, and other mechanical devices. Primarily, used oils are generated from removal through routine maintenance.

Options: Current Practice: PNL currently segregates used oils into three categories: Refrigeration Oils, Motor Oils, and All Other Oils. Refrigeration Oils have been segregated due to the high levels of halogenated hydrocarbons associated with these oils. Used Motor Oils have been segregated due to the high levels of lead associated with these oils. The ÒotherÓ category of oils consists of used vacuum pump oils, compressor oils, pump oils, etc. Segregation of used oils allows PNL to isolate the hazardous constituents in some of the oils and provides more oil recycling opportunities.Option 1 - Continue segregating used oils by type to prevent cross contamination and allow for recycling opportunities.Option 2 - Evaluate routine maintenance for possibilities to extend period between change out of oil.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Eric Hauth
Phone: 509-376-9773	**Phone:** 509-376-5631
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Paint Waste **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA-13 **Specific Waste Type:** Solvents

Date: 27-jul-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Building

Description: Solid paint waste consists of brushes, rollers, crushed empty paint cans, drop clothes, masking tape, spray booth ventilation filters, spray booth floor paper, etc. generated from routine painting operations. Liquid paint waste consists mainly of paint solvents that are used in clean-up activities and a small amount of liquid paint.

Options: Current Practice: Current waste minimization activities consist of reuse of solvents for paint brush cleaning in order to reduce usage of solvents; crushing empty paint cans in order to reduce volume ultimately disposed; replace methyl ethyl ketone with mineral spirits in order to reduce toxicity of spent solvents.Option 1 - Purchase and install a solvent reclaiming unit.Option 2 - Purchase and install an in-drum compactor.Option 3 - Procure less hazardous/non-hazardous paints.Option 4 - Label paint cans as hazardous or non-hazardous so that empty cans can be segregated with non-hazardous cans and can be disposed of as solid waste.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Lawrence Jenks
Phone: 509-376-9773	**Phone:** 509-376-6223
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Light Ballasts **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA-14 **Specific Waste Type:** Polychlorinated Biphenyls, PCB

Date: 27-jul-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Building

Description: Ballasts are changed out of lighting fixtures as they fail and are disposed of according to their type and constituents (PCB and non-PCB).

Options: Current Practice: PCB contaminated or potentially contaminated ballasts (pre-1978) are disposed to a TSCA chemical landfill. Magnetic ballasts have been found to contain small quantities of regulated substances in their capacitors and are, therefore, disposed of as dangerous waste.No waste minimization activities are being conducted on this waste stream.Option 1 - Replace magnetic ballasts with energy efficient electronic ballasts.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Eric Hauth
Phone: 509-376-9773	**Phone:** 509-376-5631
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Used Lubricating Oils **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA-15 **Specific Waste Type:** Oil

Date: 04-aug-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Equipment

Description: Powerhouse maintenance activities require that air compressors and pumps have the oil changed out regularly to prevent unnecessary wear to the components. The frequency of oil changes to each piece of equipment is controlled by Preventative Maintenance Procedures.Used oils are collected in bulk containers for shipment to recycling, while residual oil is cleaned with rags, thus generating the solid stream.

Options: Current Practice: Updating of Preventative Maintenance Procedures to change oil in pumps and compressors more often to reduce constituent loading in used oil.Utilization of catch pans in areas of persistent leaks/drips.Transfer from other onsite facilities those oils suitable for incineration for energy recovery.Option 1 - Inventory Control .Option 2 - Catch Pans .Option 3 - Energy Recovery. Option 4 - Recycle.Option 5 - In-Line Cleansing/Filtering .Option 6 - Hour Meter.Option 7 - Oil/water separation.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Eric Hauth
Phone: 509-376-9773	**Phone:** 509-376-5631

Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Investigative Drilling Operations **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA-16 **Specific Waste Type:** Soil

Date: 31-jul-1992 **Major Activity Type:** Environmental Restoration **Specific Activity Type:** Drilling

Description: Hanford Site Investigative Drilling Operations are conducted in order to monitor or obtain sample characterization data from suspected hazardous waste sites as required to facilitate eventual waste site remediation. The drilling activity generates large volumes of investigation/derived waste (IDW) comprised primarily of drill cuttings (soils and slurries) which are sampled and analyzed for contaminants. Unless field monitoring instruments indicate otherwise, the IDW is labeled as ÒunknownÓ pending receipt of the analytical sample results. Purge water/ground water generated during the process is either disposed to the ground or sent to Modutanks for evaporation depending upon analytical sample results. Miscellaneous waste (personal protective equipment, tools, etc.) is also generated during investigative drilling activities, but is unlikely to receive a hazardous designation due to incidental contact with IDW. Decontamination fluids are managed in a manner similar to other IDW and would only receive a hazardous designation if so indicated by analytical sample results. Spilled or leaking vehicle and equipment fluids as well as surplus chemical products are other sources of hazardous waste streams associated with the investigative drilling process.

Options: Option 1 - Mandatory maintenance for leaking or problem equipment.Current Practice: For fluids utilized in equipment/vehicles that have a higher probability of leakage/spillage to the environment, such as antifreeze or hydraulic fluid, product substitution (to brands or products less hazardous or non-regulated) is being implemented. Secondary containment is being provided for problem pieces of equipment with the potential to leak fluids to the environment.Recommended Action: This option would require that known pieces of problem equipment (drill rigs, generators, etc.) requiring secondary containment to avoid leakage of hazardous substances to the soil/environment, be placed out of service until appropriate maintenance is complete.Option 2 - Increase frequency of hazardous substance (chemical products) storage inspections to assess the potential for leaking containers.Recommended Action: Increase frequency of hazardous substance (maintenance products) storage facility inspections. Currently maintenance products are inventoried and inspected monthly. Increasing the frequency of inspections may eliminate the occasional storage scenario that contributes to the breach of containment of a stored hazardous substance.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Eric Hauth
Phone: 509-376-9773	**Phone:** 509-376-5631
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Investigative Drilling Operations - Surplus Chemical (Maintenance) Products **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA-17 **Specific Waste Type:** Chemicals

Date: 31-jul-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Building

Description: Product substitution has been implemented for a few maintenance products to minimize the inventory of regulated products.

Options: Option 1 - Utilize Site Surplus Chemical Exchange DatabaseCurrent Practice: Product substitution has been implemented for a few maintenance products to minimize the inventory of regulated products.Recommended Action: Identify the current inventory of surplus chemical products and offer to other site organizations via the Site Surplus Chemical Exchange Database.Option 2 - Establish a chemical products procurement system that minimizes procurement of unneeded, excessively

hazardous or excessive quantities of chemical products.Recommended Action: Perform an analysis of current chemical product inventory. Determine actual chemical product process needs. Eliminate inventory of marginally useful chemical products. Research alternate substitute products for those chemicals deemed necessary to the process. Establish a listing of chemicals approved for procurement for this process and incorporate a formal authorization system for procurement of any chemical products not listed.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** G. G. Hopkins
Phone: 509-376-9773	**Phone:**
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Parts Cleaner Solvent **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA-18 **Specific Waste Type:** Solvents

Date: 30-jun-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Equipment

Description: Equipment maintenance requires that oil/grease and dirt has to be removed for equipment repair. This cleaning process generates dirty, spent solvent.

Options: Current Practice: Recycling by filtration, reuse.Option 1 - Use less hazardous or non-hazardous materials.Option 2 - Filter and reuse.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Mickey Seamans
Phone: 509-376-9773	**Phone:** 509-376-0540
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Aerosol Products **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA-19 **Specific Waste Type:** Aerosol Cans

Date: 28-jul-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Vehicle

Description: Aerosol products are used in all phases of automotive vehicle maintenance.

Options: Current Practice: Replacing aerosol products with bulk products that can be applied with a rechargeable pressurized container.Option 1 - Keep looking for opportunities to replace aerosol products with bulk products.Option 2 - Replace aerosol battery cleaners with Arm and Hammer *Baking Soda.Option 3 - Replace aerosol battery conditioner with NOCO **Battery post rings.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** A. D. Poor
Phone: 509-376-9773	**Phone:** 509-376-7210

Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Mechanical Maintenance Hydraulic Systems: MMH-004 **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA-2 **Specific Waste Type:** Oil

Date: 14-apr-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Equipment

Description: Mechanical Maintenance Hydraulic Fluid changes occur as a result of routinely scheduled preventative maintenance performed on elevator and hydraulic lift systems throughout the facility. In addition, leaks or other corrective maintenance activities increase the frequency of the fluid changes and therefore, the waste generated.Waste Absorbents Contaminated with hydraulic fluids result from spill clean up and maintenance housekeeping during fluid changes. These absorbents have historically been diatomaceous earth, or universal absorbents.The type of hydraulic fluid currently in use is Pydraul/Fyrquel Houghtosafe 620, an ethylene glycol based fluid. It is considered toxic (WT02) in Washington State.

Options: Current Practice: Some facilities currently use the Product Application Matrix (PAM) and the Hazardous Material Management Plan under the authority of the Hazardous Material Specialist to ensure that the use of hazardous hydraulic fluids are reduced, by non-regulated product substitution and by ordering only the amount needed for the job.Option 1 - Recycle non-radioactive hydraulic fluids though vendor/supplier, if possible.Option 2 - Recycle the fluid through a filtering system within the facility.Option 3 - Increase the length of time between changes through sampling for viscosity and corrosion and wear.Option 4 - Substitute the present fluids with a vegetable oil based fluid which is known to be non-regulated after use.Option 5 - Use the controlled chemical inventory and material life cycling procedures to ensure all procurement of hydraulic fluids are kept alara.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** C. S. Barr
Phone: 509-376-9773	**Phone:** 509-373-1921
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Auto Body Paint/Paint Related Material **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA-20 **Specific Waste Type:** Paint

Date: 28-jul-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Vehicle

Description: Auto body repair and painting.

Options: Current Practice: We are using a paint spray gun pressure washer to clan paint spray guns.Strict inventory control.Option 1 - Substitute for less hazardous paints.Option 2 - See if a more efficient gun washer is on the market.Option 3 - See if the masking tape and paper can be shredded to reduce the volume.Option 4 - Recycle the waste solvents by distillation on a vendor contract.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** A. D. Poor
Phone: 509-376-9773	**Phone:** 509-376-7210
Fax: 509-376-2195	**Fax:**

Email: Donna_S_Merry@rl.gov	**Email:**

Title: Engine Coolant System **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA-21 **Specific Waste Type:** Antifreeze

Date: 28-jul-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Vehicle

Description: Maintenance of Automotive Engine Coolant Systems is the process that generates this waste stream. We recycle all of our used antifreeze, generated from the maintenance process and this also generates the above types of waste. Spills to the environment also contribute to this waste stream.

Options: Current Practice: We have placed spill kits to contain antifreeze spills on all of our buses and trucks in the Fleet Operations, Transportation and Maintenance Services vehicle fleet. We also purchased and installed a Òself-tighteningÓ hose clamp for all of our buses to help prevent antifreeze leaks. We placed an article in the Hanford Reach, requesting that all vehicle custodians do a Òwalk aroundÓ inspection of their vehicle and check for any leaks. This way a vehicle leak can be caught before it becomes a large spill. We also recycle and reuse all of our used antifreeze.Option 1 - Alternative types of vehicles such as electric or air cooled engines.Option 2 - Use absorbent pads that can be reused instead of rags. This could reduce the volume of waste generated.Option 3 - See if a more efficient antifreeze recycling unit can be located.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** A. D. Poor
Phone: 509-376-9773	**Phone:** 509-376-7210
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Flashlight Batteries **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA-22 **Specific Waste Type:** Batteries

Date: 28-jul-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Vehicle

Description: Flashlight batteries are used in all of our maintenance activities. Vehicle, road and grounds, track, etc.

Options: Current Practice: Purchase a percentage of rechargeable flashlights and rechargeable batteries.Option 1 - Rechargeable (alkaline) flashlights.Option 2 - Rechargeable (zinc-carbon) flashlights.Option 3 - Have a Òcore exchangeÓ vendor contract. The contract would require the vendor to take back all the used batteries, or cores for recycling, that they supply us.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** A. D. Poor
Phone: 509-376-9773	**Phone:** 509-376-7210
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Automotive Lead Acid Batteries **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA-23 **Specific Waste Type:** Batteries

Date: 28-jul-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Vehicle

Description: Automotive vehicle electrical system maintenance.

Options: Current Practice: We have a vendor contract that requires the vendor to supply us with automotive lead acid batteries and take back all the cores for rebuilding or recycling. We also order all of our batteries ÒwetÓ, so we donÕt have to store electrolyte fluid. This also prevents sulfuric acid solution spills.Option 1 - Increase the life of the battery by ordering a better grade of battery, better maintenance, and to check the condition of the battery to see if it can be recharged rather than changed out.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** A. D. Poor
Phone: 509-376-9773	**Phone:** 509-376-7210
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Off Specification/Out-Of-Date Products **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA-24 **Specific Waste Type:** Chemicals

Date: 28-jul-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Vehicle

Description: Routine vehicle maintenance and removing unwanted products from vacated maintenance shops. Substituting less hazardous products for more hazardous products.

Options: Current Practice: Material/Inventory control, reduces the total volume of products that are kept on hand at any one time.Option 1 - Strict inventory control.Option 2 - Check for vendor availability for different products. If the local vendors have a product on hand at all times and can deliver in a reasonable time frame, then we could reduce our on-hand inventory and avoid shelf life problems.Option 3 - Return un-open Off Specification/Out -Of-Date products to the manufacturer, instead of disposing of them as hazardous waste.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** A. D. Poor
Phone: 509-376-9773	**Phone:** 509-376-7210
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Parts Washer Solvent **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA-25 **Specific Waste Type:** Solvents

Date: 28-jul-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Vehicle

Description: We have nine (9) solvent parts washers in our vehicle maintenance shops. The solvent parts washers are used to clean automotive parts. We filter and reuse our solvent and this activity generates used filters, rags, and bottom sludge, which are hazardous waste.

Options: Current Practice: To reduce the volume of rags and absorbent generated from placing solvent washed parts on work benches to work on, we have started lining the tops of work benches with an absorbent mat that can be used more than once, before it is disposed of.We made our own portable filter system so that we are able to filter and reuse our parts washer solvent.Option 1 - Look for a substitute product that is Non-Regulated.Option 2 - Look for new types of equipment that uses hot water and detergent to clean parts.Option 3 - Contact vendors that are licensed to recycle solvents by distillation.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** A. D. Poor
Phone: 509-376-9773	**Phone:** 509-376-7210
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Hazardous Waste From Automotive Maintenance Cleanup **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA-26 **Specific Waste Type:** Solvents

Date: 28-jul-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Vehicle

Description: This waste stream is generated from routine automotive maintenance.

Options: Current Practice: We stress the reuse of rags and absorbent pads.Option 1 - Do not change fuel filters by date intervals, instead check the hour meter to see how many hours the fuel filter has been used.Option 2 - Make sure that all the solvent has dripped off the parts at the parts washer before they are brought back to the work station.Option 3 - Use absorbent pads instead of rags, because absorbent pads absorb more than a rag, and last longer.Option 4 - Wash and reuse the rags.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** A. D. Poor
Phone: 509-376-9773	**Phone:** 509-376-7210
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Road Striping **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA-27 **Specific Waste Type:** Paint

Date: 28-jul-1992 **Major Activity Type:** Service **Specific Activity Type:** Maintenance, Vehicle

Description: Road striping is the process of painting the yellow and white lines on site controlled roads that indicate boundaries and no-passing areas. The painting meets applicable regulatory codes.White and yellow road paints used in the process are purchased in 350 gallon bulk containers that are returnable to the vendor. Black paint is purchased in 5 gallon non-returnable containers.The dried waste paint is generated from day to day cleanup. Especially from removal of dried paint build-up on the stencil used to form the boundaries of the painted lines. Liquid waste paint is generated from the cleanup of the road striping machine. This cleaning and application process also generates paint and solvent contaminated rags, gloves, plastic and hoses.

Options: Current Practice: All road striping paint is purchased in 360 gallon portable tanks that are returned to the vendor after they are empty.Avoid changing colors as this reduces the number of times the hoses and nozzle need to be cleaned. This method reduces the volume of waste paints and thinners that is generated.Option 1 - Look for a less hazardous road striping paint that will meet the Department of Transportation requirements.Option 2 - See if it would be possible to paint the road stripes and markings only half as often as we do and still meet the Department of Transportation safety requirements.Option 3 - Look for

methods to recycle the waste paints and thinners.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** A. D. Poor
Phone: 509-376-9773	**Phone:** 509-376-7210
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Batteries (other) **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA-28 **Specific Waste Type:** Batteries

Date: 20-jul-1992 **Major Activity Type:** Service **Specific Activity Type:** Maintenance, Equipment

Description: ¥ Lead Acid Batteries ¥ Emergency Gel Cell¥ Flashlights -Ray-O-Vac Alkaline -Ray-O-Vax Carbon Zinc -Eveready Batteries -Eveready Carbon Zinc¥ Lithium from computers

Options: Current Practice: Many different kinds of batteries are needed to maintain regular maintenance operations in General Area Services-North. Some of these batteries are lead acid and are recycled to an off-site vendor that the Excess Group in Procurement maintains for the site. The rest is managed as hazardous waste.Option 1 - RechargeablesOption 2 - Less hazardous/non-hazardous batteriesOption 3 - Check batteries for use in non-essential functions.Option 4 - Contract Systems for return/recycle.Option 5 - Standardize

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** R. L. Baker
Phone: 509-376-9773	**Phone:**
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Aerosol Cans **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA-29 **Specific Waste Type:** Aerosol Cans

Date: 16-jul-1992 **Major Activity Type:** Service **Specific Activity Type:** Machining

Description: Aerosol looses its propellant; nozzle becomes lost or plugged and some of the product remains in the container.Fabrication is the process of cutting, wielding, drilling, and tapping, cleaning/degreasing, painting/stripping steel and other metal materials, shaping them into a predetermined configuration. Utilization of shop, field machinery and equipment is a part of this process.Aerosol products are used to aid in cleaning/degreasing, painting, paint stripping, drilling/tapping, welding/cutting of materials for fabrication, and the maintenance of shop, and field machinery/equipment.Waste rags are generated from the day to day clean up of fabrication activities.Liquid waste is generated when aerosol containers become usuable due to loss of pressure or broken spray nozzles.Solid waste is generated through general shop clean up of non-regulated cleaners, degreasers, and soluble oils.

Options: Option 1 - Use less hazardous or non-hazardous materials.Current Practice: Source reduction, product substitute, replace broken or plugged parts, excessed full or unused aerosols, vented aerosols to use the product in containers with pump type sprayersRecommended Action: Investigate other chemical products less hazardous or non-hazardous to replace, cleaner/degreasers anti-splatter, spray paints, and lubricants.Option 2 - Use blasting machine to clean materials.Recommended Action: Use the ÒGlass Bead BlasterÓ to clean materials/metals of paint, rust, and mill scale prior to repair, testing of

fabrication.Option 3 - Reduce chemical inventories by identifying products that could have more than one use.Recommended Action: Make a list of chemical products (on hand) that could possibly be used for multi purposes. Post list with tool room attendant and shop supervisor.Option 4 - Eliminate chemical products that have been in the inventory for one year.Recommended Action: Investigate the possibility of disposing of unused chemical products using the companies computer program or excessing them to other outside companies.Option 5 - Reduce the amount of waste rags produced by shop operations.Recommended Action: Obtain different colored rags for shop use. Use one color for non-regulated and general shop clean up. Use the other color for all regulated assignments, thus eliminating the possibility of mixing regulated, and non-regulated waste rags.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** R. L. Baker
Phone: 509-376-9773	**Phone:**
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Facility General Use Products: **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA-3 **Specific Waste Type:** Chemicals

Date: 01-dec-1994 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Building

Description: General Use products are known as commonly used cleaners, such as Kleeno Bowl, Easy Off, Windex, and other commercially used brands. In addition, they include decon agents such as Wipe Out Graffiti remover, and Rad Con aerosol sprays. Janitorial staff uses these products for cleaning of fixtures, walls, desks, windows and floors throughout the facility.Rags and empty containers are generated during the use of these products.

Options: Current Practice: Excess or overstocked products are sent to Excess Stores for Public Sale.Option 1 - Resolve Moratorium Waste Issues to reduce mixed waste and controlled wastes from excess or partially spent products generation.Option 2 - Control all containers entering the Surface Contamination areas, in order to reduce the need to buy products for both non-radioactive and Surface Contamination Areas.Option 3 - Use a managed care system with Health Physics seals or tags on items entering zones to ensure they can be sealed and taken out of zone areas once the job is completed.Option 4 - Use a Hazardous Material Management Plan, controlled chemical inventory and product application matrix to reduce unnecessary purchases.Option 5 - Barcode all hazardous materials to keep better track and real time inventories throughout the facility.Option 6 - Provide a Pollution Prevention/Lessons Learned course for Hazardous Material Management.Option 7 - Transfer products through the chemical exchange.Option 8 - Sell excess and overstocked products through the public auction.Option 9 - Set up a central Plant Redeployment program, buy bulk chemicals and distribute through all labs, maintenance and operations.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:**
Phone: 509-376-9773	**Phone:**
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Certain 2000 Waste **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA-30 **Specific Waste Type:** Paint

Date: 15-jul-1992 **Major Activity Type:** Service **Specific Activity Type:** Waste Management, Handling

Description: Certain 2000 is used for bridging encapsulation for asbestos. It is packaged in five- gallon drums and must be mixed with tint before using. Several colors are used by federal law to distinguish the hazard. Certain 2000 is a latex paint with several additives that cause it to be a Washington State non-RCRA waste. The waste consists of brushes, rollers, rags, skins, and spoiled paint in normal encapsulation of asbestos.

Options: Option 1 - Replace with non-regulated product.Current Practice: Because of the short life of Certain 2000 after it is opened and mixed, employees try to use it as soon as possible.Certain 2000 had been sent to the less than ninety day pad as soon as it was discovered to be bad. It was not discovered to have a hazardous constituent until November of 1991. When it was found to have a steady flow of waste, a satellite was established in May of 1992.Recommended Action: A product has not been identified to replace Certain 2000 and even if we did, Central Stores has purchased many gallons of the product to have on hand.Option 2 - Buy product in gallon containers.Recommended Action: By purchasing the product in one gallon containers would eliminate some of the liquid waste.Option 3 - Buy product in gallon size, premixed with tint.Recommended Action: It has not been determined if the shelf life is related to the tinting of the paint or if it begins to spoil when the seal is broken.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** R. L. Baker
Phone: 509-376-9773	**Phone:**
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Light Bulbs (other) **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA-31 **Specific Waste Type:** Fluorescent Lamps

Date: 17-jul-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Building

Description: Crushed fluorescent tubes are not regulated according to WAC-173-303 and 40 CFR 261. Current practice is to remove the burned out tube/bulb and replace it with a new tube/bulb. As a best management practice, crushing of fluorescent tubes is done in drum crushers. The filters used with the drum crusher will be managed as a hazardous waste, solid, N.O.S. when they are changed out. They are managed as a hazardous waste due to the accumulation of mercury on the filter. Incandescent bulbs are managed separately as hazardous waste because of the lead.

Options: Current Practice: Regulatory Assessment recommended as of November 1, 1991, that crushed fluorescent tubes be designated as a non-hazardous waste and dispose of into the Central Landfill or Low-Level Burial Grounds based on sample results taken by KEH. Currently the filters are being managed as a hazardous waste due to the accumulation of the leachable mercury concentration from the filters which contain the vapors from drum crushing operations, routine number X0123. As a best management practice, crushing of fluorescent tubes continues to be done in drum crushers. Incandescent bulbs are managed as hazardous waste because of the lead.Option 1 - Motion SensorsOption 2 - More efficient ballastsOption 3 - Turn off lights (review vs. leave on)Option 4 - Procure least hazardous bulbsOption 5 - Recycle

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** R. L. Baker
Phone: 509-376-9773	**Phone:**
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Light Bulbs (other) **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA-32 **Specific Waste Type:** Fluorescent Lamps

Date: 01-jan-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Building

Description: Crushed fluorescent tubes are not regulated according to WAC-173-303 and 40 CFR 261. Current practice is to remove the burned out tube and replace it with a new tube. As a best management practice, crushing of fluorescent tubes is done in drum crushers. The filters used with the drum crusher will be managed as a hazardous waste, solid, N.O.S. when they are changed out. They are managed as a hazardous waste due to the accumulation of mercury on the filter.

Options: Current Practice: Regulatory Assessment recommended as of November 1, 1991, that crushed fluorescent tubes be designated as a non-hazardous waste and dispose of into the Central Landfill or Low-Level Burial Grounds based on sample results taken by KEH. Currently the filters are being managed as a hazardous waste due to the accumulation of the leachable mercury concentration from the filters which contain the vapors from drum crushing operations, routine number X0123. As a best management practice, crushing of fluorescent tubes continues to be done in drum crushers. Option 1 - Use programmable/automatic lighting controls to ensure lights are on only when and where needed.Option 2 - Use group relamping to reduce labor costs.Option 3 - Replace standard fluorescent lamps with energy saving lamps all at one time.Option 4 - Recycle the glass.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Candice Marple
Phone: 509-376-9773	**Phone:** 509-376-1168
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Batteries **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA-4 **Specific Waste Type:** Batteries

Date: 01-dec-1994 **Major Activity Type:** Maintenance **Specific Activity Type:** Surveillance & Maintenance

Description: Batteries are used in flashlights, pagers, air purifying systems, emergency lights, and small hand held equipment. Various makes and models exist.

Options: Current Practice: A variety of batteries exist within each facility as a result of different user needs. All batteries are shipped currently as hazardous wastes, except a small amount of Nicad batteries which are currently being recharged as needed.Option 1 - Use a Hazardous Material Management Plan, controlled chemical inventory and product application matrix to reduce unnecessary purchases, and encourage product substitutes for hazardous products.Option 2 - Purchase only recycled batteries.Option 3 - Separate non-regulated from regulated batteries during disposal.Option 4 - Recycle all alkaline batteries.Option 5 - Recycle all NiCad batteries.Option 6 - Recycle all lead acid and gel cell batteries.Option 7 - Use nicad rechargeable batteries when possible.Option 8 - Purchase and use alkaline rechargeable batteries.Option 9 - Use hand held equipment which can be AC operated, versus battery operated.Option 10 - Use battery tester to verify battery is dead prior to disposal.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:**
Phone: 509-376-9773	**Phone:**
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Analytical Laboratory Reagents **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA-5 **Specific Waste Type:** Chemicals

Date: 01-dec-1994 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Chemical

Description: Laboratories use a variety of reagent and standards for analytical and development work. Some of the reagents and standards are not used in time, and become expired, or are used in very small quantities--even though they have to be purchased in larger quantities. The container as well as the chemical itself needs to be disposed of eventually. In addition, standards are typically radioactive, both before and after use, and require special disposal as mixed waste.Rags and empty containers are generated during the use of these products.

Options: Current Practice: Excess or overstocked products are sent to Excess Stores for Public Sale.Option 1 - Resolve Moratorium Waste Issues to reduce mixed waste and controlled wastes from excess or partially spent products generation.Option 2 - Control all containers entering the Surface Contamination areas, in order to reduce the need to buy products for both non-radioactive and Surface Contamination Areas.Option 3 - Use a managed care system with Health Physics seals or tags on items entering zones to ensure they can be sealed and taken out of zone areas once the job is completed.Option 4 - Use a Hazardous Material Management Plan, controlled chemical inventory and product application matrix to reduce unnecessary purchases.Option 5 - Barcode all hazardous materials to keep better track and real time inventories throughout the facility.Option 6 - Provide a Pollution Prevention/Lessons Learned course for Hazardous Material Management.Option 7 - Transfer products through the chemical exchange.Option 8 - Sell excess and overstocked products through the public auction.Option 9 - Set up a central Plant Redeployment program--buy bulk chemicals and distribute through all labs, maintenance and operations.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:**
Phone: 509-376-9773	**Phone:**
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Office Wastes Copier Toners **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA-6 **Specific Waste Type:** Toner Cartridges

Date: 01-dec-1994 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Building

Description: When copier machines and printers require changing of the toner, the toner is collected in non-recyclable and recyclable drums or containers.Toners are changed when an alarm or light indicates the toner is low.Rags and empty containers are generated during the use of these products.

Options: Current Practice: Currently only those toners designated as recyclable, or non-regulated are being purchased by the plant, when possible. When the copier or printer cartridge is changed, the old cartridge is recycled through Central Stores.Option 1 - Use a Hazardous Material Management Plan, controlled chemical inventory and product application matrix to reduce unnecessary purchases, and encourage product substitutes for hazardous products.Option 2 - Purchase only recycled toners.Option 3 - Separate non-regulated from regulated toners and cartridges.Option 4 - Recycle all toners.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:**
Phone: 509-376-9773	**Phone:**
Fax: 509-376-2195	**Fax:**

Email: Donna_S_Merry@rl.gov	**Email:**

Title: Maintenance/Electricians/Ballasts **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA-7 **Specific Waste Type:** Fluorescent Lamps

Date: 01-dec-1994 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Building

Description: Ballasts and fixtures are changed out as needed in the facility, or when they are detected leaking. This requires the electrician to handle the entire waste as PCB contaminated, if applicable, generating rags, and clean up materials in addition to the ballast.

Options: Current Practice: Ballasts are changed as needed by electricians. Currently, all fluorescent ballasts are removed and separated into PCB and non PCB. No minimization activities have been initiated on this stream.Option 1 - Use rapid start fixtures rather than ballast start fixtures to save on life of bulb.Option 2 - Section and change all known PCB ballasts at one time to avoid leakage and spill wastes.Option 3 - Use Intech 200 citric based cleaner to clean all fixtures instead of solvents and NPH.Option 4 - Switch overhead lighting to compact fluorescent lighting, where feasible.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:**
Phone: 509-376-9773	**Phone:**
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: PSLR001 Glovebox Routines **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA-8 **Specific Waste Type:** Textiles

Date: 21-jan-1993 **Major Activity Type:** Maintenance **Specific Activity Type:** Deactivation

Description: Wastes are generated through the entering of glovebox areas, during processing, maintenance and surveillance activities.

Options: Current Practice: Changes in procedure to require horsetailing of seal out bags, and a change in procedure to increase the mandatory life of glove bags and port gloves.Option 1 - Extend the life of plastic bags and gloves to increase change out frequency.Option 2 - Seal ends of change out bags and then horsetail, rather that horsetailing alone--allows bag to be changed less often.Option 3 - Plan seal outs to maximize effort.Option 4 - Post inventories for all glovebox items, such as tools, and containers to eliminate the need to seal more in.Option 5 - Pneumatic transfers between gloveboxes and other areas to minimize seal outs.Option 6 - French Can seal outs, (bagless transfer system)Option 7 - Install assay systems for smaller seal outs to determine whether they are low level or TRU waste.Option 8 - Install plasma ionization chamber for decon of equipment.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** L. J. Estey
Phone: 509-376-9773	**Phone:** 509-373-3387
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: PRFR003 Room Waste/Low Level **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA-9 **Specific Waste Type:** Textiles

Date: 21-jan-1993 **Major Activity Type:** Maintenance **Specific Activity Type:** Deactivation

Description: Wastes are generated as a result of performing routine housekeeping and surveillance activities in these areas. This waste stream analysis does not include personal protective clothing, which has already been studied.

Options: Current Practice: Zone reductions are ongoing; decreasing the size of areas allowed to be treated as surface contamination areas decreases the amount of waste categorized as low level.Option 1 - Improve assay capabilities to better segregate wastes.Option 2 - Segregation of materials, (opening packages) prior to entry into zones.Option 3 - Planned usage--control volumes of materials.Option 4 - Planned Area Entries to better coordinate materials being brought into the zones.Option 5 - Storage limits for certain hazardous materials and misc. items (such as cardboard, paper, etc.) within zones.Option 6 - Post inventories prior to entering zones.Option 7 - Training on material reduction in zones.Option 8 - Mock training prior to jobs within zones.Option 9 - Managed care of materials--HPTs place seal on items, and if monitored or left unopened, these can be unconditionally released.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** L. J. Estey
Phone: 509-376-9773	**Phone:** 509-373-3387
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Light Ballasts **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA_33 **Specific Waste Type:** Solid Waste

Date: 01-jan-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Relamping

Description: PCB Ballasts and non-PCB Ballasts are used throughout the facility. The ballast fails and is replaced with a non-PCB Ballast during regular maintenance.

Options: Option 1: Replace used PCB Ballasts with non-PCB Ballasts.Current Practice:Replace used PCB Ballasts with non-PCB Ballasts as old ballasts fail.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** C. E. Marple
Phone: 509-376-9773	**Phone:**
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Oil (Used) **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA_34 **Specific Waste Type:** Oil

Date: 01-jan-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Equipment

Description: Oil is put into machinery to maintain it. The old oil is removed/drained and new oil put in. Old pieces of equipment are drained of any oils upon removal.

Options: Option 1: Label machinery to identify the type of grease or oil used to maintain machinery.Current Practice: If the waste designation/Analysis of the oil allows the oil to be shipped to an off-site vendor to be recycled it is so done.Option 2: Standardize oil and grease.Current Practice: Recycle, if analysis of the oil allows.Label machinery to identify the type of grease or oil used to maintain machinery.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** C. E. Marple
Phone: 509-376-9773	**Phone:**
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Paint/Paint Related Waste (Latex) **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA_35 **Specific Waste Type:** Paint

Date: 01-jan-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Painting

Description: Preparatory work for building painting of interior and exterior consists of scraping, cleaning and patching. Sealing or priming maybe applied in some cases. One or two coats of finished material will be applied for a finished coat.

Options: Option 1: Drop cloths reused.Option 2: Evaluate the need to repaint on a room by room request.Option 3: Standardize paints and colors.Option 4: Preplanning, work planing, documentation on application of exterior paints to eliminate sampling for heavy metals.Option 5: Plastic paint buckets.Option 6: Material exchanges.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** C. E. Marple
Phone: 509-376-9773	**Phone:**
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Paint/Paint Related Material (other) Silk Screening **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA_36 **Specific Waste Type:** Paint

Date: 01-jan-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Painting

Description: A positive (what the sign says) is made on the computer out of a vinyl. The positive is transferred to the screen by using Ulano film and Ulano activators. The screen is then placed on the screen printing press. The wording will be transferred through the silk screen on to the metal sign blanks by using a rubber squeegee pulled across the screen forcing the enamel inks through the open lettering portion of the screen. The screening is used when a large quantity of the same sign is required. One positive can generate several signs in a fraction of time it would take to make on the computer.

Options: SOURCE REDUCTION1. Use less hazardous or nonhazardous materials.RECYCLE1. Use a distillation to recover solvents in liquid cleanup waste.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** C. E. Marple
Phone: 509-376-9773	**Phone:**
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Paint/Paint Related Waste **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA_37 **Specific Waste Type:** Paint

Date: 01-jan-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Painting

Description: Spray painting in a paint booth is done on pieces of equipment brought into the shop that require a smooth finish. By using a spray paint booth the air around is clean because of the air vacuum system in the-booth. Turning on the exhaust fan and waterpump in the spray booth creates a waterfall of water which is used to filter the overspray of paint. By filtering out all the paints, the air that exits out the vent is clean air.Shop paint work (painting done by brushes) is done when it doesn't matter if the paint brush strokes show up.

Options: SOURCE REDUCTION1.Material substitution - use less hazardous or non-hazardous materials that will provide a quality job.2.Procurement Controls/Management avoid over purchasing.3.Puncturing aerosol cans.RECYCLING1.Use distillation to recover solvents in liquid cleanup waste.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** C. E. Marple
Phone: 509-376-9773	**Phone:**
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Railroad Batteries **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA_38 **Specific Waste Type:** Batteries

Date: 01-jan-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Grounds

Description: There are 19 railroad signal crossings on the Hanford Site. Batteries run the system that activate the crossing gate arm. Eleven of these crossings use solar power to charge the batteries-and eight crossings use commercial power. Edison cell battery is a non rechargeable battery that detects the train coming down the track, the life span is about 2 years. These batteries are dated upon installation, calcium carbonate and water is the electrolyte in the battery. Lead acid batteries are rechargeable batteries that contain sulfuric acid as the electrolyte, the life span of a lead acid battery is approximately 10 years. Nickel cadmium (NiCad) batteries are a rechargeable battery that contain sodium hydroxide as the electrolyte. The life span of these batteries is approximately 25 years if properly maintained and installed.

Options: SOURCE REDUCTION1.Evaluate DOE Order for Signal Crossing.2.Monitor flow of traffic.3.Eliminate unneeded crossing.4.Flag person.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** C. E. Marple

Phone: 509-376-9773	**Phone:**
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Oil Used **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA_39 **Specific Waste Type:** Oil

Date: 01-jan-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Equipment

Description: Products from routine maintenance work are not completely spent or are abandoned. The products were discovered during a major housekeeping effort of the facilities. If no immediate use is identified for these products or if the shelf life has expired they are declared a waste.

Options: SOURCE REDUCTION1.Dispensary Control.2.Procurement Restriction (Avoid over purchasing).3.Control of Products through Procedures.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** C. E. Marple
Phone: 509-376-9773	**Phone:**
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Light Bulbs (other) **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA_40 **Specific Waste Type:** Glass

Date: 01-jan-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Building

Description: 1.Routine replacement of bulbs from inactive facilities that require lighting for surveillance and maintenance activities.2.Decommissioning facilities that still include light bulbs that must be shipped as waste, and/or no longer have lighting requirementsCrushed fluorescent tubes are not regulated according to WAC-173-303 and 40 CFR 261. Current practice is to remove the burned out tube and replace it with a new tube. As a best management practice, crushing of fluorescent tubes is done in drum crushers. The filters used with the drum crusher will managed as a hazardous waste, solid, n.o.s. when they are changed out. They are managed as a hazardous waste due to the accumulation of mercury on the filter.

Options: 1.Motion Sensors2.More Efficient Ballasts3.Turn Off Lights (vs. Leave On)4.Procurement of Least Hazardous Bulbs5.Recycle

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Jason Webb
Phone: 509-376-9773	**Phone:**
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Clean Up Of Spill Residues **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA_41 **Specific Waste Type:** Chemicals

Date: 01-jan-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Decontamination

Description: Environmental Restoration Operations inherited this facility from another organization. At this time, several drums of the Dearcide already existed and had been out of use for some time. The drums had deteriorated significantly and existed in a weakened condition. The Dearcide 717 1 - leaked through a breach in 30 gallon drum, and was discovered on 4/24/91. Clean up waste was placed in an 8 gallon drum, and all the drums have been disposed per applicable regulations.

Options: SOURCE REDUCTIONTraining:Lessons LearnedSpill ResponseEquipment Inspections/MaintenanceProceduresPrejobWorkplansPreventative MaintenanceProduct SubstitutionEquipment Modifications/ReplacementLeak DetectionInventory ControlContainmentsTREATMENTSIdentify Clean-up Technologies

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Paul Rymarz
Phone: 509-376-9773	**Phone:**
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Excess/Out of Date Materials **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA_42 **Specific Waste Type:** Chemicals

Date: 01-jan-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Cleaning

Description: Products . from routine maintenance and janitorial work are not completely spent or are abandoned. The products are discovered during routine surveillance of the inactive facilities. If no immediate use is identified for these products they are declared a waste.

Options: 1.Avoid over purchasing (procurement control) (Source Reduction)2.Set up a centralized or controlled area for dispensing chemicals (Source Reduction)3.Conduct periodic materials tracking, or inventory (Source Reduction)4.Utilize material exchanges (SCE and Excess) (Recycle)5.Find a different application for the substance (Source Reduction)6.Extend shelf-life/ Contact vendor, manufacturer (Source Reduction)7.Control/Track dated or shelf-life material (Source Reduction)8.Review procurement specifications (Source Reduction)

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Todd Hasfjord
Phone: 509-376-9773	**Phone:**
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Used Photographic Fixer **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA_43 **Specific Waste Type:** Chemicals

Date: 01-jan-1995 **Major Activity Type:** Service **Specific Activity Type:** Photographic Services

Description: The processing of photographic film and paper produces a regulated recyclable waste, known as used fixer. Used fixer from photographic processes throughout the Hanford site are processed through an electrolytic and or ion exchange columns to remove silver. The silver is sold to an offsite silver reclamation facility. -The effluent of the silver recovery process is non regulated and goes to the 300 area sanitary sewer.Scrap film and paper, processed and unprocessed, and used fixer filters are collected and held for shipment to an offsite silver reclamation facility.

Options: 1 Send people to nation wide trade shows.2 Look for new processors and ideas. 0-3 Electronic Imaging

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Skip Gest
Phone: 509-376-9773	**Phone:**
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Ammonium Hydroxide from Duplicating Services **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA_44 **Specific Waste Type:** Caustic

Date: 01-jan-1995 **Major Activity Type:** Service **Specific Activity Type:** Printing

Description: Ammonium Hydroxide (NH,OH) vapors facilitate blueprint imaging for the production of engineering and architectural blueprints. A one gallon container of ammonium hydroxide solution, connected by hoses in a closed system, is circulated through the blueprint machine. As the solution vaporizes, it reacts chemically with the blueprint paper creating an image on the paper. When the solution gets weak, fewer vapors are emitted and the image begins to fade. The gallon container is then replaced with a fresh one leaving approximately one-half gallon of spent ammonium hydroxide to be disposed of as hazardous waste.

Options: Replace remaining ammonium blueprint machines with non-ammonium white print machines. (Will be implemented)

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** K E H
Phone: 509-376-9773	**Phone:**
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Liquid Paint Waste / Related Wastes from Painting **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA_45 **Specific Waste Type:** Paint

Date: 01-jan-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Painting

Description: Painting operations at KEH are extremely diverse and varied. Therefore using an example paint operation to describe the process that generates hazardous waste seems to be an appropriate method of explanation.Preparation of the substrate, or the surface of the object to be painted, is the initial step in a painting operation. If the substrate is newly constructed bare steel it may be wiped down with acetone or another solvent to cut any oil or grease that may be on the surface. It is then etched with an etching medium such as copper sulfate or a sulfuric acid mix. The etching process is used to better prepare the substrate to accept paint by actually eroding away most foreign material adhering to the surface. The hazardous wastes generated to this point would be rags, cloths, brushes, and other things used to apply the solvents and etchings and to clean up after their use. Preparation could also require sandblasting to ready the substrate for painting. A non-regulated blasting agent is

now used for this process. Blasting a previously unpainted surface prepares this surface exceptionally well and generates very little if any waste. However, if blasting a previously painted surface, the old paint could contain lead, asbestos or other hazardous material therefore creating a hazardous wastestream that includes the now contaminated blasting agent.Painting is the second step in this painting operation. There are many variables involved in this process such as: The surface to be painted may require one or more coats of primer to be applied prior to applications of one or more coats of the. regular paint. Paint can be applied by brush, roller, spray gun, spray can or all of these, once again depending upon the job requirements, Whether or not the paint used contains hazardous ' material (i.e. heavy metals, solvents etc.) or not depends upon a myriad variables. Most notably, what protective qualities must the coating offer and what elements of the environment is the coating required to withstand. Other than leftover or excess paint, any wastestreams generated from this point forward come from clean-up operations.Clean-up, after the painting operation is completed, generates the greatest quantity of waste during the painting process. Brushes, rollers, rags, spray guns and most other reusable equipment is cleaned in the triple brush wash.(see worksheet 3) Drop cloths are reused, but masking tape and paper plastic coverings, and empty paint cans are disposed of (see worksheet b)-.

Options: Source ReductionPeel Away paint stripperSteel grit abrasive blasting agentElectrostatic spraying systemRecyclingSolvent recovery system

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** K E H
Phone: 509-376-9773	**Phone:**
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Routine Maintenance **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA_46 **Specific Waste Type:** Batteries

Date: 01-jan-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Utilities

Description: Routine Maintenance is the scheduled or as-needed replacement of the following items needed to maintain continuous operation of the plant.Batteries - Lead-acid, Nickel-Cadmium and Gel Cell batteries support back up power supplies and emergency lighting throughout the facility. Hazardous waste is generated from the disposal of the heavy metals and acids that these products contain.Fluorescent Light Tubes - Fluorescent light tubes and ballasts provide general lighting throughout the plant. Hazardous waste is generated from the disposal of the mercury that is contained in the light tubes and the PCBs that are contained in the ballasts.Lubrication - Lubrication includes oil and ethylene glycol that are used to maintain steam turbine exhaust fans, instrument air compressors, and a freight elevator. Hazardous waste is generated when heavy metals accumulate in the oil from the wear of equipment.Painting - This is the process using paint to coat equipment and piping with protective finishes to maintain their integrity and provide appropriate markings and labeling. Solvents are also used in the preparation of surfaces for painting and the clean-up tools used in paint application. Hazardous waste is generated from leftover or excess paint and solvents used in the process.

Options: Batteries/1.Substitute with rechargeable batteries2.Recycle batteriesFluorescent Light Tubes/1.Install motion sensors2.Use more efficient ballasts3.Change policy of leaving lights on4.Procure less hazardous light tubes5.Recycle light tubesLubrication/1.Recycle2.Use of inventory control3.Develop an oil testing program4.Use substitute oils5.Treat oil by filtrationPainting/1.Procurement controls2.Find substitutes for hazardous paints '3.Segregate waste

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:**
Phone: 509-376-9773	**Phone:**
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Maintenance Shops **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA_47 **Specific Waste Type:** Chemicals

Date: 01-jan-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Equipment

Description: The PFP has four maintenance shops within the facility, two mechanical maintenance shops and two instrument shops. In the process of maintaining the mechanical and electrical equipment within the plant, these shops utilize many chemical products that contribute to the hazardous wastestream in small amounts. Most of them can be classified into the following three types:Solvents - Solvents are used in the degreasing and general cleaning of equipment.Adhesives - Adhesives include liquid and spray adhesives and various caulkings used for attaching labels, fastening gaskets, etc.Cutting oils Cutting oils are used in machining metal parts and threading bolts and piping.Hazardous waste is generated from leftover or excess product and the clean-up of the equipment used in the application of the product.

Options: Solvents/1.Find substitutes for hazardous solvents2.Procurement controlsAdhesives/1.Find substitutes for hazardous adhesives2.Procurement controlCutting oils/1.Find substitutes for hazardous cutting oils2.Procurement control

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:**
Phone: 509-376-9773	**Phone:**
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Non-Routine Operations **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: HFD-PWA_48 **Specific Waste Type:** Chemicals

Date: 01-jan-1995 **Major Activity Type:** Nuclear Facility Operations **Specific Activity Type:** Cleaning

Description: There are generally three wastestreams generated at the Plutonium Finishing Plant that result from the occurrence of unplanned events or circumstances. Each of these non-routine operations are detailed below:Decontamination - Decontamination is the process of cleaning an area or piece of equipment to remove the presence of radioactive materials. The process usually involves the use of a cleaning agent, often a hazardous chemical, to loosen the fixed material so that it can be removed. At the PFP the primary process that generates this waste is the decontamination of the On Line Alpha Monitor (OLAM) which monitors the amount of radioactive material present in the plant's primary liquid effluent discharge. Over a period of time radioactive contamination builds up in the piping and creates high background levels that interfere with the OLAM's normal operation. To correct this problem the system is usually flushed with an acid solution to remove the contamination. Hazardous waste is generated from the disposal of the waste solution from this process and the leftover excess chemical that is unused.Expired/Excess Chemicals - The Plutonium Finishing Plant stores many chemicals in bulk quantities to support its operations. Often processes are modified and the chemicals are no longer required, or processes are shut down for maintenance and the chemicals expire beyond their usefulness.Spill Clean-up - Hazardous waste is generated from the clean-up of spilled hazardous materials. Often the spilled material cannot be recovered or recycled due to the use of absorption materials to mitigate and contain the spread of spills.

Options: Decontamination/1.Conduct better prejob planning2.Find substitute chemicals3.Decommission OLAMExpired/Excess Chemicals/1.Procurement control2.Establish a chemical custodian3.Conduct periodic materials tracking and inventory4.Utilize material exchanges5.Find substitute application6.Extension of shelf-life7.Control/Track shelf-life material8.Review procurement specifications9.Return material to supplier10.Regenerate chemicalsSpill Clean-up/1.Better prejob planning2.Find substitutes for cleaning products3.Equipment modifications or replacement4.Conduct surveillances

Site: Hanford Site

Site Coordinator: Donna Merry	**Team Leader:**
Phone: 509-376-9773	**Phone:**
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Analytical Laboratory **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: HFD-PWA_49 **Specific Waste Type:** Chemicals

Date: 01-jan-1995 **Major Activity Type:** Nuclear Facility Operations **Specific Activity Type:** Laboratory, Chemical

Description: The PFP has within the facility an analytical laboratory that does analyses of primarily radioactive materials. Most of the analyses that produce hazardous waste involve the analysis of process chemicals to verify that they meet specifications. This process generates only a small amount of hazardous waste annually. The majority of hazardous waste generated from the analytical laboratory comes from the clean out of expired and excess chemicals.

Options: Routine Process Support Analysis/1.Modernize laboratory analysis equipment2.Review lab procedures for waste minimizationExpired/Excess Chemicals/1.Site-wide laboratory chemical exchange2.Procurement control3.Centralized chemical steward4.Regenerate chemicals

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:**
Phone: 509-376-9773	**Phone:**
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Surplus Chemicals (out of date Materials) **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA_50 **Specific Waste Type:** Chemicals

Date: 01-jan-1995 **Major Activity Type:** Service **Specific Activity Type:** Maintenance, Building

Description: Products from routine maintenance and janitorial work are not completely spent or are abandoned. The products are discovered during routine surveillance of facilities. If no immediate use is identified and no other user can be found for these products they are-declared waste and handled accordingly.Over purchasing of material is most prevalent when the material is needed for specific jobs or projects. Often, a material is chosen based on the preference of the person writing the specifications and no regard to waste reduction is apparent. When the job or project is completed there is often excess which is not a candidate for offsite sale because it is not full and is not usable on-site because it is specialized.

Options: SR1. Avoid over purchasing (procurement control).SR2. Review procurement specifications for possible use of less hazardous material.SR3. Institute procurement control; review purchase requisitions for on-site availability prior to off-site purchase.SR4. Return expired material to supplier (put in future contracts).Rl.Utilize material exchanges (SCE and Excess).R2.Find a different application for the substance.R3. Update Hazardous Materials Inventory Database (HMID) to download information directly onto the SCE and produce Declaration of Excess form. (Not currently available. Expected availability: Fall 1993.)

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** J. A. King

Phone: 509-376-9773	**Phone:**
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Solid Paint Wastes / Related Wastes from Painting **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA_51 **Specific Waste Type:** Paint

Date: 01-jan-1995 **Major Activity Type:** Service **Specific Activity Type:** Maintenance, Building

Description: The painting performed by WTCM Crafts persons is varied. Usually, painting is done as part of routine maintenance of facilities and parking lots. These items usually involve preparation of the surface by either cleaning or scraping, followed by several applications of paint. Paint is applied by spray cans, brushing, rolling, or a combination of the -above. When painting is completed, wastes are segregated into hazardous and non-hazardous and placed into accumulation areas. The hazards of the paint and related material are related to the contents. Use of paints is decided based on many factors, including environmental considerations. Basically, the least hazardous paint which will provide the cover and protection needed will always be used.

Options: SR1. Procure climate controlled storage building to consolidate inventory (to prevent over purchasing) and maintain constant temperature (to avoid unusable material due to freezing or overheating).SR2.Use of less hazardous paints.SR3. Obtain paint striper/sprayer to use less hazardous paint and consolidate equipment.Rl.Use of Surplus Chemical Exchange (SCE) and Excess Sales and Surplus Shipping (ESSS).

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** J. A. King
Phone: 509-376-9773	**Phone:**
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Surveillance/Maintenance/Clean Up **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA_52 **Specific Waste Type:** Cleaning Supplies

Date: 01-jan-1995 **Major Activity Type:** Service **Specific Activity Type:** Maintenance, Building

Description: Product from routine maintenance/operation/ janitorial work are not completely spent or are abandoned. The products are discovered during routine surveillance of the facilities. If no immediate use is identified for these products, they are declared a waste.

Options: 1. Procurement Restrictions2. Job Control3. Conduct periodic materials tracking or inventory4. Utilize material exchanges (SCE and Excess)5. Improve housekeeping, sweep facilities for old, unknown chemicals

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** D. Chase
Phone: 509-376-9773	**Phone:**
Fax: 509-376-2195	**Fax:**

Email: Donna_S_Merry@rl.gov	**Email:**

Title: Laboratory Waste **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-PWA_53 **Specific Waste Type:** Chemicals

Date: 01-jan-1995 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Chemical

Description: Current practice is to dispense amount of chemical needed. This chemical is mixed with a diluent. The rinseate is added and the reagent is brought up to volume. The reagent is then checked for concentration. These checks involve testing a small amount of reagent, usually ten milliliters, by titration, specific gravity, and weighing. Waste is generated from these analyses.Used oils are collected in bulk containers for shipment to recycling, while residual oil is cleaned with rages, thus generating the solid stream.

Options: 1. Chemical Regeneration2. Chemical exchange3. Update and modify laboratory equipment4. Chemical steward/material specialist5. Procurement Control6. Chemical reuse

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Fran Steen
Phone: 509-376-9773	**Phone:**
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Recovery, Removal and Disposal of Non-Radioactive Asbestos **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-Site_1 **Specific Waste Type:** Asbestos

Date: 16-aug-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Disposal

Description: Non-radioactive asbestos waste disposal practice at Hanford currently consists of traditional landfill trenching. Asbestos waste, metal fasteners, and other asbestos-containing materials similar to pipes and other components generated by the Hanford contractors are cut, wrapped, bagged and deposited into the trench and back-fill of existing soils is pushed over the waste. Because the allowable waste stream is so diverse, asbestos project waste handling activities are relatively simple. The entire waste stream is packaged and transported to the landfill without segregation or special handling.Other background information:The asbestos landfill being used at Hanford opened in FY 1972. Since that time, an estimated 14,000 yd3 of asbestos waste has been deposited. The asbestos landfill will be closed on or before March 31, 1996. Alternate disposal methods are currently being investigated by DOE. Approximately 1,000 yd3 of asbestos is being stockpiled above ground in a controlled area to be converted to a nonregulated waste and disposed via an asbestos waste conversion unit, a technology demonstration that will be conducted from September 1995 through March 1996 as a possible alternate method of disposal. The conversion unit will accept the bagged waste, shred the asbestos-containing materials, and thermochemically convert the non-radioactive asbestos into an asbestos-free material. Other potential disposal methods have not been fully explored and documented.

Options: Option 1: Asbestos Waste Conversion UnitCurrent Practice:The Hanford contractors remove asbestos by cutting and wrapping the asbestos in glove bags or under negative pressure settings in a greenhouse enclosure and then transport the bagged waste to the asbestos landfill to be deposited into the trench where back-fill is pushed over the waste. Transite sheeting, piping, and other similar wastes are broken down to manageable sizes. The asbestos is a regulated waste and must be accounted for from cradle to grave (from project handling to asbestos waste disposal).Recommended Action:Purchase and install an asbestos waste conversion unit that thermochemically converts the non-radioactive asbestos waste into an asbestos-free material. The end-product material is not regulated or considered hazardous, thereby, eliminating cradle-to-grave liabilities. This unit will reduce asbestos waste by 100% and eliminate the landfill disposal costs and the need to look for landfill options. The asbestos waste conversion unit accepts all waste streams and reduces the total waste volume by 70%. The unit is energy efficient because it utilizes clean electrical burning. When used in conjunction with other waste minimization methods, such as a

shredder/compactor, the unit improves overall waste handling efficiency. The end- product material can be used as a void-rill material. The unit has the potential to create revenue by accepting and converting other offsite waste streams. A local vendor that manufactures such a unit is available in Washington State.Option 2: Recovery, Removal and Disposal of Non-Radioactive AsbestosCurrent Practice:The asbestos in glove bags or under negative pressure enclosures. The bagged waste is transported to the asbestos landfill to be deposited into the trench where back-fill is pushed over the waste.Recommended Action:Dispose of the non-radioactive asbestos waste via the vitrification facility at the Albany Research Center, Department of Interior's Bureau of Mines in Albany, Oregon. The facility at the Bureau's Albany Research Center consists of 50 and 1,000 kVA electric arc melting furnaces each with dedicated air pollution control systems and equipment to prepare materials for melting. The capability to prepare and vitrify furnace feed derived from simulated low-level, high-sodium liquid tank waste from Hanford was added in 1995. The facility is equipped with a modern analytical laboratory and machine shop, and is available for public and private use. The furnace feed must be prepared by crushing, grinding, mixing, and drying the materials. Materials to be melted are delivered to the furnace at rates to 25 ft3 per hour (2,000 lb/h for materials with bulk density 80 lb/cu ft) through a receiving bin, bucket elevator, conveyors, metering bin, and rotating air lock. Feed enters the furnace through 4 ports in the roof each provided with a double-wall water-cooled feed tube that extends to 18 inches above the surface of the molten pool to discourage entrainment of fine particles in the offgas. Glass or slag can be tapped from the furnace on demand or continuously through a water-cooled copper tapping fixture provided with auxiliary heat for remote opening. The hearth is emptied through a bottom center drain. The asbestos would be encapsulated in a vitrified glass matrix that currently has been used as road-fill material at other sites. The vitrification creates more waste volume due to the addition of glass constituents.Option 3: Expand Abatement to Perform Larger Jobs/TasksCurrent Pr actice:Projects involving asbestos removal are performed during the year based upon funding. For each project involving asbestos work, the Hanford contractors manually remove the asbestos by cutting, wrapping, and packaging in glove bags or under negative pressure enclosures. The asbestos waste, greenhouse enclosures, and glove bags are disposed after each project is completed. There is no coordination between jobs involving asbestos removal. Several jobs may occur simultaneously onsite without knowledge in the planning phase of the project. No coordination exists in the field with other projects involving asbestos removal.Recommended Action:Coordinate in the field through upfront prejob planning by combining the small asbestos removal jobs with a larger asbestos removal job that would reduce the number of trips to the landfill. The larger asbestos removal job would require only one trip to the landfill for disposal rather than numerous trips from the smaller jobs. Performing a larger job decreases hazardous exposure and implements ALARA. Yearly maintenance costs, as well as secondary wastes (e.g., PPE, byproducts, plastics) are decreased by combining the smaller jobs into a single larger job. The larger job compliments other projects by allowing more time for the laborers.Option 4: High Speed Mobile Shredder with Vacuum SystemCurrent Practice:The Hanford contractors manually remove asbestos by cutting, wrapping, and packaging asbestos-containing materials in glove bags or under negative pressure greenhouse enclosures. During this activity, laborers occasionally incur cuts, abrasions, and other minor injuries. The bagged waste is transported to the asbestos landfill to be deposited into the trench where back-fill is pushed over the waste.Recommended Action:Purchase two Pittman shredders without a vacuum system to compact non-radioactive asbestos waste. Two vacuum systems are currently available onsite and can be used with the purchased shredders. The shredders reduce the manual labor involved in cutting and shredding asbestos-containing materials (e.g., piping, metals, fasteners). The shredders will decrease the medical costs involved with manual labor byapproximately $20,000 per year, based upon asbestos management process knowledge.The Pittman/Future Air Inc. shredder/compactor system comprises a completely self-contained mobile vacuum packaging unit and can be towed by Class 3 hitch. The shredder reduces materials to a minimal size by shredding quickly under negative pressure. By vacuum, particles are transferred into the main processing unit. The main packing unit separates the particle from the airflow using a filtration system (HEPA). The major particulate displacement chamber continuously collects the waste, agitates and compacts it. The system then automatically forms and seals polyethylene bags, packs the materials, all before the asbestos material is ever released from containment. During the packing process the asbestos material is also compacted thus reducing the volume of waste. Bulk containment can be custom designed from 18 yd3 sealed units down to traditional waste containers.- The system can shred nearly all construction abatement waste such as wire lathe, heating and ventilation ducting, ceiling structures, plastic, and fiberglass. The throughput is 18 cu ft per minute of container feed of 3 inches thick by 24 inches wide material.Option 5: Outer Rigid Layer Greenhouse ReuseCurrent Practice:For projects involving asbestos removal work outdoors (e.g., tanks, vessels, cross-piping, decontamination and decommissioning of retired facilities), the Hanford contractors manually remove asbestos by cutting, wrapping, and packaging in glove bags under negative pressure greenhouse enclosures. The greenhouse enclosures are made of wooden tube blocks covered with fire retardant plastic sheeting that is wire-tied to the tube block framework. Two layers of plastic sheeting are installed inside the greenhouse enclosure: one outer rigid layer for the enclosure itself and one inner removable layer for spills and contaminants. Depending upon the environmental conditions at the work location, forced ventilation using a portable fan/exhaust system may be added to the enclosure. The greenhouse enclosures are used one-time during the job completion and are disposed with the asbestos waste via the asbestos landfill.Recommended Action:Reuse the greenhouse outer layer framework and dispose only the inner layer plastic sheeting between jobs. If outer layer is contaminated with asbestos, spray on Lockdown (registered trademark), a nonhazardous fixative decontamination spray that prevents the release of asbestos particulates from contaminated surfaces. Reusing the greenhouse outer layer decreases the costs involved with building and rebuilding greenhouse enclosures for each asbestos removal job. The number of trips to the landfill are decreased by reusing the outer enclosure.Option 6: Nonradioactive and Radioactive Asbestos WasteCurrent Practice:For projects involving asbestos removal work, the Hanford contractors manually remove asbestos by cutting, wrapping, and packaging in glove bags or under negative pressure greenhouse enclosures. Radioactively- contaminated bagged waste is

transported to the 200 Area radioactive Burial Trench for disposal. Nonradioactive asbestos is transported to the asbestos landfill to be deposited into the trench where back-fill is pushed over the waste. The annual volume of asbestos waste generated at Hanford is comprised of nonradioactive asbestos (2,500 yd3) and radioactive asbestos (1000 yd3).Recommended Action:Integrate radioactive and nonradioactive asbestos by purchasing and operating the asbestos waste conversion unit for radioactive asbestos. The conversion unit would operate in the same manner as the nonradioactive asbestos except for the waste would be radioactive (see opportunity #1). The end product will be radioactive, requiring transportation to a radioactive treatment and disposal site. The Environmental Restoration Disposal Facility (ERDF) will accept the end product as a disposal site.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Mary Betsch
Phone: 509-376-9773	**Phone:** 509-372-1627
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Hazardous/Regulated Chemical and Product Procurement **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-Site_3 **Specific Waste Type:** All

Date: 13-sep-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Disposal

Description: All Hanford contractors, with the exception of ICFKH, each have their own separate procurement departments (WHC Procurement manages the procurement for ICFKH). The Procurement process is similar with all contractors. According to the individual Hanford contractor cognizant engineers, the procurement of hazardous/regulated chemicals is similar to the procurement of other items on the Site. The procurement methods available are: Purchase Requisitions, Store Orders, Just-in-Time (JIT) Contracts, and Purchasing Cards (P-Cards).Purchase requisitions, containing requests for hazardous materials, are specified by project design or field personnel and are submitted to the contractor's procurement department. WHC and ICFKH purchase requisitions are reviewed by staff in the WHC P2 group for safer substitutes or availability in excess. The purchase requisition is reviewed by Procurement to determine if the item is in the current store stocks. If the item is not in the store stocks, the item is ordered from the vendor and purchased by Procurement. If the product is already in stock, a store order form is used in place of the purchase requisition.Store order forms are completed by WHC and ICFKH personnel by using the Workhouse Inventory Management System (WIMS). Other similar systems are used by the other contractors. The store order is then processed through Central Stores to see if the item is in stock. If in stock, the item is delivered to the end-user. If the item is not in inventory, the material is procured through a JIT contract.The Materials Coordinator places all JIT orders with the vendor. The vendor then ships the item to either Central Stores or directly to the end-user.Within WHC, BCSR and ICFKH, the P-card is available for purchasing material s without purchase requisition. The cardholder places the order and the vendor delivers directly to the end-user. The cardholder may purchase up to $5,000 per transaction for a wide variety of equipment and materials and up to $2,500 per transaction for fixed-price services. This service is similar to a standard credit card, in that, reconciliation of charges by the cardholder is handled electronically on a monthly basis. PNL has a similar purchasing card system.Tracking, use, and control of hazardous materials is deemed the responsibility of the user. Individual users control hazardous chemicals by storing the materials in locked cabinets. Individuals using hazardous materials interact with Procurement only at the time of purchasing and receiving.At this time, there is no established system for independent review of Material Safety Data Sheets (MSDS), work processes, product substitution, and engineering change notices (ECN) by the contractors for purchasing hazardous chemicals. The PNL project managers and scientists utilize an electronic database for purchasing hazardous chemicals. This database maintains a daily inventory of materials and identifies whether the purchased materials are hazardous or nonhazardous.Databases are currently being developed by some of the other contractors for product substitution and future uses. The WHC Hazardous Material Reduction Initiative (HMRI) database system provides a vehicle by which employees may become aware of the waste hazards of materials which they are working with. Often, reducing the amount of hazardous materials means using a less hazardous substitute rather than using less of a current product. All WHC/ICFKH purchase requisitions are reviewed by the WHC P2 Group for availability of the product onsite through the surplus program, availability of a less hazardous substitute, and the potential of using less of the product for the job at hand. The system also examines store stocks to ensure that only less hazardous products are carried on the shelves.

Options: Option 1: Training and Awareness for ProcurementCurrent Practice:Four methods exist in the procurement of hazardous/regulated chemicals on the Hanford Site. These methods include: 1) purchase requisition for operations and

construction; 2) store orders for materials in the stores inventory; 3) vendor contracts for orders shipped directly to the end user from the vendor; and 4) P-cards for which the card holder places an order and is billed monthly. An electronic database that contains a list of available chemicals for purchases approved by the Waste Management Group is available for PNL personnel. The ERC obtains purchases through their Procurement Group by using purchase requisitions. Current practice permits the purchase of hazardous/regulated chemicals without first checking shop stock inventories or contacting other facilities using similar chemicals. Currently, there is no system in place that prevents the purchasing of hazardous/regulated chemicals deemed unnecessary for a particular activity. There are, however, limited provisions for product substitution and chemical management on Site, such as HMRI, internal facility reviews, informal networks via P2 Groups, and excess chemical listings. Primarily, though, the management of chemicals is placed solely on the individual end-user. To improve waste minimization/pollution prevention efforts on Site, the WHC Pollution Prevention (P2) personnel have provided Pollution Prevention Awareness Training for P2 coordinators and certain project managers onsite.Recommended Action:A vast amount of hazardous/regulated chemicals (133,000kg total = 24,000kg PNL + 109,000kg WHC/ICFKH) are procured each year for use on the Hanford Site without regard to potential pollution prevention alternatives (i.e., chemical awareness, product substitution, chemical excess management, etc). The annual amount spent for procuring these hazardous/regulated chemicals is $1,059,626 ($192,000 PNL + $867,626 WHC/ICFKH). The amount of waste generated per year from the use of these hazardous/regulated chemicals is 37,240kg (6,720kg PNL + 30,520 kg WHC/ICFKH). Using a life cycle cost value developed at Hanford for DOE of $9.60/kg ($9,600/m3 X l m3/1,000kg), this waste stream cost $360,000 for handling and disposal.Option 2: Implement a Charge-Back SystemCurrent Practice:Once a hazardous/regulated chemical is procured, it is shipped to the individual user or requisitioner for use. The use of hazardous/regulated chemicals produces hazardous waste. This waste is then placed in the appropriate waste containers and is transported for disposal. Currently, the full cost of waste disposal is not accurately reflected to the requisitioner's organization.Recommended Action:Develop and implement a sitewide charge-back system. A charge-back system is a system designed to allow the generator of waste to manage the costs for handling and disposal of that waste. A charge-back system is implemented to inform the generator of the costs of generation, to place some of the liability of generation with the generator, and to promote waste reduction by the generator. To achieve this goal, an individuals) would have to research the different types of charge-back systems (either existing or potential) and analyze their applicability to the Hanford Site. The charge-back system chosen would have to be developed so it would be tailored specifically for the hazardous/regulated chemical waste generated on the Hanford Site. PNL, as well as other DOE Sites, are currently working on model charge-back syst ems.Of the 133,000kg (24,000kg PNL + 109,000kg WHC/ICFKH) of hazardous/regulated chemicals procured each year for use on the Hanford Site, approximately 28% or 37, 240kg (6,720kg PNL + 30,520kg) per year becomes waste.To improve this deficiency, research and analysis needs to be performed on the development and implementation of a charge-back system for use on the Hanford Site in regards to the waste generated from hazardous/regulated chemical usage.Option 3: Database Consolidation and SharingCurrent Practice:Currently, there is limited guidance or support for procurement, management, and product substitutions pertaining to hazardous/regulated chemicals on the Hanford Site. With the exception of informal networks and assistance, the procurement and management of hazardous/regulated chemicals is placed solely on the individual enduser. Although various databases have been established by individual organizations on the Hanford Site to provide some insight pertaining to hazardous/regulated chemical activities, there is currently no contractor cross-cutting or resource interconnections.Recommended Action:Some databases existing include PNL's PopChem, HMRI's safer substitutes database, the WHC Recycling Group's listings, and numerous off-Site clearinghouses and lists.There are a number of databases, both on-site and off-site, that pertain to hazardous/regulated chemicals. These databases contain valuable and pertinent information related to waste minimization/pollution prevention, product substitution, waste management, etc. The specifier and end-user (who are usually in the field) often do not have the time or resources to utilize the information contained in these databases. Recommend researching existing on-site and off-site databases for information that can be applied to the Hanford Site and consolidate this data so that it is readily available. Note that the implementation cost would depend on the extent of the consolidation (which has not been determined at this time) and, therefore, a detailed cost analysis will not performed. For the purpose of this P20A Opportunity, a generic implementation cost will be assumed so that payback can be calculated.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Jill Engel
Phone: 509-376-9773	**Phone:** 509-376-8737
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Soil Redesignation in Tank Farms **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: HFD-TWRS_1 **Specific Waste Type:** Soil

Date: 08-dec-1994 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Storage

Description: This activity will examine the management of contaminated soils listed as mixed waste. Tank waste leaks and spills on the ground resulted in contaminated soil that contains listed nonspecific source spent solvents (F001 - F005 codes, see Attachment 1) according to Washington Administrative Code (WAC) 173-303-070. The contaminated soil is currently removed and placed in containers and managed as mixed waste that contains a dangerous listed waste (FOOL - F005) component and a radioactive component. Alternatives to this practice will be explored.

Options: Option 1: Contained-In Policy With Analytical Svc/Env MonitCurrent Practice:Historical tank waste leaks and spills on the ground have resulted in contaminated soil. The contaminated soil is placed in containers when excavated during routine maintenance and upgrading activities. Tank wastes contain listed non-specific source spent solvents (FOOL - F005 codes) identified from the WAC 173-303-070. Currently, contaminated soil is managed as mixed waste with the F001 - F005 constituents and a radioactive component. Once identified as mixed waste, soil containers are shipped to Central Waste Complex for storage.Recommended Action:The recommended action is to redesignate Tank Farm soils using the contained-in policy with Analytical Services providing the analysis support. The Washington State Department of Ecology (Ecology) adopted the contained-in policy for management of environmental media in a memo dated February 19, 1993. A contained-in determination would be based on the concentration comparison of listed waste constituents in the environmental media to the Model Toxic Control Act (MTCA) cleanup standards. Ecology would provide a determination after it decides, based on evidence such as analytical sampling results, that the environmental media does not contain listed dangerous waste constituents above the MTCA residential cleanup levels. A contained-in determination would not release the environmental media from being Managed as a dangerous waste according to the Resource, Conservation, and Recovery Act of 1976 (RCRA) requirements if the media exhibits dangerous waste characteristics. The wastes would remain subject to RCRA land disposal requirements (LDR). Upon approval from Ecology a contained-in policy would no longer consider the media to contain dangerous waste and could then be disposed of as low level as opposed to mixed waste.The submittal of a contained-in policy to Ecology would include a Sampling and Analysis Plan (SAP) for collecting tank farm soil data to determine the presence of Dangerous Waste Codes F001-F005. To expedite the process, the use of a Pilot Soil Redesignating Study would be performed on one tank farm (241-BX). The study would be used to determine the optimal and appropriate statistical sampling design necessary to use for each container of waste removed from a farm. If the data received on the waste from a farm did not meet the contained-in requirements the wastes would be handled appropriately. The study would allow the plan to be technically defensible and cost effective.The redesignation of mixed waste to low level waste would significantly reduce the disposal costs and make storage space available for other mixed wastes.Option 2: Contained-In Policy With FAST/Special Anal. StudyCurrent Practice:Historical tank waste leaks and spills on the ground have resulted in 'contaminated soil. The contaminated soil placed in containers when excavated during routine maintenance and upgrading activities. Tank wastes contain listed non-specific source spent solvents (FOOL - F005 codes) identified from the WAC 173-303-070. Currently, contaminated soil is managed as mixed waste with the F001 - F005 constituents and a radioactive component. Once identified as mixed waste, soil containers are shipped to Central Waste Complex for storage.Recommended Action:The recommended action is to redesignate Tank Farms soils using the contained-in policy with FAST providing the sampling and analysis support in the field. Ecology adopted the contained-in policy for management of environme ntal media in a memo dated February 19, 1993. A contained-in determination would be based on the concentration comparison of listed waste constituents in the environmental media to the MTCA cleanup standards. Ecology would provide a determination after it decides, based on evidence such as analytical sampling results, that the environmental media does not contain listed dangerous waste constituents above the MTCA residential cleanup levels. A contained-in determination would not release the environmental media from being managed as a dangerous waste according to the RCRA requirements if the media exhibits dangerous waste characteristics. The wastes would remain subject to RCRA LDR. The use of a contained-in policy Ecology would no longer consider the media to contain dangerous waste and could then be disposed of as low level waste as opposed to mixed waste.The submittal of a contained-in policy to Ecology would include a SAP for collecting tank farm soil data to determine the presence of F001-F005. To expedite the process, the use of a Pilot Soil Redesignating Study would be performed on one tank farm (241-BX). The study would be used to determine the optimal and appropriate statistical sampling design necessary to use against for each farm. If the data received from a container did not meet the contained-in requirements the wastes would be handled appropriately. The study would allow the plan to be technically defensible and cost effective.The redesignation of mixed wastes to low level wastes would significantly reduce the disposal costs and make storage space available for other mixed wastes.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Mary Feucht
Phone: 509-376-9773	**Phone:** 509-373-2207
Fax: 509-376-2195	**Fax:**

Email: Donna_S_Merry@rl.gov	**Email:**

Title: Replacement of 242-A Evaporator Steam Supply **Major Waste Type:** Sanitary Waste

PPOA ID Code: HFD-TWRS_2 **Specific Waste Type:** Aqueous

Date: 07-nov-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Recovery

Description: The purpose of the P20A is to examine alternate energy sources and delivery systems for replacement of the current steam supply being provided to the 242-A Evaporator facility. This P20A examines six steam loads currently in use at the 242-A Evaporator. Each load is evaluated for possible conversion to alternative steam or energy sources. The following six steam loads were identified by VMC Process Engineering:E-A-1 ReboilerBuilding Ventilation Heating CoilsSteam Turbine Driven Backup ExhausterVacuum Condenser Steam JetsJet Gang-Valve Sump PumpWeight-Factor Purge System

Options: Option 1: Replacement of 242-A Evaporator Steam SupplyCurrent Practice:Steam is currently supplied from the 200 East Area Central Steam Complex to the 242A Evaporator facility located in the 200 East Area of the Hanford Site.Recommended Action:Eliminate the current steam source to the 242-A Evaporator facility and revise the systems to accommodate the following recommended sources:A package boiler steam supply is recommended for the E-A-1 Reboiler, Vacuum Condenser Steam Jets, and Jet Gang-Valve. Two 600 boiler horsepower units are suggested so that if one boiler unit becomes inoperable, fifty percent of the maximum design capacity could be maintained by the remaining boiler.The hot water circulating system is recommended for replacement of the steam used for ventilation heating. Because this system is estimated to be used only 150 days per year, a large savings associated with lost energy from steam line loss ran be obtained.A 150 kilowatt stationary standby diesel generator with a 200 gallon fuel supply, and a 75HP/480 volt/1800 rpm electric motor can replace the steam supply for the Steam Turbine Driven Backup Exhauster. The diesel generator alone will reduce the quantity of steam that must be purchased from the 200 East Area Central Steam Complex and will eliminate the energy loss associated with line loss. When the generator is in place, there will no longer be a need for a continuous supply of steam to meet the demand of the Turbine Driven Backup Exhauster.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Thomas Seifert
Phone: 509-376-9773	**Phone:** 509-373-0119
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Elimination of Paper Both Electronically and Hard Copy **Major Waste Type:** Sanitary Waste

PPOA ID Code: HFD-TWRS_3 **Specific Waste Type:** Paper

Date: 08-nov-1995 **Major Activity Type:** Office **Specific Activity Type:** Waste Management, Disposal

Description: This activity will examine the actions identified by Profile II to help reduce the paper waste in Tank Waste Remediation System (TWRS). TWRS Profile II was a work process analysis developed by Westinghouse Electric Corporation through its Productivity and Quality Center in Pittsburg, PA. The study surveyed more than 1,000 TWRS employees and identified numerous low or no-value activities. Profile II examined the enormous duplication, distribution, and waste of paper within TWRS. Approximately 50% of the 800 tons of paper wastes generated annually for TWRS activities were generated by TWRS while the remaining wastes were generated by other facilities associated with TWRS. Personnel recycled 750 of the 800 tons of paper.Note: Mary M. Feucht is the author of this P20A. Mr. Mike K. Mahaffey is the Project Lead in this assessment.

Options: Option 1: Paper Usage For Computers, Faxes, Etc.Current Practice:Correspondence is being sent to many individuals, in some cases in the same group, when only a few people need the information. Correspondence often is sent to individuals both electronically and hard copies. The distribution many times contains complete documents when only a portion is needed. Distribution lists are continually updated, but seldom are names removed. The volume of paper usage is impacted by the 36,316

controlled documents that need periodic revision to be effective tools.Recommended Action:The recommended actions include the following-1) Hard copy correspondence should be sent to addressees with necessary documents and/or attachments. All other interested personnel should be sent electronic copies. Correspondence should be sent to individuals on a need to use and not to cover all bases. Managers can help control the distribution process by sharing information verbally, cc:mail, etc. Managers as well as employees should challenge the need for the frequency (e.g., weekly to monthly) to generate correspondence.2) Accurate mailing distribution lists continually need to be updated to locate individuals for forwarding correspondence. Individuals not wanting to be on distribution should request to have their names removed. Distribution of information should be performed using the one up/one over policy, return to sender/remove from distribution stickers, and/or electronic distribution. Electronic communication can be highly effective for informing and educating employees on voice mail, cc:mail, LanCal, fax machines, etc.3) Individuals make full use of pages and not leave white pages in documents,Option 2: Increased Mail HandlingCurrent Practice:The volume of mail handled by workers has increased due to document duplication and mail distribution. Postal workers handled 24 million pieces of mail in 1993 with 50% coming from TWRS personnel. Some of the mail handled was the result of employees having bulk mail sent to their work station. In other cases, correspondence contained wrong Mailstop Identification Number (MSIN) resulting in the postal workers having to locate individuals to forward the mail. Individuals are sending duplicate copies of documents to a large number of personnel when only a few need the documentation.Recommended Action:The volume of documents mailed would decrease by personnel using cc:mail and other electronic means of communication. Documents being mailed need to contain correct MSIN to avoid looking up MSINS. Westinghouse Postal Service personnel should eliminate distribution of bulk rate mail and second class mail containing incorrect MSINS, and use standardized envelopes.There are 318 MSINs with less than ten associated individuals. The 318 MSINs should be combined with other locations to alleviate additional sorting required by postal workers. MSINs also should be fixed to locations rather than to groups. To speed mail handling, notification cards should be provided to employees for changing their addresses. Also, sort bins need to be provided at mail locations to expedite the distribution process. Individuals using the sort bins could presort large volume of mail for distribution.Mail service operating procedures should reflect changes in handling bulk mailing, second class mail, and combining MSINS. The procedural changes would consist of a Page Change to revise Document Control and Records Management Manual (CM-35), Correspondence and Commitment Control (Section 12.9), and Office Administration Manual to reflect changes towards paper reduction, recycling, and electronic communication usage.Option 3: Use of Copy MachinesCurrent Practice:TWRS has 96 available copy machines for personnel use in 1993. Copies are generated on regular and oversize paper, and mass produced resulting in a large volume of paper being used. Individuals seldom use the duplex function or even consider whether the copy is necessary.Recommended Action:The paper waste can be resolved by rationing paper, totally eliminating or removing 50% of the copiers, and/or using the correct paper size for copies being made. The use of the duplex function will decrease the paper volume significantly if copies are necessary. Machines could also be reset from multicopies to a default of one. Individuals should decide if the one up/one over can be used for document distribution. Personnel could be required to use a charge code for copies, thereby making individuals accountable for paper wastes. Also, waste paper should be recycled and/or the back side of the paper used for scratch, notes, etc. People need to be aware of the volume of paper used and question whether copies are necessary.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Mike Mahaffey
Phone: 509-376-9773	**Phone:** 509-373-6266
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Handling Core Drilling Generated Wastes From Tanks

Major Waste Type: Low Level Waste

PPOA ID Code: HFD-TWRS_4

Specific Waste Type: Core Samples

Date: 09-nov-1995

Major Activity Type: Environmental Restoration

Specific Activity Type: Sampling & Characterization

Description: This activity will examine how core drilling wastes are generated by Characterization Engineering. Characterization Engineering personnel use drill strings to sample tank wastes. After use, the drill strings are placed in 2Õ x 2Õ x 6Õ boxes for storage and disposal. The containers can hold 6 or 7 drill strings. Frequently, boxes only contain two or three drill strings resulting in a significantly large number of partially empty containers being shipped for long term storage. Storage cost at the Central Waste Complex is based on the external volume of the container and not the internal volume. The result is excessive costs for container storage.

Options: Option 1 - Containers in 90-Day Storage AreasCurrent Practice: Drill strings and wastes, generated by Characterization Engineering, are placed in containers set up in Tank Farms until either the containers are full, the dose rate limit has been reached, or the 90 day clock runs out. The 90 day clock starts on the day waste is first placed into a container. Usually, the 90 day clock runs out before containers are full, resulting in containers not being filled to capacity. In a number of cases, containers have been only one quarter full before being sent to the Central Waste Complex (CWC) for long term storage.Recommended Action: The recommended action is to fill the container to capacity before shipment, because the disposal cost is the same whether or not the container is full. The existing 90-Day Storage Areas should be changed to Satellite Accumulation Areas (SAAs). Once three drill strings are placed in the container located in a SAA the container would then be placed on a 90 day clock. This process would allow SAAs to be used on an unlimited time basis until three drill strings are placed into a container. This will permit more drill strings to accumulate in the container before a time limit is imposed.Option 2 - Inventory Core Drilling WastesCurrent Practice: Currently, personnel undress and dispose of personal protective clothing and other debris in containers at the end of a job. The debris and waste are recorded on inventory sheets at the end of the job. It takes approximately one hour to undress and complete the necessary paperwork for container waste inventory.Recommended Action: Wastes generated during a job should be placed in containers and inventories as each item is placed in the container. Inventory sheets are required for disposal of all wastes. The time allotted for undressing and filling out necessary paperwork is reasonable. Personnel are using best management practices. No change in current practice is recommended.Option 3 - Decon Auger Drill StringsCurrent Practice: Once drill strings are used, the preferred method of disposal has been to place drill strings in 2Õ x 2Õ x 6Õ containers. The container size results in a large number of containers being closed before being filled to capacity. This practice additionally results in a shortage of available containers for waste disposal.Recommended Action: The recommended action is to decontaminate the drill strings allowing their reuse. This would save on the number of drill strings being ordered, cut back on the requested containers, eliminate oversize containers, and would eliminate extra costs for storage of partially empty containers.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Mary Feucht
Phone: 509-376-9773	**Phone:** 509-373-2207
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Glovebox and Process Room Activities in TRU Environment **Major Waste Type:** Transuranic Mixed Waste

PPOA ID Code: HFD-TramP_13 **Specific Waste Type:** Solid Waste

Date: 27-jul-1995 **Major Activity Type:** Manufacturing **Specific Activity Type:** Waste Management, Disposal

Description: Activities discussed included canyon entries, pit entries, sump entries, glovebox work and process room work in which transuranic wastes were generated. These include, but are not limited to: glovebox maintenance, scrap stabilization, solution load in and load outs, process solution transfers, entries and egress from highly contaminated tru areas, analytical/sampling procedure activities in process hoods and cells, HEPA filter changes (tru only), and decontamination of tru contaminated surfaces.

Options: Option 1: Awareness and Training WorkshopsCurrent Practice:Currently, no method exists to train specific crafts, operations and engineers on specific P2 ideas and tools for their activities. In addition, most P2 awareness is done at the site level, and each facility has had very little interaction in developing awareness tools for their own operations.Recommended Action:Develop craft/operations/function specific P2 training for facility personnel at PFP and PUREX in the reduction of TRU waste.á Incorporate a modular training in P2 which integrates the P2 process throughout the work planning process. á Develop P2 Awareness tools for use in change rooms, work locations, offices and lunchrooms. These tools include posters of P2 accomplishments in the facility, posters informing personnel of the cost of disposal in terms of jobs and monetary goals, and ideas for reducing waste in various locations of the facility.Option 2: Improved Bag Out Practices and Seal outsCurrent Practice:Current procedures and practices require the removal of wastes from gloveboxes within 24 hours, or within a shift, regardless of the amount of waste actually generated. WIPP and TRUPACT II shipment and acceptance criteria require each package of waste to be wrapped in two to three layers of plastic inside the lined drum. In addition, rags, PPE, and other items are generated as waste during seal outs.Recommended Action:Change procedures and policies allowing the composting of waste in areas within the glovebox, or transferred to a separate glovebox for consolidation of the waste packages. Place these packages into the least amount of layers of plastic practically possible.Option 3: Installation and use of French Can

Sealouts/BaglesCurrent Practice:Current procedures and practices require the removal of wastes and polaars from gloveboxes, sometimes within 24 hours, or within a shift, regardless of the amount of waste actually generated. WIPP and TRUPACT II shipment and acceptance criteria require each package of waste to be wrapped in two to three layers of plastic inside the lined drum. In addition, rags, PPE, and other items are generated as waste during seal outs. Storage and transportation requirements within the facility between gloveboxes, assays, and storage pedestals require two layers of plastic around each can or jar. This activity greatly increases plastic waste during semi annual and annual inventories for special nuclear materials.Recommended Action:Install French Can or Bagless transfer ports on gloveboxes where high activity exists for transfers, seal outs and inventories of canisters. Using this bagless method of transfer, which includes the installation of airlocks, sphincter ports and portable canisters mounted to a gasket on the face of the glovebox, would reduce the need for wrapping the containers in plastic prior to transfer or storage. In addition, wastes can be added directly to a repackaging glovebox where the waste can be consolidated with other waste to reduce packaging requirements.Option 4: Improved assay capabilities for TRU wasteCurrent Practice:Current procedures, practices and technology require the generator to treat non-TRU waste as suspect TRU or TRU waste due to limitations with current systems. When waste is generated during deactivation, decontamination, building maintenance, operations or facility modifications, several items cannot currently be assayed to assure a non-tru or tru designation. This requires some large items such as gloveboxes, piping, concrete, soil and other construction wastes to be handled, packaged and disposed as TRU waste. This increases the labor associated with size reduction to placed items in smaller 55 gallon drums and Standard Waste Boxes, and the labor and materials required to meet WIPP and TRUPACT II criteria.Recommended Action:Purchase and install adequate assay equipment and software to provide better determination of Tru/LLW, and reduce the amount of waste being handled and stored as WIPP Certifiable. In two cases, system hardware already exists at PFP and at PUREX, but insufficient priorities and resources have not allowed for software development or completion of the installation.Option 5: Improved Decon Capability/Light Aided DeconCurrent Practice:Current practices and technology used by generators to decontaminate contaminated surfaces include chemical stripping, detergent cleaning, steam cleaning, and sandblasting. In addition to the labor intensive aspects of sectioning and cutting piping, ducts, plenums, and gloveboxes for disposal as TRU waste, little effort is used to decon these surfaces due to the poor results observed during previous efforts.Therefore, a lot of the waste packaged as TRU or TRU mixed would be reduced to LLW or releasable scrap for recovery.Recommended Action:Prior to sectioning and disposal of equipment, gloveboxes and other materials contaminated with transuranic radionuclides, use light or laser aided decontamination to reduce the amount of waste generated during decontamination, deactivation and decommissioning activities.Option 6: Extend life of glovebox glovesCurrent Practice:Current practices and procedures for the changing of glovebox gloves are based upon Quality Control procedure time intervals, not upon whether the glove lacks integrity or actually needs replacement. Failure rates have not been determined on technical standards, according to the manufacturer, but on an unnecessary degree of conservatism at the Hanford site. In addition, leaded gloves are used to reduce exposures to personnel while working in the gloveboxes.Recommended Action:Extend the life of glovebox gloves to the actual failure rate recommended by the manufacturer, or when a survey actually detects a failure. This would extend the glovebox gloves from 12 month change intervals for lead gloves to 18 months, and from 18 months to 24 months on the hypolon gloves. In addition, bismuth erbium oxide gloves from North manufacturing are being developed as replacements for the leaded gloves. This will increase the life expectancy of the gloves by an estimated one year, while reducing the manufacturing of lead (toxic) and providing an estimated 60-70% greater reduction rate from neutron exposure.Finally, place ports which seldom require the use of gloves on a deactivation status by pie plating the port opening. Activate the glove only when it is actually being used, when practically possible.Option 7: End Point Process Automation ToolCurrent Practice:Currently, no single method exists for transferring the information gathered from one Transition Projects facility to another, in relation to end point criteria. The end point criteria defines the parameters, limits, methods, and potential best management practices for preparing transition facilities for D&D during the deactivation phase. Traditionally, each facility used their own engineering staff to prepare NEPA, readiness review, end point criteria and work plans for the deactivation of facilities. In addition, without adequate understanding of the end point criteria, and the lessons learned from previous deactivations, facilities generate unnecessary TRU and mixed waste. In several cases, waste can be generated cleaning an area which will be grouted, removed in situ, or decontaminated by a better method during the D&D phase.Recommended Action:Using the experiences learned during the PUREX and U03 deactivation activities, design and develop an automated tool (CD ROM) for use by other facilities when planning the deactivation activities. This automated process tool would be used by crafts, operators, designers, and the teams responsible for D&D and deactivation to create work plans and practices which eliminate unnecessary generation of wastes.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Joe Estey
Phone: 509-376-9773	**Phone:** 509-373-3387
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Electrical Lighting Maintenance **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-TramP_16 **Specific Waste Type:** Solid Waste

Date: 07-jun-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Waste Management, Disposal

Description: Maintenance of electrical lighting systems including fluorescent, incandescent, sodium and mercury bulbs and fixtures. In addition, activities associated with the replacement and repair of ballasts, including PCB and DOP ballasts. Replacement of PCB ballasts also include spill clean up activities associated with PCB leaks and ballast replacement.

Options: Option 1: Use rapid start ballasts in place of DOP or existCurrent Practice:Fixtures in place in TrP facilities were installed in the 1950's to the 1970's, and are generally not energy efficient. The use of PCB and DOP insulated ballasts are inefficient, consuming more energy than necessary, and generating waste through unnecessary changes due to failure, in comparison to current fixture technology.Recommended Action:Replace fixtures in facilities with rapid start fixtures rather than DOP ballast fixtures.Option 2: Switch from low cost high maintenance bulbs to ** moCurrent Practice:Fixtures in place in TrP facilities were installed in the 1950's to the 1970's, and are generally not energy efficient. The bulbs currently being procured on site are based upon purchase price (low bid) and not length of service. The use of low cost bulbs increases the frequency the bulbs are changed. (most are rated at less than 1000 hours of life)Recommended Action:Replace bulbs with long life, low maintenance bulbs. Although the initial cost of the bulbs in 7 times higher than low cost bulbs, the frequency of changes increases from every 8 months (average estimate) to every 7 years.Option 3: Consolidation CenterCurrent Practice:Wastes generated from each facility are shipped in separate containers to the 616 and PCB 212 facilities, based upon <90 day temporary storage requirements. In addition, aerosol cans, batteries, oils, bulbs, and ballasts are generated at each facility, but no effort is made to consolidate or recycle these wastes instead of shipping to an offsite treatment, storage and disposal facility.Recommended Action:Rather than shipped the wastes as separate containers to off site TSDS, create a center for the consolidation of the wastes, with a focus on finding secondary uses, or recycling options for the wastes or materials. Aerosol cans could be combined with similar cans from all facilities, depressurized and redeployed as product. Light bulbs and ballasts could be recycled from the collection center. Oils could be combined into a larger tank for bulk shipment. Each of these options would reduce the labor, packaging, storage and documentation burden on the generator, while cost effectively reducing the charge per package. The maximum volume of waste would be sent to the TSD rather than single containers.Option 4: Remove lead solder from incandescent bulbsCurrent Practice:Wastes generated from incandescent bulbs are considered regulated due to the solderbead at the base of the bulb, (42 ppm lead). In many cases, the bulb is thrown awayintact with the bead, creating unnecessary volumes of waste.Recommended Action:Remove the solder bead from the base of the bulb, and handle the glass separately. In addition, place the lead bead along with other lead scrap for recycling.Option 5: Implement better lighting practices in electricalCurrent Practice:Wastes generated from electrical wastes are often unnecessary. Electricians are not trained in the use of energy efficient lighting systems, total cost analysis of energy systems, the use of the Pollution Prevention Design Guidelines, or the use of the Green Lights manual by EPA. In addition, few facilities use the Configuration Control group or the Energy Conservation group for advise on what to do to reduce energy consumption in a work location.Recommended Action:Develop awareness training and a method for improving the knowledge and skills of electricians on site so that they understand the resources available to them in the area o waste reduction and energy conservation. This includes introducing them to the P2 design database, the configuration group and energy conservation group representatives and what information might be available in the EPA's Green Lights manual.Option 6: Improved PCB Ballast Removal PracticesCurrent Practice:FCB contaminated waste are generated in radiological and non radiological areas through the replacement of leaking and non- leaking ballasts. Typically, a ballast is only changed if it is known to be leaking, unless the entire fixture is being replaced for a particular reason. Once a PCB ballast leaks, the room is quarantined, spill clean up procedures are initiated, and PCB contaminated wastes including absorbents, cloth rags, PPE and masks are generated. In addition, due to the storage requirements for PCB ballasts and contaminated articles, these wastes are shipped in 30 to 55 gallon drums, even though 1/10 of the drum is actually full. In addition, kerosene or other flammable solvents are used to decon areas affected by PCBS, and consequently, rags and gloves are treated as hazardous wastes during decontamination.Recommended Action:Reduce PCB ballast and contaminated wastes through:á Training of electricians in the handling and cleaning of PCB spillsá Removing the PCB ballast part and separating it from the rest of the ballastá Sectioning all PCB ballast areas off and changing while non- leaking instead of waiting for leaking to occurá Use Intech 200 or citric terpene to decon ballast areas instead of solvents

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Joe Estey
Phone: 509-376-9773	**Phone:** 509-373-3387

Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Deactivation, Decontamination and Zone Reduction **Major Waste Type:** Transuranic Mixed Waste

PPOA ID Code: HFD-TramP_17 **Specific Waste Type:** Solid Waste

Date: 07-jun-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Disposal

Description: As maintenance, surveillance, decontamination, housekeeping and deactivation activities are performed, wastes are generated in radiological areas. This includes activities associated with zone reduction, contamination control, maintenance support, and deactivation facilities for transition to D&D.

Options: Option 1: Tamper Indicating system for release of materialsCurrent Practice:Maintenance, surveillance, decontamination and deactivation activities are performed, a variety of products and tools may be used to complete work. In some cases, equipment and materials are brought into a contaminated area, but the job is postponed, or canceled and the materials cannot be released unconditionally because the release standards are too stringent for current technology. This creates the unnecessary generation of low level wastes. In other words, new products and tools cannot be reasonably surveyed for free release once entered into some Contaminated Areas due to technical and procedural constraints in DOE orders and release criteria.Recommended Action:Use tamper indicating seal and containment (bag) on those items which enter an area for a planned activity. HPTs would place a tamper indicating tape across the containment bag (in which the pump, gloves, equipment are placed), and then initials and dates the seal, indicating that the items were clean going into the zone. If the materials are never used, and the tape is still intact, the HPT at the survey station should be confident that the items inside the bag are free of contamination. This would allow the items to be reused, recycled, or managed in a manner other than as low level waste.Option 2: Controlled Inventories-Chemical and MaterialCurrent Practice:As maintenance, surveillance, decontamination and deactivation activities are performed, a variety of products and tools may be used to complete work. This creates unnecessary generation of wastes through the bringing of chemicals and tools into an area where these materials may already be stored in greater quantities than can be used in a reasonable period of time. In addition, new products and tools cannot be reasonably surveyed for free release once entered into some Contaminated Areas due to technical and procedural constraints in DOE orders and release criteria.Recommended Action:Use centralized, posted storage for chemicals and tools--control the purchase, type and toxicity of materials going into zones to ensure a just in time inventory is maintained at the lowest possible threshold, while ensuring sufficient materials are available to perform all tasks.Option 3: Update technology of hand held instruments to meetCurrent Practice:As maintenance, surveillance, decontamination and deactivation activities are performed, a variety of products and tools may be used to complete work. Materials which are brought into a zone cannot be released upon completion of work due to a delta between the method and type of instrument used to survey and the free release criteria. This creates the unnecessary generation of low level wastes. The Radiological Control Manual requires tech smears to be performed on many items, which cannot be feasibly performed in a timely and cost effective manner.Recommended Action:There are combination survey instruments and better detectors available currently than are in use at Hanford. These instruments may be able to detect at lower levels than available presently, thereby allowing items to be free released from zones.Option 4: Decontamination/Deactivation WorkshopCurrent Practice:As maintenance, surveillance, decontamination and deactivation activities are performed, a variety of products and tools may be used to complete work.Decontamination and deactivation activities pose a problem in waste generation in a different way than routine or normal process operations. Operators, Health Physics technicians, and others are not trained in specific techniques which might improve their productivity during decontamination and deactivation, and which also might reduce waste. For instance, absorbents and cleaners which are largely ineffective, are continuing to be used even though technology has produced better substitutes for most activities.Recommended Action:A joint workshop(s) should be held for operators and HPTs which would highlight the specific techniques to improve decontamination and deactivation. The workshop should include a hands on demonstration of different decontamination techniques and technology such as light aided decon, alternatives to sandblasting and surface removal, C02 Pelletization, non-toxic/non-regulated decon detergent use, etc. In addition, proper waste handling and packaging, including the correct use of the best absorbents, would be performed.Option 5: Eliminate Paper or Disposal Personal Protective ClCurrent Practice:As maintenance, surveillance, decontamination and deactivation activities are performed, a variety of personal protective clothing is used. At the Plutonium Finishing Plant and the PUREX facility, areas known or suspected to be contaminated with alpha contamination may only be entered using paper or disposal clothing. In some cases, the clothing is removed in one room, discarded and new clothing donned in a room next to it. Clothing with potential alpha contamination cannot be adequately surveyed and released for transportation to offsite laundry facilities, as is done in other facilities.Recommended Action:Develop a contract with the offsite laundry facility to accept and launder reusable cloth laundry from PFP and PUREX, eliminating the need for paper clothing.Option 6: Integrate P2 into the Performance Based InitiativeCurrent Practice:As maintenance,

surveillance, decontamination and deactivation activities are performed, a variety of wastes are generated. Performance based initiatives or indicators (PBls) may focus on the specific milestone date, safety indicators and other parameters such as total operating efficiency and maintenance downtime, but none have been based on a goal to reduce waste. PBIs should be created to provide financial incentives on each project in order to reduce or eliminate wastes during start up, operation and shutdown activities.Recommended Action:Develop PBIs for projects and facilities that will provide financial incentives to reduce or eliminate wastes.Option 7: Integrate P2 techniques and design into planning oCurrent Practice:As maintenance, surveillance, decontamination and deactivation activities are performed, a variety of wastes are generated. Sometimes, more emphasis is placed on meeting a milestone date or other success measure with little regard for waste minimization. Formally incorporating waste minimization and pollution prevention ideas into work packages would provide better support to those performing these tasks by ensuring productivity improvements, materials and waste plans have been adequately evaluated and implemented during the planning cycle.Recommended Action:Develop methods for formally evaluating and incorporating waste minimization and pollution prevention techniques into work control planning.Develop methods for formally evaluating and incorporating waste minimization and pollution prevention techniques into work control planning.Option 8: Defrock HEPA FiltersCurrent Practice:Maintenance, decontamination and deactivation activities generate a variety of contaminated HEPA filters. Some are generated during through use on containment tents or greenhouses, and some are the resultant wastes from decommissioning of filterboxes. In most cases, these filters are placed into B-25 metal or plywood boxes for subsequent shipment or burial. Filters are awkward to handle and require a use up a great deal of the capacitance of the burial boxes. In addition, Washington state mixed waste rules require DOP filters to be treated as mixed waste, and other filters which may have come in contact with a F-listed solvent or characteristic waste stream are considered mixed waste, as well.Recommended Action:Develop methods for defrocking or tearing apart the filter media from the plywood or metal housing. This allows the paper filter media to be handled as a mixed waste when necessary but the volume can be reduced by placing the media into a low level waste drum and compacting the waste matrix. The housing can be treated as non regulated and handled as radioactive waste, (usually at a substantially less contaminated level than the media). In some cases, however, filters containing tru or alpha contamination cannot be defrocked in a containment tent, and may require separation in a glovebox.Option 9: Alternatives to chemical decontamination and sand blastCurrent Practice:Maintenance, decontamination and deactivation activities generate a variety of contaminated wastes during surface removal or painting preparation. Current methods for removing, preparing or cleaning surfaces include sandblasting and use of chemical agents, such as oven cleaner and acid cleaners, which result in mixed waste generation.Recommended Action:Use the following alternative method for surface preparation, depending upon the need to control the secondary wastes, if any, are produced during the decon activity:o CO 2 Pelletization (system on site)This system has been used to reduce the volume of paint and surface debris related wastes, especially on soft surface areas, in both radiological and non radiological areas.Option 10: Alternatives to chemical decontamination and sand blastCurrent Practice:Maintenance, decontamination and deactivation activities generate a variety of contaminated wastes during surface removal or painting preparation. Current methods for removing, preparing or cleaning surfaces include sandblasting and use of chemical agents, such as oven cleaner and acid cleaners, which result in mixed waste generation.Recommended Action:Use the following alternative method for surface preparation, depending upon the need to control the secondary wastes, if any, are produced during the decon activity:o ARMEX Decon SystemThis system uses a baking soda blast particulate media which is non regulated and can be flushed down sanitary drains upon use. In addition, drummed waste can be handled and shipped as non regulated. The unit has been used to reduce the volume of paint and surface debris related wastes, especially on lead based paint surfaces, epoxies, and steel soft surface areas, in both radiological and non radiological areas.Option 11: Alternatives to chemical decontamination and sand blastCurrent Practice:Maintenance, decontamination and deactivation activities generate a variety of contaminated wastes during surface removal or painting preparation. Current methods for removing, preparing or cleaning surfaces include sandblasting and use of chemical agents, such as oven cleaner and acid cleaners, which result in mixed waste generation.Recommended Action:Use the following alternative method for surface preparation, depending upon the need to control the secondary wastes, if any, are produced during the decon activity:o Product Substitutes for decon agents, (Environmental Scientific Incorporated's ESI 635, 625, 670 non-regulated products)The ESI products listed have been used at other nuclear power and radiochemical processing facilities across the United States and the United Kingdom. The products are non-regulated and specially formulated for specific decon applications--635 is designed to emulsify and remove oxide based contaminants, 670 and 625 designed to remove nitrate or acid based contaminants on concrete and steel surfaces.Option 12: Reduce vegetation or reduce the need to handle tumCurrent Practice:Housekeeping of outside areas generates large volumes of dried, blowing tumbleweeds. These tumbleweeds are placed into a compactor truck, and handled as low level waste, although the actual detection levels of the weeds may be lower than release limits. In other words, little is done to assure the weeds are actually contaminated because-current site procedures require the weeds be independently surveyed to be released (sometimes requiring a tech smear, which is impossible to perform in most cases). In some cases, such as B Plant and PUREX, the tumbleweeds constitute one of the largest sources of low level waste by volume.Recommended Action:Work with site radiological control engineering to develop a better way to segregate and handle the tumbleweeds. It is believed that any effort to reduce the number of weeds currently handled as low level waste would reduce the stream by as much as 75% or more. This includes efforts to burn the weeds, chip and assay the weeds, or eliminate the weeds with herbicides or other means.Option 13: Alternatives to chemical deco ntamination and sand blastCurrent Practice:Maintenance, decontamination and deactivation activities generate a variety of contaminated wastes during surface removal or painting preparation. Current methods for removing, preparing or cleaning surfaces include sandblasting and use of chemical agents, such as oven cleaner and acid cleaners, which result in mixed waste generation.Recommended Action:Use the following alternative method for surface

preparation, depending upon the need to control the secondary wastes, if any, are produced during the decon activity:o Kelly steam cleaner (PUREX)The Kelley steam cleaner decon unit has been used at other nuclear power and radiochemical processing facilities across the United States. The system utilizes high pressure, high temperature steam to clean contaminated surfaces instead of abrading or cleaning surfaces with mechanical or chemical means. Currently, the system is located at PUREX, but is underutilized through lack of awareness across the site.Option 14: Reduce contamination area zones to reduce the amountCurrent Practice:Entries, surveillances, and housekeeping in contamination areas require the majority of materials being disposed of to be handled as low level waste because insufficient techniques or technology exists to free release and radiologically characterize the waste. A contamination control implementation plan exists at some facilities to ensure zones are reduced to a number as low as reasonably achievable.Recommended Action:Ensure each facility has an active CCIP program, and that low level wastes from these areas are being calculated in the total cost savings or avoidance. Ensure all savings and reductions are noted on quarterly and annual reports.Option 15: Purchase bulk gloves in operation areas to reduceCurrent Practice:Rubber Gloves purchased for use in contamination areas are generally bought in boxed quantities and individually wrapped. These gloves are usually worm two at a time, with each pair generating paper wastes in low level waste containers.Recommended Action:Purchase gloves in bulk quantities to reduce the amount of paper and cardboard waste generated in radiological areas.Option 16: Use teflon lining on surfaces to assist in ease ofCurrent Practice:Steel and painted surfaces, exposed to contamination sources during work activities, are often difficult to decontaminate, usually requiring extensive labor and resources.Recommended Action:Place teflon lining on surfaces prior to performing work activities in order to speed decon. The advantage over this method than plastic sheeting is that the sheeting is generally not reusable and needs to be replaced once contaminated.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Joe Estey
Phone: 509-376-9773	**Phone:** 509-373-3387
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Painting and Coating Applications/Surface Preparation **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: HFD-TramP_18 **Specific Waste Type:** Solid Waste

Date: 23-apr-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Painting

Description: During decontamination and preparation of surfaces for painting, modifications or removal, hazardous and radiological wastes are created. These activities include sandblasting, chemical stripping, and mechanical scabbling or stripping. Activities also include set up and clean up in preparation for surface painting and decontamination.

Options: Option 1: Painting Techniques WorkshopCurrent Practice:As painting and coating application activities are performed, a variety of products and tools may be used to complete work. Existing training and awareness opportunities for painters do not exist on site for coating and painting specialists or painters.Recommended Action:Workshops should be held which would highlight the specific techniques to improve surface preparation and painting applications. The workshop should include a hands on demonstration of different surface preparation techniques and technology such as light aided decon, alternatives to sandblasting and surface removal, C02 Pelletization, nontoxic/non-regulated decon detergent use, etc. In addition, proper waste handling and packaging, including the correct use of the best absorbents, would be performed.Option 2: Alternatives to chemical decontamination and sand blastCurrent Practice:Painting and Coating application activities generate a variety of contaminated wastes during surface removal or painting preparation. Current methods for removing, preparing or cleaning surfaces include sandblasting and use of chemical agents, such as oven cleaner and acid cleaners, which result in mixed waste generation.Recommended Action:Use the following alternative method for surface preparation, depending upon the need to control the secondary wastes, if any, are produced during the decon activity:o CO 2 Pelletization (system on site)This system has been used to reduce the volume of paint and surface debris relatedwaste especially on soft surface areas in both radiological and non radiological areas.Option 3: Controlled Inventories-Hazardous Material ManagementCurrent Practice:As painting and coating application for surface preparation activities are performed, a variety of products and tools may be used to complete work. These materials may already be stored in greater quantities than can be used in a reasonable period of time. In addition, new products and tools are purchased with little, if any, review for toxicity, volume or material needs. As a result, a lot of the materials end up expiring or being discarded as waste when jobs are postponed or canceled.Recommended Action:Use centralized storage and approval for chemicals and tools--control the purchase, type and toxicity of materials going

into zones to ensure a just in time inventory is maintained at the lowest possible inventory threshold, while ensuring sufficient materials are available to perform all tasks.Option 4: ARMEX ACCUSTRIP--Alternatives to chemical decontamCurrent Practice:Surface preparation and decontamination activities generate a variety of contaminated or hazardous wastes during surface removal or painting preparation. Current methods for removing, preparing or cleaning surfaces include sandblasting and use of chemical agents, such as oven cleaner and acid cleaners, which result in mixed waste generation.Recommended Action:Use the following alternative method for surface preparation, depending upon the need to control the secondary wastes, if any, are produced during the surface preparation activity:This system uses a baking soda blast particulate media which is non regulated and can be flushed down sanitary drains upon use. In addition, drummed waste can be handled and shipped as non regulated. The unit has been used to reduce the volume of paint and surface debris related wastes, especially on lead based paint surfaces, epoxies, and steel soft surface areas, in both radiological and non radiological areas.Option 5: Refrigeration and Reuse of Painting toolsCurrent Practice:As painting and coating application for surface preparation activities are performed, a variety of products and tools may be used to complete work. Brushes and rags are often discarded after their first use, or washed in a sink where the rinse materials are collected and treated as a hazardous waste.Recommended Action:Eliminate the rinseate and discarding of materials after one application through the storage and reuse of these materials, using refrigeration to keep brushes and rags fresh and pliable.Option 6: Water Borne Products/PaintsCurrent Practice:Traditionally, oil based paints are used, and mixed with solvents such as Methyl Ethyl Ketone, Acetone, and Turpentine, in order to paint surfaces for cosmetic reasons.Recommended Action:In most cases, latex or water based products can be used in place of oil based epoxies and paints. There are currently water based epoxies such as Murello, available commercially which have been proven as adequate protection for both corrosion and weather resistant environments.Option 7: Centralized Sign and Paint ShopCurrent Practice:Traditionally, sign painters were assigned to a facility to fabricate decals, labels, signs, and postings. Often, these are facility specific, and a wide variety of techniques are used to produce the signs, including graphic computer vinyl printing, silk screening, and air brush oil painting. Along with a variety of signs, a variety of wastes are generated.Recommended Action:In most cases, a standard sign, decal and label should be used, rather than allowing each facility to create it's own specific format. This would standardize the signs, allowing sign painters to produce the maximum number of products, with a minimum amount of wa stes. In addition, each facility would have a ready supply of signs and decals and sign painters would not have to use additional materials in set up, clean up and resetting of silk screen shops. Through centralization of sign shops, one point of procurement and waste generation would be realized, further reducing wastes.Option 8: Surface Preparation Agent/B-PlantCurrent Practice:As painting and coating application activities are performed, a variety of products with Methyl Ethyl Ketone and acetone, may be used to prepare surfaces on pumps, equipment, and room areas. Existing techniques create hazardous and mixed wastes through the use of these products, often in unnecessary volumes or toxicities.Recommended Action:Use of a surface preparation chemical, R-Remover (need title from Hank Finch/B-Plant), has proven successful in preparing areas to be white clean for epoxy or coating applications, without the use of solvent based products. The resultant waste is smaller in volume and non- regulated. The use of this product at other facilities on site would reduce the overall use of solvents in painting applications.Option 9: Dry Powder PaintingCurrent Practice:As painting and coating application activities are performed on equipment pieces, a variety of products with Methyl Ethyl Ketone, acetone, and oil based products may be used. Existing techniques create hazardous and mixed wastes through the use of these products, often in unnecessary volumes or toxicities. In addition, liquid wastes are generated during clean up of the materials with water, detergent or thinners.Recommended Action:Use of a dry powder anodation system, which uses high wattage lamps and a dry paint would eliminate all liquid wastes currently generated. An additional benefit isthe dry powder coating is an improved protective barrier over epoxies and paints.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Joe Estey
Phone: 509-376-9773	**Phone:** 509-373-3387
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Electrical system Maintenance **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-TramP_2 **Specific Waste Type:** Solid Waste

Date: 14-jun-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Relamping

Description: During the replacement of electrical services, light bulbs, ballasts, PCB contaminated rags, personal protective clothing and absorbents are used. In some cases, the cheapest bulbs are used to reduce procurement costs, however, these bulbs

are also hazardous and have a short life.

Options:

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Joe Estey
Phone: 509-376-9773	**Phone:** 509-373-3387
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Electrical System Maintenance/Lighting **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-TramP_3 **Specific Waste Type:** Solid Waste

Date: 14-jun-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Relamping

Description: During the repair and replacement of PCB/DOP Ballasts and Lighting fixtures, a variety of wastes are generated including personal protective clothing, PCB contaminated rags, cleaning fluids, absorbents, spent bulbs and leaking and non leaking ballasts.

Options:

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Joe Estey
Phone: 509-376-9773	**Phone:** 509-373-3387
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Painting and Coating Applications **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-TranP_1 **Specific Waste Type:** All

Date: 21-apr-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Sand Blasting

Description: All transition projects use this activity includes all stripping and coating removal tasks needed to decontaminate and prepare surfaces for further remediation or painting. This includes sandblasting, CO2 pelletization, Armex decon and wet chemical stripping using agents such as Zip Strip and Terpene.

Options: Option 1 - Alternative Blasting MediaCurrent Practice: Sandblasting with garnet.Recommended Action: Use Armex Baking Soda media.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** James Hilliard
Phone: 509-376-9773	**Phone:** 509-373-1782
Fax: 509-376-2195	**Fax:**

Email: Donna_S_Merry@rl.gov	**Email:**

Title: Well Utilization **Major Waste Type:** Hazardous Waste

PPOA ID Code: HFD-WHC_15 **Specific Waste Type:** Solid Waste

Date: 16-oct-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Sampling & Characterization

Description: Tri-Party Agreement (TPA) Milestone M-24-00 has required the installation of up to 50 RCRA groundwater monitoring wells per year since CY 1989. An estimated 2,400 wells are currently used by all site programs on the Hanford Site for monitoring of groundwater chemistry and water levels. There is an established interface between the PNL Well Programs and the WHC Well Services Group for performing well drilling remediation, rehabilitation, maintenance, and decommissioning of wells for the RCRA and Operational Monitoring Program at the Hanford Site. Waste is generated from all four of these well activities, with the largest contributor being maintenance. Maintenance of approximately 50 wells and pumps per year is essential to the collection of acceptable groundwater samples. Maintenance is scheduled so that the wells are cleaned and the pumps replaced or cleaned at least once every 5 years. This maintenance includes scouring the casing wall and removing sediment from the bottom of the well, and it is performed by the WHC Well Services Group or another drilling subcontractor. This activity primarily generates a vast amount of waste from drilling, maintenance and disposal of used well materials that are packaged in 55 gallon drums or sent to an above ground storage area. Plastic piping and other debris, excluding purgewater, are the largest volume of waste. Approximately 4,000 cubic feet is in storage and 1,000 cubic feet of waste is generated every year. Other wastes include electrical cable, wire rope and plastic-containing materials that total 200 cubic feet in storage and 50 cubic feet is generated every year.

Options: Option 1: Procedures for Interior Surveys of Tubing(PumpsCurrent Practice:Well utilization comprises of remediation and decommissioning of abandoned wells no longer in use under RCRA, rehabilitation of existing wells, and well maintenance. A vast amount of waste is generated during maintenance and drilling. Stainless steel (SST) and acrylonitrile-butadiene-styrene (ABS) tubing and various types of pumps that have been used during well maintenance in a suspected or known radioactively contaminated well drilling site are routinely surveyed by the health physics technician. The materials are not released by health physics because the interior of these materials is not surveyed to verify that radioactive contamination does not exist. The material is then stockpiled in the radiological materials control area (RMA) until they are transported to the 200 Area radioactive burial trench for disposal.Recommended Action:Develop a procedure that will allow the interior portion of these materials to be surveyed by a health physics technician onsite, thus, if surveyed cleaned, eliminating or drastically reducing (nearly 100%) the amount of materials going to the sanitary landfill. This procedure would require a more extensive survey than what is currently being done. The nonreusable stainless steel casings and pieces could be sold as scrap metal if surveyed clean and released by health physics.Option 2: Recycle/Reuse Plastic SheetingCurrent Practice:During well drilling and maintenance activities, plastic sheeting is used as a protective ground covering to prevent cross-contamination between wells. For radioactively contaminated well locations, pumps and other materials are wrapped in plastic and disposed via the radioactive burial trench. The plastic used for preventing radioactive cross-contamination is 10 mil thick . and is very difficult to handle. Plastic used for covering the ground, wrapping pumps and other materials at non-radioactive well sites is 7.5 mil less and is discarded into large trash dumpsters that are later disposed via the landfill. The plastic used for non-radioactive well sites has an average lifespan of 3 months due to weather conditions and sun damage.Recommended Action:Purchase plastic that is easier to handle and can be reused from one well site to another. Investigate the feasibility of using recycled plastic for this activity. Establish a procedure that allows the reuse of plastic sheeting for noncontaminated well locations.Option 3: Purgewater Volume ReductionCurrent Practice:During well maintenance and drilling, raw water or purgewater is used to rinse and clean equipment that has contacted a radioactively-contaminated and hazardous well site. The water is collected in a truck and transported to the 600 Area Modutanks for disposal. If the well site is determined to be free of contamination, the rinse water is discharged directly to the ground approximately 100 feet away from the well site. Purgewater comprises approximately 9 cubic meters of waste, the largest single waste volume generated from well utilization.Recommended Action:A recent test was conducted by Applied Research Inc. from Seattle, Washington at one well site to compare the low-volume purging technique with the current Hanford practice of using Hydrostar pumping. The Hydrostar pumps require significant maintenance and are subject to numerous mechanical failures. The associated SST tubing does not join tightly at the pump connections, creating air in-leakage that causes bubbles affecting the samples. It is thought that if the Hydrostar pump was performed at a lower purge rate, the incidence of maintenance/mechanical failures would increase,The test was conducted by Applied Research Inc. at a cost of $5,000 to indicate whether the use of a different pump can support the option of using low-volume purging. A report on the findings and whether the technology is feasible will be completed by October 1995. Well Services would like to conduct this test at a cost of $25,000 at other well locations to demonstrate this technique for all applications of well utilization.Option 4: Purchase Mobile High Speed ShredderCurrent Practice:During well drilling and maintenance (e.g., cleaning pumps, well casings, etc), plastic, metal ties, and tubing materials are generated as waste from the non-radioactive well site. Plastic is used as a protective ground

covering and metal ties are used to fasten the plastic to the ground. Other tubing materials are used to withdraw samples and testing equipment from the well. The integrity of plastics is quickly degraded due to the environmental and weather conditions. These excess materials from clean well sites are transported to an onsite storage yard and stockpiled. Some of the materials are manually compacted and placed in 55-gallon drums to be disposed via. the landfill.Recommended Action:Purchase a Future Air Incorporated high speed shredder/compactor system to compact the excess materials and eliminate the waste that is stockpiled in the onsite storage yard. The shredder/compactor system is comprised of a self-contained mobile vacuum packaging unit and can be towed by a Class 3 hitch. The system shreds excess materials to a minimal size under negative pressure. By attaching a vacuum system to the unit, particles are transferred into the main processing unit. The main packing unit separates the particles from the airflow using a High Efficiency Particulate Air (HEPA) filter system. A particulate displacement chamber continuously collects the shredded waste, agitates and compacts it. The system then automatically forms and seals polyethylene bags, and packs the materials. Throughput is approximately 18 cubic feet per minute of container feed materials that is 3 inches thick by 24 inches wide. The shredded material can be used as void-fill for other buried wastes.

Site: Hanford Site	
Site Coordinator: Donna Merry	**Team Leader:** Jack Mizner Jr.
Phone: 509-376-9773	**Phone:** 509-376-9081
Fax: 509-376-2195	**Fax:**
Email: Donna_S_Merry@rl.gov	**Email:**

Title: Organic Vapor Determination in Air by Chemical Desorption and Gas Chromatography

Major Waste Type: Hazardous Waste

PPOA ID Code: INEL-CFA612 01

Specific Waste Type: Solid Waste

Date: 30-jun-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Environmental

Description: This PPOA addresses activities involved in the collection and analytical processing of environmental samples.

Options: Sample and standard volumes should be minimized whenever possible, since they directly result in a hazardous waste stream. Sample volumes, however, are driven by laboratory protocol, and thus can't really be minimized. Standard volumes have already been reduced by 76% but could possibly be further reduced. Since it is only necessary to have a 1 micro liter sample to inject into the GC, there is really no need to prepare very much working standard. IH personnel have already reduced the working standard volume from 10 ml to 1 ml. It may be possible to reduce to 1/2 ml or less. There is further evaluation of new Super critical Fluid Extraction that could possibly eliminate the need for the carbon disulfide, and thus, eliminate the generation of hazardous carbon disulfide waste. This technology should be further investigated to determine its feasibility in this application.

Site: Idaho National Engineering Laboratory	
Site Coordinator: John Griffin	**Team Leader:** David Busch
Phone: (208) 526 6997	**Phone:** (208) 526 2393
Fax: (208) 526 1458	**Fax:** (208) 526 5474
Email: JDG@inel.gov	**Email:**

Title: Procurement and Disposal of Lab Chemicals **Major Waste Type:** Hazardous Waste

PPOA ID Code: INEL-CFA625/633 10 **Specific Waste Type:** Chemicals

Date: 01-may-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Purchasing

Description: This PPOA addresses the procurement practices of hazardous chemicals to be used in laboratory operations.

Options: Use chemical exchanges. The Pacific Material Exchange (PME), a national material exchange program has implemented a national computerized industrial waste exchange network to encourage pollution prevention. This network currently links with most industrial waste exchanges in America and some in Canada and is available for use 24 hours a day and can be reached at 1 800 8558 6625. One of the goals of the Pacific Materials Exchange is to set up an exchange program between all the Department of Energy contractors.Utilization of the INEL specific Material Exchange Program.Open purchase orders have proven viable for chemicals, which allow for reduced time to procure needed chemicals. This will allow employees to procure only needed quantities of chemicals, rather than large quantities to ensure they can get it in a timely manner.

Site: Idaho National Engineering Laboratory	
Site Coordinator: John Griffin	**Team Leader:** Dan McDonald
Phone: (208) 526 6997	**Phone:** (208) 526 1247
Fax: (208) 526 1458	**Fax:** (208) 526 9822
Email: JDG@inel.gov	**Email:**

Title: Laboratory Operations (Acid/Heavy Metal Analytical Lab) **Major Waste Type:** Hazardous Waste

PPOA ID Code: INEL-CFA625/63309 **Specific Waste Type:** Solid Waste

Date: 30-sep-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Environmental

Description: This PPOA addresses laboratory operations, with unique issues pertaining to local municipalities. Approximately 40% of the acids and heavy metals waste shipped to a TSDF from the Idaho Research Center (IRC) exceeds the city sewer limits, yet is below the RCRA MCL limit. Therefore, the waste is not necessarily hazardous as defined by RCRA, but must disposed as such due to the POTW requirements.The following four steps describe the generation of acids and heavy metals waste in the laboratory.a,b 1. Receiving Samples: Samples are received from a variety of projects like Boron Neutron Capture Therapy (BNCT), New Production Reactor (NPR), and Waste Management. Numerous kinds of contaminants or constituents are analyzed, but only those that generate acids and metals waste are recognized in this PWA.f 2. Sample Preparation: Various methods of sample preparation can be used for metals analysis, (e.g., microwave digestion, acid digestion with heat, and fusions). Other activities directly related to sample preparation include preparation of standards, buffers, indicators, mobile phases, and sample matrices. 3. Sample Preparation Waste: Sample preparation waste containing heavy metals above city sewer limits4 is transferred to a Satellite Accumulation Area (SAA)2 or an industrial waste storage area if it is not RCRA hazardous.5 At this time a Request for Chemical Recycling or Waste Disposal (RCRWD) g form is completed and submitted to a waste management professional.c,d This waste is then be taken to a Temporary Accumulation Area (TAA)1 for storage until it is sent to a TSDF.6 If the waste does not contain heavy metals above the city sewer limits it4 is neutralized2 and disposed of to the POTW.2 See Figure 2. 4. Analysis of Sample: Some analyses done involve High Pressure Liquid Chromatography (HPLC). The acids and heavy metals waste resulting from f. EG&G Idaho Company Procedure 8.20, Process Waste Assessments, September 30, 1992. g. Science and Technology, Standard Practices (SP) 2.1.1, Laboratory Waste Disposal, 7-29-91.

Options: The lab procured a simultaneous inductively coupled plasma atomic emission spectrometer (ICP AES) to reduce the amount of waste generated.Use ion exchange columns to remove heavy metals from the waste stream. Neutralize the liquid waste and discharge it to the POTW. The spent resin (containing heavy metals) would be diminutive in comparison to the liquid waste generated. This waste would be sent to a TSDF or preferably to a recycling facility.

Site: Idaho National Engineering Laboratory	
Site Coordinator: John Griffin	**Team Leader:** Dan McDonald A. Pruett
Phone: (208) 526 6997	**Phone:** (208) 526 1247
Fax: (208) 526 1458	**Fax:** (208) 526 9822
Email: JDG@inel.gov	**Email:**

Title: TLD Chip Cleaning (Dosimetry) **Major Waste Type:** Hazardous Waste

PPOA ID Code: INEL-CFA690 01 **Specific Waste Type:** Chemicals

Date: 30-jul-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Monitoring

Description: This PPOA addresses the maintenance process required for the Dosimetry devices (TLD).

Options: Reduce the amount of solvent used in cleaning. The INEL reduced the amount of methanol by half, while cleaning efficiency remained unaffected.The process was modified to implement methanol reuse for two washes, rather than one.

Site: Idaho National Engineering Laboratory	
Site Coordinator: John Griffin	**Team Leader:** Sharon Sorce
Phone: (208) 526 6997	**Phone:** (208) 526 8696
Fax: (208) 526 1458	**Fax:** (208) 526 4759
Email: JDG@inel.gov	**Email:**

Title: Tritium Extraction **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: INEL-CFA6900601TIL **Specific Waste Type:** Chemicals

Date: 01-feb-1995 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Radiological

Description: This PPOA addresses the extraction of Tritium via a radiochemical procedure used to extract the tritium isotopes from water.

Options: Substitute Ultima Gold for Insta gel scintillation cocktail.

Site: Idaho National Engineering Laboratory	
Site Coordinator: John Griffin	**Team Leader:** Samuel Pole
Phone: (208) 526 6997	**Phone:** (208) 526 9654
Fax: (208) 526 1458	**Fax:** (208) 526 0875
Email: JDG@inel.gov	**Email:**

Title: Instrument cleaning, Maintenance and Repair **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: INEL-CFA698 01 **Specific Waste Type:** Solid Waste

Date: 31-aug-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Calibration

Description: This PPOA addresses issues pertaining to the calibration, cleaning and repair of instruments used in day to day operations at laboratory. This process generates hazardous, Low level Waste and mixed low level waste.

Options: Pre measured quantities of ethylene glycol/water solutions were reused in calibration activities. The solutions are reused until the quantity runs low and then more ethylene glycol and water are added to formulate the required density. Once maximum use is attained from the solution, the remainder is recycled.Reuse of AgCl solution in the probes.Use only the necessary amount of the AgCl solution to fill the probe.The process has been modified to use only one rag per probe refill.Reuse of cleaning rags was implemented. The rags were reused up to the point where the cleanliness of the pin gauges and gauge

blocks is affected. This procedure reduced the waste generated at the lab by 50%.Hazardous solvents used in cleaning instruments was replaced with a non hazardous replacement. New instrumentation was procured and allowed for better segregation of the low level waste. The instrument was the TCM 2 Counter. The Rad/Con Technicians will frisk and count the swipes used in day to day operations, to determine appropriate disposal. This has reduced the amount of LLW generated at the lab by over 50%.

Site: Idaho National Engineering Laboratory	
Site Coordinator: John Griffin	**Team Leader:** Linda Holland
Phone: (208) 526 6997	**Phone:** (208) 526 3515
Fax: (208) 526 1458	**Fax:** (208) 526 5465
Email: JDG@inel.gov	**Email:**

Title: Repair of Manometers, Thermometers, and Barometers **Major Waste Type:** Hazardous Waste

PPOA ID Code: INEL-CFA698 05 **Specific Waste Type:** Mercury

Date: 31-jan-1993 **Major Activity Type:** Maintenance **Specific Activity Type:** Calibration

Description: This PPOA addresses issues pertaining to the cleaning and repair of thermometers, manometers, and barometers used in day to day laboratory operations. This process generates hazardous waste (i.e. characteristic, metals)

Options: The Hg generated is recovered and reused for its intended purpose. This opportunity, utilizing on the average of four (4) fluid ounces, saved the company $5000.00. This savings is realized for every Hg recycling activity.The Hg that can no longer be used (due to impurities that are introduced after much reuse) is held for recycling.Liquid Hg is segregated from the Hg debris, to facilitate recycling of the liquid.There is no know substitute for Hg in weather measurements due to its high density (13.59).

Site: Idaho National Engineering Laboratory	
Site Coordinator: John Griffin	**Team Leader:** Linda Holland
Phone: (208) 526 6997	**Phone:** (208) 526 3515
Fax: (208) 526 1458	**Fax:** (208) 526 5465
Email: JDG@inel.gov	**Email:**

Title: Waste Calcining Facility **Major Waste Type:** High Level Waste

PPOA ID Code: INEL-CPP659002 **Specific Waste Type:** Solid Waste

Date: 01-may-1993 **Major Activity Type:** Nuclear Facility Operations **Specific Activity Type:** Waste Management, Treatment

Description: Specific Waste Type: High Level Waste CalcineThis PPOA discusses the New Waste Calcining Facility, which converts acidic High Level Radioactive Waste into a stable granular solid (calcine) with volume reduction ratio of approximately 8:1. Using a high temperature fluidized bed, the waste is processed through a series of vessels and piping within secondary containment which contains liquid or off gas equipment.

Options: Mist eliminator will reduce the consumption of HEPA filters.Utilize existing Nitric Acid sources for supply, which will eliminate the need to procure additional acid.To reduce NOx emissions at all stacks, the Nox can be scrubbed with water to produce nitric acid. To meet the NWCF nitric acid needs and offer economic abatement of Nox, a detailed proposal for the use of an NOx recovery/recycle system that uses a scrubber column design could be implemented. This system would remove

approximately 67% of the N0x from the off gas system and recycle it in the form of 3.5 to 4.5 Molar nitric acid, which could be concentrated to higher molarity values.

Site: Idaho National Engineering Laboratory	
Site Coordinator: John Griffin	**Team Leader:** Glade Gilchrist
Phone: (208) 526 6997	**Phone:** (208) 526 5769
Fax: (208) 526 1458	**Fax:** (208) 526 1458
Email: JDG@inel.gov	**Email:**

Title: Calcined Solids Storage Facilities **Major Waste Type:** Low Level Waste

PPOA ID Code: INEL-CPP6593 **Specific Waste Type:** Soil

Date: 01-jan-1994 **Major Activity Type:** Nuclear Facility Operations **Specific Activity Type:** Nuclear, Material Processing

Description: This PPOA addresses issues pertaining to the operation of the New Waste Calcine Facility, which converts acidic high level radioactive liquid waste from the Tank Farm into a stable granular solid with volume reduction ratio of approximately 8:1.

Options: The Thermo Analytical Inc. mechanical sorting technology will be used to greatly reduce the amount of contaminated soil. This will save approximately $1.5 million in soil storage and handling costs.

Site: Idaho National Engineering Laboratory	
Site Coordinator: John Griffin	**Team Leader:** Glade Gilchrist
Phone: (208) 526 6997	**Phone:** (208) 526 5769
Fax: (208) 526 1458	**Fax:** (208) 526 1458
Email: JDG@inel.gov	**Email:**

Title: Pipefitting **Major Waste Type:** Hazardous Waste

PPOA ID Code: INEL-CPP6630301 **Specific Waste Type:** Metal Debris

Date: 27-jun-1995 **Major Activity Type:** Service **Specific Activity Type:** Machining

Description: This PPOA addresses the pipefitting operations at the Idaho Chemical Processing Plant.

Options: Replace disposable rags with launderable material.Stainless steel and carbon steel pipes threading is one of the sources of hazardous waste generated by shop because they contain chromium. When feasible (depending on the application), these pipes should be replaced by polybutylene pipes to eliminate or to reduce hazardous waste. The polybutylene pipe requires no threading for adjustment, therefore, a labor reduction can be realized as well.

Site: Idaho National Engineering Laboratory	
Site Coordinator: John Griffin	**Team Leader:** Jila Banaee
Phone: (208) 526 6997	**Phone:** (208) 526 7463
Fax: (208) 526 1458	**Fax:** (208) 526 (None lis

Email: JDG@inel.gov	**Email:**

Title: Metal Photography Process **Major Waste Type:** Hazardous Waste

PPOA ID Code: INEL-IET651 03 **Specific Waste Type:** Chemicals

Date: 30-may-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Electronics

Description: This PPOA addresses the photography process.

Options: A Mark VI Silver Recovery Unit was purchased as a commercial control system or a primary recovery unit. When used as a primary recovery unit, silver concentrations are reduced to .5mg/L or less. When used for silver recovery, .2mg/L or less of silver concentrations are consistently achieved. Keeping records on the number of times solutions are used to get the maximum number of effective usages. This will also assist in tracking when the columns need to be changed.Reduce aerial oxidation by storing photo processing chemicals in glass containers topped off with an inert gas. Use plastic coatings on the glass to prevent breakage.Place marbles into photo chemistry tanks to displace chemistry for less oxidation. Recycling of the fixer solution. An electrolytic unit is needed for recycling the fixer solution that can be done on a continuous basis rather than a batch operation. If batch treatment is used, there is a tendency for the photographic process to be compromised. Also, during batch recovery of silver, it is necessary to monitor the silver concentration and current density. If too much current is used or if the recovery unit is left on too long, the thiosulfate in the fixer will break down to form sulfide ion and silver sulfide. The thiosulfate in the fixer breaking down is a problem as is the formation of sulfide gas which is poisonous.

Site: Idaho National Engineering Laboratory	
Site Coordinator: John Griffin	**Team Leader:** Dan McDonald
Phone: (208) 526 6997	**Phone:** (208) 526 1247
Fax: (208) 526 1458	**Fax:** (208) 526 9822
Email: JDG@inel.gov	**Email:**

Title: Alkaline and Carbon Zinc Battery Change Out **Major Waste Type:** Hazardous Waste

PPOA ID Code: INEL-IFF61601001T **Specific Waste Type:** Batteries

Date: 01-jun-1993 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Equipment

Description: These assessments addressed battery changeout at all levels. The scope ranged from emergency lighting to handheld calculators.

Options: Procure better quality batteries to reduce the frequency of necessary changeout.Scheduled changeout can be reduced from semi annual to annual.Changeout battery operated clocks with AC replacement.Affirmative procurement of equipment which utilize environmentally friendly batteries (non hazardous)Batteries which have only been partially spent are reused in equipment that does not require fully charged batteries.Characterize batteries to determine applicability of RCRA regulations (i.e. determine levels of lithium prior to disposal)Substitute Ni Cd batteries wherever possible to avoid the generation of hazardous waste.Placement of multiple devices on one (1) battery has reduced the number of battery change outs in some areas.Inventory control Batteries were utilized before expiration of shelf life.A training program was developed and delivered to employees, which described techniques to extend the life of the batteries (i.e. handling, storage etc.)

Site: Idaho National Engineering Laboratory	
Site Coordinator: John Griffin	**Team Leader:** Carole A. Pruett
Phone: (208) 526 6997	**Phone:** (208) 526 1246

Fax: (208) 526 1458	**Fax:** (208) 526 0393
Email: JDG@inel.gov	**Email:**

Title: Idaho Research Center Machine Shop **Major Waste Type:** Hazardous Waste

PPOA ID Code: INEL-NHL63901-1 **Specific Waste Type:** Solvents

Date: 01-aug-1994 **Major Activity Type:** Service **Specific Activity Type:** Maintenance, Utilities

Description: These PPOA's address general machine shop and craft equipment such as lathes, ban saws, drill press, grinders and sanders. The machine shop utilizes solvents and lubricating oils associated with operations. The PPOA addressed each potential hazardous waste stream with emphasis put on secondary waste streams such as generated swarf and industrial materials.

Options: Water soluble oil was also replaced with Lenox Band ADE Sawing Fluid, Permatex Degreaser was also replaced with Planisol M Liquid Cleaner. Tapmagic was replaced with triple E. Tapmatic.Dust collection system implementation.Saw blade sharpening Service.Reuse of excess pipe for other operations.Crushing oil filters Use of reusable stainless steel filters where possible (reactor safety needs must be implemented and agreed upon).

Site: Idaho National Engineering Laboratory	
Site Coordinator: John Griffin	**Team Leader:** Dan McDonald
Phone: (208) 526 6997	**Phone:** (208) 526 1247 (208
Fax: (208) 526 1458	**Fax:** (208) 526 9822 (NA)
Email: JDG@inel.gov	**Email:**

Title: North Holmes Laboratory for Machine Shop and Flow Loop **Major Waste Type:** Hazardous Waste

PPOA ID Code: INEL-NHL63901-2 **Specific Waste Type:** Solvents

Date: 30-sep-1995 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description: This PPOA addresses machine shop operations as they pertain to laboratory specific machining operations.

Options: Use of non hazardous cleaning fluids (Citri X and Opti clean)Replace polar chip coolant with safetap coolant which is non hazardous.Recycle gas cylinders and Deionizer Resins.Use mechanical joints rather than glued joints for gloveboxes.Recycle used oil.

Site: Idaho National Engineering Laboratory	
Site Coordinator: John Griffin	**Team Leader:** Jim Findley
Phone: (208) 526 6997	**Phone:** (208) 526 Same as ab
Fax: (208) 526 1458	**Fax:** (208) 526
Email: JDG@inel.gov	**Email:**

Title: Incineration Operations **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: INEL-PBF620 02 **Specific Waste Type:** Containers

Date: 31-jul-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Waste Management, Treatment

Description: This PPOA covers the Baghouse bag changeout at the Waste Experimental Reduction Facility.

Options: Use a longer lasting treatable bag.Use a cage that incorporates the venturi and clamp. This eliminates a waste stream of hose clamps, venturies, drums, gaskets and ploy sleeving.

Site: Idaho National Engineering Laboratory	
Site Coordinator: John Griffin	**Team Leader:** Al Hancock
Phone: (208) 526 6997	**Phone:** (208) 526 8010
Fax: (208) 526 1458	**Fax:** (208) 526 6933
Email: JDG@inel.gov	**Email:**

Title: Health Physics Pb Survey's **Major Waste Type:** Low Level Waste

PPOA ID Code: INEL-PBF620 03 **Specific Waste Type:** Cleaning Supplies

Date: 31-may-1992 **Major Activity Type:** Nuclear Facility Operations **Specific Activity Type:** Radiological Surveys

Description: This PPOA covers the survey's of materials for Pb and Radioactive contamination.

Options: Disposal container for the used swipes and smears was moved, making it less accessible to waste. This reduced the volume of waste, due to better segregation.A more efficient approach is utilized by Rad Con Techs (RCT's) when taking smears and swipes. A significant decrease in waste generation has been observed, from .4 yd3 to .004 yd3 per year.Muslin cleaning towels were replaced with washable reusable gloves.Respirator cartridges are analyzed for Pb, if they do not contain lead, they are not disposed of as hazardous waste.

Site: Idaho National Engineering Laboratory	
Site Coordinator: John Griffin	**Team Leader:** Shawn Parkinson
Phone: (208) 526 6997	**Phone:** (208) 526 8054
Fax: (208) 526 1458	**Fax:** (208) 526 8007
Email: JDG@inel.gov	**Email:**

Title: Management of Used Oil **Major Waste Type:** Hazardous Waste

PPOA ID Code: INEL-PBF63801-1 **Specific Waste Type:** Oil

Date: 01-jan-1996 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Equipment

Description: This PPOA covers the routine oil changeout on equipment (i.e. emergency generators, etc.)

Options: An analytical laboratory was used to analyze oil rather than change it out. Many times when an emergency generator will not be used for months except for routine checks to insure its operational. By analyzing the oil and identifying the constituents in the oil, the useful life of the oil is increased. Most major lubrication companies will set up the program free of charge.

Site: Idaho National Engineering Laboratory

Site Coordinator: John Griffin	**Team Leader:** Carole A. Pruett
Phone: (208) 526 6997	**Phone:** (208) 526 1246
Fax: (208) 526 1458	**Fax:** (208) 526 0393
Email: JDG@inel.gov	**Email:**

Title: Used Oil (Diesel emergency generators) **Major Waste Type:** Sanitary Waste

PPOA ID Code: INEL-PBF63801-2 **Specific Waste Type:** Oil

Date: 01-jan-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Equipment

Description: This PPOA addresses issues pertaining to the scheduled maintenance of diesel powered emergency generators.

Options: Brief Option Description: * An 8 ounce sample of oil is obtained and sent to an approved lab (under contract). The lab analyzes the condition (breakdown) of the oil and provides a detailed analysis of metal particulates (from engine wear), and checks for impurities, such as, sulfur, water, coolant, fuel in the system, and viscosity. The oil is changed only when the sampling results warrant that an oil change is necessary.

Site: Idaho National Engineering Laboratory	
Site Coordinator: John Griffin	**Team Leader:** Al Hancock
Phone: (208) 526 6997	**Phone:** (208) 526 8010
Fax: (208) 526 1458	**Fax:** (208) 526 6933
Email: JDG@inel.gov	**Email:**

Title: Portable Water Treatment Unit **Major Waste Type:** Low Level Waste

PPOA ID Code: INEL-PBFPWT010000ML **Specific Waste Type:** Sludge

Date: **Major Activity Type:** Environmental Restoration **Specific Activity Type:** Waste Management, Treatment

Description: This PPOA addresses the operation of a portable water treatment unit.

Options: Use combustible materials instead of aluminum to wrap sampling equipment and tools so the materials can be incinerated if they become radiologically contaminated.Survey all PPE and sampling equipment to ensure that they are radiologically contaminated before disposing of as LLW.Dispose of compactable sampling equipment in place of decontaminating them. The volume of waste generated during decontamination was greater than the volume of equipment.Minimize the personnel required to sample to avoid unnecessary generation of radiologically contaminated wastes.Optimize the number of samples to be retrieved.Change filter cartridges only when absolutely necessary to meet safety and/or operating limits.Use filter cartridges manufactured from combustible materials to allow incineration at WERF.Use waste water characterization data to calculate the maximum water that can be processed by the filter in order to maintain the expected heavy metal concentrations of the used filter waste below the WERF waste acceptance criteria (WAC) to allow incineration. Incinerate LLW ion exchange resin in place of direct disposal at the Radioactive Waste Management Complex (RWMC) to minimize the volume. Care must be taken to insure incineration viability.If direct disposal of ion exchange resin is required, use the column as the disposal container to eliminate the potential for spills and generation of additional wastes. Use macroencapsulation in place of other stabilization methods for ion exchange resins if a solidified matrix is required before disposal. De water the sludge as much as possible to minimize the volume to be stabilized.Optimize the stabilization recipe for the sludge to minimize the volume increase of the sludge upon grouting.Use absorbent agents to eliminate the free liquids for LLW sludge in place of grouting to minimize the volume increase.Combine the ashes produced from incinerating any PWTU wastes with other ashes to allow for grouting of a larger quantity of ash per drum.

Site: Idaho National Engineering Laboratory	
Site Coordinator: John Griffin	**Team Leader:** John Griffin
Phone: (208) 526 6997	**Phone:** (208) 526 6997
Fax: (208) 526 1458	**Fax:** (208) 526 1458
Email: JDG@inel.gov	**Email:**

Title: Radiography of Welding and Fabrication **Major Waste Type:** Hazardous Waste

PPOA ID Code: INEL-TRA635 03 **Specific Waste Type:** Chemicals

Date: 30-sep-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Photographic Services

Description: This PPOA addresses the radiography process on nuclear welds and fabrication. This process is directly related to reactor operating schedules and other nuclear operations.

Options: Reduced the use of Kodak Exomat Processor to coincide with the Advanced Test Reactor outages; limit amount of start ups for the purpose of developing reduced amounts of film.Developer and fixer solutions are reused until exhausted.

Site: Idaho National Engineering Laboratory	
Site Coordinator: John Griffin	**Team Leader:** Tom Wheeler
Phone: (208) 526 6997	**Phone:** (208) 533 4137
Fax: (208) 526 1458	**Fax:** (208) 533 4901
Email: JDG@inel.gov	**Email:**

Title: Test Reactor Area Machine Shop **Major Waste Type:** Hazardous Waste

PPOA ID Code: INEL-TRA65301 **Specific Waste Type:** Metal Debris

Date: 01-jun-1995 **Major Activity Type:** Service **Specific Activity Type:** Machining

Description: This PPOA addresses the Test Reactor Area (TRA) experimental machine shop. The machine shop is a full service machine shop.

Options: Routinely generated metal scrap will be segregated into five groups (stainless steel, carbon steel, aluminum, brass and bronze) and sold in the excess program to outside vendors.Use launderable rags in place of disposable wipes.Soap based cutting fluids will eliminate the water soluable cutting fluid waste stream. The soap based cutting fluids require cleaning at shorter time intervals, but they are reusable. The fluids are passed through an omni filter which purifies the oil by eliminating solids entrained by the oil.Only change oils when analytical dictates, rather than time period.

Site: Idaho National Engineering Laboratory	
Site Coordinator: John Griffin	**Team Leader:** Tom Wheeler
Phone: (208) 526 6997	**Phone:** (208) 533 4137
Fax: (208) 526 1458	**Fax:** (208) 533 4901
Email: JDG@inel.gov	**Email:**

Title: Test Reactor Area Low Level Radioactive Combustible Waste **Major Waste Type:** Low Level Waste

PPOA ID Code: INEL-TRA670801L **Specific Waste Type:** Personal Protective Equipment

Date: 08-jun-1994 **Major Activity Type:** Nuclear Facility Operations **Specific Activity Type:** Nuclear, Reactor Operations

Description: This PPOA addresses the combustible waste stream generated during routine operations of the Advanced Test Reactor.

Options: Launder neoprene gloves in place of disposing them as Low Level Waste.Reuse cotton liners in gloves if they aren't radioactively contaminated.Replace plastic shoe covers and booties with launderable nylon or rubber booties.Wherever possible, blotter paper should be replaced with other items. Corderal tarps, strip coat, or epoxy can be used as replacements for blotter paper in certain instances.Utilize launderable cloth bags for gathering items coming from contaminated areas rather than the poly bags.Survey all items prior to characterizing them as radioactive or contaminated. It is estimated that 20% of all Low Level Waste disposed of as contaminated waste is in fact clean.

Site: Idaho National Engineering Laboratory	
Site Coordinator: John Griffin	**Team Leader:** Tom Wheeler
Phone: (208) 526 6997	**Phone:** (208) 533 4137
Fax: (208) 526 1458	**Fax:** (208) 526 4901
Email: JDG@inel.gov	**Email:**

Title: Sewage Treatment Plant **Major Waste Type:** Low Level Waste

PPOA ID Code: INEL-Unassigned -SewageTreatment **Specific Waste Type:** Sludge

Date: 28-feb-1994 **Major Activity Type:** Waste Management **Specific Activity Type:** Disposal

Description: This PPOA addressed the on site sewer treatment system. They system is utilized for radiological as well as sanitary waste.

Options: Filter contaminants that have created a contamination plume with MCE filters to concentrate the pollutants on the filter and then send the filters for disposal at the Radioactive Waste Management Complex.Obtain new air injector and compressed air system that will only inject 30 gallons of effluent to the storage tank. If the tank receives more than 30 gallons, it becomes overtaxed. This tends to allow algae to build up which in turn uses oxygen and the system goes anaerobic.

Site: Idaho National Engineering Laboratory	
Site Coordinator: John Griffin	**Team Leader:** John Griffin
Phone: (208) 526 6997	**Phone:** (208) 526 6997
Fax: (208) 526 1458	**Fax:** (208) 526 1458
Email: JDG@inel.gov	**Email:**

Title: 55 Ton Cast Maintenance **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: INEL-Unassigned-CastMaint. **Specific Waste Type:** Lead

Date: 22-jul-1993 **Major Activity Type:** Maintenance **Specific Activity Type:** Inspection

Description: This PPOA covers the actions taken during the inspection of hoisting equipment utilized to lift radioactive casks.

Options: Modified the process by substituting a new chain instead of utilizing RCRA listed material to clean the chain in question.

Site: Idaho National Engineering Laboratory	
Site Coordinator: John Griffin	**Team Leader:** Thomas Wheeler
Phone: (208) 526 6997	**Phone:** (208) 533 4137
Fax: (208) 526 1458	**Fax:** (208) 533 4901
Email: JDG@inel.gov	**Email:**

Title: Decontamination & Decommissioning of miscellaneous facilities **Major Waste Type:** Hazardous Waste

PPOA ID Code: INEL-Unassigned-D&DMisc **Specific Waste Type:** Concrete

Date: 01-may-1992 **Major Activity Type:** Environmental Restoration **Specific Activity Type:** Decommissioning

Description: Decontamination and decommissioning operation will include several waste types and processes. The D&D Operations addressed in these PPOA's cover the following facilities: 1) Borax V Reactor Building 2) Auxiliary Reactor Area II 3) Auxiliary Reactor Area III 4) Hot Laundry Facility

Options: Use good packaging techniques for waste boxes to prevent void spaces.Use techniques such as scabbling of contaminated concrete to remove only the contaminated areas to reduce waste volume.Plan work sequences to minimize PPE usage and reuse PPE when possible.Size piping and equipment to facilitate packaging with minimum voids.Fill voids in waste boxes with contaminated soilSeparate clean from contaminated material by cutting.Recycle non contaminated steel.Utilize the D&D Process Waste Assessment Checklist.

Site: Idaho National Engineering Laboratory	
Site Coordinator: John Griffin	**Team Leader:** Russ Buckland
Phone: (208) 526 6997	**Phone:** (208) 526 9813
Fax: (208) 526 1458	**Fax:** (208) 526 3370
Email: JDG@inel.gov	**Email:**

Title: Sampling and Drilling Activities **Major Waste Type:** Low Level Waste

PPOA ID Code: INEL-Unassigned-Drilling **Specific Waste Type:** Equipment

Date: 30-nov-1992 **Major Activity Type:** Environmental Restoration **Specific Activity Type:** Sampling & Characterization

Description: This PPOA addresses sampling and drilling activities required during environmental remediation.

Options: Use combustible materials to wrap sampling equipment and tools, to facilitate incineration if they become radiologically contaminated.Place the clean tools and equipment into washable, reusable containers. This would probably create more decontamination fluids, however, it would eliminate a low level combustible waste stream.Reference the Waste Experiment Reduction Facility (WERF) Waste Acceptance Criteria for determination of acceptable waste.Survey and screen all debris before it is declared a low level or mixed waste. A lot of the waste could probably be sent to the landfill rather than to

RWMC.Ensure the waste is properly characterized prior to declaring it hazardous. Make sure that the appropriate analysis is requested for the waste to adequately characterize the waste for disposal (i.e. if a waste is suspected of containing a TCLP metal, do not request a Total Metals analysis to determine whether the material is RCRA hazardous). This could result in excessive handling and disposal costs associated with the waste.Use radioactive soils to fill voids in Low Level waste containers, thus it will eliminate the need to dispose of two separate LLW streams and also eliminate the need to purchase other non contaminated filler materials.Return soil to boreholes when only samples are taken (i.e. no monitoring wells are installed). This would reduce the amount of soil cuttings declared as waste.Screen cuttings when drilling monitoring wells and segregate the cuttings as clean or radiologically contaminated if possible. This will avoid the cross contamination of clean media and reduce the amount of waste generated while allowing the clean materials to be placed back into/onto the ground.Select the drilling method appropriate for the depth and type of material to be drilled that will produce the least amount of waste (i.e. try to use auger drilling over rotary drilling to minimize drill cuttings).Limit the number of wells to only those absolutely necessary to meet the goals of the investigation.Store and reuse equipment with fixed low level radiological contamination for future sampling in radiological areas.Install multi port or nested wells that are able to monitor a number of aquifers or zones within aquifers through the use of a single borehole/well installation.Utilize solvent substitution wherever possible to avoid the unnecessary generation of hazardous solvent waste.Investigate real time analysis and other alternate sampling and analysis methods.

Site: Idaho National Engineering Laboratory	
Site Coordinator: John Griffin	**Team Leader:** Pat Walsh
Phone: (208) 526 6997	**Phone:** (208) 526 0699
Fax: (208) 526 1458	**Fax:** (208) 526 4017
Email: JDG@inel.gov	**Email:**

Title: Groundwater Monitoring for H3 **Major Waste Type:** Hazardous Waste

PPOA ID Code: INEL-Unassigned-Groundwater **Specific Waste Type:** Chemicals

Date: 18-dec-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Environmental

Description: This PPOA addresses issues pertaining to groundwater sampling of H3.

Options: Replacing Insta Gel XF with Ultima Gold XR as the scintillator has allowed for disposal of the scintillator waste/sample mixture to the sewage system.

Site: Idaho National Engineering Laboratory	
Site Coordinator: John Griffin	**Team Leader:** Ray Randolph
Phone: (208) 526 6997	**Phone:** (208) 526 2105
Fax: (208) 526 1458	**Fax:** (208) 526 2548
Email: JDG@inel.gov	**Email:**

Title: Light Bulb Changeout **Major Waste Type:** Hazardous Waste

PPOA ID Code: INEL-Unassigned-Lightbulb **Specific Waste Type:** Fluorescent Lamps

Date: 30-sep-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Building

Description: This PPOA covers the changeout of light bulbs and ballasts at facilities which utilize large numbers of bulbs. The bulbs are potential hazardous waste, due to the potential of breaching the MCL for Hg.

Options: Utilization of a light bulb crusher: tubes are crushed and are then tested for Hg. This characterization allows for bulbs

which are not hazardous waste to be disposed of as sanitary waste.Test the electronic eye of the bulb to determine whether just the eye or the entire bulb is had before disposal.Change bulbs on a routine basis to reduce the number of ballasts generated.

Site: Idaho National Engineering Laboratory	
Site Coordinator: John Griffin	**Team Leader:** Dixie Lainhart
Phone: (208) 526 6997	**Phone:** (208) 526 2492
Fax: (208) 526 1458	**Fax:** (208) 526 6332
Email: JDG@inel.gov	**Email:**

Title: Automotive Painting **Major Waste Type:** Hazardous Waste

PPOA ID Code: INEL-Unassigned-Paint **Specific Waste Type:** Paint

Date: 30-sep-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Vehicle

Description: This PPOA addresses the vehicle maintenance operation (painting, body & fender).

Options: Reuse paint containers for mixing after cleaning.Use supplied air in place of respirators.

Site: Idaho National Engineering Laboratory	
Site Coordinator: John Griffin	**Team Leader:** Dave Dahlquist
Phone: (208) 526 6997	**Phone:** (208) 526 7451
Fax: (208) 526 1458	**Fax:** (208) 526 2614
Email: JDG@inel.gov	**Email:**

Title: Reactor Operations **Major Waste Type:** Low Level Waste

PPOA ID Code: INEL-Unassigned-Reactor **Specific Waste Type:** Personal Protective Equipment

Date: 30-jun-1994 **Major Activity Type:** Nuclear Facility Operations **Specific Activity Type:** Nuclear, Reactor Operations

Description: This PPOA addresses the operation of the Power Burst Facility. It encompasses all maintenance activities and day to day operation. This PPOA does not cover core changeout.

Options: PVC shoe covers were replaced with polyethylene covers.Non compactable waste boxes are packed to insure minimal void volume is generated.Decontamination activities were increased to reduce the volume of material characterized at LLW.Improved planning assisted in showing a reduction in waste generated. (Example: Numerous entries to control zones daily accounted for a large majority of the PPE waste generated. By insuring the maximum workload is completed during each entry, a reduced number of entries is required to complete the work and contamination of duplicate equipment is not encountered.)

Site: Idaho National Engineering Laboratory	
Site Coordinator: John Griffin	**Team Leader:** Greg Gerber
Phone: (208) 526 6997	**Phone:** (208) 526 8230
Fax: (208) 526 1458	**Fax:** (208) 526 8051

Email: JDG@inel.gov	**Email:**

Title: Vehicle Maintenance Operations **Major Waste Type:** Hazardous Waste

PPOA ID Code: INEL-Unassigned-VehicleMaint. **Specific Waste Type:** Solvents

Date: 30-sep-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Vehicle

Description: This PPOA addresses processes related with vehicle maintenance.

Options: Install Oberg oil filters on all vehicles (at least for the fleet) to eliminate the generation of oil filters/used oil from these vehicles.Recycle anti freeze. Propylene Glycol is a good replacement.Purchase washable, cleanable air filters (K and N Brand) which will eliminate the amount of waste being sent to the landfill.Look into synthetic oils which will increase fuel economy and decrease the frequency in which the oil requires changing.Install battery connectors on the lead acid batteries in vehicles and equipment. This will prevent the corrosion of battery terminals and provide more power to the vehicles while also saving time and money.

Site: Idaho National Engineering Laboratory	
Site Coordinator: John Griffin	**Team Leader:** Dave Dahlquist
Phone: (208) 526 6997	**Phone:** (208) 526 7451
Fax: (208) 526 1458	**Fax:** (208) 526 2614
Email: JDG@inel.gov	**Email:**

Title: Demineralization of Water **Major Waste Type:** Low Level Waste

PPOA ID Code: INEL-Unassigned-Water **Specific Waste Type:** Wastewater

Date: 18-jan-1996 **Major Activity Type:** Nuclear Facility Operations **Specific Activity Type:** Waste Management, Treatment

Description: This PPOA covers the demineralization of the Advanced Test Reactor water.

Options: A Sparging system was implemented in 1988/1989 which reduces the acid and caustic required to regenerate the resin beds by fifty percent.

Site: Idaho National Engineering Laboratory	
Site Coordinator: John Griffin	**Team Leader:** Thomas Wheeler
Phone: (208) 526 6997	**Phone:** (208) 533 4137
Fax: (208) 526 1458	**Fax:** (208) 533 4901
Email: JDG@inel.gov	**Email:**

Title: D&D of Zero Power Reactor III and the Argonne Experimental Facility **Major Waste Type:** Hazardous Waste

PPOA ID Code: INEL-WMO60101 **Specific Waste Type:** Solid Waste

Date: 20-jun-1994 **Major Activity Type:** Environmental Restoration **Specific Activity Type:** Demolition

Description: This PPOA addresses issues pertaining to the demolition of the Zero Power Reactor III structure and the Argonne Experiment Facility. This PPOA covers more than one waste type to include asbestos containing materials, hazardous waste, and some low level radioactive waste.

Options: All usable equipment and material can be excessed and sold for other use. The equipment excessed is certified free of radiological contaminants and any hazardous constituents as regulated under RCRA.The concrete is crushed and used as backfill. This will reduce the volume of waste sent to the landfill.

Site: Idaho National Engineering Laboratory	
Site Coordinator: John Griffin	**Team Leader:** Glade Gilchrist
Phone: (208) 526 6997	**Phone:** (208) 526 5769
Fax: (208) 526 1458	**Fax:** (208) 526 1458
Email: JDG@inel.gov	**Email:**

Title: Cutting Fluid Perform.Test **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-A825-811AMCTFLPERF **Specific Waste Type:** Oil

Date: 30-sep-1992 **Major Activity Type:** Service **Specific Activity Type:** Laboratory, Metallurgy

Description:

Options: Reduce the amount of material needed to run test.Order only minimum quantity of material needed.Give unused sample to universities.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: ICAP, AA & ICP/MS Metal Analysis **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL-834CASAMETALS **Specific Waste Type:** Acid

Date: 05-aug-1994 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Metallurgy

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735

Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Ion Chromatography Analysis **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL-838CACAICAN **Specific Waste Type:** Acid

Date: 28-may-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Chemical

Description: The sample and standards are loaded into an autosampler. A column is equilibrated. A suppresser column is regenerated. The sample and standards are injected in two columns. The effluent goes into a 5-gallon liquid acid waste container.

Options: Buy a micro-IC. This would reduce all materials by 75%.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: NMR Analysis **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL-838CACANMARN **Specific Waste Type:** Solvents

Date: 28-may-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Organic Analysis

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Inorganic C,S,N,O,H Analysis **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL-838CAININORGSH **Specific Waste Type:** Compressed Gas Cylinders

Date: 30-nov-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Chemical

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Gas Chromatograph/Mass Spectrometer/FTIR Spectrometer **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL-838CAOMGCAN **Specific Waste Type:** Compressed Gas Cylinders

Date: 05-aug-1994 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Organic Analysis

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Organic Materials Analysis **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL-838CAOMORMAN **Specific Waste Type:** Solvents

Date: 29-jul-1994 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Organic Analysis

Description: Organic materials are analyzed for a variety of parameters, including moisture, viscosity, hydroxyl number, epoxy equivalent weight, amine equivalent, acid number, pot life, appearance, application time, and many more. These analyses generate sample and solvent wastes.

Options: Use an autotictator for titrimetric analyses.Use a small sample adapter for viscosity measurements.Use acetone instead of methylene chloride (a CHC) for dye penetrant analysis.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Cyanide Analysis **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL-838CASACYAN **Specific Waste Type:** Cyanide

Date: 30-oct-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Chemical

Description:

Options: Purchase a mini automatic distillation station.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Air Monitoring:CO Testing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL-838MAMPAIRCO **Specific Waste Type:** Compressed Gas Cylinders

Date: 30-nov-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Chemical

Description: Carbon monoxide analyzers compare ambient air samples to a known calibration gas through a method of infrared spectroscopy. Upon completion of this comparison, data is recorded and the sample and calibration gas are exhausted to the outside air. All emissions are point-source and no waste is sent to waste management.

Options: Minimize use and loss of calibration gas.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Air Monitoring:Foxburo Analyzer **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL-838MAMPAIRFOXB **Specific Waste Type:** Compressed Gas Cylinders

Date: 30-nov-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Chemical

Description: The Foxburo analyzer compares an ambient air sample to a known calibration gas through the method of infrared spectroscopy. Upon completion of the comparison, the air sample and the calibration gas are exhausted to the outside air. All emissions are point source with no waste being sent to waste management.

Options: Minimize use and loss of calibration gas.

Site: Kansas City Plant	

Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Air Monitoring:H2S Testing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL-838MAMPAIRH2S **Specific Waste Type:** Compressed Gas Cylinders

Date: 30-nov-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Chemical

Description: H2S analyzers compare an ambient air sample to a known calibration gas through a method of pulsed-fluorescence. Upon completion of the comparison, data is recorded and the sample and calibration gas are exhausted to the outside air. All emissions are point-source and no waste is sent to waste management.

Options: Minimize use and loss of calibration gas.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Air Monitoring:SO2/NO Testing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL-838MAMPAIRSO2NO **Specific Waste Type:** Compressed Gas Cylinders

Date: 30-nov-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Chemical

Description: Sulfur dioxide analyzers and the nitrogen dioxide analyzers compare an ambient air sample with a known calibration gas through the method of pulsed fluorescence and chemical luminescence, respectively. Upon completion of the comparison, both sets of analyzers exhaust the air sample and calibration gas to the outside air. All emissions from the process are point-source with no waste going to waste management.

Options: Minimize use and loss of calibration gas.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Low Temperature Brittleness **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL-838MAMPBRITTLE **Specific Waste Type:** Solvents

Date: 29-sep-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Mechanics

Description: Methanol or isopropyl alcohol is cooled to -94 deg F or -65 degrees F, respectively, with dry ice in the low temperature brittleness tester (CE 18379). Rubbed samples are then immersed in this bath and then an impact load is applied to the samples. Testing is repeated at different temperatures until no visible crack or separation in the samples are denoted. The corresponding temperature of non-failure is then reported.

Options: Order smaller amounts of dry ice for the test.Use smaller kimwipes for the test and cleanup.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Flammability Testing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL-838MAMPFLAME **Specific Waste Type:** Paper

Date: 30-nov-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Organic Analysis

Description: Foam samples are burned using a Bunsen burner. Samples are held in the flame for a period of 60 seconds, and data on the rate of effects of the flame on the foam material is reported. Emissions are point source (EFS-022) and waste material is discarded through normal trash waste stream.

Options: Minimize use of natural gas.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Heat Distortion **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL-838MAMPHEATDIS **Specific Waste Type:** Paper

Date: 31-mar-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Mechanics

Description: Samples are loaded into the tinius olsen tester and then submerged into the silicone oil, heat transfer media. Dead weight is loaded onto the samples and then the oil is slowly heated. After a 0.010" deflection is noted, a record of the oil temperature is recorded. Samples are then cleaned with a number of kimwipes.

Options: Use a smaller kimwipe for cleanup.Re-use kimwipes instead of immediate disposal.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Tape Adhesion **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL-838MAMPTAPE **Specific Waste Type:** Solvents

Date: 31-mar-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Cleaning

Description: Highly polished metal plates are cleaned with a wipe of diacetone alcohol and heptane using an absorbent cloth. This cleaning is repeated three times and the strips of pressure-sensitive, adhesive-coated tapes are adhered to the cleaned plates. A peel test is then conducted to determine the average force required to remove the tape from the plate.

Options: Use a more "environmentally clean" solution for the process.Use smaller kimwipes for cleaning. Reuse kimwipes instead of immediate disposal.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Torque Testing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL-838MAMPTORQUE **Specific Waste Type:** Paper

Date: 31-mar-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description: Threads of the fastener and the bearing surface of the fastener head are coated with a layer of anti-seize lubricant (M/S 6520004-01-520). Fasteners are then torqued in a test block for a period of 72 hours. After the nominal time period, the fasteners are removed from the test block. All lubricant is removed from the fasteners and test block using a number of kimwipes.

Options: Use a less hazardous lubricating material.Use smaller kimwipes.Reuse kimwipes.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: EPMA Maintenance-1 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL-838MDEOEPMA1 **Specific Waste Type:** Paper

Date: 25-nov-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Laboratory, Metallurgy

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: EPMA Maintenance-2 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL-838MDEOEPMA2 **Specific Waste Type:** Paper

Date: 25-nov-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Laboratory, Metallurgy

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: SEM Maintenance-1 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL-838MDEOSEM1 **Specific Waste Type:** Paper

Date: 25-nov-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Laboratory, Metallurgy

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735

Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: SEM Maintenance-2 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL-838MDEOSEM2 **Specific Waste Type:** Paper

Date: 25-nov-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Laboratory, Metallurgy

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: SEM Maintenance-3 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL-838MDEOSEM3 **Specific Waste Type:** Paper

Date: 25-nov-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Laboratory, Metallurgy

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: STEM Maintenance **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL-838MDEOSTEMAIN **Specific Waste Type:** Paper

Date: 28-oct-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Laboratory, Metallurgy

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Metallographic Equipment Maintenance **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL-838MDMEEQUIPMN **Specific Waste Type:** Paper

Date: 30-nov-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Metallurgy

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Metallographic General Consumables **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL-838MDMEGC **Specific Waste Type:** Polymers

Date: 28-oct-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Metallurgy

Description: Three general consumables are used in the preparation of samples for various types of testing. These three general consumables are: 1) Areoduster-used to blow dust and water off parts and equipment, 2) Contact Renu-used to service and clean electrical contacts, and 3) Fluoriglide-used as a dry lubricant on hardness tester's moving parts.

Options: Aeroduster - discontinue use.Aeroduster, reduce use.Contact Re-Nu, discontinue use.Fluoroglide FB, discontinue use.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Metallographic Etching **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL-838MDMEMETECH **Specific Waste Type:** Acid

Date: 01-jan-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Metallurgy

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Metallographic Sample Prep **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL-838MDMESAMPREP **Specific Waste Type:** Metal Debris

Date: 27-aug-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Metallurgy

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Oakite 90 Cleaner Solution Analysis **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL-838MDSL90STEEL **Specific Waste Type:** Acid

Date: 23-dec-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Chemical

Description: A measured amount of the Oakite 90 solution is transferred by pipette to a reaction vessel containing deionized water, a magnetic stirring bar, and phenolphthalein indicator. The reaction vessel is placed on a magnetic stirrer and standard 0.2 N hydrochloric acid is added from a burette until the solution is colorless. This is the equivalence point. The spent solutions are poured into the appropriate waste barrels. When these barrels are full, they are shipped to the waste management department.

Options: Cease analyzing solution.Reduce frequency of analysis.Reduce sample size.Reduce number of parameters analyzed.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735

Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: BOD Analysis **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL-838MDSLBODA **Specific Waste Type:** Sanitary Sewer

Date: 28-may-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Biological

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Colorimetric Analysis **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL-838MDSLCOLOR **Specific Waste Type:** Acid

Date: 25-mar-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Chemical

Description: A sample aliquot is taken and the solution is adjusted and prepared for color development. The reagent that forms a color with the material to be checked is added. After the color has developed in the sample aliquot, it is measured against a blank in the colorimeter. The results are compared to standards or to charts derived from these standards to determine the amount of material present in the sample aliquot.

Options: Reduce frequency. This would impact the liquid waste volume.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Hull Cell Analysis **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL-838MDSLHULLCELL **Specific Waste Type:** Cyanide

Date: 16-apr-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Chemical

Description: Fill the hull cell with one of the plating solutions, cadmium cyanide, copper cyanide, or acid tin. Place the proper

anode, copper, cadmium, or tin, in the plating solution at one end of the hull cell. At the other end of the hull cell along the diagonal bar, place an anodically cleaned hull cell panel. Attach leads from a power supply to the anode and the panel. Turn on agitation, air or mechanical, and plate the panel for the specified amperage and time. Remove panel and inspect for contamination, organics, brightener deficiency, etc.If brightener is required, make additions of S-1 and S-3 for copper cyanide, udylite #53 for cadmium cyanide, and ultra-stan 100 primary and activator for the acid tin. Continue this procedure until a satisfactory plate is achieved. These analyses require a trained operator to evaluate the plated panels.

Options: Reduce analysis frequency. This would affect liquid waste volume.Use smaller hull cells. This would affect liquid waste volume.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: ICP Analysis **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL-838MDSLICPANA **Specific Waste Type:** Acid

Date: 20-jul-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Chemical

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: KF Coulometer **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL-838MDSLKFCOUL **Specific Waste Type:** Paper

Date: 25-mar-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Mechanics

Description:

Options: Use less hazardous epoxy.Use smaller Kim Wipes.Reuse Kim Wipes.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049

Email: wschlosberg@kcp.com	**Email:**

Title: pH Meter Analysis **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL-838MDSLPHMETER **Specific Waste Type:** Caustic

Date: 16-apr-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Chemical

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Surface Analysis Maintenance **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL-838MDSRASMAINT **Specific Waste Type:** Solvents

Date: 27-aug-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Chemical

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Gas Chromatography/Mass Spectrometry/FT-Infrared Spectroscopy **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL-PB5CAOMGCAN **Specific Waste Type:** Solvents

Date: 21-nov-1995 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Chemical

Description: Solvents are used in the laboratory for rinsing of glassware, extraction of residues, sample preparation, and calibration standards. Hand-operated mechanical dispensers and squeeze bottles are used for rinsing operations. Medicine droppers are used to dispense small amounts of solvent onto the test samples to dissolve off the residue into a small dish. The solvent is then evaporated and the residue identified. Dilution, sample extraction from adsorption columns, and dissolving the sample before analysis are common laboratory operations. Standards for calibrating instruments are prepared by dissolving them in solvents to known concentrations to generate calibration curves for analysis. At the end of the work day the waste solvents

from these operations are placed in a 5-gallon flammable storage container.

Options: Options for this assessment include:(1) Reduce the use of Freon 113 from 150 mL to 100 mL.(2) Ultra high purity water will be replaced with deionized water already available in the department.(3) Helium use will be reduced when the equipment is not in use.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Stan V. Dubiel
Phone: (816) 997-3673	**Phone:** 816-997-3858
Fax: (816) 997-4208	**Fax:** 816-997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Strain Gage Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL838MAMPSGCLEAN **Specific Waste Type:** Paper

Date: 15-sep-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Mechanics

Description: A cleaning process is required to properly attach strain gages to various parts for experimental stress analysis. This process consists of mechanically abrading the surface with sandpaper followed by a cleaning with acetone or alcohol. Cleaning is completed by wetting the surface of the part and wiping with a kimwipe and/or cotton tipped applicator. Disposal of the solvents is through evaporation and the disposal of the contaminated kimwipes and cotton swabs is through the use of a 55-gallon hazardous waste drum.

Options: Use a water-based cleaning solution for the process.Use a smaller kimwipe to reduce paper waste.Reuse kimwipes instead of immediate disposal.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Strain Gage Installation **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL838MAMPSGINSTALL **Specific Waste Type:** Paper

Date: 15-sep-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Mechanics

Description: Small strain gages are attached to various components using two different adhesives. One is a two-part epoxy and the other is a "super glue." After bonding, lead wires are attached using solder, flux and rosin solvent for cleaning.A protective coating is then applied for environmental protection. Kimwipes and cotton-tipped applicators are used in the process and must be disposed of as hazardous waste. Only limited amount of waste is produced in this process.

Options: Use a citrus-based cleaner to remove solder flux.Use a smaller towel to clean surface.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch

Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Solder Dipping **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL838MAMPSOLDER **Specific Waste Type:** Paper

Date: 15-sep-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Mechanics

Description: Copper clad panels are coated with a layer of silicone grease and are stress cycled by submerging in a solder bath. After dipping, the silicone grease is removed with kimwipes and all waste is disposed of in a nearby 55-gal hazardous waste drum. The panels are then bond strength tested in the department.

Options: Use smaller kimwipes to remove waste.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Thermocouple Installation **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL838MAMPTCINSTALL **Specific Waste Type:** Polymers

Date: 15-sep-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Joining

Description: Thermocouples are attached to various components using a 2-part epoxy. This process is completed to assist in temperature monitoring and control experiments.

Options: Use a less hazardous epoxy material.Use smaller kimwipes.Reuse kimwipes.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Temperature Retraction **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ANSL838MAMPTEMPRET **Specific Waste Type:** Solvents

Date: 17-sep-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Environmental

Description: Methanol is cooled down to 94 deg F with dry ice in the low temperature retraction tester (CE 55290). Rubber samples are then submerged in this bath, and measurement of the samples are recorded as the bath is uniformly raised in temperature. Determination of the rate of retraction is then calculated.

Options: Order smaller amounts of dry ice for the test.Use smaller kimwipes for cleanup.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Tapping and Tool Testing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-B212-811BRIDTPTLTST **Specific Waste Type:** Metal Debris

Date: 11-dec-1992 **Major Activity Type:** Service **Specific Activity Type:** Laboratory, Metallurgy

Description:

Options: Order minimum quantity to perform test.Give unused samples to universities.Stop performing tests.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Bonding **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-BOND-131BONDING **Specific Waste Type:** Polymers

Date: 17-dec-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Joining

Description: The bonding process may occur anywhere within the test equipment operational surety envelope but is primarily done in the main laboratory. The super glue is applied to one of the surfaces to be bonded. The other surface is joined and held together with fingers until the joint is tight. This only takes a few seconds.

Options: Use staples or paper clips. Reject: Does not work on all materials.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Richard Vartanian
Phone: (816) 997-3673	**Phone:** (816) 997-2493
Fax: (816) 997-4208	**Fax:** (816) 997-3331

Email: wschlosberg@kcp.com	**Email:**

Title: Bonding **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-BOND-142142006 **Specific Waste Type:** Polymers

Date: 10-dec-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: The bonding process is very basic and well known. It consists of applying a bonding agent, in the prescribed manner, to two or more items, bringing them in contact with one another and immobilizing them until the bonding agent dries or cures. In our department we use three types of bonding agents. They are super glue, two-part epoxies, and vinyl solvent for vinyl. Super glue is applied directly from its container. Two-part epoxies must be thoroughly mixed before application. Vinyl solvent is placed in a container and vinyl is dissolved into it. It is then used to bond vinyl to vinyl.

Options: Replace Cyclohexenone.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Richard Vartanian
Phone: (816) 997-3673	**Phone:** (816) 997-2493
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Barco Bond Fast Cure Epoxy Adhesive **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-BOND-340BOND000 **Specific Waste Type:** Miscellaneous

Date: 16-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: Barco Bond adhesive is used in firing systems in the following applications: 1) Bonding, 2) Sealing of potting dams and 3) Staking of wires or flat cables. The two-part adhesive is weighed under a vented hood in a small tin foil cup. The two parts are mixed at the workbench using a toothpick or wooden tongue depressor to mix the adhesive. The mixed adhesive is carried to the workbench where it is used. The adhesive is spread on a small plastic bag to impede the exothermic reaction which helps prevent the adhesive from curing before it is used. Toothpicks and/or tongue depressors are used to apply the adhesive to the surfaces to be bonded. Lint-free cloths are used to clean up any spills. Any chemicals which are used in cleanup will be addressed by another assessment. Since the department is required to use gloves or fingercots, some adhesive may get on these. Only one batch size is permissible which is 7.35 to 7.65 grams. Smaller batch sizes are not used due to scale accuracy.Larger batch sizes will result in more exothermic which will result in lower pot life. It has been found that this batch size is satisfactory for the uses in the department. The resulting waste is sent to waste management as solid waste.

Options: Use material supplied in smaller packages. Previous history has not provided satisfactory results.Work smarter to reduce process material.Use another material with a longer pot life. Must be a more environmentally safe material.Process multiple parts using a single batch.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Fast Cure Epoxy Adhesives **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-BOND-340BOND001 **Specific Waste Type:** Polymers

Date: 16-jul-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: The following fast cure epoxy adhesives are covered in this assessment: 1) 2181113 - MVP acrylic adhesive, 2) 2181050 - 5 minute epoxy, 3) 2181092 - Barco Bond Fast Cure epoxy adhesive and 4) 2502303 - Locktite. For the first two, the correct ratio of hardener-to-base is automatically achieved whenever the two parts are injected from their containers; therefore the adhesive is not weighed.The adhesive is injected into a container where it is hand mixed. The two-part Barco Bond adhesive is weighed under a vented hood in a small tin foil cup. The two parts are mixed at the workbench using a toothpick or tongue depressor. The mixed adhesive is spread on a small plastic bag to impede the exothermic reaction which helps prevent the adhesive from curing before it can be used. Only one batch size is permitted which is 7.35 to 7.65 grams. Smaller batch sizes are not used due to scale inaccuracies. Larger batch sizes result in more exothermic reaction which reduces pot life.The resulting waste is sent to waste management as solid waste.

Options: Work smarter to reduce process waste. Process multiple parts using a single batch. Five Minute Epoxy and MVP11 adhesive - weigh adhesive for consistent batch size. Use material supplied in smaller packages. Previous history has not provided satisfactory results. Use material with a longer pot life. Must be a more environmentally safe material.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: High Thermal/Conductive Adhesives **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-BOND-340BOND002 **Specific Waste Type:** Polymers

Date: 03-dec-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: Both materials are mixed similarly. Each component (parts A and B) is weighed under a vented hood in a tin foil cup. The two parts are mixed at the vented hood using a toothpick or tongue depressor. The materials are then applied to the product. Per the work instruction, only one batch size is permitted when mixing 2181005 (Delta Bond 152), which is 106.45 to 108.55 grams. The batch size of 2180355 (Conductive Adhesive) is not controlled.

Options: Work smarter to reduce process waste. Process multiple parts using a single batch.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Epoxy Bonding/Encapsulation **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-BOND-340BOND003 **Specific Waste Type:** Polymers

Date: 17-dec-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description: The following oven-cured epoxy bonding/encapsulating materials are covered in this assessment: Scotchcast 8, HYSOL 4169 Green, Epibond, A-2 Epoxy (2149060, 21409070, 2181065), EC2216, EA956, EA934, 7256 Blue, Versamid and Cab-o-sil. The above materials are used for bonding and high voltage encapsulation. The materials are processed as follows: Remove materials from room temperature storage cabinet.Weigh materials in a mixing container on a calibrated scale in a vented hood (NOTE: specific batch sizes specifying minimum, nominal, and maximum weights are listed in the work instructions). Reseal containers of unused materials and return them to storage cabinet. Thoroughly mix weighed materials. Apply mixed material on bonding surfaces or into potting dams using toothpicks or syringes. Remove excess material from assemblies using lint-free cloths, paper wipes, or toothpicks.Cure material in an oven stabilized at the cure temperature of the material.

Options: Work smarter to reduce amount of miscellaneous process waste. Process multiple parts using one batch of mixed material.Use material with longer pot lives (and be more environmentally-safe than present materials).

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: RTV Adhesive Bonding **Major Waste Type:** Sanitary Waste

PPOA ID Code: KCP-BOND-340BOND004 **Specific Waste Type:** Cardboard

Date: 30-sep-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: RTV is received in a metal tube. Material is dispensed into plastic syringes and applied to the parts as necessary. RTV 3140 and RTV 3145 are used primarily to seal wire dams. No mixing is required. There are no minimum batch sizes. The only waste is from empty containers.

Options: Recycle cardboard boxes. This option was not considered since less than 0.2 pounds of cardboard could have been recycled.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Thermal Barrier Silicon (TBS) Bonding **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-BOND-340BOND005 **Specific Waste Type:** Polymer

Date: 15-oct-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: This is a process to bond components and assemblies. The process involves preparing material, applying material, and then curing the product in an oven. Each step of the process is described below: Thermal Barrier Silicon comes as a two-part kit (2079037) consisting of base (resin) and catalyst (accelerator). The two components are mixed at a 10 to 1 weight ratio in a plastic container with a stainless steel spatula or with a wooden tongue depressor. The mixture is placed in a vacuum chamber at a pressure of 0.5 to 3.0 torr for 2 to 3 minutes. The mixed material is then transferred to a dispensing syringe for bonding the products. The bonded assemblies must be cured for 4 to 8 hours at 160 degrees F.

Options: Prevent the waste of material scrapped for shelf life expiration by maintaining minimum quantities on hand.Reduce batch size to what is actually needed. Batch sizes are being set by process characterization and control to optimize product quality.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Transfer AdhesiveBonding **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-BOND-340BOND006 **Specific Waste Type:** Polymers

Date: 15-dec-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: This assessment deals with the transfer adhesive film (3M Company Product Designation 9469 M/S #9517156) used to bond modules and other piece-parts together in firing set housings. The tape used has a thickness of 5 mils, with paper backing on both sides of the adhesive film.It comes in a 2-inch wide roll that is 50 feet long. The adhesive is cut into desired shapes using a clicker press designed specifically for use on the Firing Set and cut into necessary shapes as needed when used on other firing sets. To apply the adhesive, the paper backing is removed from one side of the adhesive film and applied to the module or piece part. Next, the remaining paper backing is removed so the module or piece-part can be bounded into place. The process is very efficient--nearly 100% of the adhesive is used and very little adhesive is wasted. The primer waste is the nonhazardous paper backing, which is required to make the adhesive easier to cut and apply.Without the paper backing, the adhesive would stick to anything with which it came in contact.

Options: Redesign the clicker press to minimize adhesive use and minimize paper wasted.Investigate using fast cure epoxies for bonding. Epoxies generate more waste than the acrylic adhesive.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Adhesives **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-BOND-8001 **Specific Waste Type:** Polymers

Date: 22-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description:

Options: Reduce the number of adhesives used.Improve order/tracking system.Find other uses for expired material.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Anita Cates
Phone: (816) 997-3673	**Phone:** (816) 997-4158
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Epoxy Bonding **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-BOND-811SAFINGWHEEL **Specific Waste Type:** Polymers

Date: 13-sep-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: Metal and ceramic parts are epoxy bonded as part of development activities in the C-Lab. The epoxy is EA 956, a two-part system supplied by the Hysol division of the Dexter Corporation. Amino silane is added to the uncured epoxy as a coupling agent. The normal batch size for each mixing of epoxy is 79.5 grams (0.175 lbs.). The components in the mixture are 50 grams (0.110 lbs.) resin, EA 956 Part A; 29 grams (0.064 lbs.) curing agent, EA 956 Part B; and 0.5 grams (0.001 lbs.) amino silane coupling agent. The batches of epoxy are mixed an estimated 35 times per year. The components are weighed and mixed in a paper cup. Mixing is accomplished by stirring with a wooden tongue depressor. The epoxy mixture is spread on the bond surfaces with a metal spatula. The spatula and any other non-disposable tools that contact the epoxy, as well as any dribbles, are cleaned by wiping with a tissue wiper. A small amount of resin is poured into the "empty" curing agent container to set any residue before disposal. Conversely, a small amount of curing agent is poured into the "empty" resin container to set any residue. After all waste epoxy, epoxy on disposable materials, and epoxy residue in "empty" containers have set, they are disposed of via Waste Management.

Options: Mix smaller batches of epoxy, which reduces quantities of all input materials. Due to the minimal quantity of parts, this will not be pursued.Batch parts so epoxy is not mixed as often, which reduces quantities of all input materials. Due to the minimal quantity of parts, this will not be pursued.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: 2214 Adhesive **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-BOND-92-2214 **Specific Waste Type:** Polymers

Date: 02-oct-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description:

Options:

Site: Kansas City Plant

Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Thread Sealants **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-BOND-92ANAEROBIC **Specific Waste Type:** Polymers

Date: 31-aug-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description:

Options: Use epoxy or other adhesive to stake threads.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Hysol EA934NA Adhesive **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-BOND-92EA934NA **Specific Waste Type:** Polymers

Date: 10-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description:

Options: Reduce minimum mix requirement.Consolidate types of epoxies.Procure epoxy in special dispenser packages.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Epon 826/Curing Agent U **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-BOND-92EPON826 **Specific Waste Type:** Polymers

Date: 14-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description:

Options: Decrease quantity of minimum mix.Improve product definition to eliminate rework.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Laminar X500 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-BOND-92LAMX500 **Specific Waste Type:** Solvents

Date: 23-apr-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description:

Options: Decrease minimum mix requirement.Replace with less hazardous material.Schedule work for better material utilization.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Sylgard Adhesive **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-BOND-92SYLGARD **Specific Waste Type:** Polymers

Date: 13-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description:

Options: Consolidate adhesive types.Change minimum mix quantity to 10 grams.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Drill and Profile PWBs **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-C844-61D040026 **Specific Waste Type:** Printed Circuit Boards

Date: 31-may-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Drilling

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Calibration **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CALB-142142008 **Specific Waste Type:** Compressed Gas Cylinders

Date: 16-dec-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Calibration

Description: The calibration process performed by associates determines accuracy, and to some extent, reliability of test equipment used by inspection and some production associates. During calibration, readings or values derived by or from many types of test equipment are compared with values derived from secondary standards to determine test equipment compliance with various calibration procedure requirements and tolerances. The secondary standards used are calibrated by the Metrology Laboratory and have certified the cable to the National Bureau of Standards. Calibration schedules and records are updated at the time of each calibration, and in some cases, the actual calibration. Data is stored for future reference. The only material used in calibration as referred to in this PPOA is dry nitrogen, which is used in calibration of some pressure gauges.

Options: Substitute plant air for dry nitrogen. Rejected for purity, moisture content and pressure capability reasons.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Richard Vartanian
Phone: (816) 997-3673	**Phone:** (816) 997-2493
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Lubrication Operations **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CALB-421-10 **Specific Waste Type:** Oil

Date: 11-aug-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Calibration

Description: The chemicals identified on the flow diagram are used to lubricate various pieces of equipment that are either being calibrated or used in the calibration process. This includes things as mechanical moving parts like lead screws, electrical switches, O-rings used for pressure and flow calibration, etc. These chemicals are typically manually applied using a lint-free wipe or by direct application from the container.

Options: Eliminate Mobil LO-17 oil and replace with a noncarcinogen.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Resistance Calibrations w/ Mineral Oil **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CALB-421-11 **Specific Waste Type:** Paper

Date: 29-jul-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Calibration

Description: Metrology's reference resistance standards are maintained in two oil baths, one commercial and one designed and built at FM&T/KC. Resistors are periodically removed from the oil baths for shipment to the Primary Standards Laboratory (PSL) at SNLA for re-certification. When removed from the oil, the resistors are suspended over the oil baths to allow oil to drain off the resistors. Any remaining oil is then wiped off with AccuDry wipes which are disposed of in a hazardous waste step can. Metrology also has two oil-filled reference resistors. Sending each resistor to SNLA for re-certification requires emptying the resistor into a container prior to sending the resistor and then refilling the resistor upon its return from SNLA. Both operations require the use of a funnel which, after use, is wiped off with AccuDry wipes which are then disposed of in a hazardous waste step can.

Options: Replace existing mineral oil with a highly refined mineral oil which is not a known carcinogen.Utilize one bath instead of two.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Bonding and Sealing Operations **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CALB-421-12 **Specific Waste Type:** Solvents

Date: 15-jul-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Calibration

Description: These chemicals are used for bonding and sealing operations in Metrology. ORTV 108 - A sealant used to prevent air and fluid leaks. Permabond 910 - An adhesive used for miscellaneous bonding applications. Data Koat - A clean sealant.Data Koat Thinner - A solvent for clean sealant. Durakore Liquid - A catalyst and drying agent used in bonding applications. Durakore Powder - An adhesive, when mixed with durakore liquid, used in bonding applications. Omega Therm - A thermally conductive paste used in temperature calibrations. Some bonding and sealing agents will remain on the product as part of the process.

Options: Eliminate the use of Data Koat and Data Koat thinner by 12/93 because it is currently not required by Metrology.Substitute Permabond 910 for Durakore Powder and eliminate Durakore Powder by 12/93 because it is a suspected carcinogen.

Site: Kansas City Plant	

Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Humidity Calibrations **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CALB-421-13 **Specific Waste Type:** Antifreeze

Date: 25-may-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Calibration

Description: The Thunder Scientific Frost Point Generator, Model 4000, uses a very low temperature to generate low humidities. The first stage of the generator, the saturator, is blanketed in methanol which can be varied from -80 deg C to 0 deg C and circulated to keep the saturator at a constant temperature. The second stage, the working chamber, is blanketed in circulating antifreeze which can be varied from -10 deg C to 80 deg C. The water-saturated air with known pressure and temperature is forced into the working chamber where the pressure and temperature are changed. The changes in temperature and pressure are measured precisely and used to calculate a known humidity.

Options: Use fluorinert to replace methanol.Use mineral oil to replace methanol.Use alcohol to replace antifreeze.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Mercury Maintenance and Calibration **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CALB-421-14 **Specific Waste Type:** Mercury

Date: 15-mar-1994 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Electronics

Description: Mercury is used as a sealing ring for the pistons in three flow measurement standards, Volumeter, CE 17166, Volumeter, CE 31603, and Sierra Cal Bench, CE 80624. The mercury serves as a seal to retain the gas flowing into the standard. The waste is generated when the systems are cleaned during normal calibrations. During disassembly of the piston from the glass tube, the mercury is removed and a portion becomes waste. When the system is reassembled, new mercury must be added. Mercury is currently used in the DC area during calibration of standard resistors. Small pools of mercury in stands are used to ensure low resistance connections to the resistors. A small amount is removed from the resistors after use. Mercury is also used to coat a shorting bar during calibration of the Guideline Ratio Divider. After the calibration is complete, the mercury is removed from the bar using isopropyl alcohol and an accudry.

Options: Use copper buss wire to connect standard resistors instead of mercury stands.Eliminate mercury coating on shorting bar for Guildline Ratio Divider calibration.Decrease the number of flow standards in use.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630

Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Inert Gas Operations **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CALB-421-15 **Specific Waste Type:** Compressed Gas Cylinders

Date: 02-feb-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Welding

Description: Argon, helium, nitrogen and argon-nitrogen bottles are connected to a five-bay manifold system. The inert gas is supplied via stainless steel tubing to the Pressure Lab as source pressure for various calibrations. Bottled argon is used for oxide masking in welding thermocouples. Liquid nitrogen is used as a refrigerant for ultra-low temperature calibrations. Rosemont temperature controller and Duralab hood are used with an exhaust stack. Bottled nitrogen is used as a cleaning and drying agent. Input materials are inert bottled gases. Output materials are spent gas released to the atmosphere, and empty bottles which are recycled to the supplier for refill and reissue.

Options: Reduce or eliminate the use of inert gases. Not practical, the volume is insufficient to affect the makeup of natural atmosphere which contains the same inert gases.Recover spent gas. Not practical, the volume is insufficient to affect the atmosphere.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Leak/Flow Calibration **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CALB-421-16 **Specific Waste Type:** Caustic

Date: 19-may-1994 **Major Activity Type:** Service **Specific Activity Type:** Inspection

Description: The Buck Calibration Soap, HMIS #9212, is used in the calibration process for a gas flow standard called the Buck Calibrator. Metrology currently has two of these calibrators on schedule, CCN 21095 and CCN 21096. The soap provides a bubble for the gas flow standard to measure as it moves in a glass tube, resulting in a determination of flow rate. The Buck Calibration Soap and the Airtec, HMIS #4041, are used interchangeably in another flow calibration standard called a Matheson Scientific Burette, CCN 9547. The Airtec is also used to check plumbing connections to determine if a leak is present. When a coating of Airtec is applied to a pressurized plumbing connection, bubbles will form if a leak is present.

Options: Use Buck Calibration soap in both types of standards to detect leaks.Increase calibration intervals for Flow Standards CCN 9547, CCN 21095 and CCN 21096.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Lapping Operations **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CALB-421-17 **Specific Waste Type:** Metal Debris

Date: 16-may-1994 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Equipment

Description: The materials listed on the flow diagram are used to perform lapping operations as required for calibration purposes. This operation is performed only if the equipment being calibrated is worn or has been damaged. The process is used to restore the flatness of contact surfaces used in dimensional measuring equipment such as micrometer anvils.

Options: Have lapping operations performed outside the plant.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Dry Ice for Temperature **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CALB-421-2 **Specific Waste Type:** Air

Date: 07-dec-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Environmental

Description: Dry ice is used by Metrology on a routine basis to make triple point of water cells. These cells are a defining point of temperature at 0.01 degrees C. The cells are cooled by placing crushed dry ice in the cell to freeze distilled water around a center mantle. The solid, liquid and vapor present simultaneously are what makes the triple point. The dry ice is also used to eliminate mercury separations in thermometers. The extremely low temperature pulls all of the mercury into the reservoir and allows the mercury to recombine. When the mercury returns to room temperature, the separations are gone. When not in use, the dry ice is stored in a heavily insulated container kept in the Temperature Lab.

Options: Buy dry ice every other week instead of every week.Only buy dry ice when needed.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Cleaning Operations **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CALB-421-3 **Specific Waste Type:** Solvents

Date: 17-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The chemicals identified on the flow diagram are used to remove rust, dirt, oil and other foreign material from equipment, tools, work stations and other items as necessary for calibration purposes. This includes mechanical and electronic

equipment. Many cleaning processes involve manually wiping with AccuDry wipes. It is difficult to tell the quantity of AccuDrys used with each chemical, so one bulk amount was determined. Some cleaning processes utilize evaporation or blow drying with air, nitrogen or microdusters. The cleaning processes are performed in the areas shown on worksheet 3.

Options: Eliminate the use of Genesolv D by having items cleaned using soap and water. This would affect CFC reduction.Eliminate the use of Microdusters by using plant dry filtered air or nitrogen instead.Eliminate the use of Microdusters by using squeeze bulbs and camel's hair brushes.Eliminate the use of Contact Renu by using isopropyl alcohol. This would affect CFC reduction.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Cleaning & Lubricating Surfanalyzer **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CALB-421-4 **Specific Waste Type:** Solvents

Date: 07-dec-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Cleaning

Description: The subject kits (EKT-1116) are supplied by the manufacturer for cleaning and lubricating of the surfanalyzer linear drives. The kits contain the following items: (1) 2-oz bottle cleaning fluid, (1) 2-oz bottle dry lube, (1) 2-oz bottle lube solution, (1) 2-oz liquid wax, (1) cleaning brush and (1) package of lint-free disposable wipes. Manufacturers instructions for use of the kit are as follows: 1) Cleaning fluid is applied to the lint-free wipes and the wipes are used to degrease and remove any dirt or dust that has collected in or on the unit.In order to remove any hardened or build-up materials the cleaning brush is used with the cleaning fluid. 2) After the unit has been cleaned, the liquid wax solution is applied to the Precision Bar using the lint-free wipes. After the wax has been applied to the bar, lint-free wipes are used to remove any excess wax and to polish the bar. 3) The dry lube is applied to the top and front surfaces of the Precision Bar using the lint-free wipes as an applicator. 4) The lube solution is used on the rear areas of the Precision Bar, Lead Screw assembly, Dovetail area, Sideways and the Elevating Screws. After all cleaning, lubrication and wax has been applied, the lint-free wipes are used to remove any excess or build-up of materials.

Options: Send Surfanalyzer Linear Drives to the manufacturers for cleaning and lubrication.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Metrology Soldering **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CALB-421-5 **Specific Waste Type:** Lead

Date: 07-dec-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Soldering

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Dielectric Fluid **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CALB-421-6 **Specific Waste Type:** Oil

Date: 02-dec-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Calibration

Description: Dielectric fluid is used inside a high-voltage divider probe. The fluid is inside the probe, and the dielectric fluid and vapor keep out moisture and keep the high voltage from arcing. If the seal on the probe barrel becomes defective or loose, the dielectric fluid must be replaced and the seal must be secured.

Options: The process of refilling a high-voltage probe is very rarely done. In 1991, no dielectric fluid was used. Since the Dielectric Fluid is F-114, a CFC, will soon be phased out. We will choose to eliminate it now.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Pressure/Vacuum Equipment **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CALB-421-7 **Specific Waste Type:** Oil

Date: 31-mar-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Calibration

Description: The chemicals are used to lubricate or act as a pressure-generating media for pressure and vacuum calibration equipment. The normal calibration process involves manually wiping one or two drops of fluid that escape when the gage being calibrated is disconnected from the calibration system. The cleaning process involves manually wiping with AccuDry wipes. One AccuDry wipe may be used for several gages. The AccuDry is disposed of in a hazardous waste step can. The normal preventive maintenance to support pressure and vacuum calibration equipment requires draining or filling small quantities of fluid. The quantities should not exceed 1.0 liter for any one piece of equipment. The drained fluid is poured into a used oil container provided upon request from waste management. The filling operation is routinely performed by pouring directly from the bottle received from the manufacturer. The transfer equipment such as a funnel and any escaped fluid is cleaned by manually wiping with AccuDry wipes and placing them into a hazardous waste step can.

Options: Replace Skellite and Monoplex Dos with ethylene glycol and water.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers

Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: High Temperature Bath Calibration **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CALB-421-9 **Specific Waste Type:** Oil

Date: 13-apr-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Calibration

Description: Dow Corning 550 Fluid is placed in the Rosemont Temperature Bath to provide a stable temperature medium for calibration of temperature measuring devices such as thermometers, thermocouples, thermistors and other temperature sensors. The temperature bath is set at required temperatures, a temperature standard and the device to be calibrated are placed in the bath and their readings compared at either a single temperature or multiple temperatures. When temperature measuring devices are removed from the bath, excess Dow Corning 550 Fluid is removed with a KayDry.

Options: Use a smaller bath to reduce evaporation. The evaporation is so small, this would be negligible.Silicone Oil Type 200.2. This is virtually identical to what we are using and would have no advantage.Dow Corning 200.5 Oil. This oil goes higher in temperate and is cheaper to procure.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CLEN-131CLEANING **Specific Waste Type:** Paper

Date: 17-dec-1993 **Major Activity Type:** Maintenance **Specific Activity Type:** Cleaning

Description: The cleaning process may occur anywhere within the test equipment operational surety envelope. It is similar to household cleaning. Glass cleaner is used to clean desk tops, furniture, cabinets, and CRT screens. The cleaner is sprayed directly onto the surface or sprayed on a paper towel and applied to the surface to be cleaned. After cleaning, the paper towels are discarded into regular trash containers. Our department uses disk drives that require periodic cleaning. Those drives are supplied with cleaner for disk heads. Department associates use the supplied material to clean them. Static build up can damage the computers, work stations, and disk drives. An anti-static spray is sometimes applied to associates clothing or equipment.

Options: Don't clean. Reject: Office and lab areas will accumulate dirt. Also, disk drives may be damaged.Use plain tap water. Reject: Doesn't do an adequate job on glass surfaces.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Richard Vartanian
Phone: (816) 997-3673	**Phone:** (816) 997-2493
Fax: (816) 997-4208	**Fax:** (816) 997-3331

Email: wschlosberg@kcp.com	**Email:**

Title: Bench Cleaning with TCE and IPA **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CLHD-340CLEAN004 **Specific Waste Type:** Solvent

Date: 16-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: This assessment was performed on bench cleaning which includes all solvent cleaning other than spray cleaning. Some of this includes cleaning solder joints, stainless steel storage pans and bench tops. Cleaning solvents used are trichloroethylene (TCE) and isopropyl alcohol (IPA). TCE is a suspected carcinogen and used in this department. In another department, IPA and lint-free cloths are used to clean stainless steel storage pans, glass petri dishes, bench tops, vacuum ovens and tools. TCE and lint-free cloths are used to clean ink off of stainless steel pans and glass petri dishes. In other departments, IPA and lint-free cloths are used to clean bench tops and tools. TCE soaked foam tipped swabs (tex wipes), foam cubes held with triceps or acid brushes followed by IPA-soaked tex wipes, foam cubes or acid brushes are used to clean rosin flux contamination and other miscellaneous organic materials from electronic assemblies after soldering operations. This is later followed by a TCE/IPA spray cleaning. IPA and lint free-cloths are used to clean bench tops, vacuum ovens and tools. IPA-soaked tex wipes, foam cubes or acid brushes are used to clean rosin flux contamination and other miscellaneous organic materials from electronic assemblies after soldering operations. This is later followed by d-limonene/IPA spray cleaning. TCE is dispensed from either a 4-oz. pump can or an 8-oz. flip top can. IPA is dispensed from a 4-oz. pump can, an 8-oz. flip top can or an 8-oz. squirt bottle. Foam tipped swabs (tex wipes), foam cubes held with triceps or acid brushes are used to clean electronic assemblies. Lint-free cloths are used to clean pan, benches, tools, etc.

Options: Enforce the current policy of closing lids on IPA and TCE cans when not in use.Substitute IPA for any bench cleaning that currently used TCE.Mark stainless steel pans with ink that can be removed with IPA instead of TCE.Require that Teflon tape be applied to stainless steel pans and any labels then be applied to tape.Mark stainless steel pans with water soluble ink.Use aqueous wiping solution to clean bench tops instead of IPA.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Glass Cleaner **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CLHD-340CLEAN006 **Specific Waste Type:** Air Emissions

Date: 11-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: This process involves use of aerosol glass cleaner to remove smudges, film, scum, smears, fingerprints, dust, and other foreign material from eyeglasses, Plexiglas, desk and table tops, glass doors, windows, showcases, enamel surfaces, etc.Directions for use: 1) Shake can well before use. 2) Remove protective cap from can. 3) Hold can upright approximately 6 to 8 inches from surface to be cleaned. 4) Press firmly on spray button; spray sparingly on surface to be cleaned. 5) Polish with clean, lint-free, dry cloth or towel. 6) Install protective cap and store container.

Options: Use pump variety of glass cleaner to avoid using any type of aerosol propellant.Use water or some other environmentally safe cleaner and an Accu-Dry towel.

Site: Kansas City Plant	

Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Clean Parts with IPA **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CLHD-61501 **Specific Waste Type:** Solvents

Date: 17-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The operator obtains alcohol squirt bottle from flammable storage cabinet and a box of Kaydrys from shelf. The operator applies approximately 1/2 oz of alcohol to a Kaydry. The operator wipes part down with Kaydry. Kaydry is discarded in step can. Alcohol squirt bottle is returned to flammable cabinet.

Options: Clean part with water; a Kaydry would still be required to wipe part off.Don't clean at all; any parts requiring cleaning at the packaging level should be handled with gloves and/or received in plastic bags.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Alan Rittel
Phone: (816) 997-3673	**Phone:** (816) 997-4281
Fax: (816) 997-4208	**Fax:** (816) 997-3533
Email: wschlosberg@kcp.com	**Email:**

Title: Cleaning with Alcohol **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CLHN-430ALCOHOL **Specific Waste Type:** Solvents

Date: 30-oct-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Inspection uses alcohol in several cleaning processes. Inspectors are required to clean their gages, test adapters/connectors, holding fixtures, workstations, and Quality Visual Aids (QVAs), etc., prior to use. Alcohol is also used in the following operations: rubber ink stamp cleaning, coupon sample cleaning, removing voided acceptance stamps, and miscellaneous clean-up of product. The process involves either; applying a small amount of alcohol on a disposal wipe or using an alcohol spray booth, located in manufacturing area and cleaning the desired surface or item. The used wipe is then disposed of in an approved waste container (i.e., stepcan). Different manufacturers of alcohol are permitted as long as the MSDS is available. The safety precautions recommended during this type of cleaning are to avoid eye and skin contact through the wearing of safety glasses and approved gloves specified in the MSDS.

Options: Use a cheese cloth (tacky cloth) to clean dust off gages and work surfaces.Use Starrett Cleaner (57009203) instead of alcohol to clean workstations and gages.Use general purpose glass cleaner in a pump container.Start using a special cleaner MSDS 8069, 4702423(mostly soap and water) to clean workstations, gages fixtures, etc.Reduce the number of Kaydrys or disposal wipes used by using cloth wipes and launder them for reuse.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630

Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Cleaning with Starrett Cleaner **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CLHN-434STARRETT **Specific Waste Type:** Solvents

Date: 21-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Inspection uses Starrett Cleaner to clean a variety of gages and fixtures for proper maintenance requirements. The process involves applying a small amount of Starrett Cleaner on a disposable wipe and cleaning the desired gage or fixture. The used wipe is then disposed of in an approved container.

Options: Reduce the amount of Kaydrys or disposable wipes used by using cloth wipes and reusing them.Use general purpose glass cleaner in a pump container.Start using Special Cleaner, MSDS #8069, 4702423 (mostly soap and water) to clean workstations, gages, fixtures, etc.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Clean **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CLPT-1901CLEAN **Specific Waste Type:** Solvents

Date: 31-aug-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options: Do not use D-Limonene.Purchase in smaller sizes.Share with other departments.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Richard Vartanian
Phone: (816) 997-3673	**Phone:** (816) 997-2493
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Contact & Connector Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CLPT-432INSP **Specific Waste Type:** Aerosol Cans

Date: 24-nov-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Environmental

Description: Inspection is required to examine all tester interface devices which interface with product during testing and take action to correct any discrepancies noted prior to the connectors of product. The examination includes checking for damage, wear, and/or contamination. Cleanliness and absence of foreign material play an important part in the electrical testing of product.If a connector needs to be cleaned, the inspector sprays a small amount of Contact Re-Nu, 57009180 on the contacts to remove any contaminates. The connector is then allowed to air dry.

Options: Replace Contact Re-Nu with Fluorinert, FC43; Contact Re-Nu is no longer available.Use isopropyl alcohol instead of Contact Re-Nu.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Isopropyl Alcohol Part Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CLPT-7CLEAN001 **Specific Waste Type:** Solvents

Date: 25-jan-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options: Use Replacetone solvent instead of IPA.Examine alternative cleaning methods/materials.Isolate cleaning process to the Deburr area.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Trevor Whitney
Phone: (816) 997-3673	**Phone:** (816) 997-5743
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Surface Plate Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CLSP-434INSP **Specific Waste Type:** Solvents

Date: 22-feb-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Cleaning

Description: To utilize the maximum benefit of a surface plate, it must be cleaned prior to use. This will ensure accurate and consistent readings when used. This cleaning process involves applying a small amount of Starrett Cleaner, 57009203, on the surface plate and wiping the surface with a disposable wipe. The used wipe is then disposed of in an approved waste container.

Options: Reduce the amount of disposable wipes by using cloth wipes and reusing them.Use general purpose glass cleaner in a pump container.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers

Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Use of Lacquer Thinner **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CLST-432INSP **Specific Waste Type:** Solvents

Date: 18-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Periodically a unit is returned from the field or manufacturing for reprocessing or rework. Prior to returning unit to manufacturing, all acceptance stamps must be removed.The process to remove these acceptance stamps is to apply a small amount of lacquer thinner on either the unit or suitable wipe and rub the stamp until all evidence of it is removed. The disposable wipe or lint free cloth is then disposed of into a flammable step can.Health hazards associated with this process are eye and skin irritations. Inhalation may irritate nose and throat. Safety precautions recommended during this process is to wear approved gloves and safety glasses and always keep lacquer thinner properly stored when not in use.

Options: Use alcohol to assist in removing voided acceptance stamps.Void stamp out by completely covering it up using a black marking ink.Sand stamp off by using fine sand paper. No solvents.Leave stamps on units and control the reacceptance by paperwork only. This will eliminate the removing and restamping unit after acceptance.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Jim Urness
Phone: (816) 997-3673	**Phone:** (816) 997-4375
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Abrasive Blasting of Leads **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CLSU-339AC027003 **Specific Waste Type:** Compressed Gas Cylinders

Date: 23-apr-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Components are placed in a holding fixture while the contact areas of the leads are abraded under a stream of sodium bicarbonate intermixed with dry nitrogen. The precleaning, hot solder dipping, and post-cleaning operations associated with this process are included in PPOA TINN0339A-J-115-001. Therefore, this assessment looks at only the blasting operation.

Options: Reuse sodium bicarbonate collected in the dust collector.Eliminate the need for this process.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Factory Cleanup **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CLSU-430CLEANING **Specific Waste Type:** Solvents

Date: 11-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Inspection is required to clean work stations, table tops, fixtures, gages, etc.daily. Several cleaners are used throughout the inspection areas. Listed are the various cleaners used: - Starrett Cleaner, 57009203 - alcohol, 4601031 - Glitter II, Clean-N-Shine, Watco "S'Kleen" glass cleaner, or Meyer's Sparkle glass cleaner, - all have the same support stores number, 58001216, but different MSDSs. The process involves applying an adequate amount of the desired cleaner to the surface to be cleaned and wiping it with a suitable cloth. The used wipe is then properly discarded in the appropriate container. Different types of cleaners are allowed for factory cleanup keeping in mind any restrictions for each given area. Health hazards associated with this type of cleaning are eye and skin irritation. Prolonged overexposure may lead to dermatitis. Safety precautions could be to wear safety glasses and gloves during this type of cleaning.

Options: Use Starrett Cleaner (57009203) instead of alcohol for general cleanup.Proposal: replace alcohol where possible.Evaluate the use of "Special Cleaner" formulated for general cleanup.Use water to wipe down and clean workbenches, using reusable cloths or sponges.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Trichloroethylene Spray Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CLSU-8002 **Specific Waste Type:** Solvents

Date: 17-oct-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The TCE spray clean is a process used to remove residues of flux from recently soldered electrical assemblies. Parts are carried to a nonflammable spray booth where a pressurized spray tank contains the TCE solvent. The waste can sits in a weight-sensitive containment tray. When the capacity of the waste can exceeds approximately 80% of the total capacity, a switch on the tray opens and disables the spray gun. Therefore, it is impossible to overfill the waste container. The parts are sprayed with a hand-held spray gun which is connected to the pressurized solvent tank via an air logic switch. After spray cleaning, the parts are dried by a nitrogen blast from a spray nozzle connected to the plant nitrogen system.

Options: Discontinue use of trichloroethylene as a spray cleaning solvent and replace with d-limonene.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Anita Cates
Phone: (816) 997-3673	**Phone:** (816) 997-4158
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Alcohol Spray Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CLSU-8003 **Specific Waste Type:** Solvents

Date: 01-dec-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The primary reason for spray cleaning with alcohol is to serve as a nonpolar spray wash after cleaning with a polar solvent, primarily, trichloroethylene. To spray with alcohol, the operator must first press the "start" button located outside the spray booth. This turns on the ventilation blower which provides airflow through the exhaust hood. The operator then verifies that there is sufficient alcohol in the supply bottle and that the waste can is not full. Next, the drain valve to the waste can is opened and the valve to the overflow can is closed. The part to be washed is then sprayed, usually for 30-60 seconds, then dried with dry nitrogen after spraying, the operator closes the valve to the waste can and opens the valve to the overflow can.

Options: Change primary cleaning solvent from trichloroethylene and AP20 to d-limonene. Unsure of effect on alcohol usage. This change is already scheduled to take place by 1/31/94.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Anita Cates
Phone: (816) 997-3673	**Phone:** (816) 997-4158
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Acetic Acid Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CLSU-811ACETICCLEAN **Specific Waste Type:** Acid

Date: 02-oct-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The bonding surfaces of metal and ceramic parts are roughened for epoxy bonding by blasting with dolomite. The dolomite blast media left on the surface or embedded in the surface is removed by a dilute acetic acid (HAC) bath. The parts are submerged in the agitated bath for a length of time necessary to dissolve the dolomite. The cleaning is followed by an initial rinse and final rinse. The initial rinse water is saved and placed in the waste acid container. The HAC bath is made up of 20% glacial acetic acid and water. The cleaning and mixing of the HAC solution takes place in the C-Lab. The solution is stored in a sealable polyethylene bottle between uses, until it no longer effectively dissolves dolomite. The concentrated HAC is stored in its original one-gallon container with other acids under the fume hood in the C-Lab. Empty glass containers are rinsed thoroughly and disposed of in a broken glass can. Rinse water and the used HAC solution are stored in an approved waste acid container until sent to waste management.

Options: Do not attempt to remove embedded dolomite. Just clean off surface residue.Use larger grit blast media that will not embed in surface of parts.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Acetone Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CLSU-811ACETONEUSE **Specific Waste Type:** Solvents

Date: 28-sep-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Acetone is used in minimal quantities as a cleaning solvent during process development activities to clean small parts and surfaces. One current example of a use is the cleaning of ceramic and metal surfaces in preparation for epoxy bonding. The specific uses are ever-changing due to the varied development activities taking place in the C-Lab but the general use as a cleaning solvent remains the same. The acetone is generally swabbed or wiped on using a cotton swab, cotton ball, or tissue. The acetone evaporates into the surrounding air. The cotton balls, swabs, and tissue wipers (as well as their containers) are sent to waste management. The acetone is brought to the C-Lab in minimal quantities (<500 ml) from a common stock. The acetone is stored in and dispensed from a polyethylene squeeze bottle while in the C-Lab.

Options: Replace with an abrasive cleaner and water.Have parts degreased in a degreaser where the solvent is recycled.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Isopropyl Alcohol Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CLSU-811ALCOHOLUSE **Specific Waste Type:** Solvents

Date: 25-sep-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Ultrasonic Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CLSU-97ULTCLN **Specific Waste Type:** Caustic

Date: 20-dec-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options: Use cleaner longer before making up fresh solution.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016

Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Degrease **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CLSU-98DEGREASE **Specific Waste Type:** Solvents

Date: 15-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Coatings and Sealants **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-COAT-008005 **Specific Waste Type:** Polymers

Date: 21-dec-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description:

Options: Reduce the number of sealants and coatings used.Improve order/tracking system.Reduce container sizes.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Anita Cates
Phone: (816) 997-3673	**Phone:** (816) 997-4158
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: CPR Manikin Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CPRC-915-MANIKIN **Specific Waste Type:** Solvents

Date: 22-dec-1993 **Major Activity Type:** Service **Specific Activity Type:** Cleaning

Description: During any CPR class, each mannequin's mouth area must be cleaned between each class participant's use. A kimwipe soaked in alcohol is used for this process. After each CPR class, ES&H Training is responsible for fully cleaning each of the six mannequins. The process is as follows: ADULT MANNEQUIN (2) - Remove face from mannequin. Wipe down with alcohol. Remove throat and lung bags; discard.Wipe down all interior plastic parts and exterior skin areas of the mannequin with

alcohol. Put new throat and lung bags in mannequin. Place face back onto mannequin. Replace batteries semiannually. JUNIOR MANNEQUIN (2) - New Model: Wipe down all skin areas with alcohol. Pull new mouth and lung bag into place. Old Model: Remove head from mannequin. Flush with alcohol. Remove throat and lung bag. Wipe down all interior plastic areas with alcohol. Put new throat and lung bags in mannequin. Place head back on mannequin and wipe down all skin areas with alcohol.BABY MANNEQUIN (2) - Open stomach cavity and remove breast plate. Wipe down breast plate and interior plastic area with alcohol. Soak plastic parts (breathing tube, intake/output valves in alcohol). Remove and discard lung bags and replace with new. Air dry the above-mentioned parts and replace in mannequin. Wipe down all skin areas with alcohol. Once a month, each of the above mannequins must be given a bath using detergent and water, followed by an alcohol cleaning. Fill two 10-gallon buckets with warm water. Squirt detergent in one. Wash all plastic and rubber areas of manikin with soapy solution and then rinse with water. Clean all manikins as required in alcohol cleaning process. Reassemble manikins. WASTE DISPOSAL - Wastes produced during these processes are to be disposed of as follows: Alcohol-contaminated wipes in step can waste to be disposed of daily. Batteries to be placed in appropriate satellite storage container and guidelines. Water to be poured into sink connected to sanitary sewer. All other wastes can be disposed of in general plant trash (ie. plastic part, replaced lung bags, paper).

Options: Use a substitute for alcohol as a disinfectant/cleaner, perhaps hydrogen peroxide. Effectiveness would need to be evaluated.Send mannequins out for commercial cleaning.Use pre-packed antiseptic wipe instead of soap-and-water solution and alcohol. This may be a problem when small internal mannequin parts need disinfected.Do not use soap-and-water solution, followed by a rinse. Use only clean rinse water to clean. This may not be effective to ensure small internal parts are sanitary for the next users.Store each mannequin in sanitary container, i.e., a plastic zip lock bag, until required. This would eliminate the need to clean every month.Do not clean mannequins at all. This could present health concerns to the users.Purchase latest model mannequins - similar to the latest junior model. This model requires less cleaning.Rent mannequins and require contractor to clean and replace parts as necessary. May be difficult to maintain standards.Dispose of mannequins after each use. This would be a total waste and not economically feasible.Issue contract for CPR training to contractor who provides training for identified KCP associates at an outside facility.Designate medical services as responsible organization to clean mannequins. It may be that organization already has the equipment to do the cleaning and the expertise in hygiene. This would have to be confirmed.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Milton Bryant
Phone: (816) 997-3673	**Phone:** (816) 997-4111
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Packaging Cushioning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CUSH-635-06 **Specific Waste Type:** Polymers

Date: 07-jan-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Packaging

Description: The checker/packer cuts required cushioning to length per the requirements of the production traveler or the applicable packaging specification. Two-inch and four-inch foam is cut on a bandsaw. One-quarter inch, one-half inch, and 1one-inch foam is cut on the foam cutting table. Excess material is discarded in a wire basket until the basket is full, at which time it is set out for trash pickup.

Options: More efficient use of cushioning material. Supervision should emphasize the use of larger scrap pieces when available, instead of discarding.Set up recycling program. Recycling options for foam cushioning have been researched; at this time we are not aware of any recycling options.Use of Box Maker to reduce usage of material. The department has recently purchased a fiberboard box maker. This will reduce the amount of "filler material" required to be put in the boxes.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Alan Rittel
Phone: (816) 997-3673	**Phone:** (816) 997-4281

Fax: (816) 997-4208	**Fax:** (816) 997-3533
Email: wschlosberg@kcp.com	**Email:**

Title: Covercoat Ink Marking **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CVCT-340INKMARK000 **Specific Waste Type:** Solvents

Date: 13-sep-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Covercoat Labels w/Krylon **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-CVCT-63503 **Specific Waste Type:** Solvents

Date: 14-may-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description: The operator obtains can of Krylon from the flammable storage cabinet. The nozzle of the can is cleared by test spraying. The operator sprays the covercoat over the label and continues until all of the packages have been completed. The operator then returns the can of Krylon to the flammable storage cabinet. Assumptions: Krylon Aerosol Spray is used only to covercoat labels. Fifty percent of Krylon used in the process results in fugitive emissions.

Options: Use clear tape to cover labels.Change packaging specifications to allow a clear oversized label to be applied over the existing labels.Use a plastic label with a different ink.Eliminate use of Krylon.Conduct experiments to determine need for covercoating of labels. Packaging specifications would need to be revised to remove the requirement.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Alan Rittel
Phone: (816) 997-3673	**Phone:** (816) 997-4281
Fax: (816) 997-4208	**Fax:** (816) 997-3533
Email: wschlosberg@kcp.com	**Email:**

Title: Rough Lapping - JC **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-D725-96ROUGHLAP-JC **Specific Waste Type:** Solvents

Date: 18-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options: Replace rinsing solvent.Change to a water-based abrasive mixture.Change rinsing technique.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Rough Lapping - MB-30 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-D725-96ROUGHLAP-MB **Specific Waste Type:** Solvents

Date: 18-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options: Replace rinsing solvent.Change to a water-based abrasive mixture.Change rinsing technique.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: RTV Deburring Application **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-DEBR-7RTV003 **Specific Waste Type:** Polymers

Date: 01-may-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Trevor Whitney
Phone: (816) 997-3673	**Phone:** (816) 997-5743
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Dish/Pan Washing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-DSWG-340CLEAN010 **Specific Waste Type:** Solvents

Date: 20-apr-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** David Shepherd
Phone: (816) 997-3673	**Phone:** (816) 997-4993
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Robotic Component Preparation **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-E010-53J115006 **Specific Waste Type:** Air Emissions

Date: 13-dec-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description: Preparation of axial lead components is a four-step process requiring the leads of each component to be fluxed, tinned, cleaned, and preformed. Preforming is the bending of the component leads so the component can be inserted into a printed wiring board. A robotic component preparation (RCP) wordcell was designed to perform the process steps automatically using an industrial robot (Unimation model 260). The robotic process is completely enclosed and vented to reduce exposure to the heat and vapors.

Options: Dump flux less often.Keep lids on flux.Dip less lead in flux.Use a dross inhibitor.Run pump only when processing.Use a non-wave solder pot.Use immersion in TCE instead of spraying.Use d-Limonene.Clean equipment with only alcohol.Use a nitrogen blanket. Studies show this doesn't work.Spray clean less. Process already at the minimum.Use IPA instead of flux. Cannot use a flammable liquid.Batch clean parts.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Steel Rule Die Blanking **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-E153-37-BLANK **Specific Waste Type:** Polymers

Date: 01-jul-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Flat Flex Cable Contour **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-E153-63D038013 **Specific Waste Type:** Metal Debris

Date: 31-jul-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Mold Releasing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-E300-26MR011 **Specific Waste Type:** Aerosol Cans

Date: 01-apr-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description:

Options: Use greener products.Use air propelled aerosols.Use higher concentration aerosol releases.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Injection Molding & Extrusion **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-E320-26IE004 **Specific Waste Type:** Plastic

Date: 09-sep-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Molding

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Compression Molding **Major Waste Type:**

PPOA ID Code: KCP-E330-26C1003 **Specific Waste Type:** Polymer

Date: 28-feb-1994 **Major Activity Type:** **Specific Activity Type:**

Description:

Options: Request the material vendor to package and ship molding resin in larger boxes.Inspect and alter the compression molds as required to improve fitup.Connect the compression presses which use tap water for cooling to the recycled chilled water system.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Getter Pwdr Prep (Pelletizing) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-E332-49PP003 **Specific Waste Type:** Solvents

Date: 28-sep-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Molding

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: MDA - Desiccant Molding **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-E335-49MD001 **Specific Waste Type:** Polymers

Date: 28-jun-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Curing

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Getter Pwdr Prep (Preforming) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-E335-49PF003 **Specific Waste Type:** Solvents

Date: 28-sep-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Hot Isostatic Pressing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-E375-96HIPPER **Specific Waste Type:** Compressed Gas Cylinders

Date: 06-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description:

Options: Use atmospheric air to replace argon.Capture argon and helium for reuse.Reduce process temperatures and pressures.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016

Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Encapsulations **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ENCP-008006 **Specific Waste Type:** Polymers

Date: 03-oct-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description:

Options: Reduce the number of encapsulants used.Improve the order/tracking system.Reduce container sizes.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Anita Cates
Phone: (816) 997-3673	**Phone:** (816) 997-4158
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Encapsulation **Major Waste Type:**

PPOA ID Code: KCP-ENCP-019019005 **Specific Waste Type:** Miscellaneous

Date: 13-may-1993 **Major Activity Type:** **Specific Activity Type:**

Description: This is a generic description of the encapsulation process and is not intended to be process specific. Two chemical parts are mixed in proper proportions by weight. Upon completion of mixing, the mixture is placed in a vacuum chamber, where most of the volatiles and air are removed. The mixture is then poured into encapsulation molds and allowed to harden. Some materials require heating during hardening and are therefore placed in an oven. Items used to accomplish this are aluminum weighing dish, plastic funnel, knife blades, kraft paper, needles, syringes, tape, tongue depressors, paper containers, kimwipes or kaydrys, and air gun cartridges and nozzle.

Options: When mixing EPON 828 and Versimid 140, pour some of the mixture back into the epon measuring cup and blend. Then return to the Versimid cup.Use Versimid instead of shell curing agent "U".Eliminate Hysol. Use EPON Versimid mixture.Eliminate RTV630. Use RTVE.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Richard Vartanian
Phone: (816) 997-3673	**Phone:** (816) 997-2493
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: GMB/CTBN Epoxy Encapsulation **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ENCP-340ENCAP001 **Specific Waste Type:** Polymer

Date: 11-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description: GMB (6090014) is mixed with CTBN (2140646) by weight in a poly container using a stainless steel spatula and heated for one hour in an oven. The mixture is removed from the oven, stirred with the spatula and cooled slightly. After adding the catalyst, the mixture is stirred with the spatula and evacuated in a coffin chamber. The mixture is then poured into preheated 30 cc syringes, reheated in an oven, and evacuated again in a coffin chamber. The syringes are then placed back in the oven until dispensing. The parts which have been plasma cleaned, placed in RTV molds and associated fixtures and heated, are now removed from the same oven containing the catalyzed mixture and placed on a clean bench. The syringes are removed from the oven and attached to an air dispensing machine. The syringe barrel tip caps are removed and a preheated needle is attached. A small amount of the catalyzed mixture is dispensed to remove contaminants from the needle and to adjust the flow rate. The syringe/needle is then positioned in the bottom of the mold and the mixture dispensed until the mold is full. The filled mold is returned to the oven and subsequently evacuated in the coffin chamber. The molds are returned to the oven for reheat, then topped off with the catalyzed mixture until slightly above level. The encapsulant is then oven cured and the molds torn down. Surface imperfections are filed, ground, and filled in with patch pot (GMB/CTBN with 4604225 catalyst). The encapsulated product is then x-rayed for voids. If product does not conform due to internal voids, the voids are dug out using an air grinder. The resultant holes are filled with patch pot. This cycle is repeated until an acceptable part is produced.

Options: Reduce batch size. Not considered due to the resultant reduction in exotherm of the reduction. Any reduction in the exotherm will change resultant material properties.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Encapsulation with Scotchcast #8 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ENCP-340ENCAP003 **Specific Waste Type:** Polymer

Date: 15-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description: This is a process to encapsulate high voltage potting dams with a manual application of Scotchcase #8. The process involves preparing material, injecting the material into the potting dams, and then curing the material in an oven. Each step of the process is described below. Scotchcase comes as a two-part kit (2140606): part "A" and part "B." The two components are withdrawn from their containers, weighed at a ratio 1 to 1, and hand-mixed in a plastic cup with a tongue depressor. The mixed material is placed in a vacuum chamber for 2 minutes minimum. The mixed material is then transferred to a dispensing syringe for encapsulating the product. The encapsulated assemblies must be cured for 2 hours minimum at 160 deg F.

Options: Reduce batch size to what is actually needed. Batch sizes are being set by PC&C to control product quality.Schedule parts in group to match usage with minimum batch size. Scheduling parts in group would not be consistent with our continuous flow manufacturing.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: EN7/EN8 Replacement Encapsulants **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ENCP-340ENCAP004 **Specific Waste Type:** Polymers

Date: 11-feb-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: The Pet 90 base material (2502800) solidifies at room temperature; therefore, it must be placed in a 145 degree F.oven before use. A small amount of "skin" usually forms on the top of the Pet 90 base material; therefore, this skin must be removed after opening the container. To minimize the formation of skin, dry nitrogen is sprayed over the top of the unused material prior to sealing the container. The container material must be sealed immediately for the nitrogen to be effective. One hundred grams of Pet 90 base material is mixed with 9 grams of Ethacure 300 and 8 grams of Cab-O-Sil in a polyethylene cup using a wooden tongue depressor or stainless steel spatula. Method of application is usually left to the discretion of the operator. A wooden or plastic toothpick is usually used to apply adhesive to small areas. A syringe is usually used to apply adhesive to large areas. The unused adhesive, cup, toothpick, syringe, wipers, and any other waste materials are discarded as solid waste in a satellite storage can.

Options: Use material supplied in smaller containers.Process multiple parts using single batch of adhesive.Use smaller batch sizes. Scale inaccuracies from smaller batch sizes would be a major problem.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Hershal Hudson
Phone: (816) 997-3673	**Phone:** (816) 997-5595
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Sylgard Encapsulation **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ENCP-340ENCAP005 **Specific Waste Type:** Polymer

Date: 15-oct-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description: Sylgard 184 (2070087) comes as a two-part kit consisting of base (resin) and curing agent. A mixture of 100 parts by weight of resin and 10 parts by weight of curing agent to 30 parts by weight of Glass Microspheres (6090014) is mixed in a stainless steel or plastic container with a stainless steel spatula or with a wooden tongue depressor for 5 minutes minimum. The mixture is placed in a vacuum chamber at a pressure of 0.5 to 3.0 torr for 3 minutes after the foam rise collapses. The mixture is then transferred into a dispensing syringe for encapsulating the products. The encapsulated assemblies must be cured 16 hours minimum at room temperature, followed by 8 hours minimum (allowable in 2 separate 4-hour periods) in an oven set at 160 deg F.

Options: Prevent the waste of material scrapped for out-of-shelf-life expiration by maintaining minimum quantities on hand.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Beta Eucryptite Encapsulation **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ENCP-340ENCAP006 **Specific Waste Type:** Polymer

Date: 15-oct-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description: 1) Remove Beta Eucryptite Filler (4535232) from drying oven and weigh out 370 grams nominal (366.35 to 373.35) into a 1-gallon poly container. 2) Remove can of DER 331 Epoxy Resin (2140045) from preheat oven and add 200.0 grams nominal (198.05 to 201.95) to the filler. 3) Mix filler and resin with a spatula for 5 minutes minimum. 4) Reheat mixture at 225 deg F in a forced convection oven for 6 hours. 5) Redistribute the filler in the resin by stirring with a stainless steel spatula.If the mix becomes too viscous to disperse all the filler uniformly in the resin, then place the mixture back in the oven until it is thin enough to stir easily into a homogeneous mixture. Stir mixture until the temperature drops to between 170 and 180 deg F. 6) Add 24.0 grams nominal (23.81 to 24.19) of Diethanolamine Curing Agent (4604020) to the mixture. 7) Mix thoroughly for 2 minutes minimum. Be sure to scrape the sides of the container while mixing. 8) Immediately upon completing mixing, place the warm mixture on a thermal insulator in a vacuum chamber to avoid heat loss and then evacuate at a pressure of 0.5 to 2.0 torr absolute for 2 to 3 minutes after the initial foam rise collapses. This de-aeration shall be completed within 10 minutes after the addition of the curing agent. The final pouring operation shall be completed within 1 hour after addition of the curing agent. 9) Pour, inject, etc, mixture into part cavity. After unused material has set up, place in a step can for disposal by waste management.

Options: Reduce minimum batch size as specified by Special Work Direction SP64ADHESIVE (scale inaccuracies for weighing smaller amounts would not provide a consistent acceptable mix ratio). Presently Beta Eucryptite mixing is required for approximately 30 combinations of part numbers, operation numbers, and weapons programs.Work smarter and use one mix on more than one job.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Polysulfide Bonding/Sealing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ENCP-340ENCAP007 **Specific Waste Type:** Polymers

Date: 30-sep-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: Polysulfide is used in firing systems to bond, seal, and stress relief. Polysulfide is mixed by electronic assemblers. The polysulfide mixture is formulated by mixing the base with the accelerator (hardener) in a polyethylene cup using a wooden tongue depressor or stainless steel spatula to mix the material. The tongue depressor is discarded as process material. If a spatula is used, it is wiped off using a wiper. All mixing operations are performed under a vented hood. The method of application to part is left to the discretion of the operator. For small area application such as bonding, stress relief, and some sealing operations, the polysulfide is usually applied to the part using a wooden toothpick. A syringe may be used to apply polysulfide on larger areas. The unused polysulfide, cup, toothpick, syringe (if used), finger cots and any wipers used are discarded into a satellite storage can.

Options: Reduce minimum batch size. (Scale inaccuracies for smaller weights would be a problem).Use more 4115061-04-800 where practical. Work smarter to reduce process waste.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769

Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Engraving **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ENGR-19019004 **Specific Waste Type:** Metal Debris

Date: 14-dec-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description:

Options: Use New Hermes Engravers Enamel.Use crayon on all engraving jobs.Use laser engraver.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Richard Vartanian
Phone: (816) 997-3673	**Phone:** (816) 997-2493
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Drilling Projects **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ENVN-922DRIL **Specific Waste Type:** Soil

Date: 23-dec-1993 **Major Activity Type:** Environmental Restoration **Specific Activity Type:** Drilling

Description:

Options: Decrease the number of soil borings taken.Implement use of geo-probe to collect soil samples.Implement the use of sonic drilling techniques to collect soil samples.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Milton Bryant
Phone: (816) 997-3673	**Phone:** (816) 997-4111
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Handling of Desiccant **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ENVR-432DESICANT **Specific Waste Type:** Air

Date: 22-jan-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Activation

Description:

Options: Change desiccant only when within 5% of limit.Change to self-indicating desiccant.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Purge Can With Dry Nitrogen **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ENVR-61502 **Specific Waste Type:** Compressed Gas Cylinders

Date: 22-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Packaging

Description: The operator assembles the package by placing packaging material and part in the can. The operator then places the lid on top of the can and positions the lid so that the nitrogen nozzle may be inserted into the can. Nitrogen is forced into the can for a period of two minutes; the can is then considered purged. The lid is lowered on the can and the can is sealed in accordance with the Protective Canning Specification. Assumption: 50% of all nitrogen used in canning is wasted.

Options: Use less nitrogen to purge can; apply nitrogen for one minute rather than two minutes.Don't use nitrogen on parts at all; it will be determined, through discussions with product engineers, if nitrogen is necessary on this process.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Alan Rittel
Phone: (816) 997-3673	**Phone:** (816) 997-4281
Fax: (816) 997-4208	**Fax:** (816) 997-3533
Email: wschlosberg@kcp.com	**Email:**

Title: Sampling of Monitor Wells **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ENVRN-922MWSAM **Specific Waste Type:** Solvents

Date: 29-sep-1993 **Major Activity Type:** Environmental Restoration **Specific Activity Type:** Monitoring

Description:

Options: Reduce the number of monitor well samples.Employ micropurge techniques.Seal Flush mount monitor well to reduce infiltration of additional water.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Milton Bryant
Phone: (816) 997-3673	**Phone:** (816) 997-4111
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Resistance Weld **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-F116-91RESISTWELD **Specific Waste Type:** Metal Debris

Date: 30-sep-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Welding

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Gas Tungsten Arc Welding **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-F211-91GTAW **Specific Waste Type:** Compressed Gas Cylinders

Date: 30-sep-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Welding

Description:

Options: Utilize outside training facilities to improve operator skills.Place several welds per weld sample.Use stainless steel wire disk longer.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Gas Metal Arc Weld **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-F231-91GMAW **Specific Waste Type:** Compressed Gas Cylinders

Date: 16-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Welding

Description:

Options: Don't train welders who don't need it.Recycle pure copper contact tips.Train with multi-weld spots on one sample.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016

Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Electron Beam Welding **Major Waste Type:** Sanitary Waste

PPOA ID Code: KCP-F311-92EBWELD **Specific Waste Type:** Sanitary Sewer

Date: 23-sep-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Welding

Description:

Options: Recirculate chilled water instead of dumping tap water.Wipe etchant with wiper instead of flushing with water.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Pulse Arc Welding **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-F443-97PULSEARC **Specific Waste Type:** Compressed Gas Cylinders

Date: 30-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Welding

Description:

Options: Adjust flow rate of gas down.Select the pre- and post times at minimum level.Consider alternate cover gas.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Hermetic Solder Sealing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-F450-78J105013 **Specific Waste Type:** Lead

Date: 09-dec-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Printed Trans / Inductor Bonding **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-F510-73B016022 **Specific Waste Type:** Solvents

Date: 13-sep-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options: Eliminate IPA.Decrease the wash tank size - implemented.Decrease rinse time.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Lead Frame Bonding **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-F510-73B016023 **Specific Waste Type:** Metal Debris

Date: 12-feb-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Gold Wire Bonding/Pull Testing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-F514-75B016017 **Specific Waste Type:** Metal Debris

Date: 01-sep-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description:

Options: Monitor shelf life expiration date.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Aluminum Wire Bonding - Wire Pull Test **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-F514-78B016016 **Specific Waste Type:** Metal Debris

Date: 11-nov-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: RTV Binding **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-F516-855F071019 **Specific Waste Type:** Polymers

Date: 23-jun-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: 1. Product requires a metal disk to be bonded to a similar surface. 2. Wipe the area clean using a kimwipe moistened with alcohol (4601031). Allow to air dry. 3. Apply RTV material (4115970) to the metal disk. Position metal disk on product - apply pressure and maintain per process. Seal product interface zones by applying a bead of material wipe. Wipe away excess. 4. Allow for material to cure at room ambient temperature.

Options: Redesign to eliminate need for bonding. Small production schedule precludes an effort that could be more costly than benefits derived. Redesign for another material or gasket. MSDS indicates hazardous polymerization does not occur with this material. Material is stable nontoxic.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** T. Joe Riehle
Phone: (816) 997-3673	**Phone:** (816) 997-7154

Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Eutectic Die Attach Test **Major Waste Type:** Transuranic Mixed Waste

PPOA ID Code: KCP-F520-78J109014 **Specific Waste Type:** Metal Debris

Date: 01-aug-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Laser Marking **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-F613-58H093021 **Specific Waste Type:** Solvents

Date: 28-jul-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: CO2 Laser Beam Welding **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-F613-58N170022 **Specific Waste Type:** Compressed Gas Cylinders

Date: 30-jun-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Plastics Assembly **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-F721-26BA008 **Specific Waste Type:** Polymers

Date: 31-may-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Molding

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Gas Tungsten Arc Welding **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-F811-58N169020 **Specific Waste Type:** Solvents

Date: 30-jun-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: An arc is initiated between a tungsten welding electrode and the parts being welded. The heat from the arc melts the metal of the parts and forms the weld. The parts welded are cleaned with alcohol prior to welding. The alcohol is the only element of the process which constitutes hazardous waste. Operator qualification is required. The heat of the process is related to the welding current and the travel speed of the electrode. During the actual weld there are no materials into or out of the process. Cleaning with alcohol prior to welding is the only concern. All other wastes are nonhazardous.

Options: Wear gloves until they need to be thrown out -perhaps as long as 1 week.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Automated Drag Soldering **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-F930-53J106005 **Specific Waste Type:** Solvent

Date: 12-dec-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Solder Dispensing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-F933-73J105007 **Specific Waste Type:** Metal Debris

Date: 09-sep-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Vapor Phase Soldering **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-F938-80J116002 **Specific Waste Type:** Lead

Date: 13-apr-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297

Email: wschlosberg@kcp.com	**Email:**

Title: Vapor Phase Solder, Hi Temp **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-F938-91VAPPHASEHI **Specific Waste Type:** Lead

Date: 30-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description:

Options: Purchase more efficient equipment.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Vapor Phase Solder, Lo Temp **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-F938-91VAPPHASELO **Specific Waste Type:** Lead

Date: 30-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description:

Options: Purchase more efficient equipment.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Induction Braze **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-F941-91INDUCTBRAZ **Specific Waste Type:** Metal Debris

Date: 30-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description:

Options: Cover boiling water with lid.Increase shelf life of flux.Use solder directly from spool.

Site: Kansas City Plant	

Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Air Induction Brazing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-F941-97INDUCBRAZE **Specific Waste Type:** Acid

Date: 11-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Welding

Description:

Options: Use minimum flux.Eliminate flux and use inert gas.Braze in vacuum environment - eliminate flux.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Solder Leveling **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-F943-61J114015 **Specific Waste Type:** Printed Circuit Boards

Date: 16-oct-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options: Install manual independent shutoffs on DI rinse.Install automatic shutoffs on DI rinse.Allow use of out-of-date flux to deoxidize solder pot.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Shock Testing Lead Programmers **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-F951-431KPL005 **Specific Waste Type:** Lead

Date: 15-nov-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Mechanics

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Hydrostatic Pressure Testing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-F951-431PHT007 **Specific Waste Type:** Oil

Date: 08-dec-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Mechanics

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Solder Lab **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-F961-83703007 **Specific Waste Type:** Lead

Date: 30-nov-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Soldering

Description: The solder laboratory provides metallurgical evaluations for soldering process characterizations and material solderability studies. There are many tests and evaluations including wetting balance testing, solder reflow characterizations, solder coverage evaluations, and flux comparisons. Production problems are brought to the attention of material engineering personnel. These persons then select the appropriate test(s) and evaluation(s). The workload can vary with production. The waste generated is often tin/lead or indium/lead solder alloy coated wires and printed wiring boards. The material is either returned to the person requesting the effort or placed in the recycle bins.

Options: Standardize use of copper strip size used for wetting balance testing. Smaller copper coupons will generate less total waste.Do not fill solder pot to brim.Do not leave solder pots to cycle in idle. Will reduce dross.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049

Email: wschlosberg@kcp.com	**Email:**

Title: Sikama Reflow Soldering **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-F993-855J105021 **Specific Waste Type:** Solvents

Date: 28-jun-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description: Electronic components are soldered to printed wiring boards, thick film networks or thin film networks using either 63-37 tin lead solder or 50-50 lead-indium solder alloy and rosin flux. The components are soldered by first applying a thin layer of flux to the substrate. A solder preform is applied to the joint area. The components are placed and solder flux diluted with isopropyl alcohol. The stack-up is then heated using the Sikama condition reflow machine. After solder reflow, the units are cleaned at the next assembly process.

Options: Discontinue process. Process is essential for limited number of products.Alternate materials. No other materials are technically acceptable and these materials are safest available.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** T. Joe Riehle
Phone: (816) 997-3673	**Phone:** (816) 997-7154
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: X-Ray Film Processing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-FPXR-435FILMPROCESS **Specific Waste Type:** Sanitary Sewer

Date: 15-apr-1993 **Major Activity Type:** Service **Specific Activity Type:** Photographic Services

Description: X-ray film processing involves the use of a Kodak X-OMAT automatic film processor and the various chemicals and films used in actual processing. The only time an operator may be exposed to the chemicals would be during mixing of the chemicals, repairing of equipment, or cleaning of the processor. All film processing is automatic, meaning that it is not hand processed but fed automatically through the processor. Daily cleaning of the processor is accomplished by rinsing and wiping the top rollers of each tank with a cloth wipe or sea sponge. A full cleaning is done by dismantling the roller racks, washing, reassembling and replacing the racks in the proper tanks.

Options: Install "wash water recycling system" on each film processor. This reduces the total usage of water by at least 60 to 70% of the present volume used.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Laser Trim **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-G231-71D038131 **Specific Waste Type:** Metal Debris

Date: 11-sep-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Laser Scribe and Break **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-G233-71D037124 **Specific Waste Type:** Inorganic Solid

Date: 28-feb-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Laser Machining **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-G234-71D035119 **Specific Waste Type:** Polymers

Date: 04-feb-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297

Email: wschlosberg@kcp.com	**Email:**

Title: Laser Stripping **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-G235-47LASER **Specific Waste Type:** Solvents

Date: 15-jun-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options: Use an eximer laser instead of the CO2 laser to eliminate solvent cleaning.Replace alcohol with d-limonene.Strip two tapes in one laser cycle.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Laser Strip with OH/He/CO2 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-G235-63D038007 **Specific Waste Type:** Paper

Date: 31-jul-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: CO2 Laser Welding **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-G241-92LASERWELD **Specific Waste Type:** Compressed Gas Cylinders

Date: 29-nov-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Welding

Description:

Options: Reduce weld sample requirements.Design weld samples for more use and minimize size.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Wet Deburr **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-G416-61D034020 **Specific Waste Type:** Printed Circuit Boards

Date: 30-apr-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options: Replace 1,1,1-trichloroethane solvent.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Wetblasting **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-G418-61C022014 **Specific Waste Type:** Printed Circuit Boards

Date: 05-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Abrasive Blasting **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-G421-92DRYBLAST **Specific Waste Type:** Metal Debris

Date: 10-jun-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options: Collect and reuse the blast media.Schedule work to have fewer usages.Eliminate need for blasting.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Urea Screening **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-G504-37SCREEN **Specific Waste Type:** Fertilizer

Date: 07-oct-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description:

Options: Use nonconforming urea for snow removal or fertilizer.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: RTV Extruding Application **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-G506-7RTV001 **Specific Waste Type:** Polymers

Date: 15-mar-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Curing

Description:

Options: Reuse tongue depressors.Reuse paper towels to catch excess RTV.Reuse toothpicks to puncture air bubbles.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Trevor Whitney
Phone: (816) 997-3673	**Phone:** (816) 997-5743
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Polyurethane Mixing and Curing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-G517-34MACHINEMIX **Specific Waste Type:** Polymers

Date: 31-mar-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Mixing

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: MDA - Desiccant Mixing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-G525-49MI-001 **Specific Waste Type:** Polymers

Date: 28-jun-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Curing

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: TDI-Based Polyurethane Foam **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-G528-340FOAM000 **Specific Waste Type:** Polymer

Date: 16-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description: The polyurethane foam process is used to encapsulate Firing Systems with 4, 6, or 14 pound density foam per 9927115. The process uses one Decker Industries foam dispenser (model DG-6SP). Calibration of the machine is done with a PC-based program written in DBase. At the start of a shoot, the operators dispense the R and T components into paper cups to determine the ratio. The critical process parameters are input into the program. The program then instructs the operator which parameters to adjust and how much. The minimum number of shots is three in a 5-25-5 second sequence. It may take as many as six or seven shots if the ratio of the R and T components is drastically out of range. The calibration session ends when the last shots are all within + or - one-half percent by weight of the target ratio. At the end of the calibration sequence, the R and T components are mixed and provide reacted process waste. After calibration, the machine head is assembled to shoot product. Production travelers specify a shot time for each cavity of the part. The times are determined from prior volume tests. After dispensing foam, the machine head is flushed using methylene chloride and subsequently torn down for another calibration.In addition to the calibration, foam samples are shot into paper cups for analyzing carbon, nitrogen and hydrogen balances for each

shoot session. The foam samples are cured in the same ovens as the product. After cure, a core sample is extracted from the cup and sent to the lab for analysis. Results are used to determine if the machine was in calibration when the product was actually shot.

Options: Switch flush agent from methylene chloride to d-limonene. This would eliminate methylene chloride; however, the flush would still contain the T-component and thus will be treated as a carcinogen.Reduce overshoot quantity dispensed. Switch from machine dispensed to hand mix for all product. This would reduce R and T quantities but would significantly increase flush quantity and dispensing equipment consumables.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Developmental Foam Resin Components **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-G528-340FOAM001 **Specific Waste Type:** Polymer

Date: 15-nov-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Molding

Description: At the start of a shoot, the operators dispense the R and T components into paper cups to determine their ratio. The critical machine parameters are input into the computer program. The program then instructs the operator which machine parameters to adjust and by how much. The sequence of shots is a function of the parameters when the shoot session starts. The minimum number of shots is three in a 5-25-5 second sequence.It may take as many as six or seven shots if the ratio of the R and T components is drastically out of range.T he calibration session ends when the last shots are all within +/1 1/2% by weight of the target ratio. At the end of the calibration sequence, the dispensing R and T components are mixed to provide reacted process waste. After calibration, the machine head is assembled to shoot product. Development travelers specify a shot time for each cavity of the mold. After dispensing foam, the machine head is flushed using DBE (dibasic ester) and subsequently torn down for verification. If the ratio and the weight requirements meet the calibration criteria, the machine can be considered calibrated and used for a subsequent shot within one hour. After verification, the machine ports are removed and the machine is prepared for standby. In addition to the calibration, foam samples are shot into paper cups for analyzing carbon, nitrogen, and hydrogen balances. The foam samples are cured in the same ovens as the product. After cure, a core sample is extracted from the cup and sent to the laboratory for analysis. Results are used to determine if the foam was on ratio when the product was actually shot.

Options: Develop hand mix processes. Requires reformulation of the catalyst in the R and T components. Would eliminate 90% of the contents of waste streams 4 and 5.Improve machine repeatability performance to reduce calibration waste shots. Requires machine head retrofit. Machine currently under another departmentÕs control.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Foam Mix Head Cleaning w/TCA **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-G528-58C027001 **Specific Waste Type:** Solvents

Date: 16-oct-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Monomeric TDI Polyurethane **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-G528-58F070002 **Specific Waste Type:** Polymers

Date: 31-mar-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description: Electronic assemblies are encapsulated for shock and vibration protection. Foam components ("R" and "T") are stored, metered and mixed by an automated foam encapsulation machine which has been in use since October 1989. Polyurethane foam contains a hazardous component, toluene diisocyanate (TDI), a respiratory irritant, requiring the use of HVAC equipment to protect operators from harmful vapor. Properly mixed and cured foam (62% T and 38% R) is a nonhazardous material.

Options: Make R and T components separate part numbers.Recycle and re-treat calibration foam instead of mixing it up.Use less foam for calibration.Shoot a smaller sample cup.Reduce the number of waste shots shot, before shooting production parts.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: TDI Polyurethane Machine Mix **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-G528-77F070001 **Specific Waste Type:** Polymers

Date: 30-jun-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952

Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Pre-Expanding Polystyrene Beads **Major Waste Type:** Sanitary Waste

PPOA ID Code: KCP-G543-49PE011 **Specific Waste Type:** Polymers

Date: 15-aug-1995 **Major Activity Type:** Manufacturing **Specific Activity Type:** Packaging

Description: This assessment includes the pre-expansion, screening, and packaging of polystyrene beads for product acceptance. Expandable beads are injected into the Ôpre-expanderÕ in the 3 lb. loads. The pre-expander consists of a steam-jacketed chamber, control panel, and an intake and discharge system. The primary controls are steam pressure and cycle time.Once expanded, the beads are suctioned into a large separator to achieve size uniformity. Beads are discharged from the separator into barrels for further processing. During discharge, samples are collected into a graduated cylinder to determine bulk density. Beads with densities of 16-19 lb/cu. ft. meet product requirements. Low density beads are discarded. High density beads are recycled through the pre-expander to improve yield.

Options: One waste reduction option was to correlate equipment settings with density. However, bead pentane content, bead size, room temperature and humidity are uncontrollable factors that prohibits an accurate correlation. Several cycles must be performed to provide this information; which is not economically feasible at this time.Another option was to periodically maintain the separator to improve efficiency. This option will be investigated.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Charles B. McField
Phone: (816) 997-3673	**Phone:** 816-997-4227
Fax: (816) 997-4208	**Fax:** 816-997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Centrifuge **Major Waste Type:**

PPOA ID Code: KCP-G555-78L142021 **Specific Waste Type:** Miscellaneous

Date: 25-aug-1991 **Major Activity Type:** **Specific Activity Type:**

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Wire Cut and Strip Using Eubanks **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-G571-55M165065 **Specific Waste Type:** Lead

Date: 31-may-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description:

Options: Do not tin unused solder cups.Use different flux.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: MDA - Filament Winding **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-G575-49FW001 **Specific Waste Type:** Polymers

Date: 28-jun-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Curing

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Component Installation **Major Waste Type:**

PPOA ID Code: KCP-G626-53M159020 **Specific Waste Type:** Miscellaneous

Date: 13-nov-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:**

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297

Email: wschlosberg@kcp.com	**Email:**

Title: A-2 Adhesive **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-G641-92A2 **Specific Waste Type:** Polymers

Date: 11-sep-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Fiberglas Wrapping **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-G720-47WRAPPING **Specific Waste Type:** Glass

Date: 24-sep-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Curing

Description:

Options: Replace fiberglas tape with fabric.Use fiberglas preform.Use narrower width fiberglas fabric.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Epoxy Impregnation **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-G730-47IMPREGNATION **Specific Waste Type:** Polymers

Date: 15-jun-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description:

Options: Use a different epoxy resin system to replace the existing system.Use a reduced amount of the epoxy resin system.Use a different process method to impregnate each assembly.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Bonding/Curing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-G731-47BONDING **Specific Waste Type:** Polymers

Date: 15-jun-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description:

Options: Reduce the amount of excess epoxy materials used during the piece part bonding process.Use less hazardous epoxy materials.Reuse the input materials to the process.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: RTV Sealing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-G731-47SEAL **Specific Waste Type:** Polymers

Date: 05-nov-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description:

Options: Use a new sealant that requires less material.Incorporate integral seals into the wrap fixture.Reduce the amount of excess RTV.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Fine Leak Test with Helium **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-G810-78L146015 **Specific Waste Type:** Compressed Gas Cylinders

Date: 21-aug-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Inspection

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Leak Detection **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-G812-340LEAK000 **Specific Waste Type:** Compressed Gas Cylinders

Date: 15-apr-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Inspection

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** David Shepherd
Phone: (816) 997-3673	**Phone:** (816) 997-4993
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Gross Leak Testing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-G812-78L146007 **Specific Waste Type:** Solvents

Date: 03-oct-1991 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Mechanics

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Pind Test With Aqueous Wash **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-G820-78L147003 **Specific Waste Type:** Sanitary Sewer

Date: 06-nov-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Ink Jet Marking **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-G840-49IJ006 **Specific Waste Type:** Solvents

Date: 16-jul-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Ink Jet Printing Process **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-G840-69H096064 **Specific Waste Type:** Solvents

Date: 19-jan-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Printing

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952

Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Laser Marking and Permanency **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-G850-78H093018 **Specific Waste Type:** Solvents

Date: 27-nov-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Marking **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-G850-92MARKING **Specific Waste Type:** Solvents

Date: 16-aug-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description:

Options: Eliminate need for marking by other than laser.Procure electrochemical materials in smaller packages.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Laminate **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-G920-47LAMINATE **Specific Waste Type:** Printed Circuit Boards

Date: 24-oct-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Molding

Description:

Options: Reuse Teflon/fiberglass cloth and wiping cloths.Cut polyimide/adhesive coverlay closer to finished dimensions.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Gage Lubrication **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-GLUB-434INSP **Specific Waste Type:** Grease

Date: 22-mar-1993 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Equipment

Description: Inspection is required to perform maintenance on all gages assigned to their department of responsibility. To ensure accuracy, efficiency, and longevity of gages, a light film of oil is required to be placed on the surfaces and moving parts of each gage. This process involves applying a small amount of Starrett M-1 All Purpose Lubricant, 6530929-00-800, on all surfaces and all moving parts and wiping off any excess with a disposable wipe. The used wipe is then disposed of in an approved waste container.

Options: Change to WD-40 aerosol instead of Starrett M-1Oil.Bag and seal gages in high humidity areas; this will reduce the need to lubricate with oil.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Stripping Tin-Lead **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-H140-61D031006 **Specific Waste Type:** Acid

Date: 31-may-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description:

Options: Replace stripper with one that does not contain thiourea.Evaluate tin-only electroplating and use direct reflow of the tin-lead.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Copper Electroplating **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-H140-61J126005 **Specific Waste Type:** Acid

Date: 31-mar-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description:

Options: Automatically add organic additive to bath.Evaluate make-up rate of acid soak cleaner (PC-4).Extend bath life of acid copper by reclaiming excess copper.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Tin-Lead Electroplating **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-H140-61K126007 **Specific Waste Type:** Acid

Date: 31-aug-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description:

Options: Use tin-only electroplating to eliminate use of lead.Reduce the size of the plating tank as the original volume is no longer necessary.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: T2 Gold Plating **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-H150-97DD080 **Specific Waste Type:** Acid

Date: 16-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description:

Options:

Site: Kansas City Plant	

Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Sulfamate Nickel Plating **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-H190-97BB030 **Specific Waste Type:** Acid

Date: 16-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Nickel Strike **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-H190-97BB050 **Specific Waste Type:** Acid

Date: 16-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Deoxidize **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-H260-61C028008 **Specific Waste Type:** Acid

Date: 31-aug-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Electroless Copper Plating **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-H420-61K127004 **Specific Waste Type:** Acid

Date: 31-may-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description:

Options: Reduce tank size.Extend solution life.Replace formaldehyde chemistry with direct deposit process.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Nickel Acetate Seal **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-H510-97LL050 **Specific Waste Type:** Acid

Date: 16-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Aluminum Anodize Dye **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-H510-97LL080 **Specific Waste Type:** Acid

Date: 16-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Sodium Bicarbonate Rinse **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-H510-97LL100 **Specific Waste Type:** Plating

Date: 16-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Sulfuric Acid Anodize **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-H530-97MM060 **Specific Waste Type:** Acid

Date: 16-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Hot Water Seal **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-H530-97MM080 **Specific Waste Type:** Acid

Date: 16-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Permanganate **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-H640-61D039002 **Specific Waste Type:** Oxidizers

Date: 20-sep-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description:

Options: Add conductivity meters to rinse tanks to reduce usage.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Brown Oxide **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-H640-61K135001 **Specific Waste Type:** Acid

Date: 09-aug-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description: This process is used to oxidize the copper surface prior to lamination. The oxide increases the surface areas of the copper, providing better mechanical bonding during lamination. Innerlayer panels are immersed in the chemicals and rinse waters which make up this process. The facility was built in 1986 and this plating installed in 1989. Tanks are ventilated to protect workers from harmful vapors. This process is operated according to process engineering specifications P1150364 and general process instructions P0850012.

Options: Reduction in new makeup frequency on four chemical tanks, Metex S-1707, sodium persulfate, sulfuric acid, and MaCu Bond based on square footage and chemical analysis.Water usage reduction by the addition of conductivity meters to rinse tanks.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: CC-Anodize **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-H650-83304 **Specific Waste Type:** Acid

Date: 14-sep-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description: Cleaned, etched parts are placed into the anodizing fixture. Attachment is made at one corner of the part. The fixture is used to submerge parts into the anodizing tank except for the attached corner. A shaped part would be entirely submerged in the tank with electrical connections made directly to the part. Conferral shaped cathodes are placed between (around) the parts. Separate electrical connections are made to the cathodes. Voltage is applied across the parts and the cathodes causing an oxide layer to form on the part. During this process the contents of the anodize bath are circulated to control heat buildup in the process. The anodize bath is prepared by diluting 100 mL of a 5 gm/L stock solution of ammonium tartrate to 100 L. Periodic additions of deionized water are made to control the electrical conductivity of the bath between 6.0 and 14.0 uS/cm. The bath is changed if the conductivity cannot be brought into specification or if quality of oxide layer on the part is suspect. After anodizing, the parts are rinsed thoroughly with deionized water from a spray hose. Rinse water drains into the A lab sump. Sump contents are periodically pumped out to barrels and sent to the IWPF for treatment.

Options: Reduce tank size to use only minimum possible deionized water. Makes temperature control of the tank more difficult with a very small potential for savings.Eliminate this process step. There is only a small potential for savings compared to the development effort required to determine the necessity of this step.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Black Oxide Coating **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-H650-97KK060 **Specific Waste Type:** Acid

Date: 16-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016

Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Copper Etch **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-H720-61D031009 **Specific Waste Type:** Acid

Date: 30-oct-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description:

Options: Replacing with new etch system.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Plasma **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-H722-61C024003 **Specific Waste Type:** Compressed Gas Cylinders

Date: 11-nov-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Thick Film Printing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-H780-71K132104 **Specific Waste Type:** Polymers

Date: 16-apr-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Printing

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Develop Solder Mask **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-H815-61E048011 **Specific Waste Type:** Printed Circuit Boards

Date: 30-nov-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description:

Options: Replenish developer solution.Recycle/filter waste water in department. Use thinner solder mask.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Develop Photoresist **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-H815-61E048022 **Specific Waste Type:** Printed Circuit Boards

Date: 31-jan-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description:

Options: Replenish developer solution.Treat water on-site.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Vacuum Sputtering **Major Waste Type:** Sanitary Waste

PPOA ID Code: KCP-H910-83704SPUT **Specific Waste Type:** Sanitary Sewer

Date: 24-nov-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Metallurgy

Description: Vacuum sputtering is a process by which solids (substrates) are coated with other solids (target) in high vacuum. The process involves removing material from the target by bombarding it with highly energetic gaseous ions which in turn knock out species from the target, and these are deposited on the substrate as well as on the inner walls of the vacuum chamber and associated fixtures. The vacuum system is an enclosed system, gases being discharged to the atmosphere by way of a vent pipe. Once the deposition procedure is completed, the vacuum chamber is opened by first backfilling it with gas to atmospheric pressure. In this case the vacuum chamber is backfilled with pure argon gas which is also used, in minute amounts, in the sputtering process as the source of the ionic species bombarding the target. In vacuum depositions most of the target material remains on the walls of the vacuum chamber and very little is taken out with the substrates. Every so often, depending on the usage, the deposited solids on the chamber walls and fixtures are chemically removed and recovered from the solution. Argon gas, liquid nitrogen, city water, target material, and vacuum pump oils are materials used in vacuum sputtering. The majority of the argon and the liquid nitrogen, discharged as a gas, are released to fugitive waste stream, while the water is released to sanitary sewer and the used vacuum pump oil sent to Waste Management.

Options: Save water by using a closed-loop water chiller. Reduction of water and liquid nitrogen.Equipment change required. Replace diffusion pump with a cryogenic pump.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Physical Vapor Deposition **Major Waste Type:** Sanitary Waste

PPOA ID Code: KCP-H910-83704VAPDP **Specific Waste Type:** Sanitary Sewer

Date: 31-mar-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Metallurgy

Description: Physical Vapor Deposition is a process by which solids (substrates) are coated with other solids (source) in high vacuum. The process involves removing material from the source by bombarding it with an electron beam or by resistive heating and injection of these energies which puts the source in a liquid state. These are two forms of energies that produce atoms from the source which are in a vapor state and are deposited on the substrates as well as on the inner walls of the vacuum chamber and associated fixtures. The vacuum system is an enclosed system, gases being discharged to the atmosphere by way of a vent pipe. When the deposition procedure is completed the vacuum chamber is brought to atmospheric pressure by backfilling with argon gas.In vacuum depositions most of the target material remains on the walls of the vacuum chamber and very little is taken out with the substrates. The deposited solids on the chamber walls and fixtures are chemically removed and recovered from the solution. The cleaning intervals are directly proportional to the deposition time.

Options: Save water by using a closed-loop water chiller. Reduction of water and liquid nitrogen.Equipment change required. Replace diffusion pump with a cryogenic pump.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Solder Inspection **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-INSL-432VISUAL **Specific Waste Type:** Lead

Date: 25-mar-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Inspection

Description: During the visual inspection of solder in accordance with 9913000, inspectors are required to verify adherence of solder splatter. The inspector uses a small amount of pressure-sensitive adhesive (4115755) on the end of a toothpick and lightly touches the solder splatter to check for adherence. If the solder splatter is removed, it is then discarded along with the adhesive in an approved waste container.

Options: Quit using Pressure Sensitive Adhesive (Dum-Dum) in inspection. Just reject the parts with solder splatter on them.Require manufacturing to clean parts better prior to inspection.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: IWPF System Treatment Process **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-IWPF-163SYST0000 **Specific Waste Type:** Sludge

Date: 15-may-1993 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Treatment

Description: Effluents from various processes throughout the KCP are pretreated at the IWPF prior to being discharged into the sanitary sewer. The IWPF carries out both batch and continuous pretreatment processes. In addition, the IWPF carries out laboratory functions required for day-to-day operations of the pretreatment facility. The effluent wastewater from the factory is either hard piped or brought to the IWPF in containers. In addition to treating process effluent wastewater, the IWPF treats run-off from the Waste Management Operators' lots and groundwater backwash water. In addition to the numerous batch streams, the IWPF treats five distinct types of streams. 1) acid, 2) caustic, 3) cyanides, 4) industrial waste, and 5) chrome. The IWPF has six storage tanks outside and four tanks inside that are used for accumulation of each type of wastewater. Inside the IWPF, the acid and caustic streams are mixed and the streams are reduced down to four; 1) industrial wastewater, 2) acid and caustic, 3) chrome and 4) cyanides. Each of the waste streams are treated individually and combined into tanks 17A and 17B, according to the pH level of the effluent. The pH of tank 17A is normally around neutral and the pH of tank 17B is adjusted to 11 and the combined streams are fed into tank 18. Flocculating polymer is added. The stream is fed into the separator where the sludge is removed. The effluent from the separator is further filtered in the sand filter and following pH adjustment to pH 9, the stream is discharged into the sanitary sewer. The sludge is filtered to remove the water and is dried using steam. The dry sludge is sent off-site for disposal and the water is returned to tank 17A.

Options: Sludge segregation.Sludge recycling.Minimize waste at the source.Segregate process water from non-process.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Aysun Guttridge
Phone: (816) 997-3673	**Phone:** (816) 997-3038
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Ultrasonic Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J105-83704EUS **Specific Waste Type:** Solvents

Date: 31-jul-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Cleaning

Description: This process is the cleaning of test coupons made from aluminum, copper and printed circuit board material.A solvent is placed in a 1000-mL beaker.This beaker is then suspended in the water of the ultrasonic bath.The ultrasonic generator is energized which sends ultrasonic waves through the water and the solvent.This process will clean the test coupons which are placed in the 1000-mL beaker.After the test coupons have spent time in the solvent, they are transferred to a second 1000 ml beaker which contains 2-propanol.After a period of time in the second beaker, the test coupons are transferred to a third 1000-mL beaker of 2-propanol for a final rinse.When the test coupons are removed from the final rinse, they are blown dry with plant dry nitrogen, placed in a clean petri dish and sent on to another process.

Options: Recycle sample coupons. Prepare both aluminum samples and solder samples so cleaning of both can take place at the same time.Recycle the 2-propanol.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Ultrasonic Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J110-340CLEAN008 **Specific Waste Type:** Solvents

Date: 11-apr-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: This process covers ultrasonic cleaning as described in PES P1251178. Parts are ultrasonically cleaned in a beaker of isopropyl alcohol (4601035) for 2 to 3 minutes followed by a repeat process in a fresh batch of alcohol. Parts are blown dry with dry nitrogen and vacuum baked to dry. A 1200-mL beaker filled with 800 to 1000 mL of alcohol is suspended in an ultrasonic cleaning tank filled with water. A custom-designed ultrasonic cleaning console is required and located in an explosion-proof environment because of the flammability of isopropyl alcohol. Operators wear latex gloves while preparing for and performing the process.Used solvent is poured into the flammable waste solvent container. The beakers are rinsed with clean alcohol prior to using. The alcohol used for cleaning is changed after every cleaning of parts with electrical contacts, or every third group of parts if electrical contacts are not involved.

Options: Do not change solvent as frequently. The frequency of change has been determined by experience and incorporates a safety margin to ensure cleanliness.Re-distill and reclaim solvent. This requires explosion-proof equipment. A still suitable for isopropyl alcohol is being procured for lab evaluation and will allow this option to be investigated.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Robert Heinen
Phone: (816) 997-3673	**Phone:** (816) 997-2434
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Ultrasonic Cleaning with TCA/OH **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J110-63C029001 **Specific Waste Type:** Solvents

Date: 31-jul-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Ultrasonic Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J110-67026 **Specific Waste Type:** Caustic

Date: 21-oct-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** T. Joe Riehle
Phone: (816) 997-3673	**Phone:** (816) 997-7154
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Ultrasonic Clean with TCE **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J110-69C029032 **Specific Waste Type:** Solvents

Date: 29-may-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options: Minimize wasted surface area of the ceramic boards.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297

Email: wschlosberg@kcp.com	**Email:**

Title: Clean for Metallization **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J110-71C025100 **Specific Waste Type:** Solvents

Date: 23-apr-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Two Stage Clean **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J110-92SOLVENT **Specific Waste Type:** Solvents

Date: 29-oct-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Final Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J110-93CLEAN **Specific Waste Type:** Solvents

Date: 25-feb-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options:

Site: Kansas City Plant	

Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Final Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J110-95CLEAN **Specific Waste Type:** Solvents

Date: 12-may-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Manual Clean With Alcohol **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J112-69C025012 **Specific Waste Type:** Solvents

Date: 31-jan-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options: Monitor material for shelf life expiration date.Use minimum mix for jobs.Replace RTV with UV adhesives.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Copper Lead Frame Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J112-73C028004 **Specific Waste Type:** Solvents

Date: 16-oct-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Aqueous Clean **Major Waste Type:** Sanitary Waste

PPOA ID Code: KCP-J120-92AQUEOUS0000 **Specific Waste Type:** Sanitary Sewer

Date: 31-mar-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Ultrasonic/Degrease **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J120-92DEGREASE000 **Specific Waste Type:** Solvents

Date: 31-mar-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Automated Cleaning With TCA **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J210-53C026002 **Specific Waste Type:** Solvent

Date: 18-dec-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Vapor Degreasing With TCA **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J210-54C025002 **Specific Waste Type:** Solvent

Date: 28-oct-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Vapor degreaser CE 74522 is used to deflux and clean electronic assemblies. The degreaser uses 4702766-00 solvent in its 8-gallon tank. Operators receive degreaser training before they may use the machine, and they receive annual refresher training from an ES&H trainer. During the process, vapor above boiling solvent rises and condenses on room temperature parts. The condensation of clean (distilled) solvent on parts rinses away flux residue (from 4705010-04). The solvent/flux mixture drips down into the boiler of the degreaser and the solvent again vaporizes and rises to condense on the parts. This action continues until the parts have reached the temperature of the solvent (165 degrees F), then condensation ceases and the parts must be cooled outside of the degreaser before cleaning can continue. Usually only one or two cleaning cycles of 3-5 minutes is required to deflux printed wire assemblies.

Options: Degrease with alternative solvent that can be recycled and is non-ozone depleting. The sought replacements have not yet been found, but if any appear they will come to the attention of Tom Hand or George Bohnert.Use nonactivated rosin flux. Rosin flux will not affect solder joints by way of corrosion during stockpile life. However, the weaker flux may do a poor enough job of oxidation removal to cause weakened solder joints or even non-wetting.Find a non-rosin flux, possibly something alcohol-soluble, so that CHC solvent can be eliminated. One option would be a shield gas like TIG welding or solder in a booth with oxygen displaced or laser soldering.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Vapor Degreasing with TCA **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J210-73C026001 **Specific Waste Type:** Solvents

Date: 17-aug-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Vapor Degreasing with Freon TF **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J210-78C026001 **Specific Waste Type:** Solvents

Date: 12-aug-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Degreasing is done in a Delta Sonic Ultrasonic degreaser. Solvent is Freon TF. Cleaning cycle is approximately 10 minutes. Batch sizes range from 5 to 100 parts. Machine is covered when not in use. Equipment is placed to minimize the air flow and a card is attached to the machine to record additions of solvent. This allows the quantity of chemical in the machine to be tracked.

Options: Affected input - Freon TF and all products. Eliminate Freon and use alcohol and DI water.Eliminate use of Freon and use more plasma gases (oxygen, nitrogen etc.)

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Vapor Degreasing with TCA **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J210-80C026001 **Specific Waste Type:** Solvents

Date: 20-aug-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Vapor Degreasing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J210-83704VD **Specific Waste Type:** Solvents

Date: 19-nov-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Cleaning

Description: Aluminum panels, copper panels and printed wiring boards are cleaned using a vapor degreasing process. These panels and boards are used in evaluations to test alternate cleaners and cleaning processes to replace CHCs and CFCs at the KCP.

Options: Recover TCA for recycling.Use alternate non-chlorinated solvent. Use water-based detergents.Clean more panels per operation.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Alcohol Dip Rinse **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J260-73C028003 **Specific Waste Type:** Solvents

Date: 18-aug-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options: Eliminate bubble leak testing.Purchase materials in larger container.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Stereolithography Part Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J260-7SLA002 **Specific Waste Type:** Polymers

Date: 02-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Curing

Description:

Options:

Site: Kansas City Plant	

Site Coordinator: William H. Schlosberg	**Team Leader:** Trevor Whitney
Phone: (816) 997-3673	**Phone:** (816) 997-5743
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Alcohol Dip Rinse **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J260-80C028003 **Specific Waste Type:** Solvents

Date: 23-dec-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options: Eliminate alcohol dip rinse when aqueous cleaning replaces it.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Network Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J265-73C028005 **Specific Waste Type:** Sanitary Sewer

Date: 17-jan-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: LCC Aqueous Pre-Tin Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J265-80C028005 **Specific Waste Type:** Acid

Date: 08-apr-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description:

Options: Change calibration frequency of system.Re-use solution after calibration thru storage.Use out-of-shelf life flux for solder pot.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: TCE Spray Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J310-340CLEAN000 **Specific Waste Type:** Solvent

Date: 12-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Spray Clean with TCE and IPA **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J310-340CLEAN001 **Specific Waste Type:** Solvent

Date: 31-mar-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Specification (SS306378), Cleaning and Handling of Firesets, has five different methods of cleaning for various fabrication stages and material types. The Pilot PWA was conducted on "Process B", which involves spray cleaning with trichloroethylene, rinsing with isopropyl alcohol, and a nitrogen blow dry. Trichloroethylene is used to clean rosin flux contamination (primarily) and other miscellaneous organics from electronic assemblies after soldering operations and before encapsulation. Specification 9913000 requires that solvent be applied to solder joints within one hour after the solder operation. The number of parts processed depends on the type of parts. Typically, piece parts are cleaned with TCE/IPA upon receipt into the department. Small piece parts, approximately 1/4 in.x 1/4 in., are cleaned approximately 10 pieces at a time in metal baskets. The quantity of parts cleaned per day is highly dependent on the production schedules. Assemblies can be as large as 13 inches in diameter and very complex in geometrical configuration. Assemblies are usually cleaned one part at a time. However, a part may be cleaned through process B multiple times. The number of cleaning cycles is not regulated.Parts are cleaned until they are visually acceptable. The 9913000 requires that up to 20% of the solder fillet area can have flux residue provided that this condition exists on no more than 20% of the total joints. There is no analytical method available for measuring the cleanliness of these complex geometries.

Options: Clean parts in a batch cleaning machine or self-contained system where solvent can be recycled and emissions will be reduced. (This activity would affect point source air emissions for TCE and IPA.) Find an environmentally safe substitute for TCE. This would eventually eliminate the use of TCE.Improve process controls by optimizing the process; reductions could be made in the amount of TCE and IPA entering the process and, therefore, reduce emissions. Redesign of the spray booth for TCE

would increase the amount of material going to waste management for recycling.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Freon Spray Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J310-340CLEAN002 **Specific Waste Type:** Solvent

Date: 16-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: This assessment was conducted on rinsing with trichlorotrifluoroethane (FREON) and blow drying with nitrogen. Specification 9913000 requires that solvent be applied to solder joints within one hour after the soldering operation followed by a rinse with a polar solvent, such as isopropyl alcohol (IPA). An additional cleaning step is used to obtain higher levels of cleanliness. The FREON spray cleaning step is used to remove the IPA residue. When the FREON evaporates, clean, dry assemblies are produced, These assemblies are free from solvent and waste residue.The number of assemblies processed at one time depends on the type of assembly. Typically, FREON is used ot clean assemblies prior to encapsulation; FREON is not used to claen incoming parts or used as an in-process cleaner. As a result, assemblies are normally cleaned one at a time. The quantity of assemblies cleaned per day is highly dependent upon the production schedules. These assemblies are free from solvent and water residue.The solvent is sprayed using a DeVilbiss Model TGA-515 suction feed spray gun. The spray gun is adjusted for flow rates ranging from 100 to 300 ml/min. This is a bleeder-type spray gun which means that there is no built-in air valve. Air passes from the air cap continuously to prevent pressure buildup in the air line. Material is siphoned from the solvent reservoir into the spray gun. Atomization occurs outside the air cap. This method of external mixing permits greater control over the amount of atomization. The air line pressure for suction is approximately 50 psig. The standard spray booth is approximately 3'Wx3'Hx2'D. The spray booth has a pneumatically-controlled drain system. A Plexiglas shield partially covers the opening of the spray booth, leavi ng an area of approximately 3'Wx2'H open to the room. The corresponding face velocity of the spray booth is approximately 145 ft/min. Solvent and plant nitrogen are dispensed through the spray gun into the spray booth.

Options: Spray clean in a contained or enclosed system.Spray clean using airless spraying.Install a stack containment device.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Freon (DE-35) Spray Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J310-340CLEAN003 **Specific Waste Type:** Solvent

Date: 06-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Performed in a spray booth. This process is used on components and assemblies that contain or are associated with polyurethane foam, which is affected by other solvents. Parts are sprayed with cleaner, avoiding direct spraying of polyurethane foam, and then immediately blow dried with dry nitrogen. After dry nitrogen operation, parts are stored in covered containers until next operation.

Options: Source elimination by substituting a different cleaning agent (isopropol alcohol).Source elimination by substituting a new cleaning agent (d-Limonene). Alternate cleaning methods. Clean parts in batch cleaning machine or self-contained system where solvent can be recycled and emissions will be reduced.Improve process controls. By optimizing the process, reductions could be made in the amount of DE-35 entering the process.Alter spray booths. Redesign of the spray booth for DE-35 would increase the amount of material going to Waste Management for recycling.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Isopropyl Alcohol Spray Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J310-340CLEAN005 **Specific Waste Type:** Solvent

Date: 15-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: This assessment was conducted on rinsing with isopropyl alcohol (IPA) and blow drying with nitrogen. Specification requires that solvent be applied to solder joints within one hour after the soldering operation. It also requires that if a nonpolar solvent (TCE or d-limonene) is used for this post-solder cleaning, that solvent must be rinsed with a polar solvent (IPA). The primary use of IPA then is to rinse the nonpolar solvents from the cleaned parts.Assemblies are usually cleaned one part at a time. However, due to requirements, a part may be cleaned multiple times. Parts are cleaned until they are visually acceptable. There is no analytical method available for measuring the cleanliness of these complex geometries. The solvent is sprayed using a DeVilbill Model TGA-515 suction feed spray gun. The spray gun is adjusted for flow rates ranging from 100 to 300 ml/min. The spray booth has an area of approximately 3'Wx1'H open to the room and a corresponding face velocity of approximately 410 ft/min. This value depends on the size of the opening of the booth. Solvent and plant nitrogen are dispensed through the spray gun into the spray booth. The spray booths for IPA are specially designed for flammable solvents.

Options: Install/improve drain systems on spray booths.Spray clean in a contained or enclosed system.Spray clean using airless spraying.Install a stack containment device.Order solvent in 5-gallon cans instead of 1-gallon bottles. This option is not being considered due to the increased employee safety hazards and spray booth modifications that would result.Reuse/recycle glass bottles and cardboard containers.Eliminate minimum spray time requirements. Spray clean at lower spray pressures. This option is not being considered. Longer spray times would be necessary, and more solvent would be used due to the lower spray pressure. The flow rate is not dependent upon the spray pressure.Incorporate batch cleaning techniques.Use aqueous-based or no-clean soldering fluxes. This option is not being considered. The team is doubtful that these solder fluxes will be used to build firing sets.Use immersion cleaning rather than spray cleaning. This option is not being considered. This type of cleaning has not proven effective compared to spray cleaning.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: d-Limonene Spray Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J310-340CLEAN007 **Specific Waste Type:** Solvent

Date: 16-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: This assessment was conducted on Process A and Process B which involves spray cleaning with d-limonene, rinsing with isopropyl alcohol (IPA), and blow drying with nitrogen. The primary focus of this assessment was on d-limonene. d-Limonene is an environmentally safe cleaning solvent that is used in place of trichloroethylene. It is used primarily to clean rosin flux contamination and other miscellaneous organics from electronic assemblies after soldering operations and before encapsulation. The quantity of parts cleaned per day is highly dependent upon the production schedules. Assemblies are usually cleaned one part at a time. However, due to requirements, a part may be cleaned multiple times. Parts are cleaned until they are visually acceptable. There is no analytical method available for measuring the cleanliness of these complex geometries. Each solvent is sprayed using a DeVilbiss Model TGA-515 suction feed spray gun. The spray gun is adjusted for flow rates ranging from 100 to 300 mL/min. The face velocity of the spray booth openings ranges from 300 to 500 ft/min. This value depends on the size of the opening of the booth. The face velocity of the d-limonene spray booth is approximately 310 ft/min. Solvent and plant nitrogen are dispensed through the spray gun into the spray booth. The spray booths for d-limonene and IPA are specially designed for flammable solvents.

Options: Improve drain systems on spray booths. Spray clean in a contained or enclosed system.Spray clean using airless spraying.Install a stack containment device.Order solvent in 5-gallon cans instead of in 1-gallon bottles.T his option is not being considered due to the increased employee safety hazards and spray booth modifications that would result.Eliminate minimum spray time requirements. Spray clean at lower spray pressures. This option is not being considered. Longer spray times would be necessary and more solvent would be used due to the lower spray pressure. The flow rate is not dependent upon the spray pressure.Incorporate batch cleaning techniques. Use aqueous-based or no-clean soldering fluxes. This option is not being considered. The team is doubtful that these solder fluxes will be used to build firing sets.Use immersion cleaning rather than spray cleaning. This option is not being considered. This type of cleaning has not proven effective compared to spray cleaning.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Spray Cleaning with IPA **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J310-50CLEANSPRA1 **Specific Waste Type:** Solvents

Date: 01-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Spray cleaning with alcohol (4601030) is performed to remove substances from the exterior of returned product or to clean electrical connectors in accordance with the General Reprocessing Specification 9926046. The solvent is used directly from a one-gallon glass bottle placed in the mount that is part of the exhaust hood (050-002). The switch/timer controlling the exhaust fan and the dry nitrogen line pressure is turned on just prior to starting the spray cleaning process. The drain valves are set to allow any excess solvent to drain out of the catch basin and into a waste can under the hood. Viton gloves (59206116 or 59206119) are worn while spray cleaning the parts. Parts are sprayed with a wide-flushing pattern at 30 to 80 psig. The parts are sprayed with short bursts of spray until the foreign material is removed. The part is then wiped with paper wipes (99010930) and blown dry with nitrogen.T he work is performed by Modification and Conversion Operators. No certification or special training is required.

Options: Eliminate isopropyl alcohol for spray cleaning of parts and connectors. Major problem: we are eliminating TCE, and alcohol is the only alternate for cleaning connectors per 9926046.Substitute other cleaning agents for isopropyl alcohol. Probably difficult to find a material as compatible and effective. Cleaning specialists can be consulted on case-by-case basis for each product.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Edward Hitchcock

Phone: (816) 997-3673	**Phone:** (816) 997-3128
Fax: (816) 997-4208	**Fax:** (816) 997-3112
Email: wschlosberg@kcp.com	**Email:**

Title: Spray Clean with TCE **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J310-50CLEANSPRA2 **Specific Waste Type:** Solvents

Date: 31-jul-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Turn on switch/timer to exhaust fan and dry nitrogen gas (4543001) line in spray booth. Make sure drain control valves on spray booth are pointing down when spray cleaning with trichloroethylene (4615002). Put on black viton gloves (59206117 or 59206118). Place part into spray booth and lower splatter shield. Spray clean part using spray gun that is fed from trichloroethylene bottle. Clean part until foreign material is removed. Wipe part dry using paper wipes (99010930).

Options: Eliminate TCE usage in the spray cleaning operation and replace it with another solvent that is not harmful to the environment (d-limonene alcohol).Replace the TCE spray cleaning process with another method of cleaning.(Example - aqueous cleaning process.)

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Edward Hitchcock
Phone: (816) 997-3673	**Phone:** (816) 997-3128
Fax: (816) 997-4208	**Fax:** (816) 997-3112
Email: wschlosberg@kcp.com	**Email:**

Title: Manual Cleaning With TCA **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J310-53C025003 **Specific Waste Type:** Solvent

Date: 08-jan-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Manual Cleaning With IPA **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J310-53C025004 **Specific Waste Type:** Solvent

Date: 19-dec-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Manual Cleaning - TCA/IPA **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J310-54C027001 **Specific Waste Type:** Solvents

Date: 30-aug-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Manual cleaning requires applying solvent (4611006D-01) to finished solder joints with an acid brush (13800306) or applying solvent to housings to remove soils with a wipe cloth (99010930) in a scrubbing motion to loosen and dissolve flux residue (4705010-04). Next a spray cleaning with isopropyl alcohol (4661031-02) is used to remove any ionic chlorine left by the solvent. Spray booth #50244 is used per 9706011 for the alcohol spray. Finally the spray booth nitrogen supply is used to blow dry the boards so that liquid is not carried out of the booth. During brush cleaning, solvent is lost to evaporation. During spray cleaning, solvent and alcohol travel up the vent hood as well as into a collection can.

Options: Find alternative to 1-1-1-trichloroethane so that use of a spray booth is unnecessary and cleaning waste is environmentally safe.Follow solvent with brushed-on alcohol instead of sprayed on - the spray booth uses a lot of alcohol and 88% goes out through the vent stack.Modify/improve solvent handling procedures within the cleaner/still system to reduce evaporative losses as much as possible.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Spray Cleaning Operations **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J310-55C027005 **Specific Waste Type:** Solvents

Date: 15-nov-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The TCE spray clean process is used to remove flux residues from recently soldered electrical assemblies. These assemblies are hand-carried to a nonflammable spray booth and loaded into the enclosure through the openings provided for the operator's hands. The valve on the solvent catch can is opened and the spray cleaning is begun. A hand-held spray gun hooked to the plant's nitrogen line provides the needed venturi effect for the application of the solvent. The solvent's chemical reaction with the residues and the physical force exerted by the moving fluid are sufficient to remove the unwanted materials. Large

amounts of the solvent are liberated into the outside atmosphere through the spray booth's exhaust system. The remaining TCE and flux residues are channeled into a catch can located beneath the spray booth. Upon removal of all residues from the assembly, the operator applies a nitrogen blast, again using the spray gun, sufficient to evaporate any solvent remaining on the part. The valve on the catch can is then closed, the assembly removed, and the operation is complete.

Options: Alternate solvent, input material changed, same waste streams will exist, all department product is affected Alternate flux, solvent (input material) will change, same waste streams will exist, all product is affected.Operation move, no change in materials, percentage of solvent falling into catch can should increase, all product involved.Operation enclosure, percentage of solvent falling into catch can should increase, all product involved.Operation enclosure cone, percentage of solvent falling into catch can should increase, all product involved. Spray gun alter, solvent required should decrease, larger percentage will be exhausted, all product involved. Capture of material by chilling, percentage of material captured for recycling should increase, all product involved. Capture of material by pressurization, percentage of material captured for recycling should increase, all product involved. Capture of material by carbon bed, percentage of material exhausted to outside should decrease, new waste stream will be created to dispose of used carbon bed, all product involved.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Spray Cleaning with TCE and IPA **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J310-63C029002 **Specific Waste Type:** Solvents

Date: 22-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The trichloroethylene (TCE) and alcohol (IPA) spray cleaning process is used to remove flux residues from soldered electrical assemblies. The assemblies are carried to the flammable spray booth for cleaning. The valve on the solvent disposal can is open and the trichloroethylene spray is begun. A hand-held spray gun hooked to the plant's nitrogen line provides the needed venturi effect for the application of the solvent. The solvent chemical reaction with the residues and the physical force produced by the moving fluid are sufficient to remove the flux residues. This chlorinated solvent is followed by a cleaning with isopropyl alcohol. The part is blow dried with nitrogen to evaporate any solvent remaining on the part. The valve on the disposal can is closed and the assembly removed.

Options: Replace present flux with material that requires no cleaning.Alternate solvent, input material will change but waste stream will still exist. All soldered product affected.Redesign the spray booth to direct more solvent into the storage container.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Alcohol Spray Clean **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J310-65C027010 **Specific Waste Type:** Solvents

Date: 30-jun-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Alcohol spray clean is a process used to remove foreign cable assemblies. These assemblies are carried to a flammable spray booth and loaded into the enclosure through openings provided for the operatorsÕ hands. The valve on the catch can is opened and the parts are spray cleaned. Alcohol and pressurized nitrogen are controlled by the spray gun. An aspirator in the spray gun causes nitrogen to dispense/spray alcohol when the trigger is operated. The alcohol spray flushes any foreign material from the assembly as well as any hand oils that may be present.

Options: Change alcohol size code - change the isopropyl alcohol size code from -603 (4-liter jug) to -511 (55-gallon drum). This would change the cost per gallon from $17.36 to $3.45 and annually save $331 in overhead operating charges. This would allow other alcohol-using departments the same opportunity to significantly reduce their overhead charges. Note: The department is considered a minimal user of alcohol compared to other departments.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Spray Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J310-67004 **Specific Waste Type:** Solvents

Date: 08-oct-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The spray cleaning process is performed on the antenna for final clean up. Operation 130 instructs the operator to spray clean the assembly using isopropyl alcohol (4601031) at 80 psi maximum to remove loose foreign material then blow dry with nitrogen. This operation requires the spray to be directed at the product from varying angles until, in the opinion of the operator, the product is clean. This process is performed in a hood which has an air flow of 380 fpm. The spray gun is a DeVilbiss TGA-515 with nozzle #92.

Options: Blow parts off with nitrogen only .Because of the small size of the RRV particles and static electricity, this option will not clean the antennas properly.Hand clean with alcohol and a brush in place of spraying. This option actually used more alcohol than spraying.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** T. Joe Riehle
Phone: (816) 997-3673	**Phone:** (816) 997-7154
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Spray Clean With Alcohol **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J310-69C027010 **Specific Waste Type:** Solvents

Date: 31-jan-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The isopropyl alcohol (IPA) spray cleaning process is used to remove contaminants from electrical and mechanical assemblies. Contaminants often observed are oils, greases, mold releases, fingerprints, plasticizers, and solder flux.

Spray cleaning with IPA is also used to remove solvent residues such as trichloroethylene. Operators carry the contaminated assemblies over to the flammable spray booth. (NOTE: The department currently has two of these booths for IPA spray.) The selector valve for the waste can is moved to the open position and spray cleaning begins. A wide sweeping atomized spray of IPA is applied to the parts to remove contaminants and solvent residues. The part is then dried with nitrogen to evaporate any solvent remaining on the part and the selector valve is closed. Most of the solvent is ventilated into the outside atmosphere through the flammable exhaust hood. Some alcohol is retained on the parts and evaporates into the room while the remaining IPA and any residues are channeled into the flammable satellite waste can located beneath the spray booth.

Options: Spray booth modification. The amount of IPA used will be unaffected, but more alcohol will be channeled into the waste can and can be recycled by waste management.Vapor degreasing. Evaluations will be required to ensure this process is acceptable. Less IPA will be required, but heated, the IPA raises many concerns about safety and fire protection.Solid solvent stream. Evaluations will be required to ensure this process is acceptable. More IPA will be used but more of it will be channeled into the waste can for recycling.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Spray Clean With TCE **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J310-69C027033 **Specific Waste Type:** Solvents

Date: 28-feb-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The trichloroethylene (TCE) spray cleaning process is used to remove contaminants from electrical and mechanical assemblies. Contaminants often observed are oils, greases, mold releases, fingerprints, plasticizers, and solder flux. Operators carry the contaminated assemblies over to the flammable spray booth. The selector valve for the waste can is moved to the open position and spray cleaning begins. A wide sweeping atomized spray of TCE is applied to the parts to remove any contaminants. The part is then dried with nitrogen to evaporate any solvent remaining on the part and the selector valve is closed. Most of the solvent is ventilated into the outside atmosphere through the flammable exhaust hood. Some trichloroethylene is retained on parts and evaporates into the room while the remaining TCE and any residues are channeled into the flammable satellite waste can located beneath the spray booth. NOTE: Normally there are two spray booths for trichloroethylene, but one is currently being used for d-limonene evaluations.

Options: Spray booth modification. The amount of TCE used will be unaffected, but more trichloroethylene will be channeled into the waste can and can be recycled by waste management.Replace TEC with a non-halogenated solvent. Evaluations are under way to study the cleaning ability and compatibility of d-limonene. Trichloroethylene usage will be eliminated by July 1993.Solid solvent stream. Evaluations will be required to ensure this process is acceptable. More TCE will be used but more of it will be channeled into the waste can for recycling.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Thick Film Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J310-71C025101 **Specific Waste Type:** Solvents

Date: 20-aug-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description: Thick film networks are hand sprayed with trichloroethylene (MS4615002) followed by isopropyl alcohol (MS4601031), both at ambient temperature. The thick film networks are subsequently blown dry with plant nitrogen.

Options: Replace trichloroethylene with detergent solution. The trichloroethylene waste stream will be eliminated.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Strip Dry Film Photoresist **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J310-71C025102 **Specific Waste Type:** Printed Circuit Boards

Date: 10-jan-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Printing

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Dry Film Photoresist Developing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J310-71C048103 **Specific Waste Type:** Polymers

Date: 30-jun-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297

Email: wschlosberg@kcp.com	**Email:**

Title: Strip Liquid Photoresist **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J310-71E025106 **Specific Waste Type:** Printed Circuit Boards

Date: 26-jul-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Develop Liquid Photoresist **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J310-71E048112 **Specific Waste Type:** Printed Circuit Boards

Date: 26-jul-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Airless Spray Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J310-83704SPRAY **Specific Waste Type:** Solvents

Date: 29-nov-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Cleaning

Description: This process involves the cleaning of test coupons made from aluminum and copper and printed circuit board material. The solvent is placed in a pressure vessel which is then sealed and pressurized with plant nitrogen. The solvent is then sprayed using only the pressure on the solvent which causes a solid or non-aspirated stream to exit from the spray gun onto the test coupon. The test coupons have been contaminated with rosin flux and 14 general contaminants prior to the spray cleaning operation. After the solvent has been sprayed onto the test coupons, the solvent is spray rinsed with a non-aspirated spray of 2-propanol and blow dried with plant dry nitrogen and placed in a clean petri dish. The coupons are then sent on to another

process.

Options: Recycle test coupons. Prepare all samples at the same time to cut down on the amount of solvent used during the cleaning cycle.Recycle the 2-propanol.Recycle the d-Limonene.Recycle the trichloroethylene.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Spray Cleaning (TCE/IPA) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J310-855C027001 **Specific Waste Type:** Solvents

Date: 01-oct-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Connect liquid pickup tube from spray gun to one-gallon trichloroethylene, 4615002, container. Connect liquid pickup tube from second spray gun to one-gallon isopropyl alcohol, 4601031, container. Set dry nitrogen, 4543001, pressure regulators to 40 psig. Activate exhaust system and nitrogen supply to spray guns. Place product in spray booth. Direct trichloroethylene solvent spray at product from varying angles until flux, 4705010 or 4705000 residue has been removed. Direct isopropyl alcohol spray at product from varying angles to remove ionic residue. Blow dry with dry nitrogen.

Options: Consider using biodegradable d-limonene solvent made from citrus products. May be used in conjunction with options 4 and 5.Develop, purchase and implement process equipment that restricts solvent loss by reuse and containment.Purchase a conveyorized commercial cleaning system and use where possible. This option cannot be used for all products. Preliminary tests indicate type R flux encapsulation of active electrical circuits, digital and RF, has no measurable effect on circuit performance. Additional studies are needed.Use both a new solvent, d-limonene, in place of TCE and a closed-cleaning system.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** T. Joe Riehle
Phone: (816) 997-3673	**Phone:** (816) 997-7154
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Automated Vapor Degreasing with TCA **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J330-53C027001 **Specific Waste Type:** Solvent

Date: 04-dec-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The manufacture of printed wiring assemblies (PWAs) always involves at least one soldering operation. Current soldering techniques require the use of solder flux, a mixture of organic rosin and acetic rosin activators. Removal of the flux after soldering is absolutely essential for the long-term reliability of the products manufactured. This automated vapor degreaser was implemented as the primary means of flux removal. PWAs are carried on a conveyor belt into a vapor envelope of a 1,1,1-trichlorethane (TCA) based solvent. The vapor envelope is created by continuously boiling solvent (liquid) below. While in the machine the assemblies are flooded with hot liquid solvent by spray nozzles in two separate regions of the machine. The conveyor belt then raises the assembly out of the vapor zone and delivers it to an exit door where it is picked up by the operator. The vapors are contained within the system by a series of cooling coils which thermodynamically force condensation below the

machine openings. The condensate is collected in a drip-pan below the coils and flows (gravity) back into the liquid sump. No venting is required or desired. Adjacent to the machine is a still which removes the flux from the solvent and returns clean solvent (liquid) to the cleaner sump.

Options: Modify solvent holding procedure within the cleaning system to reduce evaporative loss.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Cleanliness Testing (IPA/DI H2O) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J340-53L151019 **Specific Waste Type:** Solvent

Date: 18-dec-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Cleanliness testing is the process of immersing a printed wiring assembly (PWA) gage board into an agitated solution of 75% isopropyl alcohol and 25% DI water. The ionic contamination present on the PWA is dissolved into the alcohol/water solution. The contamination dissolved into the mixture changes the resistivity of the solution. Sensors on the omega-meter measure the change in resistivity and calculate an sodium equivalence. Cleanliness testing is performed on an Kenco Omega Meter.

Options: Look into methods to seal system and make it "airtight".

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Chemical Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J356-61C027012 **Specific Waste Type:** Acid

Date: 14-oct-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options: Add water conductivity meters.Shut off equipment when not in use.Pursue alternative chemistries.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297

Email: wschlosberg@kcp.com	**Email:**

Title: Final Clean **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J357-61C027019 **Specific Waste Type:** Sanitary Sewer

Date: 31-mar-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options: Evaluate cleaning with heated DI/RO water only.Procure computer control package.Reduce evaporation by shutting off equipment when not in use.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Steel Cleaner **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J360-97CC010 **Specific Waste Type:** Acid

Date: 31-mar-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description: The process consists of an electrolytic steel cleaner tank and an associated water rinse tank, both part of a plating facility completed about1985. All equipment is in good operational condition. The process is used to remove oils and dirt from steel alloy parts prior to acid cleaning and plating. The process consists of an electrolytic steel cleaner tank and an associated water rinse tank, both part of a plating facility completed in about 1985. All equipment is in good operating condition. The process is used to remove oils and dirt from steel alloy parts prior to acid cleaning and subsequent plating operations.

Options: Use DI water to eliminate buildup of many insoluble salts.Use a spray fog rinse to reduce drag-out.Remove insolubles, analyze, readjust (batch treatment). Reduce or eliminate offsite air releases with an exhaust scrubber.Change materials altogether to reduce both types and quantities of components.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Inhibited Alkaline Al Cleaner **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J360-97MM010 **Specific Waste Type:** Caustic

Date: 16-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The process consists of cleaning parts to remove oil and dirt by soaking in a hot alkaline cleaner. The cleaner is a solution of Aldet cleaning compound and deionized water. The tank is maintained at 138 degrees F and has a working volume of 3170 liters. Solution concentration is controlled by PES 1256016. In association with the cleaning tank there is a dedicated rinse tank with a capacity of 2213 liters. Water flow in the rinse tank is controlled via a conductivity meter. Conductivity of the rinse water is maintained at 700 umhos/cm.

Options: Modify exhaust system to prevent/reduce/trap intake of cleaning solution when parts are drained and transferred to rinse tank.Drain parts more thoroughly to prevent solution intake into exhaust.Use balls atop the cleaning solution to reduce evaporation losses.Improve rinse system by replacing existing tank with a cascade series or install spray system atop process tank to pre-rinse parts as they leave to reduce rinse water usage.Install scrubber/demister on exhaust to eliminate material released offsite.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Plasma Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J375-340CLEAN009 **Specific Waste Type:** Compressed Gas Cylinders

Date: 11-apr-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The plasma cleaning process uses the following plasma machines: Branson/IPC P2100MFC, Branson/IPC L2101/3, and Branson/IPC L2101/3. All of the machines are capable of using the following gases: argon, dry air, and oxygen. The plasma machines all use the same basic process but the power and pressures used may vary. Parts are processed per SS382685 or SS386989. Gas choice is determined by the contamination on the part. For example, oxygen or dry air are used to clean parts with an organic contaminant. Previous studies have determined optimal gas choice.To perform the plasma process, the vacuum pump is first turned on. The gas bottles are checked to ensure that there is sufficient gas supply. Main RF power is turned on; a ready light will signal when the unit is ready to operate. The operator next loads the parts to be cleaned onto its fixturing and the fixture is placed inside the plasma chamber. The chamber door is closed and latched. Process time is selected. The process can be run in either a manual or automatic mode. Most use the automatic mode. In either mode, a vacuum is pulled inside the chamber, bringing the pressure to about 0.2 torr. The operator or program next introduces the gas to the chamber; pressure will rise to 0.8 torr. The RF power is switched on, striking the plasma. In either mode, the impedance of the chamber will be matched with that of the generatorÕs output automatically. There will usually be a visible glow inside the chamber when the impedance is matched and the plasma is struck, except with oxygen. Once the cycle is completed the RF power is turned off, the gas flow is stopped, the vacuum is purged back to atmospheric and the parts are removed for the next process. This process uses a non-forced vent which is not assigned a stack number.

Options: Increase power and run plasma for shorter time; using less gas. Process will be too aggressive.Use more aggressive gas and lower the process time. Process will be too aggressive and may attack part.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Robert Heinen
Phone: (816) 997-3673	**Phone:** (816) 997-2434
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Plasma Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J375-49PC010 **Specific Waste Type:** Compressed Gas Cylinders

Date: 21-aug-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options: Reduce flow rate of gases.Batch process multiple parts.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Plasma Treat **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J375-58C024016 **Specific Waste Type:** Compressed Gas Cylinders

Date: 21-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options: Decrease treatment time.Use different plasma gas.Decrease plasma time and increase RF level.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Plasma Treat **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J375-59C024022 **Specific Waste Type:** Polymers

Date: 27-sep-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options: Use batch vacuum lamination.Use thinner solder mask.Use panel-width dry film.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952

Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Plasma Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J375-67027 **Specific Waste Type:** Compressed Gas Cylinders

Date: 03-sep-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: For this process, the operator uses Branson/1PC Series 7000 cleaner with argon (4503000) and oxygen (4544001) gas. The operator loads the parts to be cleaned onto shelves in the reaction chamber, closes the door and turns on the vacuum. After the chamber pressure has fallen to below 0.1 torr, the operator switches on the argon gas flow switch and adjusts the associated needle valve for a pressure reading of 0.4 torr. Then the operator switches on the oxygen gas flow switch and adjusts the associated needle valve for a pressure of 0.1 torr, a total pressure in the chamber of 0.5 torr. After the pressure is set, the operator switches on the RF power and adjusts to a 400-watt output. The process will run for 60 minutes, then the operator shuts it down. During this time a glow should be clearly visible in the reactor window. This process is described in GPI P0860113. NOTE: This system's exhaust was tied into an existing vacuum pump exhaust.

Options: Reduce gas flow.Change gas types or use oxygen only.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** T. Joe Riehle
Phone: (816) 997-3673	**Phone:** (816) 997-7154
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Plasma Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J375-73C024009 **Specific Waste Type:** Compressed Gas Cylinders

Date: 01-dec-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The plasma cleaning process uses a Branson/IPC 2000 barrel plasma cleaner. The machine is capable of using the following gases: argon, dry air, oxygen, and hydrogen/nitrogen mix. The plasma machine uses the same basic process for each gas but the power and pressures used may vary. Gas choice is determined by the contaminant on the part. For example, oxygen or dry air are used to clean parts with an organic contaminant. Previous characterization studies have determined optimal gas choice, power, gas flow rate, and time for a given cleaning application. To perform the plasma process, the vacuum pump is first turned on. The appropriate gas bottle is opened and checked to ensure sufficient gas supply is available. The operator then pumps the chamber down to 0.2 torr and manually checks the power setting and gas flow rate for the correct values. The power and gas are then turned off, the chamber backfilled with room air and the chamber is loaded with the contaminated parts. The equipment is then set for automatic mode.At this point the machine will automatically pull a vacuum on the chamber to 0.2 torr, then introduces the gas, and switches on the power which strikes the plasma and runs for a preset length of time. There will usually be a visible glow inside the chamber when the impedance is matched and the plasma is struck, except with oxygen. Once the cycle is complete, the RF power turns off, the gas flow is stopped, the vacuum is purged back to atmospheric and the parts are removed for the next process. When all plasma cleaning is done for the day, the gas bottles are closed. The process uses a non-forced vent.

Options: The plasma cleaning process is optimized for each component which is cleaned. No changes to power settings or gas flow rate can be made and maintain the integrity of the component.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Plasma Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J375-83704PLASMA **Specific Waste Type:** Compressed Gas Cylinders

Date: 04-dec-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Cleaning

Description: The plasma cleaning process uses the following plasma machines: Branson/IPC7150, CE 81192, Branson/IPC 8000, CE 51377 and Plasma Science, CE 69083. All of the machines are capable of using the following gases: argon, dry air, helium, nitrogen, oxygen, hydrogen/argon mix, hydrogen/nitrogen mix, and tetrafluoromethane. The plasma machines all use the same basic process but the power and pressures used may vary.Gas choice is determined by the contaminant of the part. For example, oxygen or dry air are used to clean parts with an organic contaminant. Previous studies have determined optimal gas choice.To perform the plasma process the vacuum pump is first turned on. The gas bottles are checked to ensure there is sufficient gas supply. Main RF power is turned on; a ready light will signal when the unit is ready to operate. The operator next loads the parts to be cleaned onto its fixturing and the fixture is placed inside the plasma chamber. The chamber door is closed and latched. Process time is selected. The process can be run in either a manual or automatic mode. Most cleaning processes run in the automatic mode.In either mode, a vacuum is pulled inside the chamber bringing the pressure to approximately 0.2 torr. The operator or program next includes the gas to the chamber; pressure will rise to approximately 0.8 torr. The operator or program next switches on the RF power, striking the plasma.In either mode, the impedance of the chamber will be matched with that of the generators output automatically. There will usually be a visible glow inside the chamber when the impedance is matched and the plasma is stuck, except with oxygen. Once the cycle is complete, the RF power is turned off, the gas flow is stopped, the vacuum is purged back to atmospheric and the parts are removed for the next process. This process uses a non-forced vent which is not assigned a stack number.

Options: Eliminate cleaning processes using tetrafluoromethane to reduce emissions. Silicone contaminants will not be removed from parts.Increase power and run plasma for shorter time, using less gas. Process will be too aggressive and may attack part.Use more aggressive gas and lower the process time. Process will be too aggressive and may attack part.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Plasma Cleaner **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J375-92PLASMA **Specific Waste Type:** Compressed Gas Cylinders

Date: 26-jul-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The plasma cleaner is used on a limited number of parts to provide extra surface cleaning and activation to enhance bounding. The process is defined in PES P1251074. The process uses an International Plasma Corp., Model #4000 plasma cleaner supplied with argon gas. Parts are placed in one of two chambers in the equipment. The chambers are pumped down to a preset vacuum level (less than 0.5 torr). At the preset vacuum the RF power comes on and argon gas is supplied at a

low flow rate (150 cc/minute) to the chamber for the time set (150 minutes typical). The RF power is set at 35 watts. As a test of the efficiency of the plasma, the reflect (REFL) reading should be less than 2% of the power setting. Argon gas is supplied from a gas bottle located in the DI water room. The PES requires argon with support stores #57002311. The bottles are also marked with material standard #4503000-00-000. The argon is expelled from the plasma chamber through the vacuum pump which vents to the atmosphere.

Options: Reduce gas flow. If the flow is reduced, the cleaning capability would also be reduced.Use some other type of gas. Both argon and oxygen were used in the past. Argon was selected as the best choice for the particular needs if only one gas is to be used.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Plasma Clean **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J375-94PLASMACLEAN **Specific Waste Type:** Compressed Gas Cylinders

Date: 15-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The plasma cleaning process is an operation in which components are cleaned prior to being assembled. The purpose of the plasma cleaning process is to achieve a clean, wetable surface on the components prior to applying an adhesive bonding material. By eliminating all surface contaminants, the strength of the bond improves tremendously. In preparation for the plasma cleaning process, the operator cleans the bonding surfaces with alcohol to remove any gross amounts of contamination. The operator then loads the components to be cleaned into the plasma cleaner and closes the chamber door. The chamber is reduced to 0.1 torr pressure and argon gas is pumped into the chamber at 20 psi for 20 minutes. During this time an RF power source provides 400 watts of power to the chamber. After the cycle is complete, the argon gas is turned off by the controller, and nitrogen gas is pumped into the chamber for purging the system. The operator then unloads the parts from the chamber and the cleaning cycle is complete.

Options: Use oxygen or zero air only, eliminating argon and nitrogen. (Process not as effective for cleaning, and oxidation appears.)

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Cleaning After Laser Scribe **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J380-71C025118 **Specific Waste Type:** Sanitary Sewer

Date: 27-oct-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Hand Cleaning Flux **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J380-855C025002 **Specific Waste Type:** Solvents

Date: 27-jul-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** T. Joe Riehle
Phone: (816) 997-3673	**Phone:** (816) 997-7154
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: CC-Etch **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J410-83302 **Specific Waste Type:** Acid

Date: 18-aug-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description: Cleaned 6061 aluminum parts are dipped in a phosphoric acid/nitric acid solution using handheld fixtures. Periodic additions of nitric acid are made to maintain a concentration between 6.00 and 7.00 % volume. The concentration of AL 3+ ion must be maintained below 10 GM/L or the tank contents must be changed.In practice, this limit is not approached. The tank containing the etch solution has its own individually controlled exhaust hood to control emissions. The tank remains covered when not in use. The clean parts are transferred using the same fixtures to the rinse tank containing deionized water. The deionized water is circulated through the rinse tank directly to the industrial drain.

Options: Plasma treating.Etch and/or deoxidize in other deparment.Dilute deoxidizer in our area.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Metallography **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J410-8370301MET **Specific Waste Type:** Metal Debris

Date: 22-nov-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Metallurgy

Description: Oversized samples are first cut to an appropriate workable size by use of the Leco cutoff wheel. These sample pieces are then downsized by grinding on the Leco belt surface grinder. The downsized samples are now ready for final cutting on the Buehler diamond blade slow speed saw.After all cutting and grinding procedures are complete, the sample is then placed in a soap and water solution contained in an ultrasonic cleaner. Rinse the parts with tap water and dry with K-drys and/or compressed air. Dispose of all K-drys in a waste can. To protect the edges of the specimen from edge rounding, it may be necessary to overplate it with an electroless nickel plating. This is accomplished by obtaining a clean 240-mL beaker.Mix equal portions of parts A and B from the edgemet kit, supplied by Buehler. Place the beaker on a hot plate and heat the solution to 180-190 deg.F. Place a lid over the beaker to retard evaporation. Allow the solution to reach the correct temperature. Clamp the specimen with the aluminum clip that is supplied with the edgemet kit. Clean with acetone for 2 minutes. Clean again using sodium hydroxide and water for 2 minutes.Use the preclean solution supplied with the kit for 5 to 30 seconds. As a final cleaning step, place the specimen in the A and B solution for a minimum of 2 hours. After overplating is complete, the solution remaining is placed in a nonflammable solvent can to be disposed through waste management. Place the specimen in in the ultrasonic cleaner and then rinse with tap water. Dry with K-drys and/or compressed air. K-drys are disposed of in a waste can.

Options: Remove the drain lines and connect them to industrial waste lines with a sediment tank collecting heavy material prior to reaching the industrial line. Install a sediment tank to collect the heavy solid contaminants and allow the waste water to flow to the sanitary drain already available.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Nitric-Fluoride Treatment **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J410-97JJ070 **Specific Waste Type:** Acid

Date: 16-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Sodium Hydroxide Al Etch **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J410-97LL010 **Specific Waste Type:** Caustic

Date: 16-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: CC-Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J430-83301 **Specific Waste Type:** Acid

Date: 18-aug-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description: 6061 aluminum parts are dipped into a nitric acid/ammonium bifluoride cleaning solution using handheld fixtures. Periodic additions of ammonium bifluoride are made to this solution to maintain a concentration between 65.0 and 85.0 GM/L equivalent of ammonium bifluoride. The nitric acid concentration is also monitored. The entire contents of the tank are changed when the concentration of nitric acid falls below 60% by weight. The tank containing the cleaning solution has its own individually controlled exhaust hood to control emissions. The tank remains covered when not in use. The clean parts are transferred using the same fixtures to the rinse tank containing deionized water. Deionized water is circulated through the rinse tank directly to the industrial drain.

Options: Plasma treating. Input 6061/T6 aluminum parts: part surface is prepared for subsequent process steps by machining and alternate surface finishing followed by electronically generated plasma treating of surface.Perform cleaning steps in another department - consolidate work. Using the production plating facility for surface cleaning and preparation would eliminate the use to maintain a separate facility in our area.Replace acid cleaning with aqueous-based cleaning and/or deoxidizing.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Hydrochloric Acid Rinse **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J430-97CC040 **Specific Waste Type:** Acid

Date: 16-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Sulfuric Acid Rinse **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J430-97HH050 **Specific Waste Type:** Acid

Date: 16-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description: The process is the final step in the cleaning process for circuit boards. The acid rinse is used to remove any smut that may have formed in the preceding ammonium persulfate etch. The process tank has a working volume of 81.4 liters and it contains 8-12% sulfuric acid, by volume. Solution control is monitored by PES 1256066. Following the acid, parts are rinsed with water in an adjacent tank. This tank has a working volume of 92.6 liters. Water conductivity is monitored and maintained at 700 umhos/cm or less. Sulfuric acid usage for CY 91 was only 2.4 lbs for this process. Rinse water used during this time is estimated at 3087 lbs.

Options: Modify exhaust system to prevent release of entrained liquids to the outside environment.Improve rinse system to reduce water usage.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Sodium Carbonate Deoxidize **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J430-97HH090 **Specific Waste Type:** Caustic

Date: 16-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Hydrochloric Acid Rinse **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J430-97NN060 **Specific Waste Type:** Acid

Date: 16-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Solid Film Lubrication **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J509-99EF **Specific Waste Type:** Grease

Date: 19-oct-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Liquid Resist Application **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J514-71K124105 **Specific Waste Type:** Polymers

Date: 06-may-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952

Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Polysulfide Seal **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J520-855K134015 **Specific Waste Type:** Polymers

Date: 07-oct-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description: The operator weighs out part A and parts of the polysulfide sealant, mixes the material and transfers to a small syringe and then applies mixed material to the assembly. An alternate method is to use a preweighed kit. The operator mixes part A and part B in the tube supplied in the kit, then transfers to a small syringe and then applies to the assembly.

Options: Replace polysulfide sealant with silicone rubber.Use some form of gasket or o-ring.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** T. Joe Riehle
Phone: (816) 997-3673	**Phone:** (816) 997-7154
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: CC-UV Curable Spray **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J550-83312 **Specific Waste Type:** Solvents

Date: 01-jan-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The UV curable resin, MS #5086000, is used in this process without any additional VOCs. The resin is placed in the spray nozzle reservoir can and heated in an oven to 165 F for 45 minutes. This reduces the resin viscosity sufficiently to spray it directly onto the parts. Panels are mounted onto a fixture which holds three panels edge to edge. The fixture oscillates back and forth in front of the spray nozzle. The panels are passed across the spray five times. The fixture is removed with the panels still attached. The panels are then ready for the Cure #4 process, J56083313. On rare occasions, when this resin is applied to a zero can, the operation is performed in another department where the zero can be placed on a turntable and the resin sprayed on the inside. Cleanup of the nozzle is accomplished by attaching a reservoir can of toluene and spraying into the hood for two minutes. The resin container is only cleaned when the resin supply is consumed, about once per year, because of the relatively few times this operations is performed.

Options: Clean up with alternate solvent.Clean up by a soaking method instead of or in combination with spraying to keep nozzle clean.Alternate method of application of the resin (brushing, wiping, rolling) in order to avoid spraying.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: CC-Cure #2 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J560-83309 **Specific Waste Type:** Solvents

Date: 30-sep-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description: The CC-Cure #2 process consists of curing the varnish applied to the part. The parts are placed horizontally in the oven. The Set Point temperature of the oven is set to 365 deg F. The parts are cured for 1 1/2 hours after the oven temperature reaches 365 deg F. After the cure time is complete, the parts are cooled to room temperature by operating the oven blower and opening the door 1-2 inches.

Options: Lower VOC varnish.Eliminate this process step.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: CC-Cure #3 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J560-83311 **Specific Waste Type:** Solvents

Date: 30-sep-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description: The CC-Cure #3 process consists of curing the epoxy adhesive. The parts are placed in the oven so the tab rests horizontally. The set point temperature of the oven is set to 115 F. The parts are cured for 40 minutes after the oven reaches 115 F. The oven temperature is then raised to 365 F. The parts are cured for one hour after the oven reaches 365 F. After the cure time is complete, the parts are cooled to room temperature by operating the oven blower and opening the door 1-2 inches.

Options: Adhesive replacement - conductive epoxy with lower VOC.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: CC-Cure #4 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J560-83313 **Specific Waste Type:** Solvents

Date: 01-jan-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Urethane Accelerator **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J560-99ACCEL21 **Specific Waste Type:** Paint

Date: 30-nov-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description:

Options: Use only the amount of material required for the job.Identify at the beginning of the job the amount needed.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Yellow Acrylic **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J560-99ACRYLIC28 **Specific Waste Type:** Paint

Date: 30-nov-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Red Aerosol Enamel **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J560-99AEROSOL26 **Specific Waste Type:** Paint

Date: 30-nov-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description:

Options: Use only the amount of material required.Identify at the beginning of project thequantity needed.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Silicone Primer & Paint **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J560-99SILICONE5 **Specific Waste Type:** Polymers

Date: 09-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description:

Options: Use minimum quantity to complete the job.Replace silicon primer with carcinogen.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Teflon Application **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J560-99TEFLON01 **Specific Waste Type:** Polymers

Date: 23-oct-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description:

Options: Use only the amount required to complete the job.Use an airbrush to apply coating.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Waterborne Primer Applic. **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J560-99WATRBORN6 **Specific Waste Type:** Polymers

Date: 11-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description:

Options: Use only amount needed to complete the job.Replace with material that doesn't contain carcinogen.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Painting Application (Mint Gray) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J590-7PT001 **Specific Waste Type:** Paint

Date: 21-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Painting

Description:

Options: Reuse tongue depressors for mixing.Decrease frequency of water changes.Decrease frequency of paper usage.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Trevor Whitney
Phone: (816) 997-3673	**Phone:** (816) 997-5743
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Painting Application (Varnish) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J590-7PT002 **Specific Waste Type:** Paint

Date: 05-feb-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Painting

Description: Mix and apply varnish as directed by product definition. Materials used in this process are as follows: Dolph's varnish, paper cups, dacron filters, plastic cups (1-pt.), plastic cups (1-qt.), paper filters, tongue depressors, toothpicks, kaydrys, white paper, masking tape, rubber gloves, viscosity stabilizer, fumed silica and water. After spraying the material is then cured in an oven. All of these steps are performed in the paint shop.

Options: Reuse tongue depressors.Increase water change cycle on paint booth from 2 to 3 weeks.Decrease change frequency on white paper to convertible in paint booth.

Site: Kansas City Plant	

Site Coordinator: William H. Schlosberg	**Team Leader:** Trevor Whitney
Phone: (816) 997-3673	**Phone:** (816) 997-5743
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Painting Application (Carbon Blue) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J590-7PT003 **Specific Waste Type:** Paint

Date: 18-oct-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Painting

Description: Mix and apply carbon blue paint as directed by product definition. Materials used in this process are as follows: Blue paint, paper cups, dacron filters, 1-pt plastic cups, 1-qt plastic cups, paper filters, tongue depressors, tooth picks, kaydrys, white paper, masking tape, rubber gloves, and water. After spraying the material is then cured in an oven. All of these steps are performed in the paint shop.

Options: Reuse tongue depressors.Increase water change cycle on paint booth from 2 weeks to 3 weeks.Decrease change frequency on white paper to convertible in paint booth.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Trevor Whitney
Phone: (816) 997-3673	**Phone:** (816) 997-5743
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Painting Application (Red Primer) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J590-7PT004 **Specific Waste Type:** Paint

Date: 10-dec-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Painting

Description: Mix and apply red primer paint as directed by product definition. After spraying, the material is then cured in an oven. All of these steps are performed in the paint shop.

Options: Reuse tongue depressors.Increase water change cycle on paint booth from 2 weeks to 3 weeks.Decrease change frequency on white paper to convertible in paint booth.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Trevor Whitney
Phone: (816) 997-3673	**Phone:** (816) 997-5743
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Painting Application (Cardinal Tan) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J590-7PT005 **Specific Waste Type:** Paint

Date: 17-dec-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Painting

Description: Mix and apply cardinal tan paint as directed by product definition. Materials used in this process are as follows: 1) cardinal tan paint (5101400-00-502), 2) paper cups (985010349), 3) dacron filters (99010349), 4) plastic cups (1-pt) (99012463), 5) plastic cups (1-qt) (99012461), 6) paper filters (99012301), 7) tongue depressors (99016165), 8) tooth picks (99010401), 9) kaydrys (99010931), 10) white paper (99790340), 11) masking tape (990020701), 12) rubber gloves (59206082), and 13) water.

Options: Reuse tongue depressors.Increase water change cycle on paint booth from two weeks to three weeks.Decrease change frequency on white paper to convertible in paint booth.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Trevor Whitney
Phone: (816) 997-3673	**Phone:** (816) 997-5743
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Painting Application (Black Paint) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J590-7PT006 **Specific Waste Type:** Solvents

Date: 15-feb-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Painting

Description: Mix and apply black paint as directed by product definition. Materials used in this process are as follows: 1) black paint (510076200-502), 2) paper cups (98502436), 3) dacron filters (99010349), 4) plastic cups 1-pt (99012463), 5) plastic cups 1-qt (99012461), 6) paper filters (99012301), 7) tongue depressors (99016165), 8) tooth picks (99010401), 9) kaydrys (99010931), 10) white paper (999790340), 11) masking tape (99020701), 12) rubber gloves (59206082), and 13) water. After spraying, the material is then cured in an oven. All of these steps are performed in the Paint shop.

Options: Reuse tongue depressors.Increase water change cycle on paint booth from 2 weeks to 3 weeks.Decrease change frequency on white paper to convertible in paint booth.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Jerry Lovins
Phone: (816) 997-3673	**Phone:** (816) 997-3072
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Painting Application (Poly Yellow Primer) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J590-7PT007 **Specific Waste Type:** Paint

Date: 22-apr-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Painting

Description: Mix and apply Poly Yellow Primer paint as directed by product definition. Materials used in this process are as follows: 1) Poly Yellow Primer (5133801-00-504), 2) paper cups (98502436), 3) dacron filters (99010349), 4) plastic cups 1-pt

(99012463), 5) plastic cups 1-qt (99012461), 6) paper filters (99012301), 7) tongue depressors (99016165), 8) tooth picks (99010401, 9) kaydrys (99010931), 10) white paper (99790340), 11) masking tape (99020701), 12) rubber gloves (59206082), and 13) water. After spraying, the material is then cured in an oven. All of these steps are performed in the Paint shop.

Options: Reuse tongue depressors.Increase water change cycle on paint booth from 2 to 3 weeks.Decrease change frequency on white paper to convertible in paint booth.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Jerry Lovins
Phone: (816) 997-3673	**Phone:** (816) 997-3072
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Painting Application (Yellow Zinc Chromate Primer) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J590-7PT008 **Specific Waste Type:** Solvents

Date: 29-jul-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Painting

Description: Mix and apply Yellow Zinc Chromate Primer paint as directed by product definition. Materials used in this process are as follows: 1) Yellow Zinc Chromate Primer (5131201-00-504), 2) paper cups (98502436), 3) dacron filters (99010349), 4) plastic cups 1-pt (99012463), 5) plastic cups 1-qt (99012461), 6) paper filters (99012301), 7) tongue depressors (99016165), 8) tooth picks (99010401), 9) kaydrys (99010931), 10) white paper (99790340), 11) masking tape (99020701), 12) rubber gloves (59206082), and 13) water. After spraying, the material is then cured in an oven. All of these steps are performed in the paint shop.

Options: Reuse tongue depressors.Increase water change cycle on paint booth from 2 to 3 weeks.Decrease change frequency on white paper to convertible in paint booth.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Jerry Lovins
Phone: (816) 997-3673	**Phone:** (816) 997-3072
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: CC-Varnish Spray **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J590-83308 **Specific Waste Type:** Solvents

Date: 30-sep-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description: The CC-Varnish Spray consists of preparing a solution of 3 gm of Hi-therm BC-346-A resin in 6 gm of toluene for use in air brush. The air brush is adjusted to the desired pressure (25-28 psi). The solution canister is attached. Parts are mounted into a masking fixture. The air brush is operated to apply an even coat of resin to the exposed surface. The air brush is operated in a fume hood equipped to handle flammable materials. Clean up is performed with toluene. Waste solvent from clean up is sent to waste management.

Options: Lower VOC varnish.Toluene diluent replacement.Apply coating with eyedropper rather than air brush.Eliminate this process step.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Vacuum Lamination of Solder Mask **Major Waste Type:** Sanitary Waste

PPOA ID Code: KCP-J595-61K124010 **Specific Waste Type:** Sanitary Sewer

Date: 25-oct-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description:

Options: Replenish stripper solution.Treat waste water in the department.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Hot Roll Lamination of Photoresist **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J595-61K124029 **Specific Waste Type:** Printed Circuit Boards

Date: 31-jan-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description:

Options: Batch vacuum laminate.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: CC-EP Bath **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J595-83305 **Specific Waste Type:** Polymers

Date: 30-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description: EP bath solution is prepared by suspending 10.0 kg of 14 MegOhm deionized water in 1.0 kg of clear acrylic resin using a high shear mixing technique. The freshly prepared bath solutions are stored in 5-gal plastic containers until used. When a bath solution is placed "in-service" it is pumped through a filter when transferred. During use, a voltage applied across the EP bath tank and the part causes the suspended acrylic resin to electrophoretically deposit on the exposed metal surfaces of the part. Panels are attached to the EP holding fixture at the same exposed corner used to attach to the anodize fixture. The EP fixture provides the means to make electrical contact with panels as well as positioning the panels in the bath at the proper level, just below the exposed anodize boundary. Cathodes extend from the EP tank up into the bath with the electrical connection made to the side of the tank. Zero parts serve as their own tank. The cathode approximates the shape of the zero with insulated positioning fixtures. Electrical connections are made directly to the edge of the zero and to the cathode. Voltage and current are specified by the process step. After electrical power is removed, panels are transferred using their fixture to a rinse tank. After rinsing, parts are ready for the Cure #1 process, K21183306.

Options: Analyze bath components for extended use.Improve filtration on transfer pump.Additions of Cab-o-sil.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Strip Photoresist **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J614-61C027013 **Specific Waste Type:** Acid

Date: 28-feb-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options: Replenish stripper solution.Pursue an on-location water treatment system.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Titanium Etch **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-J615-71D031110 **Specific Waste Type:** Acid

Date: 02-sep-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description:

Options:

Site: Kansas City Plant

Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Vacuum Bake **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-K141-73E055024 **Specific Waste Type:** Solvents

Date: 01-oct-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Vacuum Bake **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-K141-80E055015 **Specific Waste Type:** Solvents

Date: 02-oct-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Vacuum Baking **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-K142-53E055015 **Specific Waste Type:** Air Emissions

Date: 16-dec-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Baking

Description:

Options: Obtain oven with smaller chamber.Eliminate oven.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Glove Box Operations:Dessicants **Major Waste Type:**

PPOA ID Code: KCP-K150-49GD007 **Specific Waste Type:** Miscellaneous

Date: 15-jun-1994 **Major Activity Type:** **Specific Activity Type:**

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Glove Box with Nitrogen Purge **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-K150-49GG007 **Specific Waste Type:** Compressed Gas Cylinders

Date: 15-jun-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description:

Options: Defective getter tubes are reworked into a new tube assembly.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: MDA - Desiccant Curing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-K211-49CU001 **Specific Waste Type:** Polymers

Date: 28-jun-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Curing

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Non-Vacuum Bake **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-K211-53E054017 **Specific Waste Type:** Air Emissions

Date: 16-jan-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Baking

Description:

Options: Extend solder mask shelf life.Use solvent solder mask.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: CC-Cure #1 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-K211-83306 **Specific Waste Type:** Polymers

Date: 30-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description: After the EP coating is applied, all parts (panels and zeros) are placed in drying fixtures and placed in a convection oven. The oven temperature is raised to 200 degrees F in 15 minutes. The temperature is maintained at 200 degrees F for 30 minutes. The oven temperature is raised to 365 degrees F in 15 minutes and held for 30 minutes. The coating is then cured sufficiently to test. The EP Bath process and this process are repeated until the applied coating passes its tests.

Options: Use of Cab-o-sil additive to reduce repetitions.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092

Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Temperature Soak **Major Waste Type:**

PPOA ID Code: KCP-K231-78E054023 **Specific Waste Type:** Miscellaneous

Date: 22-aug-1991 **Major Activity Type:** **Specific Activity Type:**

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: RTV Curing Application **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-K314-7RTV002 **Specific Waste Type:** Polymers

Date: 01-apr-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Curing

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Trevor Whitney
Phone: (816) 997-3673	**Phone:** (816) 997-5743
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Syntactic Molding **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-K319-48MOLDING **Specific Waste Type:** Polymers

Date: 17-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Curing

Description:

Options: Change mold release to less hazardous one.Reduce the quantity of wipes used.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Thick Film Drying **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-K490-71E047125 **Specific Waste Type:** Solvents

Date: 02-oct-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Thick Film Firing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-K490-71E047126 **Specific Waste Type:** Air

Date: 01-oct-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Burn-In

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Resistor Stabilization **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-K490-71E054132 **Specific Waste Type:** Air

Date: 26-aug-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Burn-In

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Solder Reflow **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-K490-71J114121 **Specific Waste Type:** Solvents

Date: 31-may-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Carburize **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-K513-98CARBURIZE **Specific Waste Type:** Air

Date: 15-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Burn-In

Description:

Options: Discontinue process.Use another case hardening method.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Heat Treat **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-K613-83703001 **Specific Waste Type:** Compressed Gas Cylinders

Date: 31-oct-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Heat Treating

Description: The A.V.S.Laboratory Vacuum Furnace is used for engineering evaluations, involving heat treat, annealing, and blazing of different materials and processes. Argon gas (57002311) is used to vent the chamber to atmosphere. Gas fan cooling also utilizing argon as a cover gas. This assessment will focus on the total argon usage and associated waste streams. It will assume that 80% will be point source emissions and 20% fugitive gas losses.

Options: Vent chamber with air in place of argon. This would save a large amount of gas; however, it would detract from system performance because of air contamination. Cost and hazards of argon do not warrant this change.Substitute nitrogen for argon. This solution will not improve the safety because nitrogen is also a simple asphyxiant. The cost would be $117.00 less per year; however, the heat transfer capabilities are not as good.Substitute helium for argon. This also will not improve safety or heat transfer. It is a simple asphyxiant. The cost of helium would increase $350.00 per year.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Vacuum Furnace Braze **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-K613-91FURNACEBRAZ **Specific Waste Type:** Compressed Gas Cylinders

Date: 30-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Welding

Description:

Options: Change braze alloy.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Autoclave Processing **Major Waste Type:** Sanitary Waste

PPOA ID Code: KCP-K811-49AC004 **Specific Waste Type:** Polymers

Date: 15-aug-1995 **Major Activity Type:** Manufacturing **Specific Activity Type:** Baking

Description: Laminate fabrication is a hand-layup process requiring sealing materials and personal protective equipment (PPE). Sheets of Kevlar fabric impregnated with epoxy resin (prepreg) are cut to size and layered in molds cleaned and coated with mold release. The molds are then placed in a microcomputer-controlled autoclave. Pressure, temperature, and vacuum cycles on preprogrammed diskettes allow repeatable processing from startup to cool down.

Options: Options to reduce solid waste focused on cleaning supplies. Containers, brushes, and pads may be reused longer if cross-contamination does not occur. These options will be considered.Another option with possible long-term implications is to recycle used films, cloths, and putty. This was not seriously considered due to the low amounts generated and contractual agreements required.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Charles B. McField
Phone: (816) 997-3673	**Phone:** 816-997-4227
Fax: (816) 997-4208	**Fax:** 816-997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Temperature Cycling **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-K893-73E053012 **Specific Waste Type:** Compressed Gas Cylinders

Date: 28-jan-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Heat Treating

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Temperature Cycling **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-K893-78E053011 **Specific Waste Type:** Air

Date: 23-aug-1991 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Mechanics

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Spray Adhesive Label Application **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-LABA-63504 **Specific Waste Type:** Solvents

Date: 10-nov-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description: The operator obtains can of adhesive from the flammable storage cabinet. The nozzle of can is cleared by test spraying. The operator sprays adhesive over area where label is to be applied and then applies pressure-sensitive label. This continues until all packages have been completed. The operator then returns the can of adhesive to the flammable storage cabinet. Assumptions: - 75% of adhesive remains on product.- 25% of adhesive used in process is fugitive emissions. This process considers usage of adhesive for applying labels only and not securing foam pieces together. Total of 72 cans of adhesive used per year, estimate 90% for applying labels; 72 x 90% = 65 cans/year.

Options: Use clear tape to cover labels.Change packaging specifications to allow a clear oversized label to be applied over the existing labels.Use a label that has more adhesion capabilities.Evaluate the use of different labels to see if adhesion is better.Packaging specification would need to be revised.Staple labels on wood box.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Alan Rittel
Phone: (816) 997-3673	**Phone:** (816) 997-4281
Fax: (816) 997-4208	**Fax:** (816) 997-3533
Email: wschlosberg@kcp.com	**Email:**

Title: Marking with Stencil Ink **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-LABS-63505 **Specific Waste Type:** Solvents

Date: 07-jan-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description: The operator obtains can of ink from the flammable storage cabinet. After obtaining or creating the appropriate stencil, the operator marks the shipping container by spraying ink over the stencil. This continues until all packages have been completed. The operator then returns the can of ink to the flammable storage cabinet.

Options: Use labels instead of stenciling with ink. Labels do not have the durability of ink, causing frequent reapplication of labels for reusable containers.Use spray paint instead of stencil ink. Materials engineering will be contacted in December 1993 to obtain paint alternatives. If a suitable substitute is found, packaging specifications and production travelers would require revision to allow a new part number.Use different type of ink. Materials engineering will be contacted in December 1993 to obtain ink alternatives. If a suitable substitute is found, packaging specifications and production travelers would require revision to allow a new part number.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Alan Rittel
Phone: (816) 997-3673	**Phone:** (816) 997-4281
Fax: (816) 997-4208	**Fax:** (816) 997-3533
Email: wschlosberg@kcp.com	**Email:**

Title: Lubricants and Mold Releases **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-LUBR-008007 **Specific Waste Type:** Polymers

Date: 17-mar-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Molding

Description:

Options: Reduce the number of mold releases used.Reduce the quantity used.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Anita Cates
Phone: (816) 997-3673	**Phone:** (816) 997-4158
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Solid Film Lubricant **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-LUBR-44-001 **Specific Waste Type:** Grease

Date: 14-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description:

Options: Change to a safer lubricant.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Hand Soldering to Connector Cups **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-M103-55J107010 **Specific Waste Type:** Lead

Date: 20-dec-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description: Soldering is a metallurgical joining method using a filler material (solder) to product metallic continuity between two interfaces. Soldering relies on wetting for the bond formation. Conventional hand soldering uses an electrically heated soldering iron to generate the heat needed when positioned against the connection. Solder can then be applied to the heated surfaces, melt, wet, and form the solder joint. The joint formation is accomplished as follows: 1) Flux applied to connection, 2) Tip removed from holder and wiped on sponge, 3) Tip and solder core touch work, 4) Solder melts creating a heat bridge, 5) Work and solder reach wetting temperature, 6) Solder fillet formed, 7) Solder core removed, 8) Iron removed ,9) Fillet solidifies, 10) Work cools, and 11) Iron tip tinned and placed back in holder.

Options: Use resistance soldering equipment; this would eliminate the need to tin the iron tips, thus reducing the solder waste quantity.Use a different flux that would not need to be cleaned with TCE; this would reduce the hazardous waste in the solvent waste stream.Do not use additional flux when a flux core solder is used; this would reduce fugitive air releases and reduce the flux removed in the spray clean process.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Hand Tinning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-M103-55J108015 **Specific Waste Type:** Lead

Date: 31-jan-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description: Tinning is coating the base metal surface with a filler material (solder) to improve the surfaces' solderability. An electrically heated soldering iron is used to generate the heat needed when positioned on the surface. Solder can then be applied to the heated surface, melt, and wet the entire base metal surface. Tinning is accomplished as follows: 1) Flux applied to base metal surface. 2) Tip removed from holder and wiped on sponge. 3) Tip and solder touch work. 4) Solder melts, creating a heat bridge. 5) Work and solder reach wetting temperature. 6) Solder wets base metal surface. 7) Solder removed. 8) Iron removed. 9) Solder solidifies. 10) Work cools. 11) Iron tip tinned and placed back in holder.

Options: Use resistance soldering equipment; this would eliminate the need to tin the iron tips, thus reducing the solder waste quantity.Use a different flux that would not need to be cleaned with TCE; this would reduce the hazardous waste in the solvent waste stream.Do not use additional flux when a flux core solder is used; this would reduce fugitive air releases and reduce the flux removed in the spray clean process.Do not tin unused solder cups; this would reduce the solder waste generated by the tinning process. It would also reduce the quantity of wicking wires needed for tinning.Use vapor phase soldering to tin solder cups; this would eliminate the need to tin the iron tips, thus reducing the solder waste quantity.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Solder Removal **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-M103-55J112020 **Specific Waste Type:** Solvents

Date: 03-apr-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The solder removal process is jointly associated with hand tinning and rework. In tinning, wicking wires or dry wick are used to remove gold enriched solder from filled solder cups. Rework is removing excess solder from a solder joint or removing solder from product to correct a defect. An electrically heated soldering iron is used to generate the heat needed when positioned on the wicking material and soldered surface. Flux enhances the solder flow away from the heated solder joint and onto the wicking material, thus removing the solder from the solder joint. Solder removal is accomplished as follows: 1) Flux applied to soldered area, 2) Tip removed from holder and wiped on sponge, 3) Tip and wicking wire touch work, 4) Work and solder reach melting temperature, 5) Solder wets wicking wire, 6) Iron and wicking wire removed, and 7) Iron tip tinned and placed back in holder.

Options: Use a different flux that would not need to be cleaned with TCE; this would reduce the hazardous waste in the solvent waste stream.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Sn/Pb Solder Dipping **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-M104-55J112025 **Specific Waste Type:** Solvents

Date: 31-jan-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The tin-lead dipping process involves applying a coating of tin-lead solder on wires or component leads by dipping them into molten tin-lead solder.The newly tinned surface provides a solderable surface for connection to other metallic devices.The tin-dipping process consists of the following steps: 1) At the beginning of the day, if necessary, add enough solder to the pot to bring it to the top level of the pot. 2) As required, stir solder pot and scrape dross off the surface of the solder into a pan. 3) Remove insulation tip from a wire end. 4) Dip wire end into flux. 5) Dip wire end into solder pot to tin it. 6) Dip wire end into trichloroethylene for removing flux. 7) Dip wire end into alcohol to remove flux and trichloroethylene. 8) As required, stir solder pot and scrape dross off surface of solder into pan.

Options: Use 2-oz glass jars for containing alcohol and trichloroethylene instead of the 10-oz flip-top (American Beauty) containers used for this printed wiring assembly.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Induction Soldering **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-M121-55J110030 **Specific Waste Type:** Acid

Date: 06-jan-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description: The work coil is attached to the machines.Waterlines to cool the coil are hooked up and activated. Parts are cleaned for induction soldering. Flux is applied to the surface to be tinned. Parts are placed on a jack and raised into position in the work coil. Black graphite is marked on the part for focusing and correctly controlling heat cycle. Solder is rolled around a mandrel. Solder is placed between the surfaces to be joined. Machine settings are set on control boxes. The temperature recorder is started. A footswitch is depressed to initiate the soldering cycle. The work coil starts to heat up. The temperature continues to rise until SET POINT is reached. The temperature controller keeps the partsÕ temperature for a duration at the SET POINT, then automatically terminates the heating action. Temperature of work coil continues to rise until water cooling takes effect. Water is used to cool the coil. Once the work coil is cooled, the soldered part is removed from the coil, a second part is chosen, and the cycle is repeated.

Options: A container depositing a predetermined amount of flux per cable (the objective being to lessen the amount of flux per cable). Possible elimination of solder on EMR shells. Work is being done in development to possibly eliminate soldering of new shielded (EMR shells) cables.A tighter controlled on-off timer could reduce the amount of flux evaporated in the air. New equipment would have to be procured.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Alumina-Filled Epoxy Encapsulation **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-M129-65F062005 **Specific Waste Type:** Polymers

Date: 09-jul-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description: This epoxy adhesive is used to encapsulate certain cable assemblies to provide mechanical and electrical integrity. The epoxy (2180156) has two liquid components: the A component (base resin) and the B component (activator). The two components are maintained in their original shipping containers until required for processing. For the mixing operation, the two components are dispensed and weighed manually. The proper mix ratio is 100:4 (A:B). After mixing, the epoxy is evacuated at 0-3 mm Hg until the foam rise collapses. Using this mixture, a cable can be encapsulated by open pour of syringe techniques. The encapsulated unit is placed in the oven set at 165 degrees F for 2 hours minimum for curing. After curing, any excess material is removed and discarded. Isopropyl alcohol is used for cable cleaning operations (hand and spray). This epoxy is made up of several hazardous chemicals per OSHA Hazard Communication Standard (29 CFR 1920.1200). Proper ventilation and protective clothing are maintained in the department to protect the operators from harmful vapors and/or contact with uncured materials. Unless grinding is performed, the cured epoxy is nonhazardous.

Options: Replace epoxy per 2180156 with a compatible epoxy. This material is used on a very few units. Substituting a compatible epoxy for this alumina-filled epoxy would completely eliminate the need for this material.Smaller batch size. Smaller batch size would eliminate the waste that is not used in molds. This option would require more accurate weighing techniques and equipment.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Grinding **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-M131-65C023012 **Specific Waste Type:** Plastic

Date: 31-oct-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description: The grinding process used removes excess encapsulation material from molded cable assemblies. The excess material comes from mold leakage and parting lines. The potting is softer than the product and is easily grown away. A hand grinder with brush attachment is the preferred grinding combination. The wheeled brush can remove material without leaving tooling marks. The ground away polyurethane is less than 1% of the cast shape and has the texture/consistency of coarse powder. This powder is not contained and can leave the department through many waste streams.

Options: Grind away excess material under a vented hood. A vented hood could be installed to catch most of the grinding debris. A drawback to this option is the degree of vacuum necessary to capture and remove the debris. The vacuum capability required would be enormous. This option is not cost effective nor necessary.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Cable Encapsulation Depotting **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-M131-65F061016 **Specific Waste Type:** Solvents

Date: 29-feb-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Unfilled TDI polyurethane elastomer is used to encapsulate various cable assemblies to maintain mechanical and electrical integrity. Sometimes the polyurethane needs to be removed (or depotted) from the cable assemblies due to a number of reasons such as electrical failures, damaged components or dimensional inconsistencies. The material can be removed using one of four methods or any combination of the four: use of a hot knife or heat gun to soften the material and cut it away, use of a solvent (toluene) in conjunction with the heating process to further help soften the material, use of a solvent (trichloroethylene) to soak the material off, or the use of a grinder. Proper ventilation is maintained in the area to avoid harmful vapors or dust problems.

Options: Use of a different solvent: presently we use mostly trichloroethylene and a small amount of toluene as our solvents for depotting. While this is not the only method that is available for depotting, it contributes 40% to 50% of out total depotting.A nonhazardous solvent would be found that would remove the urethane as efficiently as the trichloroethylene.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Rack and Panel Connector Repair **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-M131-65F062017 **Specific Waste Type:** Polymers

Date: 18-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: Rack and panel connector repair may occur under the following conditions. Cracked skirts where the cracks do not extend into the connector flange or chipped skirts where the chip is no more than half the height of the skirt. Damaged connectors may be repaired at the piece part, sub-assembly, or final assembly level. The tolerance on the weights is +/- 1% and the minimum epoxy resin batch size is 50 grams. The resin contains bisphenol A and epichlorohydrin, the curing agent contains phenol and the color pigment contains bisphenol A. The color pigment is mixed separately and an exact color match between the parent connector and patch material is not required. After mixing, the patching material is evacuated at 1-5mm Hg until the foam rise collapses. A compatible RTV mold is placed over the connector and then repaired with the patching material by toothpick application. The repaired connector is placed in an oven set to (2) hours minimum at 160 +/- 5 degrees F for curing. After curing, any excess material is removed and discarded.

Options: Smaller batch size. The measuring scale reads to 0.xx grams. Waste could be reduced by 50%.Use only one color pigment paste. Reduces the different colors needed on hand.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Unfilled TDI Polyurethane Encapsulation **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-M131-65F069003 **Specific Waste Type:** Polymers

Date: 30-apr-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description:

Options: Optimize the mix ratio.Eliminate redundant material.Purchase premixed material.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Isopropyl Alcohol, Hand Clean **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-M133-65C025011 **Specific Waste Type:** Solvents

Date: 29-feb-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The process "Isopropyl Alcohol, Hand Clean" (IAHC) is used for the general cleaning of work areas and the preparation of surfaces for polyurethane encapsulation. The targeted contaminates are hand oils and foreign materials. Alcohol is liberally applied to a surface and either blown dry using plant air or wiped dry using a KayDry wipe. The alcohol is readily available in 1/2-liter squeeze bottles at the workstations. Minute amounts of alcohol are needed to dislodge the contaminants. The bulk of the expended alcohol is used to disperse or flush the waste from the unit being cleaned/prepared. All of the alcohol ends up in the department as fugitive emissions. The majority of the solvent is absorbed by the KayDry wipe which is discarded into a nearby waste can to evaporate into the department at a predictable rate. The alcohol absorbed by the KayDry wipe immediately evaporates into the using department.

Options: Change alcohol size code - Change size code from -603 (4-liter jug) to -511 (55-gallon drum). This would change the cost per gallon from $17.36 to $3.45 and annually save the department $615 in overhead operating charges. This would allow other alcohol-using departments the same opportunity to significantly reduce their overhead charges.Change workbench cleaner - Do not use alcohol to clean workbenches. Blow dry parts - this would eliminate the need for KayDrys all together.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297

Email: wschlosberg@kcp.com	**Email:**

Title: Unfilled TDI Polyurethane Encapsulation **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-M133-65F069001 **Specific Waste Type:** Polymers

Date: 25-nov-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description: Unfilled TDI polyurethane elastomer is used to encapsulate various cable assemblies to maintain mechanical and electrical integrity. The elastomer (2519603) has two liquid components: A (resin) and B (curing agent). The materials are pre-heated and tumbled to eliminate any crystallization which may have occurred during storage. The materials are placed into separate nitrogen-pressurized dispensing tanks. For the mixing operation, the two components are dispensed and weighed manually. The proper mix ratio is 100:18.8 (A:B). The elastomer is then vacuum mixed at a pressure of 0-3 mm Hg for 30 seconds minimum. Using this mixture, a cable can be encapsulated by open pour, syringe, Semco gun, or vacuum pouring techniques. The encapsulated unit is placed in an oven set at 200 degrees F for 4 hours minimum for curing. After curing, the unit is removed from the mold. The excess elastomer is removed and discarded. Solvents used are isopropyl alcohol for cable cleaning operations, and trichloroethylene for cleaning of mixing blades. The elastomer contains a hazardous component, toluene diisocyante (TDI). Proper ventilation and protective clothing are maintained in the department to protect the operators from harmful vapors and/or contact with the uncured materials. When properly weighed and mixed, the cured elastomer is nonhazardous. All department personnel are required to successfully complete the Encapsulation Qualification class. This class includes instuction on the proper handling and processing of this elastomer.

Options: Smaller batch sizes: The batch size is currently controlled at a minimum of 50 grams nominal by the urethane material spec. Since a number of parts require less than 25 grams of material, a smaller batch size would minimize the waste created. Before the specifications could be changed, 25 gram batches of urethane would have to be analyzed to ensure the desired material properties are obtained.Disposable mixing blades: Trichloroethylene issued to clean the mixing blades after a mix is made using color paste and to periodically clean off the urethane buildup during normal processing. Use of a disposable plastic blade would completely eliminate the need for solvent cleaning.Static mixers: If the proper static mixer could be developed, only the required amount of urethane would be dispensed into the static mixer. After filling the unit, the entire static mixer would be discarded. This idea would require a considerable amount of R & D effort and funding.Specified batch size: Each traveler would be updated to include the size of the batch to use per unit. This would eliminate situations where 100 gram batches are mixed when less than 75 or 50 grams is required. To implement this, parts would be evaluated as they are built to determine necessary batch size.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Unfilled TDI Polyurethane **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-M133-65F069002 **Specific Waste Type:** Polymers

Date: 29-feb-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description: Unfilled TDI polyurethane elastomer is use in two ways - to encapsulate various cable assemblies to maintain mechanical and electrical integrity and to seal a cable end to prevent subsequent encapsulation from wicking up the cable sleeving. The elastomer (2519605) has two liquid components: A (resin) and B (curing agent). The materials are pre-heated and tumbled to eliminate crystallization. The materials are placed into separate nitrogen-pressurized dispensing tanks. For the mixing operation, the components are dispensed and weighed manually. The proper mix ratio is 100:18.8 (A:B). The elastomer is then vacuum mixed at a pressure of 0-3 mm Hg for 15 seconds minimum.Using the mixture, a cable can either be

encapsulated by open pour, syringe, Semco gun, or vacuum pouring techniques, or sealed to prevent wicking. The encapsulated/sealed unit is placed in an oven set at 200 degrees F for 1 hour minimum for curing. After curing, the unit is removed from the mold or fixture. Solvents used are isopropyl alcohol for cable cleaning operations and trichloroethylene for cleaning mixing blades. The elastomer contains hazardous component, Toluene diisocyanate (TDI). Proper ventilation and protective clothing are maintained in the department to protect operators from harmful vapors and/or contact with the uncured materials. When properly weighed and mixed, the cured elastomer is nonhazardous. All department personnel are required to successfully complete Encapsulation Qualification class. This class includes instruction on the proper handling and processing of this elastomer.

Options: Smaller batch sizes: The batch size is currently controlled at minimum of 50 grams nominal by the urethane material specification. Since most parts require less than 10 grams of material, a smaller batch size would minimize the waste created. Before the specifications could be changed, however, 10-gram batches of urethane would have to be analyzed to ensure the desired material properties are obtained.Disposable mixing blades: trichloroethylene issued to clean the mixing blades after a mix is made with color paste and to periodically clean off the urethane buildup during normal processing. Use of a disposable plastic blade would completely eliminate the need for solvent cleaning.Specified batch size: Each traveler would be updated to include the size of the batch to use per unit. This, in conjunction with option 1, would eliminate situations where larger than necessary batch sizes are mixed. To implement this, parts would be evaluated as they are built to determine the necessary batch size.New sealing material: New sealing materials have been identified which could replace the polyurethane elastomer. This would eliminate the use of TDI-containing materials for this process.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Loctite **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-M149-55B013040 **Specific Waste Type:** Polymers

Date: 28-feb-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: A primer per 4702692 or 4702694 is applied to the threads of fasteners by brushing, dipping, spraying, or using an eye dropper. Thread staking compound (2502303 or 2502305) is applied to the threads of screws before the screws are installed and torqued in an assembly. A drop of compound is applied to the threads of the screw from the plastic squeeze bottle containing the Loctite (TM). Excess material, if any, is then wiped off using a lint-free wipe.A squeeze bottle (1 oz.) contained 350 - 500 applications. The material has a shelf life of 3 years with no provision for extension.

Options: Screw could be purchased with Loctite pre-applied.Purchase screws with nylon or with other locking device.Replace outdated Loctite series with up-to-date material and eliminate all old series material.Store amount could be replaced.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Adhesive Bonding **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-M149-55B013045 **Specific Waste Type:** Polymers

Date: 24-mar-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: The resin and the hardener per 2181050 are contained in a dual syringe called Dev-Tube. Equal amounts of resin and hardener are dispensed in an aluminum dish by pushing the Dev-Tube plunger. Toothpicks are used to thoroughly mix epoxy. The epoxy is then applied with a toothpick to the product being bonded.Excess material, if any, is then wiped off using a lint-free wipe. The material has a shelf life of 2 years with no provision for extension.

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Hot Stamp Marking Process **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-M195-55H098055 **Specific Waste Type:** Solvents

Date: 30-jun-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description: Select the marking foil to be used and install marking foil in hot stamp machine. Select the size of type to be used and assemble the type in the type holder. Install type holder in the machine's heater element. Locate the piece to be marked directly under the type and marking foil. Mark the piece by pulling down the lever on the machine or by stepping on the foot actuator (for pneumatic operation).

Options: Using narrow marking foil would save on the cost of materials. Right now we only use one kind of marking foil - the 3-in wide by 100-ft rolls. Quite often all we mark is a potting shell and potting shell designations are only a few characters wide. It would be very feasible to order the narrower widths of marking foil for the purpose of marking potting shells.Doing away with the hot stamp process is a possibility. In fact, this year (1992) our manager has an MBO out to reduce (and hopefully phase out) marking with the hot stamp process. The implementation of this would mean switching to NC, laser, or ink jet marking as alternatives. This department is currently doing process characterization studies on all three of these alternatives (which already exist in the plant).Discard less overcoat by mixing smaller batch sizes. Operators currently mix 7 grams of covercoat with 7 grams of thinner. This is a practice that is leftover from a time when production was probably 4 times (or more) what it is now.Use less thinner with covercoat. It may be possible to mix less thinner (or don't mix any thinner) with the Corrocote #1295 than we have in the past. One department uses the same kind of Corrocote #1295 that we use, and they don't mix it with thinner. If thinner is desirable (and we could design some experiments to determine this), then it may be possible to mix up to 60% less thinner.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: NC Marking Process **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-M195-55H100060 **Specific Waste Type:** Solvents

Date: 31-jul-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description: The NC marking process utilizes a programmable marking machine and an attached Rapidograph drafting pen to mark product. An ink cartridge in the pen holds the ink that is transferred to the product. The NC marking process is used primarily for marking relatively flat surfaces such as encapsulated connectors, flat flex cables, self-adhesive paper labels, etc. The marked product is usually covered with a polyurethane covercoat for protection.

Options: Discard less covercoat by mixing smaller batch sizes. Operators currently mix 7 grams of covercoat with 7 grams of thinner. This is a practice that is left over from a time when production was probably 4 times (or more) than what it is now.Use less thinner with covercoat. It may be possible to mix less thinner (or don't mix any thinner) with the Corrocote #1295 than we have in the past. There is a department that uses the same kind of Corrocote #1295, and they don't mix it with thinner. If thinner is desirable (and we could design some experiments to determine this), then it may be possible to mix up to 40% to 60% less thinner.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Clean and Lube Connectors **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-M195-55K129050 **Specific Waste Type:** Solvents

Date: 12-mar-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The connector cleaning and lubricating operation is carried out per PES P115088. Per this specification, foreign material is removed from the connector by blowing off with nitrogen. Then, any further contamination is removed by using a toothpick or cotton swab. The recommended solvent for cleaning is isopropyl alcohol but trichloroethylene is also allowed. If trichloroethylene is used, then the connector is rinsed with alcohol. Because of the initiative to eliminate the use of trichloroethylene, personnel only use alcohol for cleaning of connectors. For this assessment, alcohol is assumed to be the only solvent used for cleaning of connectors.

Options: Design fixture - design a fixture to use for lubricating connectors.Use non-disposable tools.Duplicate vendor process.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Ink Marking with Covercoat **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-M195-63H098008 **Specific Waste Type:** Aerosol Cans

Date: 31-mar-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Printing

Description: Ink marking is used to directly mark cables. The assessment was performed on the marking process using a black ink, dispensed from a drafting pen. The pen was mounted in an NC machine which is programmed to write the marking on the part. The part area to be marked was cleaned with an alcohol-moistened lint-free wiper prior to marking. The ink is allowed to air dry for 30 minutes. The ink marking is then covercoated with Krylon which was sprayed into an aluminum cup and brushed onto the marking. The covercoat is given an air cure for 30 minutes.

Options: Spray less Krylon into the tin cup. Operator would have to estimate the amount needed.Find Krylon in liquid form, and use right from container. Need to look into availability.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Hot Stamp Marking **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-M195-63H098014 **Specific Waste Type:** Plastic

Date: 23-jun-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Printing

Description:

Options: Use foil more efficiently.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Hand Soldering and Tinning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-M217-63J108011 **Specific Waste Type:** Solvents

Date: 22-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description: Hand tinning is used to coat the exposed copper of a variety of cables with a thin layer of solder. The copper area to be tinned or soldered is treated with a drop of flux, then heat and solder are applied to tin the exposed copper or form a solder joint. During the soldering and tinning operations the alcohol in the flux vaporizes. The rest of the flux remains on the cable and eventually is routed to waste management. The majority of the solder used remains on the area of the cable that was soldered or tinned. A small portion is sent to waste management.

Options: Use aqueous flux. The use of an aqueous flux would reduce the VOCs released during the soldering process. It would also eliminate the need for a solvent to remove the remaining flux around the soldered area.

Site: Kansas City Plant

Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: D/63 Encapsulation w/ EN7 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-M282-63F069003 **Specific Waste Type:** Polymers

Date: 12-may-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description: EN7 is used to encapsulate solder connections inside connectors.EN7, 2519603, is composed of a polyurethane prepolymer (part A) and a hardener (Part B). Part s A and B are dispensed from pressure pots into a plastic cup, 100 grams A to 18.8 frames B. The components are hand-mixed and evacuated for 2 minutes in a vacuum mixer. The mix is poured into a hand syringe and injected into the connector cavity. The connector is oven cured at 160 F for 1 to 2 hours. The process is controlled by 9927087.

Options: Reduce minimum batch size.Freeze excess mixed material.Process more parts per material batch.(Rejected)

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Encapsulation with Silica **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-M282-63F069018 **Specific Waste Type:** Polymers

Date: 30-apr-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description: The process of encapsulation involves filling connector cavities with epoxy to provide support to the solder joints.In some cases, the encapsulation forms the connector housing. In the silica-filled epoxy encapsulation process, the component to be encapsulated is placed in the potting mold and preheated in an oven for 1 to 2 hours at 160 F. After preheating, the component and mold are placed in a vacuum chamber with a rubber tube attached to the mold fill spout. The rubber tube protrudes out of the vacuum chamber, and is placed in the cup of mixed epoxy. The encapsulating material is mixed in a minimum batch size, 100 grams of base to 14.5 grams of curing agent. The materials are hand-mixed, then machine-mixed in a vacuum chamber. The mix is removed from the vacuum mixer and the rubber tube placed in the mix. A vacuum is pulled on the chamber, drawing the epoxy out of the cup and into the mold cavity. When full, the mold is removed from the vacuum chamber and cured in an oven at 160 F for 2 hours. Post-cure is not required. Excess material and nonhazardous waste are discarded in a special barrel and sent to waste management. After the cure cycle, the mold is dismantled. Flash is removed from the part and the mold.

Options: Reduce minimum batch size.Freeze mixed material for patching surface voids.Pour directly from can to mixing cup.Dispense from pressure pot.Process more parts per material batch.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding

Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Lay-Up **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-M319-63B013012 **Specific Waste Type:** Polymers

Date: 29-mar-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: Lay-up is used to prepare etched flexible laminates and their corresponding insulating layers for lamination. Work is performed in a clean bench in the positive pressure room. Operators wear disposable coats and caps. Tooling pins or special lay-up fixtures are used to locate layers. Other general hand tools typical of electronic assembly are used as well as light tables. Clean bench surfaces and tools are cleaned with alcohol and a wiping cloth prior to lay-up. Layers are located on one another and heat tacked together using a heat seal iron covered with Teflon fiberglass cloth. Coverlay materials and free standing adhesive films have slip sheets that are removed prior to heat tacking. A DCR roller is used to remove foreign material from the layers. The roller is cleaned by rolling it on a DCR pad. Laminates that have been heat tacked together are stacked between protective microfoam layers. Alcohol soaked wipes are disposed of in flammable solid waste cans. Coverlay and adhesive slipsheets, coats, caps, DCR pad sheets, and Teflon fiberglass cloth are disposed of in normal trash cans. Microfoam is moved to the next process.

Options: Clean benches and tools with water. NOTE: Water will not remove grease and adhesive residues.Clean benches and tools with another cleaner. NOTE: Cleaning material would need to be proven nondetrimental to product and environment.Use less alcohol.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Flat Flex Cable Lamination **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-M329-63D034017 **Specific Waste Type:** Polymers

Date: 31-jul-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: The flat flex lamination process involves the use of either of two lamination presses that apply a programmed or manually input temperature and pressure for a certain length of time. Cables have polymide sheets, adhesive sheets and nylon heat tacked to the circuit laminate and then placed in one of the lamination presses to have the adhesive cured. These materials are laminated to the circuit laminate to provide both physical and electrical protection. The most common and generally used procedure is to place the cables between Teflon fiberglass which is placed between rubber pads. The stack-up is then placed between two metal plates. The entire stack-up is placed between the platens of the lamination press. After the press program is completed the stack-up is removed from the press and the parts are removed from between the Teflon fiberglass sheets.

Options: Place more cables in the press at one time.Use less material.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding

Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Machining **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-MACH-142142007 **Specific Waste Type:** Metal Debris

Date: 13-dec-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Richard Vartanian
Phone: (816) 997-3673	**Phone:** (816) 997-2493
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Alloy Steel Machining **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-MACH-94ALLOYSTEEL **Specific Waste Type:** Metal Debris

Date: 01-nov-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description: Alloy steel is machined on numerical controlled machining centers, rotary grinders and a turret lathe. The initial shape is typically a forging, casting, bar stock or sheet stock of the alloy steel. Most of the machining is accomplished with a water-soluble coolant and, when required, tapping fluids are utilized for adding threaded features to the product. The machining of the alloy steel consists of milling, threading, drilling, boring, turning and grinding the raw material into a specified shape. Machinists perform each operation and verify their work after each part is fabricated. The product may go through all of these processes several times or may only see one process. The final products are then shipped to both external and internal customers.

Options: Start with bulk materials more near net shape, thus generating fewer chips. Rejected because ordering small lots of material too near net shape is not cost effective and each part design must be considered on an individual basis.Replace using water-soluable coolant with cold air gun, thus eliminating the need for the coolant.Retrofit probes with other type of batteries or direct hookup to electrical circuit which would eliminate the use of lithium batteries.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Aluminum Machining **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-MACH-94ALUMINUM **Specific Waste Type:** Metal Debris

Date: 01-nov-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description: Aluminum is machined on numerical controlled machining centers, rotary grinders and a turret lathe. The initial shape is typically a bar or rod cut to length or sheet stock cut into a rectangular plate. Most of the machining is accomplished with a water-soluble coolant. The machining of the aluminum consists of milling, threading, drilling, boring, turning and grinding the raw material into a specified shape. Machinists perform each operation and verify their work after each part is fabricated. The product may go through all of these processes several times or may only see one process. The final products are shipped to both external and internal customers.

Options: Start with bulk materials more near net shape, thus generating fewer chips. Rejected because ordering small lots of material too near net shape is not cost effective and each part design must be considered on an individual basis.Replace using water-soluable with cold air gun, thus eliminating the need for water-soluable coolants.Retrofit probes with other type of batteries or direct hook-up to electrical circuit. This would eliminate the use of lithium batteries.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Marking **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-MARK-18MARKING **Specific Waste Type:** Solvents

Date: 22-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description:

Options: Don't cover coat markings.Use more durable markings.Engrave all chassis markings.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Richard Vartanian
Phone: (816) 997-3673	**Phone:** (816) 997-2493
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Marking **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-MARK-19019003 **Specific Waste Type:** Polymers

Date: 14-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description: The marking process falls into two major categories: (1) cable marking, (2) chassis marking. Cable markings consist of hot stamping, vinyl sleeving, heatshrink tubing, yellow tape or thermofit. Items are marked in a contrasting color. Chassis markings consist of using merlin tape or dry transfer characters on chassis and cloth labels. The markings are made in a

contrasting color. All markings are covered with a protective coating. The marking process can occur any place in the Fab and Prove-In Shop. Cable and chassis marking is covered by written documents (991900-06 and SP-TE0101).

Options: Don't cover coat markings. Reject: Markings will rub off.Engrave all chassis markings. Reject: Impractical and not cost effective.Use more durable markings. Reject: None found.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Richard Vartanian
Phone: (816) 997-3673	**Phone:** (816) 997-2493
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Electrochemical Marking **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-MARK-340ELECHEM000 **Specific Waste Type:** Acid

Date: 10-nov-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description: Electrochemical marking involves manually placing the part identification on the unit prior to shipment. This identification may contain a part number, serial number, log number, date code, manufacturer's code, part name, or other information needed to identify the product. The identification is typed on stencil paper (99012600). An electrical power unit supplies an adjustable current to the handmarker. A ground line is attached to the part. A cotton pad is clipped onto the handmarker. A ground line is attached to the part. A cotton pad is clipped onto the handmarker. The part is pre-cleaned in the area to be marked with a tex wipe (99010355) wetted with alcohol (4601031). This cleaning is not within the scope of this assessment. A small amount of electrolyte (2534906) is poured into a container. A tex wipe is saturated with electrolyte by dipping the tex wipe into the container of electrolyte. The handmarker pad is dabbed onto the electrolyte-saturated tex wipe until the pad is damp. The stencil is positioned on the part marking surface. The handmarker is brought down on top of the stencil and pressure is applied firmly for a few seconds. The handmarker and stencil are removed. A small amount of neutralizer solution is poured onto a container. A tex wipe is saturated with neutralizer by dipping the tex wipe in the container of neutralizer. The neutralizer-saturated wipe is vigorously rubbed over the marked area to remove residue and corrosive salts. Excess neutralizer and electrolyte in the containers is absorbed using tex wipes. Tex wipes and stencil are disposed in a red waste management step can. Both electrolyte and neutralizer are aupplied in 1 quart plastic bottle and have a 1 year shelf life.

Options: Reprocess remaining jobs to laser marking and eliminate electrochemical etch process.Procure electrolyte and neutralizer in smaller bottles. Material would be expensive to repackage and would outweigh the cost of disposal. Not enough schedules left to justify this option.Extend shelf life of electrolyte and neutralizer one extra year to reduce waste from expired material.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Inspection Ink Marking (Orange Ink) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-MARK-340INSP002 **Specific Waste Type:** Solvents

Date: 16-nov-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description: This assessment deals with orange inspection ink (5093153) used to mark accepted products and paperwork after a final visual inspection. Ink is poured from a 1-ounce bottle onto an ink pad. Thinner (4703789) is added as necessary. A rubber stamp is used to mark the products and/or paperwork. The ink on the pad tends to dry out. When this happens, more thinner is added.

Options: Replace the current carcinogenic orange ink with a noncarcinogenic ink.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Manufacturing Ink Marking (Black Ink) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-MARK-340MANUF001 **Specific Waste Type:** Solvents

Date: 10-nov-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description: Several manufacturing departments use black ink to mark products, directly or indirectly, with information required by work directions. Methods include ink usage with rapidograph pen, with stamp pad, or roll-out ink used with stamps. The rapidograph pen holds a plastic cartridge into which the ink is dispensed via an eyedropper that comes with the ink bottle. The pen may then be used to mark product in the conventional manner of penning. For stamp pads, the ink is dispensed directly from the bottle onto the pad. For roll-out inks, the ink is dispensed onto a plate and rolled to a uniform thickness. A rubber stamp transfers ink onto the product with even pressure and is removed. The marking is checked for legibility and restamped as needed. Product that has been ink stamped is allowed to air or oven dry before further processing.

Options: Use rapidograph pen whenever possible since it generates the least amount of waste; roll-out inks generate the most waste; stamping often requires rework which generates more waste.Laser mark product instead of ink stamping.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Marking **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-MARK-438004 **Specific Waste Type:** Solvents

Date: 13-may-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Printing

Description: Product is marked to designate inspected material. The materials used to mark the product must conform to specifications. The markings will designate if the product is conforming, conforms with restrictions or defective. The following material is used for marking: MATERIAL USAGE SUMMARY Description Store # Annual usage (#3 Red Opaque Ink, 5093350-01-800, 0.12 lb.), (#1 Black Ink, 5093162-01-533, 0.48 lb.), (2-propanol ,4601031-02-603, 1.0 lb.), and (kaydrys, 99010930, 1.5 lb.)WASTE STREAM SUMMARY (#1 Out of Shelf Life Material, 0.15 lb.), (#3 Empty Containers, 3.7258 lb.),

(#5 Used Material-Solid, 1.5 lb.), (#7 Fugitive Emissions, 1.3834 lb.), and (#11 Material Retained on product ,0.967 lb.)

Options: Eliminate black ink and use only one color, i.e., red.Establish a central pool to keep the ink to eliminate or reduce the out -of-shelf-life waste stream.Use less hazardous ink to mark product.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Marking **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-MARK-439007 **Specific Waste Type:** Solvents

Date: 13-may-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Printing

Description: Product is marked to designate inspected material. The materials used to mark product must conform to specifications. The markings will designate if the product is conforming, conforms with restrictions or defective. The following material is used for marking: MATERIAL USAGE SUMMARY Description Store # Annual Usage (#3 Red Opaque Ink ,5093350-01-800, 0.12 lb.), (#1 Black Ink, 5093162-01-533, 0.48 lb.), (2-propanol, 4601031-02-603, 1.0 lb.), and (kaydrys, 99010930, 1.5 lbs.). WASTE STREAM SUMMARY: (#1 Out of Shelf Life Material, 0.15 lb.), (#3 Empty Containers, 3.7258 lb.),(#5 Used Material-Solid, 1.5 lb.), (#7 Fugitive Emissions, 1.3834 lb.), and (#11 Material Retained on Product, 0.967 lb.)

Options: Eliminate black ink, use only one color of ink, i.e., red.Establish a central pool to keep the ink to eliminate or reduce the out-of-shelf-life waste stream.Use less hazardous ink to mark product.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Marking Process **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-MARK-8008 **Specific Waste Type:** Polymers

Date: 01-jun-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description: The marking material is used to mark part identification on the unit prior to shipment. This identification may contain part number, serial number, lot number, date code, part name and other information. The marking is usually sealed with a cover coat material. The drawing requirement spells out the process to be used for each part and type of marking material required. The requirement can indicate that the marking be applied directly onto the product or a bag and tag. The product drawing is the guidelines for the operator.

Options: Use only the amount required to complete the job.Laser Marking - eliminate majority of input material but equipment, operating, and maintenance costs are high. Cannot be used on covered or nonmetallic surfaces. Eliminate redundant ink. Several different black inks are used for the same function and could be consolidated into one Save on procurement cost and material discarded because of shelf life.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Anita Cates
Phone: (816) 997-3673	**Phone:** (816) 997-4158
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: BKC 62501 Dry Film Lubricant **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-MIXG-83702BKC62501 **Specific Waste Type:** Solvents

Date: 30-apr-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: This is the process for making BKC 62501 dry film lubricant. The BKC 62501 dry film lubricant is made from four ingredients: molybdenum disulfide (MS4540390), graphite (MS4513042), liquid adhesive (MS2180755), and BKC 63812 solvent blend (P1270125). The molybdenum disulfide and graphite are weighed and blended in a ball mil jar utilizing porcelain grinding balls. The dry mixture is emptied into a sieve to separate the balls from the mixture. The dry mixture is transferred to a glass jar. Next, the liquid adhesive and BKC 62812 solvent blend are weighed and transferred to a mixing container (one-gallon glass jar). The liquids are blended together. Then a weighed amount of the molybdenum disulfide/graphite blend is added to the liquid. The mixture is stirred until uniform. The mix is poured into pint metal paint containers. The equipment is then cleaned with BKC 62812 solvent blend, acetone and paper tissues.

Options: Reduce amount of acetone and BKC 62812 solvent blend used for cleanup.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: BKC 20102 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-MIXG-837BKC20102 **Specific Waste Type:** Solvents

Date: 20-oct-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: 1231 T-Component Formulation **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-MIXG-837PMDI1231 **Specific Waste Type:** Solvents

Date: 25-jun-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: This process involves combining Polymeric MDI and a resin to form the T component of a rigid polyurethane foam.PAPI 2027 Polymeric MDI is weighed and added to the 55-gallon reactor (CE#32566). It is heated to 250 degrees F through conduction heating with steam for 60 minutes.When the PAPI reaches the desired temperature, the Resin, Voranol 490 Polyol, is added to the reactor. The combination is mixed with an internal mixing blade and the temperature allowed to stabilize. The water cooling cycle cools the material to 180 degrees F (about 30 minutes). Water is circulated in a closed secondary system and therefore is not contaminated by the material.Average material amounts are as follows: 498 lb. PAPI 2027 per batch, 11.7 lb.Voranol per batch and 7470 lb. water circulated per batch. When the material, now the Aromatic Isocyanate-1231 T component, reaches 180 degrees F, it is dispensed from the reactor into a 55-gallon drum for storage until the appropriate tests are completed. A one-pint sample is taken to test viscosity, amine equivalent, and Nitrogen content. Samples are disposed of in a 5-gallon container and taken to waste management when full (1.6 containers per year). After the tests are complete, the T component is distributed into 5 gallon containers. After all batches are complete for a period of time, the reactor is cleaned with acetone (55 gallons per cleaning) dispensed directly from an outside tank. Used acetone is emptied into a 55 gallon drum and taken to waste management for disposal.

Options: Drain containers as thoroughly as possible. This option is already being practiced and an increased sense of awareness of its importance was established.Reuse nitrile gloves. This option is actively being pursued.Reuse of the nitrile gloves is in the testing phase. This phase is to determine whether the gloves will maintain their integrity and not degrade during use when being exposed to the 1231 T component material and solvents.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Mold Making (RTV) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-MOLD-434RTV **Specific Waste Type:** Polymers

Date: 30-apr-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Curing

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Cold Mount Making **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-MONT-432COLD **Specific Waste Type:** Metal Debris

Date: 27-apr-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Metallurgy

Description: This process describes the general metallurgical procedure to prepare product for microscopic evaluation using the cold mounting method. A sample is selected as defined in the Inspection Instructions or other applicable documents. A specimen is sectioned out of each sample. Specimens shall be cut in a manner that will cause minimal deformation and heat-affected zones. The specimen may be ground for ease in mounting. Center specimen in the phenolic ring form to apply adhesive (Kwik Liquid and Kwick Powder Kit), mix per manufacturing instructions and pour into the mold. Pull a vacuum until bubbles disappear and allow mount to harden. Grind mount using sand paper 120, 240, 400, and 600 grit until effects of sectioning are eliminated. Ultrasonically clean sample for 30 seconds between each grinding step. After all grinding is completed, use liberal amount of water to wash off grit. Polishing of the mount is required to remove deformation caused by grinding. Ultrasonically clean part for approximately 1 minute prior to polishing. Rinse off with tap water and apply Micron Gamma Powder .05 to the platen on Microcloth PSA. Apply small amount of lapping oil or ethylene glycol, depending on mix, to lubricant surface. Rinse off mount with tap water after polishing is completed. Ultrasonically clean mount approximately 30 seconds prior to final polish. Final polish by using a nylon cloth with Metadi 6 Suspension. Rinse off mount with tap water and blow dry. Safety glasses or goggles must be used when operating the cut-off saw and grinding specimens.

Options: Install water recyclers.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Hot Mount Making **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-MONT-434HOT **Specific Waste Type:** Polymers

Date: 30-apr-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Encapsulation

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Mold Preparation - Mold Release **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-MORL-340MOLD000 **Specific Waste Type:** Grease

Date: 15-dec-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Molding

Description: 4702064 mold release is a grease (paste) applied to mold screws and other details using a lint-free cloth. The cloth is then discarded in a red step-can and the mold release is cured in an oven at 160 deg F. The mold is assembled and used to encapsulate parts. The mold release application process is repeated every time the mold is used. 4702088 mold release is a liquid applied to mold surfaces using a lint-free cloth or brush under a vented hood. The cloth is discarded in a red step-can, and the brush reused.The mold release is cured in an oven at 160 deg F. The mold is assembled and used to encapsulate parts.The mold release application process is repeated every time the mold is used.

Options: Use RTV molds where applicable to eliminate the use of mold release and metal molds. Note: this option is being used on new, development programs; however, certain requirements will drive the need for metal molds and mold release; this process will be minimized, but not eliminated.Apply a Teflon-nickel plating (or some other appropriate non-stick plating material) to the metal molds to establish "built-in" non-stick surfaces to eliminate the use of mold release on metal molds. Note: this suggestion was tried unsuccessfully once already for foam encapsulation molds; however, new materials may be available now that were not available three years ago.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Cleanliness Testing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-OMTR-432CLEANTEST **Specific Waste Type:** Solvents

Date: 30-apr-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Electronics

Description: This method of testing monitors the cleanliness of printed wiring boards just prior to solder mask application. The equipment used to do this testing is an Omega Meter Model 600 Contamination Tester. After the cleaning operation of the printed wiring boards, one panel is selected from the first lot processed. This panel is used for the cleanliness test. The Omega Meter uses 11 gallons of isopropyl alcohol and 4 gallons of deionized or distilled water to perform the test. Prior to use, inspection must ensure to have correct chemical mix or specific gravity. By following the prompts on the LCD display, the inspector knows when and how much material to add or remove. The test sample is inserted into the holder for immersion into the solution. The tester measures the contamination present on the sample. Upon completion of test, the results are recorded and manufacturing notified. The sample is wiped with a lint-free cloth and allowed to air dry. Extract solution should be drained and refilled with fresh solution every 3-6 months.Composition should consist of 75% by volume of isopropyl alcohol, and 25% by volume of deionized or distilled water. Safety precautions for this process are to wear safety glasses and rubber gloves during the handling of samples and the filling of the tester.

Options: Change extract solution only once a year.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Silicone RTV Primer **Major Waste Type:** Sanitary Waste

PPOA ID Code: KCP-PRIM-340PRIMER000 **Specific Waste Type:** Miscellaneous

Date: 13-sep-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Painting

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Miscellaneous Primers **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-PRIM-340PRIMER001 **Specific Waste Type:** Solvents

Date: 30-jun-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description: MS5034201-BR 125 PRIMER: Remove BR 125 primer from freezer, allow to warm to liquid. Mix primer by shaking, using any suitable applicator; apply primer on surface area which will be bonded with beta eucryptite or with nitrite epoxy frozen precut adhesive later. Air cure at room temperature for 1 hour minimum and cure in oven set at 175 degrees F for 10 hours minimum. The excess material is sent to waste management as solid waste, along with contaminated nonhazardous waste like gloves , tin cups, foam Q-tips etc....BR 125 primer, 50% solid is used to: *Bond with nitrite epoxy frozen precut adhesive. *Bond with Beta Eucryptite *Decouple steel from adhesives MS4702694-PRIMER T: Use any suitable tool to apply primer, allow to dry for approximately 5 minutes.

Options: Prevent the waste of material scrapped for out-of-shelf-life expiration by maintaining minimum quantities on hand, because shelf life is 6 months from date of shipment.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Humidity Chamber PH Test **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-R610-431EPH003 **Specific Waste Type:** Air

Date: 16-sep-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Chemical

Description: The PH4 and PH7 buffer solutions are utilized for calibration of the Digi-Sense pH Meter, Model #5985-80, S/N 1092779. The meter's probe is checked in each solution for correct pH readings and then the pH level of the deionized water in each chamber is read to make sure there is no variation from the acceptable pH levels.

Options: Have another department check the pH factor of the deionized water going to the humidity chambers. This would not eliminate pH7 and pH4 from the plant.Use a different type of solution. Calibration of the probe would not be accurate.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Fine Leak Testing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-S120-439005 **Specific Waste Type:** Solvents

Date: 01-mar-1994 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Environmental

Description: Fine leak testing, performed ensures that purchased material, when required, is hermetically sealed. During leak test, the purchased material is exposed to 1-atmosphere differential of pressure. The low side is below 1 torr of pressure and the high side is purged and backfilled to 1-atmosphere of pressure with helium (4526000-01). Leak test is used to keep scrap of next assembly to a minimum. During the process, 6 chemicals and 3 articles are used: isopropyl alcohol - 4601031-02, Apiezon M grease - 990177113, Leak Tek (Formula 372e) - 2502403-01-800, helium - 4526000-01, dry nitrogen (Plant System) - 4543001-001, liquid nitrogen (plant system), - 57009318, kaydry's - 99010930, Tex wipes - 99010355, and large finger cots - 9901085.

Options: Replace isopropyl alcohol with nonhazardous glass cleaner.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Purge and Backfill **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-S310-58E052-019 **Specific Waste Type:** Air

Date: 22-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Packaging

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: EN-8 Encapsulation / Sealing Operations **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-SEAL-340ENCAP000 **Specific Waste Type:** Polymer

Date: 16-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description: EN-8 is used in a variety of applications in firesets as follows: 1) to seal ends of wires before hard encapsulation. 2) To coat high voltage solder joints for dielectric protection. 3) To coat damaged areas on HV flat cables, and 4) To bond wires or encapsulate wire bundles. EN-8 (2519605) is an Unfilled Polyurethane Elastomer containing TDI and comes in a two-part kit consisting of part A the resin and part B the hardener. The materials are maintained in their original containers (one gallon can - part A: one-quart can - part B) and stored in a nitrogen cabinet to keep out moisture. Cab-o-sil (4551262) which is used as a filler with the EN-8 approximately 95% of the time is also maintained in the cabinet in its one-gallon can. As required by processing, the two components and the cab-o-sil are manually dispensed and weighed under a vented hood (vents to atmosphere) into a one-quart plastic cup in the following sequence; 100 grams of part A + 2 to 6 grams of cab-o-sil + 18.8 grams of part B (presently because of mixer capability and concerns over getting a proper ratio mix the minimum recommended batch size for EN-8 in firesets is 118.8 grams plus cab-o-sil). It is hand mixed and then vacuum mixed for two minutes minimum at a vacuum of 0-3mm. It is then taken to the workbench where the work is to be performed and put into either a hand syringe or a EFD power dispenser syringe and applied. The unit is then typically cured at 160 deg. F for 2 hours althrough there are several alternate courses. All remaining material, used kaydrys, syringes, etc. that were used in the process are disposed of in a hazardous waste container. The vacuum mixer blade used for mixing is cleaned by putting a half-full quart cup of trichloroethane (4611060) in the mixer and putting the blade in it. As the trichloroethane evaporates it is replaced and occasionally the quart cup with residue EN-8 in the bottom is disposed of in a hazardous waste container and replaced.

Options: Smaller batch sizes -- The recommended minimum batch size is 118.8 grams. The material specification allows a 59.4-gram minimum batch. Before that could be changed, the vacuum mixer would need to be altered to accept a pint cup and training would need to be altered to ensure that the smaller batch was properly mixed.New sealing material -- Find a material that has similar cured properties that is nonhazardous and can be used in small batch sizes. New materials have been identified but they are still under evaluation. Disposable mixing blades -- Replace the permanent metal mixing blade with a disposable (probably plastic) mixing blade. This would eliminate the need for a solvent to clean the blade; however, another waste stream would be created somewhere else to make the blades and cost could be a consideration.Process more parts at a time -- Accumulate more parts so there is more to encapsulate per batch of EN-8. This is already being done as much as possible and with reduced schedules it is even more difficult.Alternate solvent -- Find a less hazardous solvent to clean the mixer blade. New solvents are being evaluated for cleaning foam machines and could be used in this application. Keep a lid on the quart container of solvent to reduce the amount of evaporation and thus usage. Training of operators would be required.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Syntactic Polysulfide **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-SEAL-340ENCAP002 **Specific Waste Type:** Polymer

Date: 11-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: Syntactic Polysulfide is mixed and applied to wire-epoxy exit points and internal components. Syntactic Polysulfide is formulated by mixing 100 parts by weight (pbw) of the Part A base component and 9.7 pbw of the Part B hardener.The minimum batch size is 109.7 grams. A typical process begins by placing a one-point polyethylene cup on a Mettler Digital Scale. Using a tongue depressor, 100 grams of Part A is scooped out of its container and placed into the one-pint cup. The tongue depressor is discarded into a satellite waste can. Next, using another tongue depressor, 9.7 grams of Part B is scooped out of its container and placed into the one pint cup. This tongue depressor is also discarded into a satellite waste can.

Using a third tongue depressor, Part A and Part B are mixed together until the mix is homogeneous. The third tongue depressor is then discarded into a satellite waste can. (NOTE: All weighing and mixing is done under a vented hood.) Approximately 20 grams of Syntactic Polysulfide are poured into a 30 cc polyethylene syringe. Next, a rubber plunger is pushed into a syringe. A plastic needle is screwed onto the syringe and the syringe is hooked up to an EFD dispensing machine. Using approximately 25 psig, an operator applies the Syntactic Polysulfide to the appropriate surfaces of the assembly. The unused polysulfide cup, syringe, and plastic needle are discarded into a satellite storage waste can.

Options: Reduce minimum batch size to 32.9 grams (30 grams base and 2.9 grams hardener).Mix material at set time in department so all users can get a syringe full of the same batch.Mix and freeze material. (Material can not be mixed and frozen.) Pre-measure a smaller batch size in a 2-part syringe. Operator would cut seals and mix when ready to use. (Do not own required equipment; will be expensive to purchase).

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Soldering **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-SLDR-18SOLDERING **Specific Waste Type:** Lead

Date: 22-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description:

Options: Twist wires together.Crimp connections together.Use wire wrap connect ions.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Richard Vartanian
Phone: (816) 997-3673	**Phone:** (816) 997-2493
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Hand Soldering **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-SLDR-340HAND001 **Specific Waste Type:** Solvents

Date: 15-dec-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description: Soldering is a metallurgical joining using a filler material (solder) to produce metallic continuity between two interfaces. Soldering relies on wetting for the bond formation. Conventional hand soldering uses electrically heated soldering iron to generate the heat needed when positioned against the connection. Solder can then be applied to the heated surfaces, melt, wet, and form the solder joint. The joint formation is accomplished as follows: Flux surface area to be joined (4705010 and 4705022) - iron tip removed from holder and wiped on sponge - tip and solder core touch component/wire lead and area to be joined (8330202, 8330260 & 8331002) - solder melts, creating a heat bridge - work and solder reach wetting temperature - solder fillet is formed - solder core removed - iron removed - fillet solidifies - work cools - iron tip tinned and placed back in holder - component/wire lead trimmed - fillet cleaned with alcohol swab and solder joint(s) spray cleaned.

Options: Use different flux (aqueous) that would not need to be cleaned with TCE. This would reduce the hazardous waste in the solvent waste stream.Do not use additional flux when a flux core solder is used. This would reduce fugitive air releases and reduce the flux removed in the spray clean process.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Reflow Soldering **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-SLDR-340REFLOW000 **Specific Waste Type:** Metal Debris

Date: 15-oct-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description: Soldering is a metallurgical joining using a filler material (solder) to produce metallic continuity between two interfaces. Soldering relies on wetting for the bond formation. Reflow soldering occurs when pretinned surfaces are brought in contact at the same time, heated together, causing the solder deposit on a wetted surface to remelt, through joining the surfaces. The joint formation is accomplished as follows: 1) Flux surface area to be joined (4705010). 2) Iron tip removed from holder and wiped on sponge. 3) Tip and solder core touch area to be joined (8330260). 4) Solder melts, creating a heat bridge and pretinning surface area. 5) Surface area cleaned with alcohol. 6) Setup reflow equipment. NOTE: Fixture FD376870-400 is used to solder bullseye connectors and does not include steps 7-10. 7) Prepare test sample (1469019, 1468983 and capacitor SA3587).8) Run test sample. 9) Clean test sample. 10) Send test sample to inspection for verification to continue. 11) Flux pretinned surfaces (4705000/4601031 50/50 mixture). 12) Load piece parts into reflow equipment. 13) Run specified machine program. 14) Clean and remove excess solder.

Options: Have cable pad solder-leveled before being sold as a cable to Firesets. Do not tin iron tips during process.Use different solder preform quantity to reduce excess solder waste.Use lead-free solder.Do not use capacitor as test sample; use cable sample for pull test.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Solderability **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-SLDR-432INSP **Specific Waste Type:** Lead

Date: 26-feb-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Soldering

Description: Inspection tests LCCAs solder pads to determine solderability. The process tests the ability of these terminations to be wetted or coated by solder and verifies that the manufacturing process used for soldering is satisfactory, and to specifications. This process consists of the following steps: 1) No wiping or cleaning of terminals is allowed. 2) Terminals shall be immersed in flux, at room temperature to minimum depth necessary to cover the surface to be tested.Immersion time shall be a period of 5 to 10 seconds. 3) The flux-covered terminals shall be immersed once in a molten solder to the same depth and manner specified in step 2. 4) After the dipping process is complete, the part shall be allowed to cool in air. 5) All residue flux shall be removed

from the terminals by rinsing in a suitable solvent (reference PPOA for vapor degreasing).

Options: Share flux with manufacturing to reduce waste.Use solder pot in manufacturing to minimize usage of solder and prevent waste.Wait until you have several parts to process before performing this test. This will maximize usage of material and minimize waste.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Hand/Manual Soldering **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-SLDR-8010 **Specific Waste Type:** Lead

Date: 17-sep-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Anita Cates
Phone: (816) 997-3673	**Phone:** (816) 997-4158
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: FlatPack Soldering **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-SLDR-8011 **Specific Waste Type:** Lead

Date: 17-sep-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Anita Cates
Phone: (816) 997-3673	**Phone:** (816) 997-4158
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Vapor Phase Soldering **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-SLDR-8014 **Specific Waste Type:** Printed Circuit Boards

Date: 20-dec-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description: Vapor Phase soldering is a technique used to solder surface mount components primarily to printed wiring boards. The solder is reflowed by the heat of vaporization of an inert material. This technique is used to control the peak soldering temperature and to minimize temperature gradients across the product. A HTC Phase-Four vapor phase soldering system, containing Fluorinert FC70 (4611153) and SF2 (4611159) is used as part of the soldering process. Prior to soldering, the solder bumps of the network are fluxed with pure kester RMA 197 mildly activated flux and left to air dry for about 10 to 15 minutes to become sticky. Stenciling is used with a cream/paste on other networks not containing enough solder. The LCC hybrids and J-lead components are placed onto the solder bumps. Then the PWB (printed wiring board) is placed onto the transport system of the vapor phase machine. The board is transported into a preheating zone for about three minutes to prevent temperature shock and to activate the flux. After preheating, the board is transported into the vapor zone for 20 seconds to reflow the solder. After soldering, the board is transported up to the home position for cooling. A final cleaning is done on the PWB at this time with either of the two cleaning PPOAs CLSU008002/003.

Options: Eliminate the use of the TCA, alcohol and AP20 as cleaning solutions for PWB.Look into newer and better soldering reflow machines that eliminate the use of hazardous chemicals.To evaluate the need for stenciling the PWBs, thereby reducing the usage of solder cream/paste.Produce PWBs that already come with solder filled pads.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Anita Cates
Phone: (816) 997-3673	**Phone:** (816) 997-4158
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Mechanism Soldering **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-SLDR-92SOLDER **Specific Waste Type:** Lead

Date: 01-nov-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description: Soldering is performed to complete electrical connections, as a covering over the fill tube pinch-off to prevent sharp edges, and to provide a mechanical bond with ground. Soldering is accomplished using either a soldering iron or a solder pot. Eutectic solder (63% tin and 37% lead) is the most common, but a 96% tin and 4% silver is also used. Some of the solder is solid wire and some is rosin-cored wire. An activated rosin flux is used in some applications and a mildly activated flux in others. The operators must pass a solder certification to be qualified if 9913000 is called out on the print. Solder joints must be cleaned to remove flux. Cleaning has become more difficult as many of the solvents (such as trichloroethylene) traditionally used to clean off flux have been removed from the plant for ES&H concerns. Currently the flux is cleaned using isopropyl alcohol, an aqueous cleaner called Bio-Kleen, or a combination of both.

Options: Consolidate types of materials for improved utilization. Both cored and solid type solder is called out and both mildly activated and activated flux for similar types of operations.Increase solder pot intervals for changing out the solder and frequency of calibration. The care and use of solder pots is covered by GPI P0860003. A GPI applies without being called out. This GPI allows thirty days of use and then the solder is removed an the solder pot recalibrated. This could be considered due to low usage.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick

Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Stamping Product & Documents **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-STMP-471INKSTAMP **Specific Waste Type:** Solvents

Date: 25-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description: The Quality Assurance Inspection Organization (QA) is responsible for stamping QA accepted product and related documents. The inks are applied to the acceptance stamps using the stamp pads provided. The stamps are then applied to the product or document. The cleaning of acceptance stamps is a part of this PPOA. Acceptance stamps are cleaned periodically to maintain a legible impression. The stamps are cleaned with alcohol and an absorbent cloth.

Options: Purchase the ink in smaller containers to reduce the amount of expired material that is sent to Waste Management.Change the type of ink to one that is less toxic and hazardous.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Meseran Testing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-T310-83704BK **Specific Waste Type:** Solvents

Date: 31-mar-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Cleaning

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Bubble Testing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-TBBL-434INSP **Specific Waste Type:** Solvents

Date: 04-dec-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Mechanics

Description: Bubble testing is performed by Electrical-Mechanical Inspectors. The material used is FC-43 Fluorinert liquid, MS411151-00-800, and dry plant nitrogen. The process involves filling a Trio-Tech Model 254 or 481-10 bubble tester with FC-43. The tank is then heated to 125 degrees F (+/- 5 degrees). Using forceps, a unit is then immersed into the tank for a minimum of 60 seconds, to a minimum depth of 2" below the surface while monitoring for any bubbles that may appear from the unit. Monitoring is required to prevent the release of any toxic vapors. The unit is then removed and the excess FC-43 is allowed to drain back into the tank. The unit is blow-dried with dry nitrogen, #4543001. Disposable wipes are used to absorb any drips or spills that might occur.

Options: Install a temperature alarm on the tester as a safety device. This will prevent the FC-43 from overheating; therefore, decreasing the probability of toxic decomposition.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Cure Test **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-TCUR-434INSP **Specific Waste Type:** Solvents

Date: 31-mar-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Coating

Description: An electro-film coating is applied to test panels. The test panels are a representative of actual coated surfaces. A cure test is performed by inspection to ensure adhesion of the electro-film coating. The process entails dampening a test cloth with 1,4-dioxane (4608013-00-604) and wiping a test coupon from each lot of product. The wiping action of the cloth should not remove the coating to expose base metal. The used wipe is then disposed of in an approved waste container. HEALTH HAZARDS: 1,4-dioxane is a known carcinogen and a carcinogen safety plan is presently in place. SAFETY PRECAUTIONS: Equipment required are approved gloves, splash proof safety goggles, and a negative pressure vented fume hood. All proper handling and storage procedures are followed. The material is labeled in accordance with the department operating procedure. And employees are trained to avoid any contact with skin or inhalation of the dioxane vapor.

Options: Change to cloth wipes and reuse.Use fewer disposal wipes.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Electrical Testing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-TELC-432INSP **Specific Waste Type:** Oil

Date: 12-apr-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Electronics

Description: Inspection uses a PT1274 Tester to electrically test impact crystals. During this process mineral oil (97022280) is

used between the part and mounting fixture as a shock absorber. This process involves applying a small amount of mineral oil on the mounting surface of the tester and mounting the part to be tested on the test fixture. After the test is completed, a disposable wipe is used to remove the mineral oil residue from the part tested. The used wipe is then disposed of in an approved waste container.

Options: Change to EEL Skil Oil.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Electronics Performance Testing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-TELC-439006 **Specific Waste Type:** Solvents

Date: 06-may-1994 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Electronics

Description: Electronics performance testing is utilized to ensure that product procured by the FM&T meets or exceeds electrical parameters prescribed by specifications. The materials utilized are Cascade - part # 4702410-01-800 (used as a wetting agent), #282 Rosin Core Solder - part # 65110011 (used to connect lengths of wire), 2-propanol - part # 4601031-02-603 (used to clean parts), and nitrogen/compressed gas - part # 4543000-01-000 (used to test transducers).

Options: Replace rosin core with shrink tubing.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Hardness Testing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-THRD-434INSP **Specific Waste Type:** Oil

Date: 17-dec-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Metallurgy

Description: Inspection is required to perform a hardness testing when specified on the Inspection Instructions. The process involves selecting the correct anvil to support the part during testing. Before using the anvil selected, clean any dust, dirt or oil off. Inspect the seating surface of the anvils and supporting surface of the elevating screw to ensure they are free from pits, heavy scratches, dust, dirt and grease. When testing is complete, coat the anvils with a light coat of eel skid lubricating oil to prevent rusting.

Options: Use Starrett M-1 All Purpose Lubricant instead of Eel Skid Oil.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers

Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Solder Dipping and Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-TINN-339AJ115001 **Specific Waste Type:** Solvents

Date: 31-jan-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Components are received into the department with various packaging configurations. After the parts are logged in and the work directions are generated, the parts are unpackaged and precleaned by agitating in a stainless steel tray of isopropyl alcohol. The component leads are then dipped in flux and then dipped in a molten bath of solder and placed in deionized water until the final cleaning. The final cleaning consists of a hot deionized spray. The residual water is evaporated off the parts prior to repackaging and shipping.

Options: Grouping of jobs. The quantity of materials used in the dipping process is dependent on the quantity of parts and number of jobs processed in a day. If grouping of jobs is practical, it would significantly reduce our current consumption of materials. Recycling of rinse water. The rinse water is dumped directly to the industrial drain with very low concentrations of flux. If we had equipment to retreat this water, we would reduce the volume of waste. Eliminate the need for process. This process is used to correct degradation of component lead solderability due to HTRB testing. This could be eliminated by requiring vendors to perform HTRB before final lead finish or by specifying nonporous gold plating.Convert to no-clean - fluxless process. These processes are currently being evaluated throughout the weapons complex for use in production applications. They may have the potential to replace our current process.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Tin Dipping **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-TINN-340TINDIP000 **Specific Waste Type:** Solvent

Date: 15-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description: The tin dipping operation uses a solder pot station, a trichloroethylene spray wash station, and a 2-Propanol spray wash station. The 500 degree F solder pot is filled with solder. The dross solder is skimmed from the top of the solder pot using a spatula. Electronic component leads are dipped into rosin flux. Leads are then dipped into the solder pot. After components are all dipped, they are placed in a wire basket and sprayed in the trichloroethylene spray. The wire basket of components is then sprayed in the 2-propanol spray.

Options: Batch process parts when possible to reduce point source emission of trichloroethylene and 2-propanol.Hand brush parts with trichloroethylene to reduce point source emission of vapors. This would result in more liquid waste and less stack emission.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier

Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Tin Dipping (Blackstone Flux) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-TINN-340TINDIP001 **Specific Waste Type:** Solvent

Date: 30-sep-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description: The Blackstone Flux tin dipping operation uses a solder pot station, a stainless steel sink with ambient tap water and deionized water (the two water sources are for flux removal), and an isopropyl alcohol/dry nitrogen spray booth. The 500 deg F solder pot is filled with solder. The solder dross is skimmed from the top of the solder pot using a spatula. Electronic component leads are dipped into the organic acid flux and then into the solder pot. After the components are tinned, they are rinsed/brushed with tap water and then rinsed with DI water (the flux-contaminated water is accumulated in a liquid waste container for disposal by waste management). Components are placed in wire baskets and spray cleaned with isopropyl alcohol and blown dry with nitrogen. The isopropyl alcohol rinse operation is not within the scope of this assessment.

Options: Batch process the parts when possible to reduce the amount of water rinses and the quantity of contaminated water disposal.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Tin-Dipping Components **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-TINN-8009 **Specific Waste Type:** Lead

Date: 19-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Anita Cates
Phone: (816) 997-3673	**Phone:** (816) 997-4158
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Fine Leak Testing with Argon **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-TLEK-434LEAKTESTING **Specific Waste Type:** Compressed Gas Cylinders

Date: 30-apr-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Mechanics

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Gross Leak Testing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-TLEK-437GROSS **Specific Waste Type:** Solvents

Date: 31-oct-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Environmental

Description: The gross leak test sample is placed into a vacuum/pressure vessel. The vessel is put onto the processor (1910161 GK155-1) and subjected to a vacuum of 5 mm Hg minimum for 30 seconds minimum. This vacuum cycle may be omitted if the samples have an internal cavity volume >/=0.1 cubic cm. Next, the vessel is back-filled with a detector fluid (FC-72) that sufficiently covers all devices in the sample without breaking the vacuum, if performed. The FC-72 is then over-pressured with nitrogen at a specified pressure and duration. Once the sample is removed from the processor, each part (up to 3 at a time) is submersed to a minimum depth of 2" in a detector fluid (FC-43) which is maintained at 125 deg C. Each device is examined for the presence and source of bubbles while in the detector fluid for 30 seconds minimum. A definite stream of bubbles, or two or more bubbles originating from the same point, shall constitute a reject.

Options: Discontinue use of FC-43 (#4611151) and switch to D02 (#57003886). This change will reduce input material costs and lower the health risks involved.Discontinue use of FC-72 (#4611155) and switch toD80 (#57003887). This change will reduce input material costs and lower the health risks involved.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Magnetic Particle Testing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-TMGP-435MAGPARTEST **Specific Waste Type:** Solvents

Date: 17-mar-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Metallurgy

Description: The following is a generic description of the magnetic particle testing process only; actual processes are based upon the material being tested. The process involves the use of an electrically energized magnetic "coil" or "head". 1.Preclean using alcohol; dry part before applying solution. 2.Part is placed in either the head or the coil, rinsed with the magnaflux carrier

(solution) and energized (magnetized). 3.The part is then removed and inspected under a black light using a microscope (if required). 4.After inspection the parts are demagnetized, alcohol cleaned and coated with Starrett M1-oil (if required).

Options: Use eddy current (a magnetic process) with a CRT/Analog scope, instead of the magnetic particle process.Perform fluorescent penetrant inspection on more parts and screws instead of magnetic particle process where applicable.Change the use of vinyl gloves to nitrile gloves that may be cleaned with alcohol and reused.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Penetrant Testing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-TPEN-434PENETRANT **Specific Waste Type:** Air

Date: 29-apr-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Metallurgy

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Contact and Connector Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-TVAC-434VACTEST **Specific Waste Type:** Compressed Gas Cylinders

Date: 30-nov-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Environmental

Description: When vacuum testing is performed on products, the seal between the vacuum chamber and the lid must be airtight and free from foreign materials. To achieve this condition, a cleaning process is performed by wiping the two mating surfaces using an alcohol-dampened lint -ree cloth. Then a light film of Apiezon grease is applied to the two surfaces to ensure an airtight seal. The vacuum chamber is then closed shut and a mechanical pump removes the air from the chamber to perform the vacuum test or check the leak rate of the product. Some vacuum testing requires a gaseous material, i.e., argon, helium, nitrogen, etc. to be used to back fill the product before a vacuum test is started.

Options: Only clean O-rings and metal parts when necessary; this will save on Apiezon grease, alcohol and lint-free cloths.Recycle glass containers or re-use glass containers for alcohol.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers

Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Ultrasonic Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-ULSN-432INSP **Specific Waste Type:** Caustic

Date: 30-apr-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Unpacking **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-UNPK-18UNPACKING **Specific Waste Type:** Paper

Date: 22-dec-1992 **Major Activity Type:** Waste Management **Specific Activity Type:** Packaging

Description:

Options: Unpack items in stores.Return boxes and packaging.Reuse packing material.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Richard Vartanian
Phone: (816) 997-3673	**Phone:** (816) 997-2493
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Unpacking **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-UNPK-19019001 **Specific Waste Type:** Office Trash

Date: 17-nov-1992 **Major Activity Type:** Waste Management **Specific Activity Type:** Packaging

Description:

Options: Unpack items in stores.Reuse foam peanuts.Return boxes and packaging.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Richard Vartanian
Phone: (816) 997-3673	**Phone:** (816) 997-2493
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Thermocouple Welding **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-WELD-19019002 **Specific Waste Type:** Compressed Gas Cylinders

Date: 10-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Welding

Description:

Options: Use crimp-type thermocouple junctions.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Richard Vartanian
Phone: (816) 997-3673	**Phone:** (816) 997-2493
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Laser Welding **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-WELD-340LASER001 **Specific Waste Type:** Metal Debris

Date: 15-dec-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Welding

Description: The CO2 Laser Welder is used to weld stronglinks, covers, and other assemblies into and on firing set housings. Typically, hermetic seals are required on these units. The components are all cast or wrought stainless steel alloys for optimum weldability. The components are pre-cleaned with isopropyl alcohol then welded under an argon cover gas to reduce metal oxidation. During welding, immeasurable quantities of Fe, Cr, Ni, and other alloying element fumes are released to fugitive air within the enclosed and vented laser welding workstation. Stainless steel wire brushes are used to remove heat tint oxide and weld spatter from the component surface after welding. All product welded on the laser welder is currently non-WR. This significantly reduces the number of weld samples required for each unit and the need for numerous samples to qualify a weld schedule for production use.

Options: Reuse weld samples (48004593 and 48002844).

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Resistance Welding **Major Waste Type:** Sanitary Waste

PPOA ID Code: KCP-WELD-340RESIST000 **Specific Waste Type:** Metal Debris

Date: 03-dec-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Welding

Description:

Options: Reuse wire and ribbon samples.Weld more product at a given time.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Belt Skimmer **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-WM-161BELTSKIMMER **Specific Waste Type:** Oil

Date: 01-oct-1993 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Treatment

Description: The water from the sump is contaminated with petroleum hydrocarbons. The oil in the water is removed by using a belt type skimmer. The belt material is designed to attract the oil molecules. The oil is attached to the belt and is lifted up. The scraper located at the top removes the oil molecules and transfers them into a 55-gallon drum. The oil that is collected is then shipped off-site for disposal.

Options: Change barrel less often.Build a treatment facility. This will eliminate the oil waste stream.Use water for other purposes.Treat the stream at existing Groundwater Treatment Facility.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Aysun Guttridge
Phone: (816) 997-3673	**Phone:** (816) 997-3038
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Container Rinsing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-WM-161CNTRRINSE00 **Specific Waste Type:** Containers

Date: 29-oct-1992 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Treatment

Description: Container rinsing is performed on containers which are reused for waste disposal by generating areas at the FM&T facility and on disposable containers prior to putting them in the normal plant refuse. For the reusable containers, the rinsing is done to ensure incompatible wastes are not mixed. For containers to be disposed, the containers are rinsed to a neutral state, because it is the best waste management practice. The containers are rinsed by one of two methods. Method 1) The container is filled to the top. 2) The container is then drained to the industrial line for treatment at the IWPF. 3) This process is repeated

three times. 4) The water is tested the third time.If the pH is neutral, the container is returned to service or nonreusable containers are thrown away with nonhazardous refuse. 5) If the pH is not neutral, then the container is refilled and retested.Method 2 - 1) Several containers (max 4 for acid or alkaline) are put on a simple spray fixture. 2) The water is turned on and the containers are sprayed (4-5 minutes). 3) The containers are drained and the rinse water is tested for a pH value. 4) If the pH is neutral, then the containers are returned to service or non-reusable containers are thrown away with nonhazardous refuse. 5) If the pH is not neutral, then the process is repeated until the result is neutral. Method 2 is estimated to use about 1/3 the volume of water as Method 1. However, Method 2 can only be used on smaller containers. The operator selects the method depending on the size of the container, number of containers, and preference.

Options: Reduce number of rinses. Reduce the number of rinses from three to the necessary number of rinses to achieve a neutral pH.Refine current fixture. Refine the current fixture to make it more efficient. Item 1: Increase the water pressure so that the fixture can be run while rinsing the 210-gallon containers with the hose. Item 2: Order 3-4 end caps for the fixture line so fewer positions can be used when necessary.Wand for rinsing. Use a wand which can reach into the container for rinsing. The problem with this suggestion is that potential splash problems would arise. Safety is the greater concern here. Revolving fixture (210-gal tanks). Design a fixture which could screw into the 210-gallon container lids. A revolving spray fixture would hang into the container and rinse the sides. This should utilize at least 50% less water and maybe more.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Aysun Guttridge
Phone: (816) 997-3673	**Phone:** (816) 997-3038
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Oil/Water Separator **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-WM-161OILWASKIMMR **Specific Waste Type:** Oil

Date: 01-oct-1993 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Disposal

Description: The oil/water skimmer is designed to remove oil down to 10 parts per million from runoff water collected from three different sump areas. The oil is a combination of cooling oils and greases from trash dumpsters and drainage from cafeteria operations. Units are designed for an oil specific gravity of 0.9. Removal is accomplished by gravity settling. Oil that is separated is pumped out and disposed offsite as necessary. Sludge is cleaned out annually and disposed offsite.

Options: Reuse water after purification.Recycle grease.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Aysun Guttridge
Phone: (816) 997-3673	**Phone:** (816) 997-3038
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Oil/Water Separator **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-WM-161OILWATSEP **Specific Waste Type:** Oil

Date: 17-mar-1993 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Disposal

Description: Water is either directly piped through the carbon filtration system or through the OilMaster followed by carbon

filtration. The effluent which leaves the carbon filtration is piped to the IWPF. Oil waste from the OilMaster storage barrel is bulked with oil at the Tank Farm. The purpose of the OilMaster is to separate aggregates of oily/water waste and thereby reduce the disposal cost. After separation, the water is sent to the IWPF for further treatment. The oil is bulked into the oil tanks in the Tank Farm and sent off-site for incineration. The OilMaster - Waste water passes through a filtering system and is pumped into a holding tank. It is then pumped through the OilMaster. A vacuum is created in the system when the pump is started. The liquid mixture separates, since the specific weights are different. In addition, the OilMaster contains a coalescing separator. Oily water is pumped through the coalescing material. The liquids pass through while materials with different surface tension properties aggregate and form larger droplets. The droplets rise to the top. Oil collects within the separator until a set quantity of oil is reached. Then the oil is discharged into a 55 gallon barrel. The water is run through a carbon filtration system and then discharged to the IWPF for further treatment. If the liquid contains excessive sludge, a preprocessing step is used to remove the solids, so the OilMaster does not clog. Waste water containing sludge flows into a large rectangular tank with several baffles. The water is pumped through the OilMaster; the sludge is disposed of as low level PCB waste. For well drillings or well vault pumping, water/silt mixture is pumped through a screen into another tank where it is collected for disposal. The sludge is disposed of as oil/solvent debris; the water is pumped directly to the carbon filtration system and onto the IWPF. (These tanks have not been used in the last year, but the potential for use is present.)

Options: Improved Filtration Prior to OilMaster Separator. An improved carbon filtration system is required prior to the OilMaster Separator to reduce the clogging in the OilMaster as well as reduce the wear and tear on pumps.New filtration system prior to the Oil Master. An improved carbon filtration system before the OilMaster would ease wear and tear on pumps, reduce the filter changes in the OilMaster, and reduce the costs of maintenance time to change filters. (2-day downtime) Use Settling Tanks - The settling tanks have not been used in the past year. The tanks are in place and could be used to help settle out some of the silt and particles in murky water.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Aysun Guttridge
Phone: (816) 997-3673	**Phone:** (816) 997-3038
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Packaging **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-WM-161PACKAGING00 **Specific Waste Type:** Containers

Date: 31-mar-1992 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Handling

Description: Packaging material is added to waste drums to be manifested and shipped off-site to a TSDF for disposal. Packaging (sawdust or clay type of material) is used to top off oil-solvent debris barrels in order to absorb any excess fluid. The packaging material is also used to top off medical waste, battery, and hazardous soil waste containers. When the drum is full, the container is topped off with several inches of the packaging material. The packaging material is used as an absorbent; it also serves to cushion materials in the waste containers during transport. Sawdust or corn cob fractions are used for packaging for containers which are incinerated. The all purpose absorbent, a clay material, is used for containers which are landfilled.

Options: In the past, wastes were bulked, but this can cause many safety hazards. In some cases it could be considered treatment. Treatment in this manner has not been applied for by KCP in the RCRA Part A & B permit application.Option 2 is to use cardboard which is thrown away as waste in the plant as packaging material. The cardboard would not have the absorbent properties of the current material used nor would it fit around the packaged materials as easily.Option 3 is to use the foam peanuts for packaging.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Aysun Guttridge
Phone: (816) 997-3673	**Phone:** (816) 997-3038
Fax: (816) 997-4208	**Fax:** (816) 997-3331

Email: wschlosberg@kcp.com	**Email:**

Title: Solvent Recycle **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-WM-161SOLVRCYCLOO **Specific Waste Type:** Solvents

Date: 06-oct-1992 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Treatment

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Aysun Guttridge
Phone: (816) 997-3673	**Phone:** (816) 997-3038
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Thermal Emulsion Breaker **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-WM-161THERMEMULBR **Specific Waste Type:** Drilling Fluids & Muds

Date: 15-dec-1992 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Treatment

Description: Many machining operations at the KCP use cutting fluids to prevent excessive heat build-up during machining. About 95% of the cutting fluid is made up of water. The Thermal Emulsion Breaker (TEB) separates the water from the cutting fluid and reduces amount of waste that must be shipped off-site for treatment. The spent cutting fluid is collected from various machines on the factory and is poured into the reservoir of the TEB through a filter which filters out solid debris. The fluid flows to a large holding tank and is automatically fed into the TEB where the cutting fluid is heated up to about 160 deg F. The heat breaks up the emulsion and the water settles down. The water is further heated until it evaporates and flows into the overhead condenser. The condensate is collected in a holding tank where it mixes with the cooling water and is pumped to the IWPF for treatment. The oil is pumped into a separator from water by gravity. The oil is drained into a carboy and is sent off-site for disposal. The water is recycled back to the TEB.

Options: Replace the TEB with more efficient equipment.Use chilled water instead of city water for cooling.Better maintain equipment. Clean TEB more often.Use a coolant that will last longer.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Aysun Guttridge
Phone: (816) 997-3673	**Phone:** (816) 997-3038
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Trash Compacting **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-WM-161TRASHCMP000 **Specific Waste Type:** Glass

Date: 20-jan-1993 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Handling

Description: Plant nonhazardous refuse is collected by maintenance into yellow wheeled containers which are taken to the trash compactor (CE60941). These are connected to the compactor (Cart Dumper CE60942) and automatically dumped into a containment area. Glass from the segregated glass barrels are also compacted with the nonhazardous waste containers. Waste from other container types may also be fed into the containment area by the operator.

Options: Recycling of Glass - Since most of the glass is currently segregated, glass recycling could be pursued. This option will not be pursued through this PPOA because an engineer in Waste Management Operations has been assigned to look into all recycling possibilities. Also, a TQ team is being championed by WMO personnel to pursue recycling and address recycling perceptions and issues in the plant.Recycling of cardboard - This option will be pursued through an assigned engineer; associated perceptions and recycling issues will be pursued by a TQ team.Recycling of packaging foams - This option will be pursued through an assigned engineer; associated perceptions and recycling issues will be pursued by a TQ team.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Aysun Guttridge
Phone: (816) 997-3673	**Phone:** (816) 997-3038
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Metal Segregation **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-WM-162ADOCK000000 **Specific Waste Type:** Metal Debris

Date: 20-jan-1993 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Handling

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Aysun Guttridge
Phone: (816) 997-3673	**Phone:** (816) 997-3038
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Groundwater Treatment **Major Waste Type:** Sanitary Waste

PPOA ID Code: KCP-WM-163GRDWATTRTO **Specific Waste Type:** Sanitary Sewer

Date: 17-sep-1993 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Treatment

Description: FM&T carries out groundwater monitoring as part of the Consent Order entered into between EPA and DOE. Contamination has been detected in some of the wells and DOE has agreed to clean up the contamination as part of the Consent Order. Trichloroethylene (TCE) contamination has been detected where the old TCE recovery unit was located. The Groundwater Treatment System is a UV/peroxide system which removes the organic contaminants in the groundwater by chemically converting them into carbon dioxide and water. The primary contaminant in groundwater is TCE from the old TCE

still area. The UV/peroxide system converts TCE into carbon dioxide and water, and hypochlorous acid. The acid is neutralized with sodium hydroxide and the treated effluent is discharged into the Kansas City sanitary sewer system.

Options: Use wastewater from the groundwater treatment facility for other purposes.Buy process chemicals in bulk.Reuse empty chemical containers.Put water back into the ground at a different location.Use a different acid.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Aysun Guttridge
Phone: (816) 997-3673	**Phone:** (816) 997-3038
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Precious Metal Recovery **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-WM-165PMETLRCOV00 **Specific Waste Type:** Precious Metal

Date: 31-oct-1993 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Treatment

Description: The Goldiver unit is an electrolytic metal recovery unit for precious metal solutions. The Goldiver unit consists of a barrel-mounted pump and a cylindrical-housed cathode. The unit is placed in a tank holding the solution to be depleted of a precious metal. Initially, the metal plating solution is analyzed for the precious metal content. This information is provided to the plater who runs the Goldiver. The plater may elect to remove any visible or large pieces of metal in the solution he receives by pouring the solution through an anode bag. At times this salvage may also be accomplished by pulling a vacuum through a setup similar to a Buchner funnel but on a much larger scale. Once any preliminary work is done, the Goldiver cathode unit is assembled and placed in the tank. A D.C.voltage rectifier supplies the current for plating the precious metal from the solution onto the cathode. The plating process continues until a short results in the cylindrical housing or the bath is exhausted of plateable metals. (This later is a visual assessment.) A sample of the solution after plating by the Goldiver is performed. The cathode with the plated gold is weighed. (Accounting maintains accountability of all precious material; therefore, the weights are closely monitored.) The remaining solution is pumped back into a drum and sent to the IWPF for processing. The precious metal on the cathode and, if applicable, in the anode bag are sent to a refinery for reclamation.

Options: Develop own anode/cathode unit for the electrolytic process. Vary anode/cathode ratios and distance of cathode to anode. Not considered - The current system is of such a simple design and the cathode cartridges, although fairly expensive, are easily accessible. It would take time and money to develop a new unit which may or may not be better.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Aysun Guttridge
Phone: (816) 997-3673	**Phone:** (816) 997-3038
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Teardown of Parts **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-WM-165TEARDOWN000 **Specific Waste Type:** Metal Debris

Date: 01-apr-1993 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Disposal

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Aysun Guttridge
Phone: (816) 997-3673	**Phone:** (816) 997-3038
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Stamping Product and Documents **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-X110-432-001 **Specific Waste Type:** Solvents

Date: 26-feb-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description: Part of the inspection acceptance process requires the stamping of product and related documents. This stamping process uses the following inks: MANUFACTURER: PART NUMBER, (Phillips #3 Red, 5093350-01-800) and (Phillips #3 Orange 5093150-01-800). The process involves applying the above inks to the inspection stamps using the stamp pads provided, carefully applying the stamp to the product document. The inspection ink may be thinned with isopropyl alcohol or lacquer thinner to facilitate better results. Two of the approved thinners for the above inks are Union Chemicals 4702013-01-504 1214 and Fischer Scientific 4601031-02-603 218. Different manufacturers of the listed thinners are permitted as long as the following conditions are met, *MSDS is available and the *Part number is the same. The safety precautions recommended to perform this process are safety glasses and approved gloves. Inspectors have been trained in the correct procedure for stamping product. They have also been trained in the correct protective clothing required to handle inspection inks.

Options: Smaller stamps using a circled KC.Using a stamp a little larger than the circled "B" stamps.Stamp finals only.Write "acc" on tags/paperwork; this reduces hazardous waste on paper.Change color of ink to white or black. This reduces the hazardous factor to nearly zero.Department orders. Each department orders in smaller quantities, cutting down on waste for expirations and unused ink.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Stamping Prod & Documents **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-X110-434STAMPING **Specific Waste Type:** Solvents

Date: 30-sep-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Printing

Description: Part of the inspection acceptance process requires the stamping of product and related documents. The process involves applying inks to the inspection stamps using the stamp pads provided, carefully applying the stamp to the product or document. The inspection ink may be thinned with isopropyl alcohol or lacquer thinner to facilitate better results. The safety precautions recommended to perform this process are safety glasses and approved gloves.

Options: Smaller stamps using a circled KC. Similar to the circle "B" stamps, but larger.Stamp finals only. Write "acc" on tags and associated paperwork instead of stamping.Change the use of red and orange ink to black and white ink which is less toxic and hazardous. Also, eliminate the use of Pannier Black Marking Ink and start using a less hazardous black ink.For each

department to order a smaller quantity in order to use up the entire amount prior to expiration.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Inspection **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-X110-67033 **Specific Waste Type:** Solvents

Date: 15-nov-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Printing

Description: This process is performed whenever a piece of product is inspected. The parts inspected may be in electrical or visual. The inspection stamp may be placed on the product or on the paperwork associated with it. The inspector uses a MARCO Inspector Pocket Pad (99010912), 1 3/4" diameter, Acme stone pad. This pad is made up of a 1/4" thick felt pad covered with a 1/4" thick stone pad. This stamp pad is filled with black ink (5093162) or white ink (5093243). This is a change to the process; orange ink (5093153) and red ink (5093350) are no longer used. This change was enacted mid-1993. First the inspector pours the ink on the pad, just enough to cover the felt pad. The stone pad is then placed on top of the felt pad and will act as a wick for the ink. Each inspector has a rubber stamp assigned to them. They dab their stamp on the stone pad and then apply it to the part and/or paper in accordance with Quality Procedures 4.4-2. When completed, a metal lid is screwed on the pad. This seals the pad and keeps it from drying out. New ink can be added as necessary and the stone can be cleaned. For cleaning, disposable wipers (99010930) and isopropyl alcohol (4601031) are used.

Options: Share stamp pads between inspectors.Do not order ink from department; use another department's ink.Do not clean stamp pad; throw it away and use a new one.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** T. Joe Riehle
Phone: (816) 997-3673	**Phone:** (816) 997-7154
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: HTRB and Electrical Testing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-X312-78L144012 **Specific Waste Type:** Aerosol Cans

Date: 21-nov-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: High temperature reverse bias (HTRB) followed by electrical testing is performed on all LCCs to eliminate electrically defective product. HTRB is run in air for 70 hours in a Blue-M oven at 175 degrees C while under reverse electrical power. The combination of high temperature and reverse electrical bias generates a potential field which allows ionic contamination (if it's present) to migrate and cause electrical failures when tested. The electrical tests also detect damaged die due to packaging or wafer fabrication. The LCCs are processed in lots. The inspector loads all LCCs onto burn-in boards and mounts the boards into the oven. The burn-in boards are then connected to the power supplies. The power settings, run time and temperature are called out in the appropriate product specifications (PS). Burn-in boards are functionally tested prior to beginning HTRB. At the conclusion of the 72 hours, the LCCs are ready for electrical testing. In electrical testing parts are tested at ambient, hot (100 degrees C) and cold (-55 degrees C). Each LCC is tested individually on a Lorlin Impact 4 tester. The

tester is programmed for the particular LCC being tested. If a part fails electrical testing, it is scrapped. If ten percent of the parts fail, the entire lot is scrapped.

Options: Eliminate contact re-nu use.No effect on product.Replace its use with alcohol to clean tester contacts.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Pumice Scrub **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z900-61C023018 **Specific Waste Type:** Acid

Date: 31-jan-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The pumice scrub process is used to mechanically abraid the surface of a printed circuit board prior to etching. Fremont 238 circuit board cleaner is the pumice used. This material is made of silica flow and phosphoric acid. The abrasive powder is placed on a wet circuit board (city water) and a hand-held brush is used to abraid the panel surface. Waste media and water are disposed of through the industrial waste line. One, 500-pound container of this product is used per year.

Options: Filter media from water before sending to industrial waste line.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Mechanical Deburring **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z901-45DEBURR **Specific Waste Type:** Metal Debris

Date: 16-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description: The majority of sheet metal products produced require some type of burr removal before cleaning and further processing or inspection. This deburr process consists of mechanical tumbling in high-speed, high G-force equipment called "harperizers" or in low-speed rotary equipment called the "vibratory tumbler." Deburr also consists of manual hand deburr with small hand tools and flat sanding by finger pressure on a flat surface or by using a "jitterbug" sanded on a flat surface or stationary belt sander; both with a vacuum system available to remove excessive dust of base metals and sandpaper medias. Parts are separated from deburr media used in mechanical tumblers with small mesh screens over a sink to wash buenishing compounds from the medias and parts. Hand deburred parts are wiped off dry with wipes. These steps are not final cleaning operations.

Options: Find alternative soap/deburr media to replace hazardous item (#10651352).Use sandpaper for longer period. Requires conscious effect on the part of operator.Reusable dry wipes to replace disposable wipes.Use of dry media rather than media with water. Dry media would separate nuisance dust which in several cases would be hazardous.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Ink Stamp & Covercoat **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z903-44001 **Specific Waste Type:** Solvents

Date: 30-sep-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description: The process of marking with ink involves the manual placement of part identification on the unit prior to shipment. This identification may contain part number, serial number, lot number, date code, manufacturer's code, part name, and other information needed to identify the product. The marking is sealed with a covercoat material. The ink and covercoat are stored in a cabinet within the department. Ink is dispensed onto an ink stamp pad from a 4 oz. bottle. A stamp with prepositioned characters is placed face down on the ink pad. The stamp is then placed on the part with even pressure and removed. The marking is checked for legibility and restamped if needed. Finally, the part marking is allowed to air dry for about one hour before being covercoated. The covercoat is supplied in 11 oz. pressurized spray cans. The area around the marking is protected using a template or a light cardboard mask. Other areas may also be protected from the overspray using paper towels or similar items. The marking area is sprayed lightly with the aerosol. The acrylic is allowed to cure for at least one hour at room temperature. The contaminated paper towels are discarded into red waste management cans. The template or mask may or may not be reused depending on the application and the condition of the template or mask. The paper templates or masks are eventually disposed of in red waste management cans. The empty aerosol cans are disposed of in the aerosol waste can. Acetone is used to clean up ink smudges and remove illegible or incorrect ink marks on product. Since acetone is a common cleaning solvent in several department processes, usage was not determined on th is process. The use of ink and covercoat is controlled by the general marking specification and by the ink marking specification.

Options: Limit ink to one bottle in the department at a time so that unused bottles are not discarded because they exceed shelf life expiration.Switch covercoat material to an epoxy coat system.Laser mark parts instead of ink stamp.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Electrochemical Etch on SS **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z903-44002 **Specific Waste Type:** Paper

Date: 30-oct-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The process of marking electrochemically involves the manual placement of part identification on the unit prior to shipment. This identification may contain part number, serial number, lot number, date code, manufacturer's code, part name, and other information needed to identify the product. The identification is typed on stencil paper 2534936. An electrical power unit supplies an adjustable current to the handmarker. A ground line is attached to the part. A cotton pad is clipped onto the handmarker. The part is precleaned in the area to be marked with a paper towel wetted with alcohol 4601030. The handmarker pad is dabbed onto a paper towel saturated with electrolyte, 2534960, until the pad is damp. Stencil is positioned on part

marking surface. Handmarker is brought down on top of stencil and pressure is applied firmly for a few seconds. Then handmarker and stencil are removed. A paper wipe saturated with neutralizer solution, 2534969, is vigorously rubbed over the marked area to remove residue and corrosive salts. Paper towels and stencil are dropped into a red waste management step can. Both electrolyte and neutralizer are supplied in 1-quart plastic bottles and have a 1-year shelf life.

Options: Reprocess remaining jobs to laser marker and eliminate electochemical etch process.Procure electrolyte and neutralizer in smaller bottles. Material would be expensive to repackage and would out-weigh the cost of disposal. Not enough schedules left to justify.Extend shelf life of electrolyte and neutralizer an extra year to reduce waste.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Hand Deburring **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z903-61D034028 **Specific Waste Type:** Solvents

Date: 31-may-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: This process provides examination, hand deburring, clip and blend, and touch-up procedures for printed wiring products. Printed wiring products are examined for defects listed in PES P1150230. Touch-up procedures for defective PWB product are given. The major items involved with this waste assessment are 1) solder flux (4705305-00-505); 2) solder (8330202-01-827); 3) solder tips; 4) Solder-Wik; 5) isopropyl alcohol (4601031-02-603); and 6) lint-free cloths.

Options: Replace the use of 1,1,1-trichloroethane to remove flux residue during soldering touch-up on PWBs.Replace type of solder used during touch-up.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Marking **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z903-61H095016 **Specific Waste Type:** Solvents

Date: 10-jan-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Printing

Description: This process is used for identification marking of PWB product using ink stamping and covercoating. The part number with design agency or production agency code, is stamped on the boards with ink and covercoated for permanent adhesion. Additional designation may be stamped on the boards as required by the traveler.

Options: Replace current PWB marking procedure using standard inks and epoxy covercoat with laser marking.Replace current inks and covercoat with aqueous, nonhazardous inks and covercoat.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Marking Process **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z903-99MARKING03 **Specific Waste Type:** Solvents

Date: 09-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description: The marking of parts is done throughout the plant on finished product or product still in the production cycle. Various types of marking take place. The department marks the product using backfill material and inks. Some of the requirements call for use of covercoat and sometimes a thinner is needed to complete the process. The drawing requirement spells out the process to be used for each part. This requirement can indicate that the marking be applied directly onto the product or a bag and tag. The work directions are the guidelines for the operator.

Options: Use only the amount required to complete the job.Try to switch to a bag and tag method. This will allow only ink pen marking. This will decrease the use of many other markings and the waste generated.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: UV Ink Application **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z903-99UVINK04 **Specific Waste Type:** Polymers

Date: 20-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description: The UV Ink is received from stores when called out in the requirement list. When the operators use the material they place a small amount of the ink onto a plate (test panel). The stamp is inked and then used to mark directly onto the part. Once the marking is complete, the ink is cured in the UV Chamber.

Options: Use only the amount required to complete the job.Check into extending the shelf life so the material can be used for longer periods of time.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Glove Cleaner **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z912-99GLOVE18 **Specific Waste Type:** Solvents

Date: 30-nov-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Glove cleaner is used in the paint shop. This cleaner is used primarily with small piece parts. Product requires that gloves be cleaner prior to handling product. The operators have written work directions detailing the use of the cleaner. This product is used only for cleaning gloves and or finger cots. The material is stored in the department until needed.

Options: Use only amount required.Identify quantity needed at the beginning of project.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Methyl Ethyl Ketone **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z912-99MEK11 **Specific Waste Type:** Solvents

Date: 30-nov-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Methyl Ethyl Ketone, 4616020-01, is used as a wipe-down solvent. This process involves the parts that are to be painted and the MEK. The parts are placed in a side-draft paint booth, and an operator then places the solvent on the wipe and wipes the part down.

Options: Use only amount required.Identify at the beginning of project the quantity needed.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Methyl Isobutyl Ketone **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z912-99MIK12 **Specific Waste Type:** Solvents

Date: 30-nov-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Methyl Isobutyl Ketone, 4616030, is used as a wipe-down solvent. This process involves the parts that are to be painted and the MIK. The parts are placed in a side-draft paint booth, and an operator then places the solvent on the wipe and wipes the part down.

Options: Use only amount required.Identify at the beginning of the project the quantity needed.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Naphtha **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z912-99NAPHTHA14 **Specific Waste Type:** Solvents

Date: 30-nov-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Naphtha is used primarily to remove tape residue from masking after a part has been painted. It may be used as a cleaner. A Q-tip or a lint-free wipe is dampened with the solvent. Naphtha evaporates into the air from the part and the items used with the solvent. A very small amount, if any, remains on the wipe or Q-tip.

Options: Use only amount required.Identify quantity needed at the beginning of project.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Palmolive Cleaner **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z912-99PALM16 **Specific Waste Type:** Caustic

Date: 30-nov-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Palmolive cleaner is used in the paint shop. The material is used for cleaning. The material is a shop tool not necessarily used as a production requirement. If the cleaner is used on production parts, the operators have written work directions as to how much cleaner they may use to achieve clean product.

Options: Use only amount required.Identify quantity needed at the beginning of project.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Ultrasonic Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z912-99ULTRA17 **Specific Waste Type:** Caustic

Date: 30-nov-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The ultrasonic cleaner is used in the Paint Shop. The material is used in the Ultrasonic cleaner C.E.73542. This cleaner is used primarily with small piece parts. The operators have written work directions as to how much cleaner they must add to the equipment to achieve clean product. The material is stored in the department until needed.

Options: Use only amount required.Identify quantity needed at the beginning of project.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Forming & Curing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z916-47FORMING **Specific Waste Type:** Polymers

Date: 18-sep-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Curing

Description: This process consists of wrapping special configuration material into flat patches of varying shapes and then transferring the patches to a layup fixture that will mold the patches into three-dimensional shapes. During this process, the patches will be secured with polyimide adhesive tape and bonded with an epoxy resin system to secure the patches in a final molded shape. After curing, the polyimide adhesive tape is removed. It is assumed that approximately 50 parts will be processed per year.

Options: Use curing agent U to replace Versamid 140.Reduce amount of adhesive used to process parts.Use kapton adhesive tape to replace Epon 826 and Versamid 140.Use 5-minute epoxy to replace Epon826 and Versamid140.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Marking **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z916-47MARKING **Specific Waste Type:** Solvents

Date: 15-jun-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Printing

Description: The basic process for applying the ink marking to a part is as follows: 1.Apply the ink to the stamp pad as required. 2.Prepare a stamp with the proper characters needed to mark the part. 3.Press stamp onto the pad containing the ink. 4.Apply the stamp to the part transferring the ink to the part. 5.Remove the ink if illegible using alcohol on a kaydry. 6.Reapply the part number to the part. 7.Spray on the covercoat.

Options: Evaluate a cover coat material that contains less volatiles.Evaluate a process change that would brush the covercoat directly over the marking instead of a spray on method.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Electrical Encapsulation **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z916-47POT **Specific Waste Type:** Polymers

Date: 03-oct-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description:

Options: Replace EN7 with suitable less-hazardous material.Reduce batch size.Schedule multiple pours per batch mix.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Mold Release **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z916-47RELEASE **Specific Waste Type:** Solvents

Date: 25-sep-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description: This process is performed by thoroughly cleaning the surface of the wrap fixtures with isopropyl alcohol and a Kimwipe. The mold release agent, Ram Chemicals Mold Release 225, is manually wiped onto the surface of the wrap fixtures with a cloth or Kimwipe and allowed to cure at room temperature. This release agent is applied in order to prevent epoxy resin from adhering to the wrap fixtures during subsequent operations. The contaminated Kimwipe/cloth, along with a pair of Nitrile gloves worn by the operator during the process, is then disposed of in the proper waste container. This process is performed every time a part is to be installed on a wrap fixture. No formal operator training has been performed for this process.

Options: Use less hazardous mold releasing agent.S tudies will be required to verify that the new mold release does not contaminate the assemblies built on the fixture.Replace alcohol with less volatile cleaning agent.Reuse nitrile gloves.Reuse wiping tissues. (Not considered: Used tissues may transfer contaminates from one fixture to another. Saving alcohol soaked tissues for reuse would create a potential fire hazard.Use Teflon-coated wrap fixtures, eliminating the need for mold release. Would require the modification of all wrap fixtures affected (possible dimensional changes).Mold release less often. Studies would be required to determine the number of fixture uses between mold releases.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson

Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Blending **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z916-48BLENDING **Specific Waste Type:** Polymers

Date: 30-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Mixing

Description: The two components, resin (219001000) and glass microballoons (609001300), are sieved and weighed to a prescribed mix ratio. Each component is loaded into the twin shell blender. The blender lid is closed and the mix is blended for one hour minimum. The blended material is then dumped into a fiber drum that is lined with a plastic bag. The drum is closed and labeled in accordance with work directions. The blender is wiped out with a Kaydry as needed to prevent buildup of the resin. The fiber drums and plastic bags are reused several times before being thrown away in the trash. Any fines that escape during the loading and unloading process are captured in the exhaust system.

Options: When small quantities are needed, mix the material by a manual operation.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Alodine Coating **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z916-49AC002 **Specific Waste Type:** Acid

Date: 30-sep-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description: Alodine coating is a process where scratches in existing alodine or anodized coatings on aluminum piece parts are repaired. The process utilizes an aqueous, acidic solution containing hexavalent chromium, activators and film-forming chemicals. A chemical reaction occurs between the alodine material and the exposed metal surface of the aluminum piece part. Alodine coating is governed by process standard 9904151, coating grade 3. The department only uses the "brush process" of chromate coating as the department is only repairing scratches in existing coatings.

Options: Delete requirement. Delete requirement to repair scratches (QA contacted, did not want to delete requirement).Find suitable replacement material. End of schedules for products listed, not cost effective.Stop performing work Option would reduce waste, but increase waste in other area where work was performed. However, other department personnel may be better trained to handle alodine, so less chance of employee exposure.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068

Email: wschlosberg@kcp.com	**Email:**

Title: Getter Pwdr Prep (Grinding) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z916-49BM003 **Specific Waste Type:** Solvents

Date: 28-sep-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: 1) Weigh materials: (3 formulations) I) DPB - 75% 1,4-diphenylbutadiyne (900 g) 25% Palladium (5%) on Carbon (300 g) II) HCPB - 79% 1,4-bis(1-hydroxycyclopentyl)butadiyne (1960 g) 21% Platium (5) on Carbon (520 g) III) DEB - 75% 1,4-bis(phenylethynyl)benzene (900g) 25% Palladium (5% on Carbon) (300g) FOR DPB & DEB ONLY - Prepare jar mill: Clean in a vented hood approved for flammables, the jar mill and grinding media with acetone. Rinse twice and decant acetone into a waste container. Place acetone soaked wipes in appropriately marked step can. Dry jar and media with compressed air. Place weighed materials and weighed grinding media in a clean jar mill. Close lid, place on rollers and mill for 16 hours minimum. - Empty jar mill onto a 3/8 mesh screen inside a vented hood approved for powders and separate the grinding media from the getter mixture. - Weigh and press getter into preforms using a 2 diameter mold on the 125 ton press (CE 55765). Save pressed preforms for the grinding operation. step (4) below. FOR HCPB ONLY - Prepare melt blend: (see process description for Glovebox Operations - Getter; Process ID Code K150049-GR-007) FOR ALL FORMULATIONS - Set-up centrifugal sifter (CE 75084) with appropriate sieve per the appropriate production traveler. Set-up rotating plate grinder and pass the material through the grinder one time. - Place ground material in sifter hopper and sieve material. - Grind oversize particles. - Repeat steps 5 & 6 until all material has passed through sieve. - Set-up smaller sieve size in sifting machine. Sieve material and save all over size particles. Identify this material by Part number, lot number and quantity. Save for either pelletizing (see step 10) or direct assembly loading. - Save under size particles for step (8) in press hopper. Run pellet press (CE 50289) and verify pellet weight and height. - At completion of pelletizing operation remove powder that did not pelletize and add to the fines from step (9). - Sort pellets. Add bad pellets to the fines from step (9). Send good pellets to inspection then to stores.

Options: Replace acetone with isopropyl alcohol.Collect, decant and recycle the used acetone.Obtain a parts washer for cleaning of loose equipment and tooling details.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Epoxy-Cabosil Bonding **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z916-49EC005 **Specific Waste Type:** Polymers

Date: 30-sep-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: The components are mixed in a plastic container using a wooden tongue depressor. The inside step of the window frame and the outside edge of the lense are wiped using a solvent-moistened KayDry. The adhesive is applied to the inside step of the window frame and to the outside edge of the window lense using a toothpick. With one protective paper removed, the lense is placed paper side out into the window frame. The lense is rotated to ensure an even adhesive coating. The assembly is allowed to cure at room temperature for 24 hours.

Options: Decrease the amounts of Epon828/versimide/cabosil/black pigment that is mixed for each group of parts to be bonded. Initial quantity requires a minimum mix of 51.5 gms.Minimize the number of parts bonding for the given quantity of adhesive mixed.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Bonding:Film Adhesive **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z916-49FA008 **Specific Waste Type:** Polymers

Date: 29-sep-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Molding

Description:

Options: Find a more environmentally friendly mold release.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Bonding w/Hot Melt Adhesive **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z916-49HM008 **Specific Waste Type:** Polymers

Date: 02-aug-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: This hot-melt adhesive bonding process temporarily joins aluminum cover halves until a machining operation is completed. After machining, the adhesive is removed and screws are inserted. The bonding operation applies the hot-melt adhesive to the cover halves with a glue gun. The adhesive is approximately 400 degrees F when applied. The halves are pressed together and locked into a bonding fixture. After cooling for about one minute, the bond has achieved 90% of its maximum strength. The assembly is removed after sufficient cooling and packaged as received.

Options: Reduce the number of kaydrys used during cleanup.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Laminates **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z916-49LU004 **Specific Waste Type:** Polymers

Date: 01-may-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description: This process description details the activity involved in the cutting of the resin-impregnated Kevlar fabric into the appropriate sized pieces for the mold lay-up. Twenty-four pieces are used to make each part. The pieces are cut as follows: 10 are cut in the horizontal direction and 14 are cut in the vertical direction based on the direction of the weave in the fabric. Because the current width of the fabric being delivered is 50" a certain amount of fabric is wasted or left over due to the size of the pieces that are cut for the molded parts. The uncured resin in the fabric is considered hazardous. However, once the material is cured, it is considered nonhazardous. The uncured resin/fabric is disposed of in a step can located in the department.

Options: Curing unused prepreg material to reduce to nonhazardous status.Change size of the molds to use all of the prepreg material.Get material precut at vendor to eliminate the hazardous material.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Marking:Hand Stamping **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z916-49MK006 **Specific Waste Type:** Solvents

Date: 14-jul-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Printing

Description: Hand stamping is one of the processes used to directly mark parts and labels with ink. The process consists of: 1.Applying ink (5093762) to a stamp pad. 2.Preparing a stamp with the appropriate characters. 3.Pressing the stamp onto the stamp pad to transfer ink to the characters on the stamp. 4.Pressing the stamp onto the object to be marked to transfer the ink to the object. 5.Removing any ink, if the marking is illegible, using alcohol or acetone on a paper wipe. 6.Reapplying the marking to the object. 7.Allowing the marking to dry. 8.Spraying an overcoat (5040400), if required. 9.Allowing the covercoat to dry.

Options: Covercoat with less volatiles.Ink with less volatiles.Brush-on covercoat instead of current spray-on covercoat.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Bonding with Silicon Adhes. **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z916-49OP005 **Specific Waste Type:** Polymers

Date: 06-jul-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: The process produces a metal-to-rubber assembly which is later mechanically fastened into a casing for electrical components. The process involves: 1) cleaning the adherends, 2) applying the primer, 3) curing the primer, 4) applying the

adhesive, 5) joining the adherends, 6) curing the adhesive, and 7) inspecting the assembly. Cleaning is performed by plasma or solvent treatment of the bonding surfaces. For plasma treatment, the metal and rubber adherends are cleaned separately, using Argon gas at 300 watts (RF energy) and Zero Air at 600 watts, respectively. For solvent treatment, a lint-free cloth, moistened with isopropyl alcohol, is used to clean the metal adherend. The primer and adhesive are generally dispensed from their original containers and applied with a brush, spatula, or syringe. Primer is applied to both adherends, adhesive is applied only to the rubber. The adherends are joined together by hand and cured under constant pressure in a clamp-type fixture. Uniform pressure of approximately 6.9 KPA is applied during cure. The primer and adhesive are cured at room temperature and relative humidity of 30 to 80%. Primers cure within 30 to 90 minutes. Adhesives cure within 24 to 48 hours for moderate handling. Since most silicone primers and adhesives require moisture to fully cure, low room humidity necessitates longer cure times or the use of a humidity chamber.

Options: Weigh adhesive and primer to amounts needed.Apply adhesive and primer with fluid dispenser at setpoint.Reduce flow rates of plasma gases.Reuse poly bags for piece parts and relabel with assembly part number.Minimize usage of disposable items.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Bonding w/ Rubber Adhesive **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z916-49RU008 **Specific Waste Type:** Solvents

Date: 28-sep-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Spray Adhesive Bonding **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z916-49SA008 **Specific Waste Type:** Solvents

Date: 02-aug-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: This process bonds a thin aluminum foil sheet to a polyurethane foam part. A rubber-based, aerosol adhesive is sprayed onto the foil and foam bonding surfaces. The adhesive is applied approximately 12" from each surface in a ventilated spray booth. The foil is then smoothed onto the foam surface with a hand roller. No curing, fixturing, or special tooling is required. Any excess adhesive not exhausted through the booth vents is collected on kraft paper placed underneath the parts. The paper and excess adhesive are discarded in a flammable waste can after the job lot is completed.

Options: Extend shelf life of material.Purchase smaller size spray cans.Pursue buying same adhesive in a non-aerosol form.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Bonding:Two-Part Silicone **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z916-49TP005 **Specific Waste Type:** Polymers

Date: 15-jun-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: An adhesive bonding process is a set of operations which join (bonds) two objects together using a glue-like material which holds those two object together. The adhesives used in these processes are two-part silicone adhesives. They are called two-part adhesives because the material is supplied in two parts: a base material and a curing agent. The two materials are not mixed together until the adhesive is to be used. If mixed too early, the material will set up before it can be applied to the parts which are to be bonded. The two-part silicone bonding process typically begins with a surface cleaning operation: solvent wipe or plasma cleaning (ref PPOA J375049-PC-010). After cleaning the surfaces of the part to be bonded, usually a primer material is applied to at least one of the surfaces, if not both. Next, the two parts of the adhesive can be mixed together in their proportions. The mixed material is then applied to the surfaces to be joined. Typically, the parts are put in a fixture that will hold the parts together under a small pressure load until the adhesive cures. The two-part silicone adhesives used are RTV (room temperature vulcanization) silicone rubbers. As the name implies, the adhesives can be cured at room temperature. This can typically be accomplished within 24 hours. Many of the products bonded with two-part silicone adhesives are cured at elevated temperatures (71 degrees - 99 degrees C) to shorten cure times which reduces flow times.

Options: Obtain smaller stainless steel mixing cups in which to mix the two-part adhesive. The batch size of each mix could be smaller, thereby decreasing the potential amount of extra adhesive remaining in the cup.Change cleaning of metal pieces from solvent wiping to plasma cleaning. Changing the solvent cleaning would eliminate the solvent waste (plus much of the paper waste).

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: FEP Tubing Preparation **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z916-49TU009 **Specific Waste Type:** Solvents

Date: 17-jun-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: SMALL TUBING: 1.Place end of stock tubing in fixture. Cut protruding end of tubing flush with fixture using a razor blade. Cut other end of tube. Repeat for each part. 2.Push one end of tubing inside hole punch fixture. Punch two through-holes. Repeat same sequence for other end of tube. 3.Place tube inside drill jig. Using .010 drill bit, drill a hole through the tube wall. Repeat process at each 2" interval along length of tube. 4.Using low pressure compressed air, blow any debris from inside tube. If necessary, wet a pipe cleaner with isopropyl alcohol and clean inside tube. Use compressed air to blow dry.

If tube is too long for a pipe cleaner, use isopropyl alcohol to flush tube.LARGE TUBING: 1.Wrap fixture with tubing. Avoid twisting of tube. Place fixture in oven and attach air pressure line to fixture inside the oven. Pressurize tube to 6 psi and set oven temperature at 350 degrees F. Heat pressurized tube for 30 minutes or until all kinks have been removed. Cut parts from fixture and repeat process for additional parts. 2.Place formed tubing in trim fixture. Cut both protruding ends of tubing flush with fixture using a razor blade or surgical knife. 3.Push one end of tubing inside hole punch fixture. Make sure tubing is flush with end of fixture. Punch two through-holes using punch detail. Repeat same sequence for other end of tube. 4.Place tube in drill jig. Using .010 drill bit, drill a hole through the tube wall at 2" intervals. Turn tube over and repeat drilling process. 5. Using low pressure compressed air blow any debris from inside of the tube. Use an isopropyl squirt bottle to flush tube clean if compressed air alone will not remove debris.

Options: Replace isopropyl alcohol with distilled water.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Hand Clean With Freon **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z916-76C025001 **Specific Waste Type:** Solvents

Date: 20-sep-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Hand cleaning with Fresno 4611111-02 is used to clean stainless steel surfaces. Freon is used because there may be trace amounts of Krytox grease on the surface. It is important to remove these because the surface will be painted in next assembly. To clean with Fresno the operator first places a lint-free wipe in a plastic cup. A small amount of Fresno is poured onto the wipe. The moistened wipe is then used to clean the stainless steel surface. After use, the contaminated wipe is placed into a step can which is collected daily by waste management.

Options: Use an alternative cleaning solvent.Minimize Freon use.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Hand Clean With TCA **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z916-76C025002 **Specific Waste Type:** Solvents

Date: 15-sep-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Hand cleaning with trichloroethane 4611060-01 is used to prepare surfaces for touch-up painting. A Kimwipe is first placed in a plastic cup. A small amount of trichloroethane is then poured on the Kimwipe. The moistened wipe is then used to clean chipped or nicked areas in preparation for touch-up painting. The areas to be touched up are generally quite small. If large areas are involved, the product is sent back to the paint shop. After the surface is cleaned, the contaminated wipe and plastic cup are placed in a step can which is collected daily by Waste Management.

Options: Use an alternate cleaning solvent.Minimize use of trichloroethane when using.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Aluminum Etch X-section **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z916-811ETCHAL **Specific Waste Type:** Acid

Date: 30-apr-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description: The etching of aluminum requires the mixing of the following materials: hydrofluoric acid (57003941) 30 mL, hydrochloric acid (57002764) 30 mL, nitric acid (57009303) 50 mL, and water (98505000) 50 mL, making Keller's Reagent. This etchant is applied by a cotton applicator (99012915) to the sample and rinsed with water.

Options: Rinse Keller's etch off sample into suitable container and empty contents of the container into a satellite storage container for acid. Then send it to Waste Management. This option will be used to meet future regulatory requirements.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Copper Etch Cross-Section **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z916-811ETCHCU **Specific Waste Type:** Acid

Date: 30-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description: The etching of copper required the mixing of the following materials: ferric chloride (4532075-00) 25 mL, hydrochloric acid (57002756) 25mL, and water (98505000) 100 mL, making copper etch. This etchant is applied by a cotton applicator (99012915) to the sample and rinsed with water.

Options: Rinse copper etch off sample into a suitable container and empty contents of the container into a satellite for acid. Then send it to Waste Management. This option will be used to meet future regulatory requirements.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Mild Steel Etch X-Section **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z916-811ETCHMS **Specific Waste Type:** Acid

Date: 23-oct-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description: The etching of mild steel requires the mixing of the following materials: cupric sulfate (57002493) 10 grams, hydrochloric acid (57002756) 50 mL, and water (98505000) 50 mL, making Marbles Reagent. This etchant is applied by a cotton applicator (99012915) to the sample and rinsed with water.

Options: Rinse Marbles Reagent off sample into a suitable container and empty contents into a satellite storage container for acid. Then send it to Waste Management. This option will be used to meet future regulatory requirements.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Stainless Steel Etch **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z916-811ETCHSS **Specific Waste Type:** Acid

Date: 27-aug-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description: The etching of stainless steel requires the mixing of the following materials: cupric sulfate (57002493) 10 grams, hydrochloric acid (57002756) 50 mL, and water (98505000) 50 mL, making Marbles Reagent. This etchant is applied by a cotton applicator (99012915) to the sample and rinsed with water. Oxalic acid is prepared by mixing 10 grams of oxalic acid (57002752) and 100 mL of water (98505000). The sample is placed in the solution and a D.C. current is applied for several seconds. The sample is then rinsed with water.

Options: Rinse Marbles Reagent off sample into a suitable container and empty contents of the container into a satellite storage container for acid. Then send it to Waste Management.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Clean EB Weld Equipment **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z916-91EBWCLEAN **Specific Waste Type:** Solvents

Date: 01-dec-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Electron beam welding equipment requires routine cleaning of the work chamber surfaces and the electron beam

gun to remove dirt and other debris, which will absorb moisture from the atmosphere, causing gun arc-outs and lengthened pumpdown times. Metal polish, applied with a cloth wiper or scouring pad, is used to remove the deposits. An alcohol wipe of the surfaces is used to remove any metal polish residue. The work chambers are cleaned once a year and the electron beam gun as required.

Options: Reduce cleaning of electron beam welding equipment. Not considered because frequency of cleaning and usage of cleaning materials are at the lowest levels possible to ensure proper equipment operation.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Polish Application **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z916-99POLISH02 **Specific Waste Type:** Paper

Date: 02-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Polishing is a process that is done to a completed paint finish. The polish helps to enhance the appearance of the part. Parts have completed the paint application, and the polishing material is applied to the parts and buffed with wipes or buffing wheels. The material is not hazardous. The wipes are thrown into the trash as regular waste.

Options: Use washable rags - less waste.Use buffing wheels - no wipes to throw away.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Hand Soldering **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z920-47HNDSLDR **Specific Waste Type:** Solvents

Date: 29-sep-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description: This process involves the hand solder tinning of twisted pairs of magnet wire, and the attachment of these pairs, as well as individual wires to flexcable lands. Weller soldering stations and the appropriate Weller soldering iron are used for the soldering operations. The solder joints are cleaned using alcohol and acid brush with Kimwipes for general cleanup. All operators performing these operations have passed the Solder Certification Program, and have updated their training through recertification on an annual basis.

Options: Replace alcohol with d-limonene. The use of d-limonene instead of alcohol would reduce the fire hazard associated with this cleaning operation. D-limonene does not require storage in a flammable storage cabinet. Its use would require acceptance as a WR-type material.Aqueous flux. The use of an aqueous flux rather than the alcohol-based flux in use would reduce the VOCs released by the soldering process. It would also eliminate the need for a solvent to remove the flux by-products of the soldering operation. Propylene carbonate. Use Propylene carbonate in place of alcohol would reduce VOCs as well as the

fire hazard associated with the use of alcohol.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Getter Pwdr Prep (Sieving) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z925-49SV003 **Specific Waste Type:** Solvents

Date: 28-sep-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: 1) Weigh materials: (3 formulations) I) DPB- 75% 1,4-diphenylbutadiyne (1960 g) 25% Palladium (5%) on Carbon (300g) II) HCPB-79% 1,4-bis(1-hydroxycyclopentyl)butadiyne(1960 g) 21% Platinum (5%) on Carbon (300 g) III) DEB- 75% 1,4-bis(phenylethynyl)benzene (900 g) 25% Palladium (5%) on Carbon (300g) FOR DPB & DEB ONLY (I & III) 2a) Prepare jar mill: Clean in a vented hood approved for flammables, the jar mill and grinding media with acetone. Rinse twice and decant acetone into a waste container. Place acetone soaked wipes in appropriately marked step can. Dry jar and media with compressed gas. Place weighed materials and weighed grinding media in a clean dry jar. Close lid, place on rollers and mill for 16 hours minimumm. 2b) Empty jar mill onto a 3/8 mesh screen inside a vented hood approved for powders and seperate the grinding media from the getter mixture. 2c) Weigh and press getter into preforms using a 2 diameter mold on the 125 ton press. Save pressed preforms for the grinding operation. step 4 below. FOR HCPB ONLY (II) 3) Prepare melt blend: (see process description for glovebox operations - getter; process ID K150049-GR-007) FOR ALL FORMULATIONS 4) Set-up centrifugal sifter (CE 75084) with appropriate sieve per the appropriate production traveler. Set-up rotating plate grinder and pass the material throygh the grinder one time. 5) Place ground material in sifter hopper and sieve material. 6) Grind oversize particles. 7) Repeat steps 5 & 6 until all material has passed through sieve. 8) Set-up smaller sieve size in sifting machine. Sieve material and save all over size particles. Identify this material by part #, lot #, and quantity. Save for either pelletizing or direct assembly loading. 9) Save under size particles from step 8 and identify as product fines. Mark container with part #, lot # and quantity. Save for next production per production traveler. 10) Pelletize: Load sieved material from step 8 in press hopper. Run Pellet press and verify pellet weight and height. 11) At completion of pelletizing operation remove powder that did not pelletize and add to the fines from step 9. 12) Sort pellets. Add bad pellets to the fines from step 9. Send good pellets to inspection then to stores.

Options: Replace acetone with isopropyl alcohol.Collect, decant, and recycle the used acetone.Obtain a parts washer for cleaning of loose equipment and tooling details.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: 2014 Aluminum Machining **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z931-20AL2014 **Specific Waste Type:** Metal Debris

Date: 01-mar-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description: Operations within the department include the machining of aluminum alloy 2014. Aluminum material of the specified size and shape is received into the department and machined on a variety of equipment per instructions provided on production travelers. Machining performed can include milling, drilling, tapping, boring, reaming, and turning. All machining operations are performed using coolant, 97022454. Piece parts machined from alloy 2014 were machined from forgings.

Options: Purchase raw material in sizes closer to final part geometry to save machining time and cutting tools and reduce the off fall or chips.Recycle coolant to remove contamination from machining.Allows for reuse.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: 5083 Aluminum Machining **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z931-20AL5083 **Specific Waste Type:** Metal Debris

Date: 01-mar-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description: Operations within the department include the machining of aluminum alloy 5083. Aluminum of the specified size and shape is received into the department and machined on a variety of equipment per instructions provided on a production traveler. Machining can include milling, drilling, taping, boring, reaming and turning. All machining operations are performed using coolant 97022454. Piece parts machined from alloy 5083 were machined from forgings.

Options: Purchase raw material in sizes closer to the final part definition. This will allow savings in machining time and cutting tool usage and will reduce chips.Recycle machining coolant to remove contamination from machining.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: 6061 Aluminum Machining **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z931-20AL6061 **Specific Waste Type:** Metal Debris

Date: 31-mar-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description: Operations within the department include the machining of aluminum alloy 6061. Aluminum material of the specified size and shape is received into the department and machined on a variety of equipment per instructions provided on production travelers. Machining performed can include milling, drilling, tapping, boring, reaming, and turning. All machining operations are performed using coolant 97022454. All 6061 aluminum machined is from forgings.

Options: Purchase raw material in sizes closer to the final part definition.Recycle coolant to remove machining contamination and reuse.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: 7079 Aluminum Machining **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z931-20AL7079 **Specific Waste Type:** Metal Debris

Date: 01-mar-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description: Operations within the department include the machining of aluminum alloy 7079. Aluminum of the specified size and shape is received into the department and machined on a variety of equipment per instructions provided on a production traveler. Machining can include milling, drilling, taping, boring, reaming and turning. All machining operations are performed using coolant 97022454. Piece parts machined from alloy 7079 were machined from forgings.

Options: Purchase raw material in sizes closer to the final part definition.This will allow savings in the machining time and in cutting tool usage. The quantity of chips will also be reduced.Recycle machining coolant to remove machining contamination.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Miscellaneous Processes **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z931-20MISC **Specific Waste Type:** Paper

Date: 18-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Daily operations within the department require numerous miscellaneous supplies. Some supplies may be used daily and others will be used only on occasions. All miscellaneous supplies are available only from internal stores. These supplies are necessary for part production and for safety of persons who are present within the department when operations are in process.

Options: Use reusable wipes. Replace disposable wipes with one that can be cleaned and reused. Supply only one type of hand lotion. Supply a single hand lotion that can add back body oils lost during daily operations.Supply one type of glove for use in the department.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478

Email: wschlosberg@kcp.com	**Email:**

Title: 15-5 Stainless Steel Machining **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z931-20STEEL15-5 **Specific Waste Type:** Metal Debris

Date: 31-mar-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description: Daily operations within the department include the machining of alloy 15-5, stainless steel. Machining can be performed on a variety of equipment, each using a water-based coolant for the removal of heat from the cutting tool and the part being machined. Machining operations can include turning, milling, drilling, boring, tapping, and threading. All work is performed in accordance to work instruction provided on travelers. Operations require communication, cooperation, and understanding between manufacturing and engineering. Parts machined from 15-5 stainless steel were made from forgings.

Options: Purchase raw material in sizes closer to the final part geometry. This will save machining time. Will reduce cutting tool usage and reduce the quantity of chips and off-fall.Recycle machining coolant to remove contamination. Allows for reuse of coolant.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: 304 Stainless Steel Machining **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z931-20STEEL304 **Specific Waste Type:** Metal Debris

Date: 31-mar-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description: Daily operations can include the machining of alloy 304 stainless steel. Machining can be performed on a variety of equipment. All machining is done using a water-based coolant for removal of heat from the cutting tool and the part being machined. Machining operations can include: turning, milling, drilling, boring, tapping, and threading. All work is performed to instructions provided on travelers. Operations require communication, cooperation, and understanding between machining and engineering. 304 stainless steel parts are made from stainless steel forgings.

Options: Purchase raw material in sizes closer to the final part geometry. This will save machining time. Will reduce cutting tool usage and reduce the quantity of chips and off-fall.Recycle machining coolant to remove contamination.Allows for reuse of coolant.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Titanium Machining **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z931-20TITANIUM **Specific Waste Type:** Metal Debris

Date: 15-may-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description: Daily operations within the department include the machining of titanium. Machining can be performed on a variety of equipment including, turning, milling, drilling, boring, tapping, threading, all utilizing water-based cooling for heat removal from the cutting tool and the part being machined. Work is performed to instructions provided by engineering in production and development travelers. All operations require communication, cooperation and understanding between manufacturing and engineering. Titanium piece parts were machined from forgings.

Options: Purchase raw material in sizes closer to the final part geometry. This will save machining time and reduce usage or cutting tools. The quantity of chips and off fall will also be reduced.Recycle machining coolant to remove contamination. This allows the coolant to be reused.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Tungsten Machining **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z931-20TUNGSTEN **Specific Waste Type:** Metal Debris

Date: 31-mar-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description: Daily operations within include machining of tungsten. Machining can be performed on a variety of equipment including; turning, milling, drilling, boring, tapping, and threading, all utilizing a water-based coolant for the removal of heat from the cutting tool and the part being machined. Work is performed to instructions provided by engineering in travelers. Operations require communication and cooperation and understanding between manufacturing and engineering. Piece parts machined from alloys of tungsten were machined from forgings.

Options: Purchase raw material in sizes closer to the final part geometry. This will save machining time. Will reduce cutting tool usage and reduce the quantity of chips and off-fall.Recycle machining coolant to remove contamination. Allows for reuse of coolant.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Aluminum Machining **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z931-21ALUM **Specific Waste Type:** Metal Debris

Date: 27-jul-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description: Aluminum alloy material of the specified size and shape is machined on numerical controlled milling machines. Machining operations include drilling, boring, milling, tapping and reaming. All machining is performed using coolant.

Options: Refrigerate coolant to reduce the amount of losses due to evaporation.Reprocess coolant to remove manufacturing contaminates and reuse coolant.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Machining Stainless Steel **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z931-21ASTEEL **Specific Waste Type:** Metal Debris

Date: 27-jul-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description: Alloy steel of the specified size and shape is machined on numerical controlled milling machines. Machining operations performed include, drilling, boring, milling, tapping, and reaming. All machining is performed utilizing coolant.

Options: Refrigerate coolant to reduce the losses due to water evaporation. Approximately 300 gallons of water must be added after each work day.Recycle coolant to remove machining contamination and reuse.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Miscellaneous Processes **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z931-21MISC **Specific Waste Type:** Paper

Date: 16-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Daily operations require the use of miscellaneous supplies. Some may be used daily and others will be used only on occasion. These supplies are available only from internal stores and include such items as ear plugs, hand lotion and tape. These items are necessary for part production or for the safety of persons who are present within the department when machining is in process.

Options: Use of reuseable wipes.Replace disposable paperwipes with ones capable of being cleaned and reused.Issue permanent sets of ear plugs.Replace current system of having disposable sets of ear plugs with one of a permanent set of hearing protection.

Site: Kansas City Plant	

Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Aluminum Machining **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z931-93ALUM **Specific Waste Type:** Metal Debris

Date: 03-jan-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description: Piece part number 1: OD Grind bar stock - Rough machine on CNC super slant CNC lathe or on screw machine. Turn, drill, tap, bore. Finish machine on CNC lathe or on a manual lathe. Turn, drill, tap, bore. Piece part number 2: Bar stock received in saw cut length. Rough machine on Monarch Cortland milling machine. Mill, drill, tap, bore, cut off. Finish machine on monarch cortland milling machine. Mill, drill, tap, bore. Finish machine on CNC lathe or on manual lathe. Turn.

Options: Substitute one universal coolant that is usable for all equipment. Can be recycled, has long life, easily disposed, less costly.Material size substitution. Obtain and use material whose original size more closely agrees to the final part size.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Stainless Steel Machining **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z931-93ASTEEL **Specific Waste Type:** Metal Debris

Date: 03-jan-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description: Part #1: Lathe part. On CNC lathe or screw machine rough turn and cut off. Finish machine on CNC lathe or manual lathe. Part #2: Lathe mill part. On CNC lathe or screw machine rough turn and cut off. Finish machine on Monarch Cortland milling machine. Alloy steel of the specified size and shape is machined on lathe, screw machines, grinders and milling machines. All machining operations include the use of machining coolant.

Options: Substitute one universal coolant that is usable in all equipment, suitable for recycling, has long life, easily disposed, and less costly.Material size substitution. Obtain and use material whose original size is closer to the final part size. Reduction of the quantity of chips.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Beryllium Copper **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z931-93BECU **Specific Waste Type:** Metal Debris

Date: 03-jan-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description: A lathe mill process. Turned, drilled, bored, tapped, cutoff, on a CNC Lathe. Beryllium copper of the specified size and shape is machined on lathes, automatic screw machines, milling machines, grinders. All machining operations utilize machining coolant.

Options: Substitute one universal coolant that is usable for all equipment, suitable for recycling, has long life, easily disposed, and less costly.Material size substitution. Obtain and use material whose original size is closer to the final part size. Reason is to reduce quantity of chips.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Brass Machining **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z931-93BRASS **Specific Waste Type:** Metal Debris

Date: 03-jan-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description: A lathe mill process. Turned, drilled, bored, tapped, cutoff on a CNC lathe. Finish machined on a CNC milling machine. Brass and copper of the specified size and shape is machined on lathes, automatic screw machines, grinders and milling machines. Each machining operation utilizes machining coolant.

Options: Substitute one universal coolant that is usable in all equipment, suitable for recycling, has long life, easily disposed, and less costly.Material size substitution. Obtain and use material whose original size is closer to the final part size to reduce the quantity of chips.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Hiperco Machining **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z931-93HIPERCO **Specific Waste Type:** Metal Debris

Date: 03-jan-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description: Machining on a CNC lathe and/or screw machine. Rough turn and cut off, finish machining. Machining on a

machining center. Mill, drill, ream, bore, tap finish machining. Grinding. Outside diameter and/or flat surface finish machining. Machining operations - starting with bar stock - rough machine on a CNC lathe followed by finish machining to final size using milling machines, grinders and similar types of equipment. Machining is accomplished using oil and water soluble coolants.

Options: Substitute material - obtain more effective bar sizes to reduce off fall. Would reduce scrap on all Hiperco parts.Replacement coolant - use of a coolant that has long life, less costly, easy to dispose of, useable in all equipment, can be recycled.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Miscellaneous Processes **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z931-93MISC **Specific Waste Type:** Paper

Date: 03-apr-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Daily operations require the use of supplies covered in general process instructions (GPI) P0850096, operating supplies. Some supplies may be used daily and others used only on occasion. Any supply used must be included in the content of P0850096. Supplies are needed for daily operations and include items such as glass cleaner, modeling clay, toothpicks and wipes. Also included is rotary finishing media such as aluminum oxide and silicon carbide.

Options: Supply one type of skin lotion. Use of a single hand lotion to add back body oils removed by daily operations of machining and deburring.Use of reusable wipes. Replacement of disposable wipes with one capable of being reused.Use one dry rotary finish media. An extensive evaluation period will be required to prove usability of dry media.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Machine Part Wash **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z931-93PARTWASH **Specific Waste Type:** Caustic

Date: 13-jan-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: At each machine there is a small ultrasonic cleaner used for part cleaning. The solution used for cleaning is one part blue gold detergent (4702988) and nine parts distilled water heated to 140 deg C. Parts are machined using coolant which must be removed prior to gaging. Coolant is removed by submerging the just machined piece part into the heated ultrasonic cleaner. Clean blue gold solution is stored in the department in a plastic drum. Dirty blue gold solution is stored in plastic drums in the department until full at which time they are sent to waste management for disposal.

Options: Use of one coolant for all machining. Obtain one coolant that has a long life, is less costly to purchase, easily disposed, usable in all equipment, can be recycled.Replacement for blue gold solution. Obtain a cleaning solution that dissolves all

processing soils, is environmentally safe, poses no health hazard, inexpensive to purchase, is easily disposed, recyclable.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Tungsten Machining **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z931-93TUNGSTEN **Specific Waste Type:** Metal Debris

Date: 03-jan-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description: A lathe mill part. Rough machine on CNC lathe, or on super slant lathe. Finish machine on Monarch Cortland milling machine. Tungsten of the specified size and shape is machined on lathes. Automatic screw machines, and milling machines. All machining is performed using machining coolant.

Options: Substitute one universal coolant that is usable in all machines, suitable for recycling, has long life, easily disposed, less costly to purchase.Material size substitution. Obtain and use material whose original size is closer to the final part size. Reduction of the quantity of chips.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Chemical Etching Processes **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-005ETCHES **Specific Waste Type:** Acid

Date: 14-may-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description: The specific etch is mixed in a beaker and covered with a watch glass. The sample to be etched is placed into the beaker with the etch. The sample remains in beaker, covered, for a specific period of time or until a certain result is achieved. When finished, the sample is removed and rinsed with water, then left to dry. The remaining etch and the water rinse are placed into the appropriate waste barrel for disposal to waste management. The entire process is performed in an exhaust hood.

Options: Find a replacement for chromium trioxide - a carcinogen.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** David Curtin
Phone: (816) 997-3673	**Phone:** (816) 997-4646
Fax: (816) 997-4208	**Fax:** (816) 997-3331

Email: wschlosberg@kcp.com	**Email:**

Title: Lid Removal **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-005RCLIDREMOVE **Specific Waste Type:** Caustic

Date: 04-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The lid removal process begins with the mixture of 73 mL of isopropyl alcohol with 7 mL of tetramethylammonium hydroxide in an 80 mL beaker. The ingredients are poured directly from their storage containers. The ceramic package is placed into the mixture. The beaker with mixture is placed uncovered on a hot plate and set to boil. Upon boiling, the epoxy begins to break down and in one hour the lid separates. Remaining in the beaker are 10 mL of the mixture with a negligible amount of epoxy particulate. An alkaline waste container is placed into the exhaust hood and the remaining mixture is poured into it. The waste container lid is removed only long enough to do this and then replaced. The package and lid are lifted off the bottom of the beaker with tweezers, then twice rinsed over the beaker with tap water. Eighty mL of water are used per rinse. The rinse is also poured into the alkaline waste storage container. Finally, tap water is used to rinse the beaker, twice, and that rinse is also poured into the alkaline waste storage container. Eighty mL are again used per rinse. The ceramic package, beaker and tweezers are air dried.

Options: Reduce heat to just below boiling temperature. This may reduce point source emissions but increase waste going to waste management.Place watch glass/cover on beaker. This should restrict vapor/source emissions but will increase waste going to waste management.Use reactive ion etcher (plasma etch) to break down the epoxy. This will eliminate the chemicals but the two required gases must be considered.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** David Curtin
Phone: (816) 997-3673	**Phone:** (816) 997-4646
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: SEM Column Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-005SEMCOLUMN **Specific Waste Type:** Solvents

Date: 03-mar-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The JEOL 840A SEM requires routine maintenance twice a year. The column is dismantled and cleaned as required with metal polish, acetone and Freon 113. After the parts are cleaned and dried, the column is reassembled. The roughing and diffusion pumps are drained, then refilled with new oil.

Options: Eliminate Freon 113 - replace with second and third rinse of clean acetone.Replace EFFA Duster (Freon 22) - use dry nitrogen for drying. Get segregated scrap barrel to recycle aluminum.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** David Curtin
Phone: (816) 997-3673	**Phone:** (816) 997-4646
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Lid Removal **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-005TILIDREMOVE **Specific Waste Type:** Acid

Date: 04-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The lid removal process begins with the mixture of 53 mL sulfuric acid with 27 mLnitric acid in an 80 mL beaker. The ingredients are poured directly from their storage containers. The ceramic package is placed into the mixture. The beaker with mixture is placed uncovered on a hot-plate and set to boil. Upon boiling, the epoxy begins to break down and in 45 minutes the lid separates. Remaining in the beaker is 10 mL of the mixture with a negligible amount of epoxy particulate. The acid waste storage container is placed into the exhaust hood and the remaining mixture is poured into it. The waste container lid is removed only long enough to do so, and then replaced. The package and lid are lifted off the bottom of the beaker with tweezers, then twice rinsed over the beaker with tap water. Eighty mL of tap water are used per rinse. The rinse is also placed into the acid waste storage container. Finally, tap water is used to rinse the beaker, twice, and that rinse is also placed into the acid waste storage container. Eighty mL are again used per rinse. The ceramic package, beaker and tweezers are air dried.

Options: Reduce heat to just below boiling temperature. This should reduce point source emissions but increase the waste going to waste management.Place watch glass (cover) on beaker. This will reduce point source emissions but increase waste going to waste management.Use reactive ion etched (plasma etch) to break down the epoxy. This will eliminate the chemicals but the two gases required must be considered.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** David Curtin
Phone: (816) 997-3673	**Phone:** (816) 997-4646
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Stripping Paint Using UresolvePlus **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-005URESOLVE01 **Specific Waste Type:** Solvents

Date: 18-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Painting

Description: In the fume hood pour 20 mL of Uresolve Plus (57000914) into a 20 ml glass beaker. Place devices to be stripped into the beaker with the Uresolve Plus. The leads of the devices are not bent and the devices will stand on end on their leads. Place the beaker with the parts and Uresolve Plus on a hot plate within the fume hood. Set the hot plate control to 500 (the temperature of the hot plate is not measured). Allow parts and Uresolve Plus to remain on the hot plate during the process. Check the devices every half hour for the degree of paint softening for easy and complete removal. Typical time needed in the Uresolve Plus is 1 hour. During the process up to half the Uresolve Plus is lost to emission; replenish to 20 mL with fresh Uresolve Plus. After the paint is sufficiently softened, transfer the parts to a 150-mL beaker of water. Pour the used Uresolve Plus and rinse water into the solvent waste can. Rinse beakers with water and pour water into the solvent waste can.

Options: Change process to allow cover to prevent point emissions. Will decrease use of Uresolve Plus by 34%.Strip paint by use of reactive ion etch system. Will eliminate use of Uresolve Plus.Strip paint by mechanical means (scraping, blasting). Will eliminate use of Uresolve Plus.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** David Curtin
Phone: (816) 997-3673	**Phone:** (816) 997-4646
Fax: (816) 997-4208	**Fax:** (816) 997-3331

Email: wschlosberg@kcp.com	**Email:**

Title: Wehnelt Cap Cleaning for SEM **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-005WEHNELTCAP **Specific Waste Type:** Solvents

Date: 11-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The Wehnelt cap cleaning process begins as the cap is removed from the 840A and placed on a lint-free cloth. Small amounts of polish are applied to the cap with cotton balls, toothpicks and cotton swabs. The polish is rubbed against the film until it is removed. The cloth is used to remove the bulk of the polish from the cap, then saved for use in future steps. Pour 100 mL each of acetone, methanol and Fresno 113 into three designated beakers and cover. To remove any residual polish, the cap is placed into the acetone beaker, washed for one minute using swabs, then blown dry with Effa Duster. Next, the cap is placed into the beaker of methanol, washed for five minutes using swabs, then blown dry with Effa Duster. Finally, the cap is placed into the beaker of Fresno 113, washed another five minutes, and blown dry with Effa Duster. To remove any residual solvent, the cap is wrapped in aluminum foil and baked. After one hour, the cap is removed from the bake and returned to the 840A. For cleanup, the solvents are poured into the waste solvent can for disposal by waste management and the beakers are dried with Accudry wipes. The used wipes, cotton balls, toothpicks, cotton swabs, vinyl gloves and lint-free cloths are placed into the flammable waste step can, again for disposal by waste management. The aluminum foil is placed in the normal trash. Assumptions: The process is performed in the wet lab, in open air. There are negligible emissions from the polish. 1ml each of acetone and methanol is lost to fugitive emissions. 2ml of freon 113 are lost to fugitive emissions. All of the Effa Duster used is lost to fugitive emissions.

Options: Eliminate Freon 113 - replace with best choice of: 1) extra methanol rinse, 2) isopropanol, 3) Mr.Clean, 4) sodium hydroxide, or 5) contact manufacturer (JEOL) for suggestions.Use methanol as third rinse until others are researched.Clean more than one cap at a time to cut down on total waste.Replace Effa Duster (Freon 22) - use dry nitrogen for CFC reduction/elimination.Get segregated scrap barrel to recycle the aluminum foil.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** David Curtin
Phone: (816) 997-3673	**Phone:** (816) 997-4646
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Epoxy Attach / Cure **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-080B013014 **Specific Waste Type:** Polymers

Date: 16-sep-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description: A single component, nonconductive epoxy is used to cover the extending pin on LCCAs which are soldered to ceramic hybrid microcircuits. The purpose for covering the extended pin is to prevent the pin from shorting to the conductive path printed on the network and routed under the LCCA. The process followed to cover the pin is to transfer a small amount of epoxy to an aluminum weighing pan from the container. Next, using a toothpick, apply a thin coating of epoxy over the extended portion of the pin. Once all the LCCAs have been covered, place them into an oven and cure the epoxy at 150 degrees C for one hour. The epoxy that is remaining in the aluminum weighing pan is cured out and discarded in the hazardous waste step can.

Options: Use a less toxic epoxy for the same process.Redesign the CAP hybrid to eliminate the need for epoxy.Buy smaller quantity of material from vendor. Note: After investigation we learned that we currently purchase the minimum quantity possible.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Soldering **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-132SOLDERING **Specific Waste Type:** Lead

Date: 28-mar-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Richard Vartanian
Phone: (816) 997-3673	**Phone:** (816) 997-2493
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: R-11 Chiller Refrigeration **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-183001 **Specific Waste Type:** Solvents

Date: 31-aug-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Utilities

Description: A process whereby water is chilled through a refrigeration cycle accomplished by mechanical compression chillers utilizing Refrigerant #11. Chilled water is routed throughout the plant for ambient and other cooling processes. The cycle begins in the evaporator where liquid refrigerant flows over the evaporator tube bundle and evaporates, absorbing heat from the chilled water circulating through the tube bundle. The refrigerant vapor, which is somewhat cooler than the chilled water temperature, is drawn out of the evaporator by the compressor. The compressor "pumps" the refrigerant vapor to the condenser by raising the refrigerant vapor process pressure (and thus temperature). The refrigerant condenses on the cooling water coils of the condenser, giving up its heat to the cooling water. The high pressure liquid refrigerant from the condenser then passes through the expansion device which reduces the refrigerant pressure (and temperature) to that of the evaporator. The refrigerant flows over the chilled water coils, absorbing more heat and completing the cycle.

Options: Provide engineering and maintenance training to reduce fugitive air releases of CFC-4-11.Write procedures for reduction of R-11 and Refrigerant Oil to reduce fugitive air releases of CFC-R-11 and solid and liquid waste. Input materials affected are R-11, oil towels, refrigeration oil, oil filters and drier strainers.Develop monthly Waste Management Procedure detailing waste submittals to reduce solid and liquid waste. Input materials affected are refrigeration oil, oily towels, oil filters, and drier strainers.Develop procedure controlling releases of R-11from central stores to authorized personnel. This would affect fugitive air releases from CFC-R-11.Establish procedure to control Hazardous Materials through a bonded stores area. This would affect solid and liquid waste streams and fugitive air emissions. Procedures to reduce refrigeration leaks. This would affect fugitive air releases of CFC-R-11.Purchase new equipment or replacement of existing equipment. This would affect fugitive air releases of CFC R-11.Retrofit existing equipment. This would affect fugitive air releases of CFC R-11.Use purge units on compressors only when needed. This will affect fugitive air releases of CFC-R-11.Justify budget inputs for replacement of existing R-11 equipment with alternative refrigerant chillers. Update the FM&T Construction Standards to require non-CFC

equipment.Continue to monitor legislative and technical developments with regard to CFC phase out

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Richard Vartanian
Phone: (816) 997-3673	**Phone:** (816) 997-2493
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Butt Tensile Test Specimen Prep **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-337ADHS002 **Specific Waste Type:** Polymers

Date: 20-oct-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Joining

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Lap Shear Test (Liquid Adh,TLV<5) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-337ADHS003 **Specific Waste Type:** Polymers

Date: 15-nov-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Joining

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Lap Shear Test (Film Adhesive) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-337ADHS004 **Specific Waste Type:** Polymers

Date: 15-nov-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Joining

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Cleaning with Acetone **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-339CLEAN001 **Specific Waste Type:** Solvents

Date: 30-sep-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Cleaning

Description: To clean miscellaneous molds and parts using acetone as a solvent. Solvent is placed on K-Drys and the parts or mold are wiped clean.

Options: Recycle cardboard boxes and glass jugs.Use water-based cleaners such as detergent in a dishwasher.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Vapor Degreasing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-339DEGR001 **Specific Waste Type:** Solvents

Date: 15-may-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Cleaning

Description: Cleaning aluminum lap shear finger panels using vapor degreasing. The cleaned finger panels go to aluminum acid etch process. Cleaning aluminum lap shear finger panels using vapor degreasing. The cleaned finger panels go to the aluminum acid etch process.

Options: Recover TCA for recycling.Use alternate non-chlorinated solvent.Use water-based detergents.Use mechanical heat exchanger.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735

Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Acid Etching of Aluminum **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-339ETCH001 **Specific Waste Type:** Acid

Date: 30-may-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Cleaning

Description: This process is referred to as the FPL etch process for preparing aluminum lap shear panels for adhesive testing. The aluminum panels are immersed to a depth of about 3/4" in a heated sulfuric acid/chromic acid solution. Once etched to roughen the aluminum surface, the panels are washed with distilled water and dried in air. The panels are then ready for adhesive bonding.

Options: Replace FPL etch with alternate etch.Partially substitute tap water for rinse.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Compression Molding DAP **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-339MOLD001 **Specific Waste Type:** Polymers

Date: 30-sep-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Molding

Description: This process is used to compression mold plastic test specimens. Thermoset materials are weighed and placed inside an electrically heated mold and compressed under hydraulic pressure. The plastic material is allowed to cure, then is removed from the mold.Any flash is then removed by filling.

Options: Send entire drum of molding compound to the receiving inspection department.Use what is needed, then return the rest to stores.Send unused material back to stores to be placed back into original drum.Reduce quantity sent to receiving inspection.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Compression Molding Phenolics **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-339MOLD002 **Specific Waste Type:** Polymers

Date: 20-oct-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Molding

Description: This process is used to compress mold plastic test specimens. Thermoset materials are measured and placed inside a electrically heated mold and compressed under hydraulic pressure. The plastic material is allowed to cure, then is removed from the mold. Any flash is then removed by filing.

Options: Send entire drum of molding compound to receiving inspection.Use what is needed, then return the rest to stores.Send unused material back to stores to be placed back into original drum.Reduce quantity sent to receiving inspection.Install exhaust vents.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Spray Mold Release Application **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-339MREL001 **Specific Waste Type:** Solvents

Date: 30-aug-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description: This process covers the application of mold releases from aerosol cans.Regardless of the type of mold release, the process remains the same.An aerosol can of mold release is aimed at the mold, either steel or aluminum, the nozzle is depressed, and the spray is directed to the mold surfaces.This process is performed in a hood and overspray is drawn through the exhaust stack.As the mold release film dries, residual solvent and carrier liquids evaporate from the deposited spray on the mold surfaces and are also drawn to the exhaust stack.

Options: Use Ram 225 in liquid form.Investigate other mold releases which are more environmentally compatible.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Wipe on Mold Release Application **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-339MREL002 **Specific Waste Type:** Sanitary Sewer

Date: 30-sep-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: This process covers the application of a wipe-on mold release. The mold release agent, a common household dishwashing detergent, is mixed in equal parts with water. Paper towels are used to transfer the mold release solution from the mixing container to the mold surfaces, which may be either steel or aluminum. This process is performed in a hood and evaporating water is drawn into the exhaust stack. As the mold release film continues to dry, the remaining water evaporates and is also drawn into the exhaust stack. What remains of the dishwashing detergent/water mix is poured down the sanitary drain.

Options: Retain mixed material for use at a later time.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Marking Rework **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-339REWORK **Specific Waste Type:** Solvents

Date: 20-apr-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Ultrasonic Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-339ULTR001 **Specific Waste Type:** Paper

Date: 01-nov-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Cleaning

Description: Cleaning aluminum lap shear finger panels using ultrasonic cleaning. The cleaned finger panels go to the aluminum acid etch process (Z951339ETCH001).

Options: Reuse clean Kay Dry for miscellaneous cleaning, e.g., Z951339CLEN001 would be an input to the next process.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Iso-Verre Wire Stripping **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-340CHMSTRIP004 **Specific Waste Type:** Chemicals

Date: 12-nov-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Removal

Description: NOTE: The following operations are performed wearing gloves, under a vented hood, and behind a safety shield. A bottle of Iso-Verre (4700282) is carefully opened and poured into a smaller bottle. Thinner (included in the Iso-Verre kit) is added until an acceptable viscosity is obtained. A pipe cleaner is dipped into the smaller bottle; the Iso-Verre is applied onto the end of the magnet wire. The Iso-Verre remains on the wire for approximately 2 minutes. The wire insulation is removed using tweezers, and the wire is cleaned with trichloroethylene (4615002). The cleaning of the wire is not included in the scope of this assessment.

Options: Replace chemical stripper with a nonhazardous chemical stripper. This would eliminate a hazardous material and the associated disposal processes.Replace wire with a solderable magnet wire. This would eliminate the need for a chemical stripper.Replace chemical stripper with a mechanical stripper. This would eliminate the need for chemical stripping.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Dip-Clean Chemical Wire Stripping **Major Waste Type:** Major Waste Stream

PPOA ID Code: KCP-Z951-340CHMSTRIP005 **Specific Waste Type:** Caustic

Date: 30-jun-1994 **Major Activity Type:** Major Process **Specific Activity Type:** Cleaning

Description: DIP STRIP FUSED SALTS and DIP CLEAN are used to remove insulation from transformer wire that is too small to remove by other means. This material replaces Iso-Verre which was more hazardous. Place Dip Strip Fused Salts into melting pot. The salts are initially melted to approximately 500 degrees F; when bubbling has ceased and any cloudiness disappears, the temperature is increased to 730 degrees F and the temperature is maintained by the temperature controller. After the melting pot has stabilized, immerse the wire into the melted DIP STRIP FUSED SALTS to the desired strip level. As the salts react with the insulation, a bubbling action will occur. Complete removal of the insulation is indicated when the bubbling ceases. Remove the stripped wire from the melting pot. Pour a small amount of DIP CLEAN metal cleaner into the disposable aluminum dish, immerse stripped wire into metal cleaner, and remove the amount of oxidation formed on the stripped copper wire. Pour a small amount of water into disposable aluminum dish, immerse stripped wire into water. Dipping wet wires may cause boiling and splattering of fused salts. The following PPE is required: solder pot shield safety glasses, apron, and nitrile gloves. When finished with stripping, turn temperature controller off. Clean vented hood surface with water. Dispose used salt solution, metal cleaner, rinse water, and miscellaneous items in waste management containers. Perform the following maintenance as required: disconnect melting pot from AC source; allow to cool; place pot at slight angle so water can run directly onto the fused salts; dissolve fused salts in water; (do not immerse melting pot or temperature controller in water). Allow melting pot to dry thoroughly before using again. Collect all waste water using metal pan labeled container from waste management.

Options: Replace Dip Clean/Dip Fused Salts stripping process with a nonhazardous chemical stripper. This would eliminate hazardous material and the associated disposal process. Note: The above replaced ISO-VERRE which was more hazardous; we are still attempting to locate a stripper that is less hazardous. Replace wire with a solderable magnet wire. This would eliminate the need for a chemical stripper.Replace chemical stripper with a mechanical stripper. This would eliminate the need for chemical stripping.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gary Hanson

Phone: (816) 997-3673	**Phone:** (816) 997-5563
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Flexmask RTV Mold Setup **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-340FLEXMASK002 **Specific Waste Type:** Solvents

Date: 15-nov-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: Flexmask is applied to the outside of RTV mold parting lines and on cable or connector junctions to prevent encapsulant leakage and contamination from encapsulants. In addition, the flexmask prevents air from entering the RTV molds through parting lines during evacuation. Flexmask is applied with a syringe or Simco tube to the area and oven cured. Unused flexmask remains in the syringe or Simco tube and is used when needed. Syringes and Simco tubes are also refilled when needed. After the oven cure and the encapsulation cure, the flexmask is removed and discarded in step cans. No flexmask is retained on the product. No PPE is required to process this material.

Options: Largest waste quantity was a result of out-of-shelf-life material. Reduce order quantities and stock quantities.Package flexmask in "user" sizes. Flexmask is received in the smallest packaged size.Process uses flexmask only as needed until the package is empty or the material shelf-life expires.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Mixing RTV for Tooling Use **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-340MIXRTV001 **Specific Waste Type:** Polymers

Date: 15-nov-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: The following RTVs for tooling use are covered in this PWA: 1) 2070069 - RTV 630 2 part kit (room temperature cure), 2) 2070132 - Premixed, de-aired, and frozen RTV 630, 3) 2070133 - Electrically conductive silicone RTV. NOTE: The department only used item 1 above in CY92. The other two items have been used in the department but not during this reporting year. The two-part RTV and cab-o-sil are weighed under a vented hood in a quart plastic cup. Base material (A RTV component) 100 grams (99-101 grams), hardener (B RTV component) 10 grams (9.9-10.1 grams), and Cab-o-sil 5 grams (4.9-5.1 grams). The two parts are mixed under a vented hood using a stainless steel spatula. The mixed adhesive is loaded into either a plastic Simpco gun cartridge or a plastic syringe. Minimum batch size of 100 grams of base material is allowed to ensure a uniform mixture. Pot life is approximately 30 minutes at room temperature. Pot life can be extended if material is stored in freezer (~20 deg.F). Resulting waste is sent to waste management as solid waste.

Options: Investigate alternative materials to replace RTV630.Use premixed RTV, P/N 2070132.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769

Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Repair of MXB-71 Molded Parts **Major Waste Type:**

PPOA ID Code: KCP-Z951-340REPAIR000 **Specific Waste Type:** Miscellaneous

Date: 16-nov-1993 **Major Activity Type:** **Specific Activity Type:**

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-5649
Email: wschlosberg@kcp.com	**Email:**

Title: Miscellaneous Solvents / Cleaners **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-340SOLCLEAN003 **Specific Waste Type:** Solvents

Date: 28-sep-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: This miscellaneous solvents/cleaners assessment covers the remaining solvents and cleaners used for cleaning processes that are not defined in other Firing Set PPOAs. The materials covered in this assessment are material standard #4612020 (toluene) and support stores #57000924 (stainless steel cleaner/polisher). Toluene is used to thin syntactic polysulfide prior to making "belly bands" (molded, cylindrical-shaped pieces that wrap around sprytron tubes prior to beta-eucryptite encapsulation). The synactic polysulfide by itself is too thick to be injected into the belly band mold -- it must be thinned with toluene to be molded. Toluene is an original ingredient in syntactic polysulfide. The additional toluene effectively thins the syntactic polysulfide material without changing any of the materialÕs physical properties. The excess toluene bakes out during syntactic polysulfide cure. This is the only use of toluene in the department. All other wastes have already been reported in PPOA #SEAL-340-ENCAP002, Syntactic Polysulfide. The stainless steel cleaner/polisher was used in development only, on an experimental basis, to clean metal surfaces. It has not been used in the department since 1992, when the last remaining material was scrapped.Its use has been discontinued -- it is reported here for record only.

Options: Select an alternate material other than toluene-loaded syntactic polysulfide to make "belly bands.Ó (Syntactic polysulfide is the only known material with the desired thermal cushioning properties, according to Materials Engineering.) Toluene is also the desired thinning solvent, per Materials Engineering. Alternative thinning solvents are either CFCs and CHCs, which are being eliminated, or are more flammable than toluene.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Hershal Hudson
Phone: (816) 997-3673	**Phone:** (816) 997-5595
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Wire/Lead Preparation **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-340WIRELEAD006 **Specific Waste Type:** Plastic

Date: 28-sep-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description: Wire/Lead preparation covers the shrink sleeving and component lead forming processes performed on wire and component leads prior to soldering. Tin dipping and lead clippings are not covered in this PPOA (see TINN-340-TINDIP000/001 or HAND0001). Heat shrink sleeving is installed over wire insulation, component leads, and sometimes component bodies to decouple wires and components from the encapsulation materials. This decoupling provides additional protection for the wires and components during thermal expansion and contraction. Wires may pull out of or break their solder joints, and components may crack during high thermal expansion without sleeving protection. Heat shrink sleeving is installed using a heat gun similar to a hair dryer. The sleeving is initially oversized and shrinks to a smaller size when heated. The oversize feature allows the sleeving to be placed over wires, component leads, and component bodies easily. The sleeving remains hot to the touch for a few seconds after shrinking, then cools to room temperature. Polyolefin sleeving is used extensively in Firing Systems; however, polyurethane sleevings could also be used if necessary. The polyolefin sleevings are MS #2211506-2211556 (regular sleeving) and 2211813-2211863 (thinwall sleeving). The sleeving is packaged in specified lengths and is available in six colors (clear, black, red, yellow, blue, and white) and several diameters. The process specification for installing heat shrink sleeving is 9926014.Excess sleeving and cardboard containers are thrown away as nonhazardous trash. The component lead forming process generates no wastes.

Options: Establish a container for scrap pieces of unused sleeving rather than throwing unused sleeving away. The scrap pieces may be used as long as they are labeled (part # and size code). There is no shelf life with polyolefin sleeving.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Gerald Meier
Phone: (816) 997-3673	**Phone:** (816) 997-5769
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Mold Release **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-34RELEASE03 **Specific Waste Type:** Paper

Date: 23-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description: The mold release process is an operator-dependent process in which various shapes and sizes of aluminum and steel molds are mold released. The wax mold releases are applied with paper wipes in an area with local exhaust.

Options: Increase awareness - Use mold release more efficiently.Minimize use of supply material through increased awareness training.Reusable applicator - Find a reusable mold release applicator. This would minimize use of kaydrys and reduce solid waste stream.Improved mold coatings - Utilize permanent release coatings such as "Nifluor" which can be used to mold product without mold release. Will work primarily on small molds.Alternate mold release - Find a substitute mold release with less volatile content. Wax based still preferred.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068

Email: wschlosberg@kcp.com	**Email:**

Title: Foam Void Repair **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-34REPAIR07 **Specific Waste Type:** Polymers

Date: 22-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Curing

Description: Foam repair material is used to repair defects (voids) which occur after the molding of polyurethane foam products. The repair material is prepared by FM&T materials department. The ingredients are mixed, then the material is injected into 10-cc plastic syringes and frozen at -40 degrees F.or below. The department receives the material frozen; it is stored in a freezer at -65 degrees F until it is required. A syringe is removed from the freezer and allowed to thaw for 15 minutes minimum. After use the syringe and the excess material are discarded into a step can and sent to waste management. Each 10-cc syringe contains approximately 8 grams (.02 lbs.) of repair material. The material is formulated from 6 material standards; another specification is formulated from 7 material standards. Five of these components are the same.

Options: Build lots of product that need patching so use can be in full tube increments. Less waste because all material is being used.Extend shelf-life of material beyond 6 months. Reduce shelf-life loss.Work more diligently to follow traveler pour patterns and mold tilts to reduce voids requiring repair.Pursue specification changes to allow larger voids. Reduce amount of patch material.Make smaller lots of material (patch) so not as much is wasted. (build lots of a size that will be used within shelf-life.Find replacement yellow pigment to eliminate small quantity of cadmium sulfide.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: Fluorinert Bath Temp Calibration **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-421-1 **Specific Waste Type:** Solvents

Date: 26-feb-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Environmental

Description: Two types of Flourinert are placed in the Rosemont Temperature Bath to provide a stable temperature medium for calibration of temperature measuring devices such as thermometers, thermocouples, thermistors and other temperature sensors. The temperature bath is set at required temperatures, a temperature standard and a device to be calibrated are placed in the bath and their readings compared at either a single temperature or multiple temperatures. When temperature measuring devices are removed from the bath, excess Fluorinert is removed with a kaydry.

Options: Smaller bath. Waste amount not significant.Reuse wipes. Waste amount not significant.Use alcohol instead of FC-72. Fire hazard, therefore unacceptable.Interval evaluation. Waste amount not significant.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-425-1 **Specific Waste Type:** Paper

Date: 30-oct-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Cleaning

Description: The chemicals are used to remove rust, dirt, oil and any other forcing material from design gages and tools, capital equipment, standard gages, work stations, cutting tools, and other equipment necessary for inspection and calibration purposes. This includes mechanical and electronic equipment. Most cleaning is manually wiping with Accudry wipes. When wiping is not performed, an ultra sonic bath is used and the chemicals evaporate or are blown off the items being cleaned. Accudrys are a part of each chemical used for cleaning. It is difficult to tell the amount related to each chemical so one bulk amount was determined.

Options: Replace Freon TWD602 and Genesolv D with soap and water. This would affect liquid waste.Replace Aero Duster with plant dry filtered air or nitrogen. This would affect CFC reduction (fugitive air), and solid waste.Replace Freon PCA with L&R Clock cleaner. This would affect liquid waste and fugitive air.Use non-aersol glass cleaner. This would affect fugitive air, CFC reduction, and solid waste. Use soap and water instead of Freon TWD602 for viscometer calibration. This would affect CFC reduction.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Maintenance **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-425-2 **Specific Waste Type:** Paper

Date: 01-dec-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Coating

Description: The oils are used for lubricating machine ways, pins, chucks, gears, drills, taps, machined surfaces, and calibrated equipment. Oils are also used as a rust preventative. Oil is commonly removed before and after lubrication with AccuDrys which are disposed of in step cans. Broken standard gage containers are maintained by regluing them. Probes, indicators and many other items are repaired with adhesives. Spray clear coat and paint markers are used to maintain Tool and Gage labels and markings. The dry imager is used in the laser printer.

Options: Find a substitute for 3M 74 spray adhesive, preferably a brush-on substitute. This would eliminate a suspected carcinogen and discharge to the air.Eliminate Johnson Shineup.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Inspection **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-425-3 **Specific Waste Type:** Solvents

Date: 25-jan-1994 **Major Activity Type:** Maintenance **Specific Activity Type:** Cleaning

Description: Chemicals are used in preparation and inspection of design gages and tools, capital equipment, standard gages, and cutting tools for inspection and calibration purposes.

Options: Find a substitute for AeroDuster. All stationary machines have compressed air available within easy reach of each unit. Elimination would be savings in the purchase price of the Aero Duster versus plant air and reduced spent cans disposal cost.Eliminate D-limonene. This would affect fugitive air and solid waste streams, reducing them.Eliminate dry-O-Lite. This would reduce chemical inventory. Reduce to two colors of stamp pad ink. No clear and definitive reason for other colors currently maintained for this process can be given. Additionally, the colors in question are not stocked by production stores.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-426-1 **Specific Waste Type:** Aerosol Cans

Date: 02-dec-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Cleaning

Description: The chemicals are used to remove rust, dirt, oil, and any other foreign material from gages, product, capital equipment, work stations, and other equipment necessary for inspection purposes. This includes mechanical and electronic equipment.

Options: Replace Aero Duster with plant dry filtered air or nitrogen. This would affect CFC reduction and solid waste.Use non-aerosol glass cleaner. This would affect fugitive air, CFC reduction, and solid waste.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Inspection **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-426-2 **Specific Waste Type:** Polymers

Date: 15-mar-1994 **Major Activity Type:** Service **Specific Activity Type:** Inspection

Description: Chemicals are used in preparation and inspection of design gages and tools, capital equipment, standard gages and cutting tools for inspection and calibration purposes.

Options: At this writing, the chemical inventory for Z951-426-2 is at its minimum. The possible exception would be the

elimination of the redundant stores numbers for ACC adhesive (ex.Krazy Glue, Super Glue etc.). This, however, will have to come on a plant-wide basis and is beyond the scope of this assessment.

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Email: wschlosberg@kcp.com	**Email:**

Title: General Maintenance and Repair (C) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431CMR012 **Specific Waste Type:** Paper

Date: 01-sep-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Maintenance, Equipment

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Accelerometer Mounting **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431EAM002 **Specific Waste Type:** Polymers

Date: 25-sep-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Joining

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Air-Ratchets Lubrication **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431EARL001 **Specific Waste Type:** Oil

Date: 01-sep-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Maintenance, Equipment

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Cleaning Test Cables **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431ECTC014 **Specific Waste Type:** Solvents

Date: 12-may-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Cleaning

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Dielectric Constant of Wire **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431EDCW009 **Specific Waste Type:** Paper

Date: 31-jan-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Electronics

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Encapsulation **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431EEC004 **Specific Waste Type:** Metal Debris

Date: 27-oct-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Encapsulation

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: General Housekeeping in E Lab **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431EGH013 **Specific Waste Type:** Paper

Date: 01-apr-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Cleaning

Description:

Options: none

Site: Kansas City Plant	
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Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: General Soldering in E Lab **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431EGS012 **Specific Waste Type:** Lead

Date: 16-mar-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Soldering

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630

Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: High Voltage Breakdown Testing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431EHV017 **Specific Waste Type:** Oil

Date: 12-jul-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Electronics

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Maintenance and Repair (E Lab) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431EMR011 **Specific Waste Type:** Paper

Date: 08-feb-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Maintenance, Equipment

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Loctite-B **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431ESN018 **Specific Waste Type:** Polymers

Date: 08-oct-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: Certain fasteners require one to two drops of Loctite applied to the threads prior to assembly. Once assembled, the substrate dries and locks the fastener in place. There is a minute waste and is used in the central service area or near shock machines. It is used on CF cable mounting screws, 17-18Z valves, and other products as required.

Options: Do not use. Total usage is less than 0.5 ounce per year and less than 0.00001 ounce wasted per year.Use locking bolts. Cost prohibitive on sizes we use and low quantity involved to make special hardware.

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Phone: (816) 997-3673	**Phone:** (816) 997-3630
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Email: wschlosberg@kcp.com	**Email:**

Title: Special Projects-Fixture Repair **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431ESP016 **Specific Waste Type:** Paper

Date: 07-jun-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Coating

Description:

Options: none

Site: Kansas City Plant	
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Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Sealant - Special Projects **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431ESSP006 **Specific Waste Type:** Polymers

Date: 02-nov-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Encapsulation

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Unit Bonding **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431EUB005 **Specific Waste Type:** Solvents

Date: 19-oct-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Joining

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Units and Components Mounting **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431EUCM007 **Specific Waste Type:** Polymers

Date: 11-nov-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Joining

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Volume and Surface Resistivity **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431EVSR010 **Specific Waste Type:** Grease

Date: 31-jan-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Electronics

Description:

Options: none

Site: Kansas City Plant	
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Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325

Email: wschlosberg@kcp.com	**Email:**

Title: Vacuum Testing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431EVT008 **Specific Waste Type:** Grease

Date: 23-nov-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Mechanics

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: WD-40 Usage **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431EWD015 **Specific Waste Type:** Aerosol Cans

Date: 20-may-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Cleaning

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Accelerometer Bonding **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431KAB001 **Specific Waste Type:** Polymers

Date: 25-sep-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Joining

Description:

Options: none

Site: Kansas City Plant	

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Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Hydraulic Braking Systems **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431KBS002 **Specific Waste Type:** Oil

Date: 06-oct-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Mechanics

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Dampening Systems Shock Equip **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431KDS003 **Specific Waste Type:** Oil

Date: 28-oct-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Mechanics

Description: Shock equipment generates rapid acceleration rates with relatively heavy weight loads. This results in the high "G" forces which are necessary for product testing. Hydraulic dampening systems are utilized as an integral part of the shock equipment to absorb and control the abrupt, high energy forces which occur during operation. These mechanisms are essential to the protection of the equipment and contribute to operator safety. The systems use Aircraft Hydraulic Oil 15 (97021085). The oil is placed into a reservoir which supplies the system with the fluid needed.

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: General Soldering, K-Lab **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431KGS015 **Specific Waste Type:** Lead

Date: 10-jun-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Soldering

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: General Housekeeping, K-Lab **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431KHG016 **Specific Waste Type:** Paper

Date: 30-jun-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Cleaning

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Internal Rust Inhibitor, Actuators **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431KIR006 **Specific Waste Type:** Oil

Date: 25-nov-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Mechanics

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Guiderail Lubrication, Shock Mach. **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431KLR004 **Specific Waste Type:** Oil

Date: 06-nov-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Coating

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Semiconductor Shock Test **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431KMP011 **Specific Waste Type:** Polymers

Date: 15-feb-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Electronics

Description:

Options: none

Site: Kansas City Plant	
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Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Vacuum O-Ring Lubricants **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431KOR026 **Specific Waste Type:** Grease

Date: 05-oct-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Coating

Description:

Options: none

Site: Kansas City Plant	
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Phone: (816) 997-3673	**Phone:** (816) 997-3630

Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Threading Inserts **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431KTI010 **Specific Waste Type:** Paper

Date: 02-feb-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Machining

Description:

Options: none

Site: Kansas City Plant	
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Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Temperature Testing, K-Lab **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431KTT017 **Specific Waste Type:** Compressed Gas Cylinders

Date: 02-aug-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Environmental

Description:

Options: none

Site: Kansas City Plant	
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Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Electrical Contact Cleaner **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431NAC001 **Specific Waste Type:** Aerosol Cans

Date: 23-dec-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Cleaning

Description: Contact Re-Nu is used to clean connector pins and sockets, relay points, variable resistor contacts, etc. The cleaning agent is sprayed on electrical contacting areas with a heavy enough spray to flow away the oil, grease, dirt or dust. The spray evaporates rapidly, leaving little or no residue.

Options: Use fine grade Emery paper to clean the contacts. Mate and unmate connectors three or four times to polish contacts.Use isopropyl alcohol spray to clean contacts.

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Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Aerosol Dust Remover **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431NAD002 **Specific Waste Type:** Aerosol Cans

Date: 21-apr-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Cleaning

Description: The aerosol can is filled with DPMS-H0817, a colorless liquefied gas. Expulsion of the gas from the aerosol displaces microscopic dust from the surface of materials in the path of the expanding gas. Items such as microminiature electrical assemblies, electromechanical assemblies, magnetic tape and tape heads, servomechanisms, timing devices, rotating instruments, computer keyboards, and plug-in boards, and computer disc mechanisms all benefit from periodic dusting. The system dusting agent is nonconductive, nonflammable, odorless, of low toxicity, compatible with most polymers, rubber and metals. Further, the dusting agent contains no chlorofluorocarbons (CFC). AERODUSTER, MS 220 has been replaced with AERODUSTER, MS 222. This PPOA is for AERODUSTER, MS 222.

Options: Use manually pumped reusable plastic bottle, using air as the dusting agent. Air is nontoxic, nonflammable and requires no purchasing or disposal costs.Use pressurized bottle filled with dry air or dry nitrogen to act as the dusting agent and propellant. Will only work if container can be pressurized to near 300 lbs per square inch. Containers located so far are plastic and will not hold the pressure.

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Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Anti-Seize Threads **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431PAST008 **Specific Waste Type:** Solvents

Date: 21-jan-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Coating

Description:

Options: CHC - none

Site: Kansas City Plant	
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Phone: (816) 997-3673	**Phone:** (816) 997-3630

Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Fluorinert Bubble Test **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431PBT009 **Specific Waste Type:** Solvents

Date: 15-jan-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Mechanics

Description:

Options: none

Site: Kansas City Plant	
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Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Post Calibration Gauge Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431PCL018 **Specific Waste Type:** Solvents

Date: 03-aug-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Cleaning

Description:

Options: none

Site: Kansas City Plant	
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Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Liquid Leak Testing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431PKLT021 **Specific Waste Type:** Sanitary Sewer

Date: 24-sep-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Mechanics

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Pressurized Bottle Gas **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431PPBG022 **Specific Waste Type:** Compressed Gas Cylinders

Date: 21-sep-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Mechanics

Description:

Options: none

Site: Kansas City Plant	
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Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Waste Explosive Detonation-Burn **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431PWEPB001 **Specific Waste Type:** Explosives

Date: 24-jun-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Mechanics

Description:

Options: none

Site: Kansas City Plant	
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Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Waste Explosive Detonation-Electr. **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431PWEPE002 **Specific Waste Type:** Explosives

Date: 24-jun-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Mechanics

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Waste Explosive Detonation-Percus. **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431PWEPP003 **Specific Waste Type:** Explosives

Date: 24-jun-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Mechanics

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Couplant, Ultrasonic Lab Testing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-431UTC013 **Specific Waste Type:** Oil

Date: 09-jun-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Mechanics

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Solder Dip Processing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-437003 **Specific Waste Type:** Solvents

Date: 25-jan-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description: The parts (ICs, transistors, and similar items) are steam-aged for 72 hours in an environmental chamber at 100 deg C. The parts then are dried in a dry nitrogen cabinet for up to 72 hours. The leads of the parts are immersed in flux (Kester 135, MS #4705000-04 or Kester 197, MS #4705010-04) for 5-10 seconds and then allowed to drain for 5 to 20 seconds. The dross and burnt flux is skimmed from the surface of the molten solder in the solder pot. This residue is disposed of as a segregated scrap. The leads of the parts are immersed in the molten solder (60/40 tin/lead, MS #8330401-01 or lead/indium, MS #8333001-00) at 245 +/- 5 deg C for 5 +/- 0.5 seconds. The parts are allowed to cool in air. Residue flux is removed from the leads by dipping the parts in isopropyl alcohol (MS #4601031-02). Half the alcohol evaporates to fugitive air; the other half is disposed of as a liquid waste. The parts are allowed to dry on a kaydry.The leads are then inspected under a microscope for adherence to specifications. The flux is poured into a 2-oz container. This container of flux can only be used once. After it is used in the solderability test, it is disposed of in a 5-gallon overpak can. The kaydrys that are used for drying the parts and some infrequent cleaning are disposed of in a step can as a solid waste.

Options: Use alternate disposal method to conserve flux solder dip bottles.Use tight control of flux measurement to reduce flux waste.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Volume Testing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-437PVT019 **Specific Waste Type:** Mercury

Date: 08-oct-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Mechanics

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Marking Permanency **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-437TCEMP001 **Specific Waste Type:** Solvents

Date: 17-dec-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Chemical

Description: Turn on the exhaust fan for the spray booth. The switch is located on the north wall adjacent to the spray booth. As a safety feature, the spray gun will not operate if the exhaust fan is switched off. Next, load the marking permanency sample into a fixture and place the fixture inside the spray booth. Open the valve installed on the trichloroethylene 5-gallon waste container. The samples are then collectively sprayed directly on the marking with trichloroethylene using an air pressure on 75 psig for 30 seconds and then blow dried for 10 seconds. This process is repeated for a total of 3 cycles. Close the in-line valve to the waste container and turn the exhaust fan off when complete.

Options: Spray booth modification - Modify the drain to allow more trichloroethylene to be caught. This will provide an opportunity for recycling.Drain line modification - Replace the manual in-line valve with an automatic valve. This will reduce the amount of trichloroethylene that evaporates and increase the amount which could be recycled.Replace TCE with a nonhazardous, nonhalogenated solvent. Compatibility evaluation using d-limonene has been completed and the results were acceptable (PDO #70594100). Pending spray booth modification and/or replacement, additional evaluations may be required.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Thermal Shock Testing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-437TSHOCK **Specific Waste Type:** Solvents

Date: 30-apr-1994 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Environmental

Description: The test sample is placed into a basket that is attached to a pivoting arm on the thermal shock tester. Next, the operator sets the desired temperature of the hot and cold liquid baths, the specified dwell times of each bath, the number of cycles, and the transfer time between baths. Once the liquid baths have achieved the specified temperatures, the operator can start the thermal shock tester. The tester will automatically cycle the sample between the liquid baths using the times selected by the operator.

Options: Discontinue use of FC-70 (#4611153) and switch to D05 (#57003886). This change will reduce input material costs and lower the health risks involved.Discontinue use of FC-72 (#4611155) and switch toD80 (#57003887). This change will reduce input material costs and lower the health risks involved.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Penetrant Testing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-437ZL19DYE **Specific Waste Type:** Sanitary Sewer

Date: 31-aug-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Metallurgy

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Solder Dip Processing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-438001 **Specific Waste Type:** Lead

Date: 24-nov-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Soldering

Description: The components are steam-aged for 8 hours prior to the solderability test. The components are then dipped in rosin flux held in a smaller container (approximately 2 oz) deep enough for immersion of the leads of the component for 5 to 10 seconds. The rosin flux is then allowed to drain from the component back into the small container for a minimum of 10 seconds. The components are then dipped in the molten solder (245 deg C) for a minimum of 5 seconds. The components are allowed to cool and then the component leads are cleaned with kaydrys soaked with isopropyl alcohol. The dross which forms on the surface of the molten solder is skimmed off before the parts are dipped. The dross is disposed of as a segregated scrap solid waste. The kaydrys, which the components are cleaned with are deposited in a step-can and are disposed of as solid waste. The rosin flux, that loses most of its liquid state because of alcohol evaporation, is disposed of as a flammable, liquid solvent. All of the alcohol that is used for cleaning or contained in the rosin flux evaporates in the department to the fugitive air.

Options: Use one solder pot for a combination of areas.Use smaller diameter solder pot; modifying the existing solder pot.Evaluate solder contaminates to possibly extend solder pot life.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: D/438 Factory Cleanup **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-438003 **Specific Waste Type:** Paper

Date: 06-oct-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The area is cleaned on a weekly basis. During this cleanup, kaydrys (99010930) and glass cleaner (Glass-Glo #58001216) are used. The dirty kaydrys are disposed of in nonhazardous office waste containers. The empty aerosol cans of glass cleaner are disposed of in the empty, aerosol-can container.

Options: Do not clean up.Extend interval between cleanup.Change materials; kaydrys to sponges.Change materials; aerosol cleaner to pump spray cleaner.

Site: Kansas City Plant

Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Soldered Wire Test Specimen Prep **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-439001 **Specific Waste Type:** Lead

Date: 30-apr-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Soldering

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Solder Dip Processing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-439003 **Specific Waste Type:** Lead

Date: 23-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description: The wire specimen shall be six inches long. Remove 0.50 inch of insulation from one end of the specimen. Then, make a 90 degree bend in the wire approximately 0.50 inches from the end of the insulation on the stripped end of the wire. Immerse the wire to within 0.12 inches of the insulation; first into a non-activated liquid rosin flux composed of 75% alcohol and 25% W W grade rosin; second in a pot of molten SN60 (60-40 tin-lead) solder maintained at 235 degrees +/- 5 degrees C for 5 +/- 1 seconds. Then the wire specimen end is cleaned with a kaydry soaked with alcohol for inspection of the wire specimen under 4X - magnification. After completion of inspection, the wire sample is disposed of as a segregated scrap.

Options: Use one solder pot for departments 437, 438 and 439.Use receiving inspection (support dept.) solder pot.Use smaller diameter pot by modifying the existing pot.Do not perform test.Evaluate solder contaminates to possibly extend solder pot life.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Visual Inspection **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-439004 **Specific Waste Type:** Paper

Date: 15-feb-1994 **Major Activity Type:** Laboratory **Specific Activity Type:** Inspection

Description: Visual inspection requires associates to confirm that material procured by AlliedSignal meets the parameters prescribed by Industrial and Military specifications. During the inspection process several compounds and materials are used to confirm measurements, clean equipment and material, and protect associates from hazardous materials and chemicals.

Options: Formalize instructions for the use of material and articles during inspection.Loosen requirements on materials.Use smaller wipes.Share chemicals with another department.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: General Maintenance **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-456KGM020 **Specific Waste Type:** Containers

Date: 17-nov-1993 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Equipment

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Heat Sink Compound **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-456KHS023 **Specific Waste Type:** Containers

Date: 22-oct-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630

Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Operation Pressure **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-456KOP24 **Specific Waste Type:** Compressed Gas Cylinders

Date: 01-nov-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Mechanics

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Staticide Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-456KSC027 **Specific Waste Type:** Paper

Date: 21-oct-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Thread and Cone Cutting **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-456PTCC025 **Specific Waste Type:** Metal Debris

Date: 14-oct-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: Sealing with Polysulfide **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-50BONDPLYSUL **Specific Waste Type:** Polymers

Date: 17-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: Polysulfide is used as an electrical grade sealant at the end caps of some batteries. These assemblies are returned for reprocessing and reacceptance, which usually requires installation of new batteries. The two-part polysulfide material is received in one-quart kits and is mixed in 110-gram batches at a ratio of 100 parts-by-weight (PBW) of base compound to 10 PBW of accelerator. The material is mixed in a paper cup and a wooden spatula is used to stir the mixture thoroughly. The material has a pot life of 30 minutes and is used immediately after mixing. The sealing compound is applied to the threads of the end caps with a toothpick or the spatula just prior to installation in the housing. The end caps are torqued at 3 to 5 inch-lbs.and a continuous bead of sealant is left at the junction of the end cap and the housing. The unused material is allowed to cure in the mix container and disposed of as nonhazardous solid waste. Because of a six-month shelf life of the material, a high percentage of expired shelf life material is disposed of as the two-part components. One of the components (lead dioxide) is considered to be an EPA hazardous waste. The work is performed by Modification and Conversion Operators. No certification or special training is required.

Options: Buy polysulfide material in smaller quantities. Material has commonly been procured in 1-quart kits. A stores code number for 2.5-oz.kits is now available.Mix material in smaller batches. Because of the six-month shelf life, the material ends up being scrapped as the two-part components when not used. There could be no gain in a small batch approach.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Edward Hitchcock
Phone: (816) 997-3673	**Phone:** (816) 997-3128
Fax: (816) 997-4208	**Fax:** (816) 997-3112
Email: wschlosberg@kcp.com	**Email:**

Title: Solvent Cleaning with MeCl **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-50CLEANSOLV1 **Specific Waste Type:** Solvents

Date: 19-oct-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The cleaning process is performed under the exhaust hood. Operators are required to wear a smock, nitrile gloves, and a face shield during cleaning operations per paragraph.4.3 of the Annex Safe Operating Procedure. If residue is found on the case of an incoming part, it is removed by washing it off with a solution of 2% detergent (4702402) and water. The cleaned area is then rinsed with methylene chloride (4515020) followed by a final rinse with isopropyl alcohol (4601031). The unit is blown dry with factory air.

Options: Eliminate the use of methylene chloride. This will eliminate the material from all waste streams. Alcohol is adequate to remove traces of the cleaning solution. A second alcohol rinse may be required.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Edward Hitchcock
Phone: (816) 997-3673	**Phone:** (816) 997-3128
Fax: (816) 997-4208	**Fax:** (816) 997-3112
Email: wschlosberg@kcp.com	**Email:**

Title: Solvent Cleaning with TCE **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-50CLEANSOLV2 **Specific Waste Type:** Solvents

Date: 01-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: This process is a manual cleaning operation which utilizes paper wipes and cotton tip swabs moistened with trichloroethylene. Most of the mechanical and electrical components are usually cleaned in this manner. All of the liquid trichloroethylene evaporates into the room air during the cleaning process.

Options: Eliminate trichloroethylene usage in the manual cleaning operation and replace it with another solvent that is not harmful to the environment. Example - alcohol or d-limonene. Replace trichloroethylene manual cleaning operation with another cleaning process. Example, an aqueous cleaning system.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Edward Hitchcock
Phone: (816) 997-3673	**Phone:** (816) 997-3128
Fax: (816) 997-4208	**Fax:** (816) 997-3112
Email: wschlosberg@kcp.com	**Email:**

Title: Solvent Cleaning with Fluorocarbons **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-50CLEANSOLV3 **Specific Waste Type:** Solvents

Date: 16-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: These materials clean electronic assemblies by displacing other liquids before evaporating or when pressurized in a can, like 57002294. Small chips and foreign material are blown away.

Options: Eliminate usage by substituting alcohol or other cleaning solvent.Eliminate usage by substituting air or dry nitrogen as a blowing agent.Restrict usage to only product which specifies usage.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Edward Hitchcock
Phone: (816) 997-3673	**Phone:** (816) 997-3128
Fax: (816) 997-4208	**Fax:** (816) 997-3112
Email: wschlosberg@kcp.com	**Email:**

Title: Solvent Cleaning with IPA **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-50CLEANSOLV4 **Specific Waste Type:** Solvents

Date: 01-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Solvent cleaning with isopropyl alcohol (4601030 or 4601031) is a manual cleaning operation used to remove foreign substances from products returned to the department for reprocessing and reactance. The alcohol is received in a one-gallon glass bottle and decanted into smaller safety containers for use at the operator's work stations. Paper wipes (99010930) and/or cotton tip swabs (99012914) dampened with the solvent are used to clean the surface of product. The cleaning operation is performed in a well-ventilated open area of the department. The paper wipes and cotton swabs are discarded in solvent-waste step cans for disposal by Waste Management. All of the alcohol evaporates into the room air and no liquid waste is sent to Waste Management. The work is performed by Modification and Conversion operators. No certification or special training is required.

Options: Switch to alternate cleaning agents. Care will be required to maintain product compatibility and cleaning effectiveness. Consultation with cleaning specialists will be required.Control the fugitive emissions from the cleaning process. The small quantity of solvent in the large well-ventilated area does not create a problem. However, consideration to designing a dedicated solvent-cleaning area in future department upgrades may be prudent.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Edward Hitchcock
Phone: (816) 997-3673	**Phone:** (816) 997-3128
Fax: (816) 997-4208	**Fax:** (816) 997-3112
Email: wschlosberg@kcp.com	**Email:**

Title: Solvent Cleaning with Toluene **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-50CLEANSOLV5 **Specific Waste Type:** Solvents

Date: 03-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Solvent cleaning with toluene is a workbench operation using a solvent can and paper wipes. Paper wipes are dampened with the toluene and used to remove surface contaminants from returned products.

Options: Eliminate toluene as a cleaning solvent by substituting alcohol or other less harmful cleaning agent.Restrict toluene usage to only product which has those requirements.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Edward Hitchcock
Phone: (816) 997-3673	**Phone:** (816) 997-3128
Fax: (816) 997-4208	**Fax:** (816) 997-3112
Email: wschlosberg@kcp.com	**Email:**

Title: Solvent Cleaning with Acetone **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-50CLEANSOLV6 **Specific Waste Type:** Solvents

Date: 01-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Solvent cleaning with acetone (4616010 or 4616011) is performed to remove surface contaminants, dirt, foreign materials, and excess marking primarily from the exterior of products returned for reprocessing and reacceptance. The solvent is decanted from 1-gallon bottles into suitably marked safety containers. Cleaning is performed by wiping the product with paper wipes dampened with solvent. After wiping the part surface with a paper wipe, the process is repeated until the surface appears clean. After cleaning, the surface is wiped with dry paper wipes until the remaining acetone is removed. Cleaning with acetone is followed by wiping the surface with alcohol (4601030 or 4601031) and paper wipes. Parts are blown dry with factory air or nitrogen. All solvent dampened paper wipes are discarded into step waste cans. The work is performed by Modification and Conversion Operators. No certification or special training is required.

Options: Substitute a different solvent for cleaning difficult-to-remove substances. We would have to consult with product cleaning specialists to determine appropriate nonhazardous substitutes.Perform cleaning operation in an exhaust hood area. This would reduce fugitive emissions to the room air. Expensive, and the area probably does not have space for an exhaust hood large enough to handle large parts.Reaccept product in the "as-returned" condition. Would require approval of DOE to reaccept parts with excess marking and foreign materials present. Poor image of reaccepted material because of cosmetic appearance.Eliminate use of acetone as a cleaning solvent. Acetone has been found to be one of the most effective solvents for removing stubborn substances. It is not considered to be a health hazard if used properly.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Edward Hitchcock
Phone: (816) 997-3673	**Phone:** (816) 997-3128
Fax: (816) 997-4208	**Fax:** (816) 997-3112
Email: wschlosberg@kcp.com	**Email:**

Title: Solvent Cleaning with MEK **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-50CLEANSOLV7 **Specific Waste Type:** Solvents

Date: 29-oct-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Solvent cleaning with Methyl Ethyl Ketone (MEK 4616020) is performed to remove surface contaminants, dirt, and foreign materials from the exterior of product returned for reprocessing and reacceptance. The solvent is decanted from a five-gallon can into suitably marked safety containers. Cleaning is performed by wiping the product with paper wipe soaked with solvent. After wiping the surface with the damp paper wipe, the process is repeated until the surface appears clean. After cleaning, the surface is wiped with dry paper wipes until remaining MEK is removed and then blown dry with factory air or nitrogen. Used paper wipes are discarded into step waste cans located in the department and sent to waste management for disposal. The work is performed by Modification and Conversion Operators. No certification or special training is required.

Options: Limit the usage of MEK. Unless the work instructions specifically call for MEK, operators should not use it to clean product.Eliminate the use of MEK. Short term - material on hand maintained for potential use. Long term - if no usage in 3 years, dispose of material.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Edward Hitchcock
Phone: (816) 997-3673	**Phone:** (816) 997-3128
Fax: (816) 997-4208	**Fax:** (816) 997-3112
Email: wschlosberg@kcp.com	**Email:**

Title: Solvent Cleaning with Naphtha **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-50CLEANSOLV8 **Specific Waste Type:** Solvents

Date: 01-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The solvent is decanted from a five-gallon can into suitably marked safety containers. Cleaning is performed by wiping the product with paper wipes soaked with solvent. After wiping the surface with the damp paper wipe, the process is repeated until the surface appears clean. After cleaning, the surface is wiped with dry paper wipes until remaining Naphtha is removed and then blown dry with factory air or nitrogen.

Options: Eliminate the use of naphtha as a cleaning agent. Short term - material on hand will be maintained for potential usage. Long term - If no usage in 2-3 years, material will be disposed of.Limit the usage of naphtha. Unless the work instruction specifically calls for naphtha, operators should not use it to clean product.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Edward Hitchcock
Phone: (816) 997-3673	**Phone:** (816) 997-3128
Fax: (816) 997-4208	**Fax:** (816) 997-3112
Email: wschlosberg@kcp.com	**Email:**

Title: Solvent Cleaning with Zep Erase **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-50CLEANSOLV9 **Specific Waste Type:** Aerosol Cans

Date: 01-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Zep Erase is provided as an aerosol spray product. The part is placed on a work bench in a well-ventilated area. The area to be cleaned is sprayed and allowed to soak for a few seconds. Paper wipes are then used to remove loosened dirt or ink.

Options: Eliminate use of Zep Erase. Only use Zep Erase when specifically listed on work instruction.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Edward Hitchcock
Phone: (816) 997-3673	**Phone:** (816) 997-3128
Fax: (816) 997-4208	**Fax:** (816) 997-3112
Email: wschlosberg@kcp.com	**Email:**

Title: Chemical Depotting with N-Meth.Pyrol. **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-50DEPOTSOLV1 **Specific Waste Type:** Solvents

Date: 01-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Depotting

Description: The chemical depotting facility was developed to separate the liner from the flange prior to rebonding and reacceptance. The last work order for this process was released in May 1988 and the activity was completed by August 1988. The facility consists of a flammable exhaust hood fitted with an explosion-proof hot plate for heating containers of

N-Methylpyrrolidone (4609063-00) with parts to be depotted. The amount of solvent was limited to 1.0 gallon in the container and the temperature was limited to 149 degrees F. The flash point for N-Methylpyrrolidone is 199 degrees F. Prior to depotting, the liner assembly was separated from a cushion by sawing the polyurethane foam of the cushion at approximately 1.0 inch from the liner. The remaining foam was removed with mechanical hand tools. The adhesive (2140285-03) and curing agent (2201225-01) used to bond the flange to the liner was dissolved in the depotting solution. The parts to be depotted were placed in the covered container of N-Methylpyrrolidone and soaked at the elevated temperature. The condition of the depotting solution and the parts were checked each hour until the adhesive had loosened enough to allow separation of the flange from the liner by hand. The parts were then washed with alcohol (4601030) and blown dry with air. The work was performed by Modification and Conversion Operators. No certification or special training was required.

Options: Eliminating N-Methyl pyrrolidone as a depotting solvent by substitution of another solvent was found to not be a feasible option because this material is still considered to be safer and more efficient than all alternative materials.Maintain the capability to depot with N-Methylpyrrolidone on a standby basis while pursuing the feasibility of installing a more efficient facility elsewhere which would be capable of processing parts and test samples from production, development, laboratories and salvage by higher temperatures and larger volumes.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Edward Hitchcock
Phone: (816) 997-3673	**Phone:** (816) 997-3128
Fax: (816) 997-4208	**Fax:** (816) 997-3112
Email: wschlosberg@kcp.com	**Email:**

Title: Encapsulation with EN-7 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-50ENCP2519603 **Specific Waste Type:** Polymers

Date: 10-dec-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description: EN-7, in accordance with 9927087, is used primarily to repair cable insulation on components returned to FM&T. EN-7 (2519603) is an unfilled polyurethane elastomer containing TDI and comes in a two-part kit consisting of part A, the resin, and part B, the hardener. The materials are maintained in their original containers (part A, qt can and part B, 1/2 pt.) and stored in a fireproof cabinet. The two components are manually dispensed under a vented hood (vents to atmosphere) into an 8-oz.paper cup. The typical batch size is 100 grams of A to 18.8 grams of B. The material is hand mixed with a tongue depressor until uniform and then placed in a vacuum chamber to evacuate at a pressure of 3 torr maximum for at least 1 minute after the foam rise collapses. The material is taken to the workbench and applied to the product. The product is then air cured or oven cured. The remaining EN-7, paper cup, paper wipes and tongue depressors are placed in a hazardous waste container. Only about 5% of the EN-7 becomes part of the product. Part of the material is discarded due to the expired shelf life.

Options: Reduce minimum batch size. Reject at this time since smaller batch size would risk quality of potting due to measurement capability and ability to achieve uniform mixture.Process more parts per batch of material. This approach is currently implemented; however, improvements can be made. Most material is scrapped due to shelf-life instead of high volume consumed by process. Use a smaller kit size to reduce loss due to shelf life expiration. The amount consumed is not significant to justify stocking an additional size.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Edward Hitchcock
Phone: (816) 997-3673	**Phone:** (816) 997-3128
Fax: (816) 997-4208	**Fax:** (816) 997-3112
Email: wschlosberg@kcp.com	**Email:**

Title: Encapsulation with EN-8 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-50ENCP2519605 **Specific Waste Type:** Polymers

Date: 10-dec-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Curing

Description: EN-8, in accordance with 9927089, is used primarily to repair cable insulation on components returned to FM&T. EN-8 (2519 605) is still an unfilled polyurethane elastomer containing TDI and comes in a two-part kit of A, the resin, and B, the hardener. The materials are maintained in their original containers (A in a 1-qt can and B in a 1/2-pt can) and stored in a fireproof cabinet. The two components are manually dispensed under a vented hood (vents to atmosphere) into an 8-oz paper cup. The typical batch size is 100 grams A to 18.8 grams B. The material is hand-mixed with a tongue depressor until uniform and then placed in a vacuum chamber to evacuate at a pressure of 3 torr maximum for at least 1 minute after the foam rise collapses. The material is taken to the workbench and applied to the product.T he product is then air cured or oven cured. The remaining EN-8, paper cup, paper wipes, and tongue depressors are placed in a hazardous waste container. Only about 5% of the EN-8 becomes part of the product. Part of the material is discarded due to expired shelf life.

Options: Reduce minimum batch size. Reject at this time since smaller batch size would risk quality of potting due to measurement capability and ability to achieve uniform mixture.Process more parts per batch of material. This approach is currently implemented; however, improvements can be made.Most material is scrapped due to shelf life instead of high volume consumed by process. Use a smaller kit size to reduce loss due to shelf life expiration. The amount consumed is not significant to justify stocking an additional size.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Edward Hitchcock
Phone: (816) 997-3673	**Phone:** (816) 997-3128
Fax: (816) 997-4208	**Fax:** (816) 997-3112
Email: wschlosberg@kcp.com	**Email:**

Title: Caster Lubrication **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-50LUBEGRES1 **Specific Waste Type:** Grease

Date: 03-dec-1993 **Major Activity Type:** Maintenance **Specific Activity Type:** Coating

Description: Repack cleaned tapered bearings (881309-00) and thrust bearing (837569-00) with new grease (6520200-02). Place small end of bearing down first into grease repacking dish. Screw on top piece of packing dish and center up bearings as top is hand-tightened down. Fill grease gun with grease and shoot grease into grease zerk on top of repacking dish until grease flows out all around top of bearing casing. Coat outside and inside of bearing with excess grease. Do not wipe down bearings except to remove large glops of grease. Apply grease liberally.

Options: Use grease gun cartridges instead of loading grease gun by hand from one pound grease guns.Purchase bearings that are prepacked with grease, and replace all bearings on the reprocessed swivel caster. This option was not considered because of cost and this option would also increase the waste stream.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Edward Hitchcock
Phone: (816) 997-3673	**Phone:** (816) 997-3128
Fax: (816) 997-4208	**Fax:** (816) 997-3112
Email: wschlosberg@kcp.com	**Email:**

Title: Marking with Black Ink (5093002) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-50MARK5093002 **Specific Waste Type:** Polymers

Date: 10-dec-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description: The process of marking with ink 5093002 involves the manual touch-up or replacement of part identification on the unit prior to recertification. The identification may contain part number, serial number, lot number, R/A date code, manufacturer's code, part name, and other information needed to identify the product. The marking is usually sealed with a covercoat material which is not included in this report. The ink is stored in a cabinet.Ink is dispensed onto a plate and spread out with a roller. A stamp with prepositioned characters is placed face down on the ink. The stamp is then placed on the part with even pressure and removed. The marking is checked for legibility and restamped if needed. Finally, the part marking is allowed to air dry for about one hour before being covercoated. There is no material currently stored. As product is received, material is ordered like in 1992. For reporting purposes 1.0 lbs./year is assumed.

Options: Batch mark parts to utilize ink most efficiently.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Edward Hitchcock
Phone: (816) 997-3673	**Phone:** (816) 997-3128
Fax: (816) 997-4208	**Fax:** (816) 997-3112
Email: wschlosberg@kcp.com	**Email:**

Title: Marking with White Ink **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-50MARK5093004 **Specific Waste Type:** Polymers

Date: 10-dec-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description: The process of marking with ink 5093004 involves the manual touch-up or replacement of part identification on the unit prior to recertification. This identification may contain part number, serial number, lot number, R/A code, manufacturer's code, part name, and other information needed to identify the product. The marking is usually sealed with a covercoat material which is not included in this report. The ink is stored in a cabinet.Ink is dispensed onto a plate and spread out with a roller. A stamp pad with prepositioned characters is placed face down on the ink. The stamp is then placed on the part with even pressure and removed. The marking is checked for legibility and restamped if needed. Finally, the part marking is allowed to air dry for about one hour before being covercoated. There is no material currently stored. As product is received, material is ordered like in 1992. For reporting purposes 1.0 lbs./year is assumed.

Options: Batch mark parts to utilize ink on plate.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Edward Hitchcock
Phone: (816) 997-3673	**Phone:** (816) 997-3128
Fax: (816) 997-4208	**Fax:** (816) 997-3112
Email: wschlosberg@kcp.com	**Email:**

Title: Black Stamp Pad Ink (5093162) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-50MARK5093162 **Specific Waste Type:** Polymers

Date: 10-dec-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description: The process of marking with ink 5093162 involves the manual touch-up or replacement of part identification on the unit prior to recertification. This identification may contain part number, serial number, lot number, R/A date code, manufacturer's code, part name, and other information needed to identify the product. The marking is usually sealed with a covercoat material which is not included in this report. The ink is stored in a cabinet.Ink is dispensed onto a sponge pad. A stamp with prepositioned characters is placed face down on the pad. The stamp is then placed on the part with equal pressure and removed. The marking is checked for legibility and restamped if needed. Finally, the part marking is allowed to dry for about 1 hour before usually being covercoated. There is no material currently stored. As product is received requiring this ink, material is ordered, as in 1992. For reporting purposes, 1.0 lbs./year is assumed.

Options: Batch product marking to minimize evaporation and usage.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Edward Hitchcock
Phone: (816) 997-3673	**Phone:** (816) 997-3128
Fax: (816) 997-4208	**Fax:** (816) 997-3112
Email: wschlosberg@kcp.com	**Email:**

Title: Black Stamp Pad Ink (5093262) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-50MARK5093262 **Specific Waste Type:** Polymers

Date: 14-dec-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description:

Options: Batch mark parts to utilize ink on plate.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Edward Hitchcock
Phone: (816) 997-3673	**Phone:** (816) 997-3128
Fax: (816) 997-4208	**Fax:** (816) 997-3112
Email: wschlosberg@kcp.com	**Email:**

Title: Red Stamp Pad Ink (5093350) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-50MARK5093350 **Specific Waste Type:** Polymers

Date: 10-dec-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description: The process of marking with red stamp pad ink 5093350 involves the manual touch-up or replacement of part identification on the unit prior to recertification. This identification may contain part number, serial number, lot number, R/A date code, manufacturer's code, part name, and other information needed to identify the product. The process is conducted as an open environment workbench operation. The product is marked using conventional rubber stamps and the remaining ink is placed into a step can which is collected by waste management. It is estimated that 1% of the ink is transferred onto the product

and 99% is disposed as solid waste in the form of dry ink. For reporting purposes, 1.0 lbs/year is assumed. Currently, only 0.25 pounds are in the department.

Options: Batch mark product to optimize ink usage.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Edward Hitchcock
Phone: (816) 997-3673	**Phone:** (816) 997-3128
Fax: (816) 997-4208	**Fax:** (816) 997-3112
Email: wschlosberg@kcp.com	**Email:**

Title: Marking with Black Ink (5096662) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-50MARK5096662 **Specific Waste Type:** Polymers

Date: 07-dec-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description: This material is used to mark identification information on various product reprocessed. This information may be touch-up or replacement of part number, serial number, R/A date code etc. The marking usually is sealed with a covercoat. The ink is stored in a cabinet.Ink is dispensed onto a plate and spread with a roller. A stamp (rubber) with prepositioned characters is used to transfer the ink from the plate to the product. The marking is checked for legibility and restamped if needed. Finally the ink is allowed to air dry for about 1 hour. CY92 usage was reported as 1.22 lbs. Approximately 0.5 pounds are in the department.

Options: Use an alternate marking method such as a label, engraving, or ink jet.Batch mark parts to utilize and maximize all ink on the plate.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Edward Hitchcock
Phone: (816) 997-3673	**Phone:** (816) 997-3128
Fax: (816) 997-4208	**Fax:** (816) 997-3112
Email: wschlosberg@kcp.com	**Email:**

Title: Marking with Hysol Black **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-50MARK5097160 **Specific Waste Type:** Polymers

Date: 19-nov-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description: This material is used to mark part identification such as nomenclature, part number, serial number, date code on the part itself. It is generally used in stockpile reprocessing applications to replace regular stamp pad ink markings because of its superior characteristics of adhesion and durability. Since this is an epoxy ink, the two components are supplied in the form of a premeasured two-part package. The catalyst and the resin are separated by a clip. The clip is removed at the time of use and the two components mixed together. The ink is then transferred to the product using preassembled rubber stamps. Legibility of the marking is verified and the part is restamped or touched-up if necessary. The ink is then cured by drying 6 hours at room temperature. This ink is not currently stored although storage cabinets are available.

Options: Use an alternate marking method such as label, engraving, or ink jet marking.Batch mark parts to utilize epoxy mix and minimize quantity to waste stream.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Edward Hitchcock
Phone: (816) 997-3673	**Phone:** (816) 997-3128
Fax: (816) 997-4208	**Fax:** (816) 997-3112
Email: wschlosberg@kcp.com	**Email:**

Title: Marking with Hysol White **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-50MARK5097161 **Specific Waste Type:** Polymers

Date: 19-nov-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description: This material is used to mark part identification such as nomenclature, part number, serial number, date code, on the part itself. It is generally used in stockpile reprocessing applications to replace regular stamp pad ink markings because of its superior characteristics of adhesion and durability. Since this is an epoxy ink, the two components are supplied in the form of premeasured two-part package. The catalyst and the resin are separated by a clip. The clip is removed at the time of use and the two components mixed together. The ink is then transferred to the product using preassembled rubber stamps. Legibility of the marking is verified and the part restamped or touched up as necessary. The ink is then cured by drying for six hours at room temperature. This ink is not currently stored although storage cabinets are available.

Options: Use an alternate marking method such as a label, engraving, or ink jet marker.Batch mark parts to utilize epoxy mix and minimize quantity to waste stream.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Edward Hitchcock
Phone: (816) 997-3673	**Phone:** (816) 997-3128
Fax: (816) 997-4208	**Fax:** (816) 997-3112
Email: wschlosberg@kcp.com	**Email:**

Title: Electrochemical Marking (Alum.) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-50MARKELCHEMA **Specific Waste Type:** Acid

Date: 16-dec-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description: Electrochemical etching is performed in accordance with 9919202 and is as follows: a. Clean the surface to be marked with alcohol and paper wipes. b. Type the required information on a piece of stencil paper. c. Ground the part to be marked to the electrical power unit. d. Position the stencil on the part. e. Decant a small amount of the appropriate electrolyte into an aluminum foil dish. f. Wet the handmarker pad connected to the power unit with electrolyte. g. Apply the handmarker pad over the stencil and lightly press for several seconds. h. Remove handmarker, ground wire, and stencil from part and clean etched surface with neutralizer and paper wipes.

Options: Extend shelf life of electrolytes and neutralizer from 1 to 2 years. Since laser marking has virtually replaced electroetching in first-time production, allow electroetched parts to be eliminated by attrition.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Edward Hitchcock

Phone: (816) 997-3673	**Phone:** (816) 997-3128
Fax: (816) 997-4208	**Fax:** (816) 997-3112
Email: wschlosberg@kcp.com	**Email:**

Title: Electrochemical Marking (Steel) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-50MARKELCHEMS **Specific Waste Type:** Acid

Date: 16-dec-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description: Electrochemical etching is performed in accordance with 9919202 and is as follows: a. Clean surface to be marked with alcohol and paper wipes. b. Type the required information on a piece of stencil paper. c. Ground the part to the electrical power unit. d. Position the stencil on the part. e. Decant a small amount of the appropriate electrolyte into an aluminum foil dish. f. Wet the handmarker pad connected to the power unit with electrolyte. g. Apply the handmarker pad over the stencil and lightly press for several seconds. h. Remove handmarker, ground wire and stencil from part and clean etched surface with neutralizer and paper wipes.

Options: Extend shelf life of electrolytes and neutralizer from 1 to 2 years. Since laser marking has virtually replaced electroetching in first-time production, wait for electroetched parts to be eliminated by attrition.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Edward Hitchcock
Phone: (816) 997-3673	**Phone:** (816) 997-3128
Fax: (816) 997-4208	**Fax:** (816) 997-3112
Email: wschlosberg@kcp.com	**Email:**

Title: Staking Caster Swivel Locks **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-50STK2502326 **Specific Waste Type:** Polymers

Date: 29-nov-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Staking

Description: Staking of swivel locks onto mounting post of the H1347 caster is performed. Sealant, Locktite 271 (2502326), is received in a 50-cc dispenser bottle and has a one-year shelf life. The grade T primer (4702694) is received in a 4-oz bottle and has an unlimited shelf life. Acetone, used to clean the mounting post after removal of the original swivel lock, is brought to the temporary area in covered dispenser cans. The caster mounting post and new swivel lock are cleaned with acetone, abraded with an abrasive disc and coated with primer. After the primer has dried, the sealant is applied to both the post and the swivel lock. The swivel lock is press-fitted onto the post, resulting in squeeze-out of excess sealant. Excess sealant is removed using paper wipes and Q-tips. All brushes used to apply primer, paper wipes/Q-tips used to remove excess sealant, and gloves worn by the operators are disposed of in waste containers sent to waste management. The work is performed by Modification and Conversion Operators. No certification or special training is required.

Options: Procurement of material (2502326) in smaller quantity to avoid loss through expiration of shelf life.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Edward Hitchcock
Phone: (816) 997-3673	**Phone:** (816) 997-3128

Fax: (816) 997-4208	**Fax:** (816) 997-3112
Email: wschlosberg@kcp.com	**Email:**

Title: Component Spacers **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-53B013018 **Specific Waste Type:** Solvents

Date: 17-dec-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description:

Options: Keep desoldering equipment clean.Reduce use of activated flux.Eliminate flux when using solderwick.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Bonding **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-53B013023 **Specific Waste Type:** Polymers

Date: 16-jan-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: Epoxy (2149070-01) is used to bond the lock washer and the connector mounting plate to the housing. The epoxy is mixed in the plastic jar with the mix ratio of 4:1 by weight; heat is applied to help soften the epoxy. The small amount of epoxy is applied to the parts with tongue depressor, the excess is cleaned with a tissue wipe, and then cured in the oven at 160 deg F for 30-45 minutes. The leftover epoxy, tongue depressor, tissue wipe and plastic jar are disposed in the hazardous waste container.

Options: Reduce the batch size from 5 g mix to 2.5 g mix.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: PWB Laminate Repair With Versamid **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-53B014022 **Specific Waste Type:** Polymer

Date: 09-jan-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Repair

Description: The repair of allowed board defects (laminated separations/exposed fibers) using versamid epoxy to correct the defects. Versamid epoxy is the end result of a mixture of Epon Resin 815 and Polyamide Resin, Type 140.

Options: Reduce material mix ratio. This would affect Versamid solid waste stream. Input materials affected are Epon 815 and Polyamide 140. Products affected are PWB numbers: 373326, 373371, 373373, 373375, and 374091.Use smaller size mix cups. This would affect Versamid and cup waste streams. Input material affected are polyethylene cups.Obtain Versamid materials in smaller quantities. Input materials affected are Epon Resin 815 and Polyamide Resin 140.Substitute another adequate epoxy for Veramid. Input materials affected are Epon 815 and Polyamide 140.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: De-Panel, Trim Tabs **Major Waste Type:** Sanitary Waste

PPOA ID Code: KCP-Z951-53D038016 **Specific Waste Type:** Solid Waste

Date: 20-dec-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description:

Options: Use smaller panels when design allows.Eliminate panel processing.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Solder Masking **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-53G081012 **Specific Waste Type:** Solvents

Date: 20-dec-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297

Email: wschlosberg@kcp.com	**Email:**

Title: Freehand Marking **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-53H095013 **Specific Waste Type:** Solvents

Date: 05-dec-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Ink Stamp Marking **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-53H098014 **Specific Waste Type:** Solvent

Date: 27-jan-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description: Ink stamp marking is performed by pouring ink onto a stamp pad, netting a rubber stamp and stamping a mark on the product. The marking contains information regarding nomenclature, part number, serial number and date codes. The rubber stamp is cleaned with alcohol and paper wipes. The stamp pad is rinsed. Applicable general process specifications are 9919100 - Marking general methods, 9919103 - Identification by ink marking.

Options: Laser marking: provides clean and precise marking. Parts must be shipped to another department where the laser marking machine is located. Some products may not have a surface to take a laser mark.Labels: fastest way to apply ID mark to product. Would require acquisition of plain or preprinted labels, equipment to print/type labels. Labels would not be compatible with environment or structure of some products.Dry transfer: requires time and care for long/large markings. Each character is "rubbed on" individually. Covercoat still required for protection of marking.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Manual (Hand) Soldering **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-53J107007 **Specific Waste Type:** Solvents

Date: 19-dec-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description: Molten solder along with heat is applied to the surface of a solder joint after a small amount of flux has been applied to the surface. The heat source is a Metcal ST2000 soldering station with a 600-700 deg F tip. Solder may be in the form of solid core, rosin core, or preform. Wire solder is used to tin or coat the iron tip when not in use to prolong the life of the tip. Alcohol is used to remove flux for verification of the joint and to clean tools and work area of spills and flux residue.

Options: Dump the sponge water bucket weekly rather than daily. This will reduce the amount of contaminated water sent to Waste Management. Wet sponges with a squirt bottle. This will eliminate disposal of contaminated water.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Assembly, Rework and Desoldering **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-53J112010 **Specific Waste Type:** Solvents

Date: 07-jan-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description: Hand solder rework is defined as correction of a solder-related defect or replacement of soldered components or connections, using solder removal equipment, including solderwick copper braid.

Options: No additional flux use with solder wick during rework. Solder wick contains organic flux. Input materials affected: activated flux, product affected: all. Reduce amount of activated flux use during rework. Input materials affected: activated flux. Products affected - all. Keep desoldering equipment clean (tips and filters). Efficient removal of solder enhances the rework process. Input materials affected: solder wick. Products affected: all.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Manual Tinning without Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-53J115008 **Specific Waste Type:** Solvents

Date: 19-dec-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description: The leads of electronic components are dipped into rosin flux and then dipped into molten solder (500 degree F). The dross which forms on the surface of the molten solder is skimmed off before parts are dipped. This solder dross is disposed of as solid waste. The flux is a flammable liquid (rosin base) and is disposed of as a liquid waste. The process takes place under a vented hood. Three hoods are used. The solder pots are dumped after 30 days of use. The flux is dumped daily, unless not used very much, in which case it is saved until the next day. The solder pot used is the standard red and black model 600. Operators are solder-certified for tinning as a minimum. Alcohol is used only for cleaning surfaces of the work area. The following process specifications apply: P0860003 Care and Use of Solder Pots, P1150103 Pretinning Component Leads and Wire, P1150287

Component Tinning for Printed Wiring Assemblies.

Options: Dump flux less often. Most operators dump the remaining flux in the one-oz jars daily. Flux has an unlimited shelf life. Some use two-oz jars. Flux could be dumped every 3-5 days.Keep flux covered. This would reduce the time the flux is exposed and reduce loss due to evaporation. It is already done by most operators. Use a lid with a small hole instead of removing the entire lid. Smaller hole/less evaporation. Use only one solder pot. When possible, heat up and use just one solder pot each day. Operators would simply take turns. Turn pot on only if needed. Do not heat up the solder unless there are parts to tin. After being turned on 30 times, the solder must be discarded.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Manual Component Preparation **Major Waste Type:**

PPOA ID Code: KCP-Z951-53M157009 **Specific Waste Type:** Miscellaneous

Date: 11-dec-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:**

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Bonding With Thermal Cond. Epoxy **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-54C025003 **Specific Waste Type:** Polymers

Date: 28-oct-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: Adhesive "Delta Bond" (2181005-01) is mixed in a small tray - the base resin and hardener are measured in by weight. The mixed adhesive is allowed to thicken before application and is applied to the contact area along transistor heatsinks with a toothpick or small applicating tool. The epoxy is cured in an oven for 1 hour at 150 degree F. Leftover adhesive and contaminated wipes and toothpicks are collected in a waste container.

Options: Mix smaller batch. Materials Engineering advises against.Freeze mix before cure. Materials Engineering advises against.Wait for more units before mixing. Production schedules are not flexible enough.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding

Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Insulative Adhesive Taping **Major Waste Type:** Sanitary Waste

PPOA ID Code: KCP-Z951-54G081007 **Specific Waste Type:** Polymer

Date: 02-jan-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description:

Options: Design fixture for lubrication.Use non-disposable tools.Duplicate vendor process.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Vibro-etch Marking **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-54H093006 **Specific Waste Type:** Acid

Date: 20-dec-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Rapidiograph Marking **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-54H095004 **Specific Waste Type:** Solvents

Date: 31-oct-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Dip Tinning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-54J115008 **Specific Waste Type:** Polymers

Date: 27-mar-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description:

Options: Purchase fasteners with dry Loctite.Use screws with mechanical locking devices.Replace grade C Loctite with new material.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Color Print Processing RA-4 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-554004 **Specific Waste Type:** Paper

Date: 31-jul-1992 **Major Activity Type:** Service **Specific Activity Type:** Photographic Services

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Eugene Sawyer
Phone: (816) 997-3673	**Phone:** (816) 997-2553
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Black and White Print Processing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-554GA001 **Specific Waste Type:** Paper

Date: 23-jun-1993 **Major Activity Type:** Service **Specific Activity Type:** Photographic Services

Description: The process involves the use of a Photomechanical Transfer (PMT) camera to expose a negative paper (positive image) or reversal paper (negative image). These papers are then contacted to either a paper or film material and are then developed using Kodak PMT III Activator (98600043). The contacted product is separated and the negative or reversal paper is scrapped.The resultant product is rinsed in a continuous flow water rinse and then mechanically dried. The product is used as is to continue the graphics process.

Options: Redefining the absolute limit on B&W reproduction to approximately 11x17 could result in significant reductions in material and water usage requirements. Existing paper/film processing equipment utilizing current computer technology is already in plant. Substitution of new products from Eastman Kodak or other supplier could result in lower toxicity and might result in reduced chemical usage. This option, at present, appears an unlikely choice until such time that manufacturers are willing to incur the increased costs of research and development. These costs would probably be reflected in higher costs to the consumer.Greater utilization of current B&W varitype equipment on past and future computer-generated artwork would reduce material usage significantly. The process could not be eliminated unless all artwork was regenerated by computer. Classified artwork would still require the use of this system.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Eugene Sawyer
Phone: (816) 997-3673	**Phone:** (816) 997-2553
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Kodalith/Contact Print Processing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-554GA002 **Specific Waste Type:** Paper

Date: 31-mar-1993 **Major Activity Type:** Service **Specific Activity Type:** Photographic Services

Description:

Options: Purchase laser copier.Replace with new products.Replace hardware and software.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Eugene Sawyer
Phone: (816) 997-3673	**Phone:** (816) 997-2553
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Varityper Black and White Processing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-554GA003 **Specific Waste Type:** Paper

Date: 31-jul-1993 **Major Activity Type:** Service **Specific Activity Type:** Photographic Services

Description: The process involves the processing of B&W print paper (98600182) and film (98600181) material, generated by computer (Macintosh systems and Varityper 4000/5300), through a Varityper 7140 Processor. The print and/or film material is developed through a 3-step process; developer (98506227), fixer (98506228), and a water rinse. The materials are then mechanically dried.The resultant product is then used in various graphic processes. NOTE: A Varityper 6400 system is used to

process classified information and is used sparingly. This system uses paper (non-stores item) and is developed using the before mentioned 3-step process.

Options: Substitution of new products from Varitype or other supplier(s) could result in lower material costs (paper and film).Change in paper size requirements when printing could save over 60% of material waste (paper and film).

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Eugene Sawyer
Phone: (816) 997-3673	**Phone:** (816) 997-2553
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Color Transparency Processing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-555001 **Specific Waste Type:** Precious Metal

Date: 30-sep-1993 **Major Activity Type:** Service **Specific Activity Type:** Photographic Services

Description: The Kodak (E-6) process is a solution process. As the Ektachrome transparency film enters the first developer, exposed silver halide is reduced to metallic silver, forming a black and white negative image. The film enters the final wash bath which acts as a stop bath for the first developer and protects the reversal bath from first developer carryover. The film then enters the reversal bath which nucleates or fogs the remaining silver halides. Next the film enters the color developer where a positive color image is formed. Then the film enters the pre-bleach where it is prepared for the bleach. Next the film enters the color developer where a positive color image is formed. Then the film enters the pre-bleach where it is prepared for the bleach. Next the film enters the bleach where all the metallic silver is converted to silver bromide. Next is the fixer which converts the silver bromide in the film into soluble silver compounds which are removed along with all other chemicals in the next step which is the final wash. The final step prior to drying is the final rinse which improves dye stability and promotes uniform drying.

Options: Procure a small, more modern, E-6 processor that will be more efficient. Because of our digital equipment, we no longer produce E-6 8x10 overheads which reduces our E-6 volume making our old processor severely underutilized. This would affect our solid and liquid waste streams.Switch from a 7-step process to a 4-step E-6 process thereby eliminating three chemicals. This would affect our solid and liquid waste streams.Use polaroid instant slide film which generates no liquid chemical waste. This would affect the liquid waste stream.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Eugene Sawyer
Phone: (816) 997-3673	**Phone:** (816) 997-2553
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Color Negative Processing (C-41) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-555002 **Specific Waste Type:** Precious Metal

Date: 30-sep-1993 **Major Activity Type:** Service **Specific Activity Type:** Photographic Services

Description: The Kodak (C-41) process is a solution process with four different chemical solutions. The negative film passes through each chemical by way of a roller transport processor. First the developer, then the bleach, a wash, the fixer, another

wash, then the stabilizer. The developer solution converts the exposed silver halide grains (the latent image) in the film into metallic silver (silver image). The bleach stops the action of the developer. Then the oxidizing agents convert metallic silver into silver halide, which can be subsequently dissolved in the fixer solution. The reduced bleach is then converted back to the active bleach through aeration. The fixer solution converts all the silver halide in the film into soluble silver complexes. Most of the silver complexes are retained in the fixer solution. The stabilizer improved dye stability, and washing is the means used during processing to remove the chemicals from the film after they have done their jobs.

Options: Procure a small, more modern, C-41 processor that will be more efficient. This would affect our solid and liquid waste streams. Use digital imaging equipment with computer-generated prints, which has no liquid waste and very little solid waste. Use Polaroid instant print film which generates no liquid chemical waste. This would affect the liquid waste stream.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Eugene Sawyer
Phone: (816) 997-3673	**Phone:** (816) 997-2553
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: 3M 938 Card Duplicator **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-555003 **Specific Waste Type:** Compressed Gas Cylinders

Date: 30-sep-1993 **Major Activity Type:** Service **Specific Activity Type:** Photographic Services

Description: The process involves the duplication of an image from a silver halide film aperature card onto a diazo film aperature card. The diazo film is exposed by a light source and developed with anhydrous ammonia dispersed from a gas cylinder.

Options: Convert engineering drawing storage to an electronic storage media for viewing and obtaining copies, thus eliminating aperture cards.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Eugene Sawyer
Phone: (816) 997-3673	**Phone:** (816) 997-2553
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: 3M 2800 Processor Cameras **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-555005 **Specific Waste Type:** Caustic

Date: 30-sep-1993 **Major Activity Type:** Service **Specific Activity Type:** Photographic Services

Description: The 3M 2800 processor camera is used solely for the production of 35 mm aperture cards of engineering drawings and documents. This process involves the use of 3M CD-5 developer, 3M HD fixer, and distilled water. The unexposed silver halide film aperture card is fed into the exposure unit, exposed and moved automatically into the processing unit where the developer, fixer, and wash water are applied. These chemicals are applied to the film by a spray mechanism. Used chemicals and wash water are collected as waste after each card is processed. The processed card is transported to the dryer section and made ready for immediate use.

Options: Eliminate the use of aperture cards and convert to an electronic format for the storage of engineering drawings and documents.Reduce the number of aperture cards produced.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Eugene Sawyer
Phone: (816) 997-3673	**Phone:** (816) 997-2553
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Itek 616S Platemaker **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-555006 **Specific Waste Type:** Wastewater

Date: 30-sep-1994 **Major Activity Type:** Service **Specific Activity Type:** Photographic Services

Description: The Itek 616S Platemaker is used solely for the production of offset plates for an offset duplicator. This process involves the use of Itek Mega Plate developer, Itek Mega plate stabilizer, and tap water. The unexposed plate material is exposed and moved automatically into the processing unit where the developer, stabilizer and wash water reside. The processed plate then exits the camera through a drying unit as a finished product.

Options: Use electrostatic plates instead of photographic plates. Eliminate the plate-making process.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Lenez Hendrix
Phone: (816) 997-3673	**Phone:** (816) 997-3501
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: A B Dick Offset Duplicator Clean-Up **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-555007 **Specific Waste Type:** Paper

Date: 30-sep-1994 **Major Activity Type:** Service **Specific Activity Type:** Printing

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Lenez Hendrix
Phone: (816) 997-3673	**Phone:** (816) 997-3501
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: A B Dick Offset Duplicator **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-555008 **Specific Waste Type:** Paper

Date: 30-sep-1994 **Major Activity Type:** Service **Specific Activity Type:** Printing

Description: The A B Dick Offset duplicator is a process of applying ink to paper using ink, fountain solution and rollers to transfer the ink to the paper. This process is used to reproduce documents of a single sheet, long run, and high quality registration.

Options: Eliminate the process. Send all work completed using this process outside through the Government Printing Office.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Lenez Hendrix
Phone: (816) 997-3673	**Phone:** (816) 997-3501
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Photo/Print Mounting **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-555GA004 **Specific Waste Type:** Polymers

Date: 16-sep-1994 **Major Activity Type:** Service **Specific Activity Type:** Photographic Services

Description: The process involves the use of spray adhesives, 3M Photo Mount (98600150) and 3M System 77 (96805540), to adhere a given product (usually paper) to a backing material (usually, but not limited to, illustration board or X board). The use of rubber cement thinner is included in this PPOA as its primary function is the cleaning of adhesive residue from prints. The resultant product is remitted to the customer for their use.

Options: Substitution of adhesive material would allow the use of a less hazardous material (Daige Mounting System) and even eliminate chemicals entirely (3M Positional Mounting Adhesive System). Start-up costs would be higher (applicants would be required), but long-term costs would be lower due to increased efficiency in the use of adhesive materials.Purchase of color copiers capable of printing on a greater range of materials would reduce the need for chemicals in smaller display jobs (11 X 17 or less). Initial costs would be high but machine would serve multiple purposes, thus justifying higher costs.Purchase of adhesive-coated foam boards would reduce chemical adhesive usage. Concerns about disposing of styrofoam products in landfills have been eased by the advent of biodegradeable foam boards.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Dale Albers
Phone: (816) 997-3673	**Phone:** (816) 997-4274
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Paper Plotting **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-557001 **Specific Waste Type:** Paper

Date: 21-jun-1993 **Major Activity Type:** Service **Specific Activity Type:** Printing

Description: Check/add/dispose of toner, replenisher and plotter paper; check/clean tape drives and toner bars with isopropyl alcohol. Start plotter, then cut and trim completed plots periodically; dispose of outputs.

Options: Cardboard box recycling.Alternative method or eliminate use of pen plotters.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Eugene Sawyer
Phone: (816) 997-3673	**Phone:** (816) 997-2553
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Alcohol Hand Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-55C025006 **Specific Waste Type:** Solvents

Date: 28-mar-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The process "Alcohol, Hand Clean" is used at the work station for general cleaning of solder joints. Alcohol is dispensed from a metal pumping can and brushed or scrubbed over the completed solder joints to allow work verification. An acid brush with trimmed bristles is the preferred tool. This brushing is not meant as a final cleaning process. When the connector has been verified, it is taken to a spray booth for final cleaning. The targeted contaminates are flux residues. The alcohol is stored in the department in 4-liter bottles and is easily transferred to the metal pumping cans for dispensing. All of the applied alcohol evaporates into the department. It either evaporates immediately or is captured in a Kaydry wipe and disposed of in a controlled flammable can. The amount that was discarded in the can will still evaporate as a fugitive emission but at a slower rate. There are other opportunities for alcohol evaporation. Trace amounts are known to become fugitive emissions during the transfer from bottle to can and while the can is in use.

Options: Evaporate excess alcohol by blow drying. Rather than use a kaydry wipe to absorb any excess material, blow dry the alcohol. Any paper wipes used would need to be disposed of in a controlled manner. It has been shown that the alcohol thrown into the waste cans via the wipes will evaporate into the atmosphere the same as if it had evaporated naturally. The only concern would be if a large amount of alcohol was evaporated in a short amount of time, it could pose a health or safety concern.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Developing Film (Fixer) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-560001 **Specific Waste Type:** Solvents

Date: 31-aug-1992 **Major Activity Type:** Service **Specific Activity Type:** Photographic Services

Description: Developing x-ray film taken in the medical department.A Konica QXFO automatic x-ray processor is used to develop the film. Kodak RP X-OMAR Fixer Working Solution is used in the processor and prepared according to the products mixing instructions.

Options: Extension of solution life. Solution depletes over time, leading to poor quality of film.Fixer Replacement. Not recommended for machine.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Eugene Sawyer
Phone: (816) 997-3673	**Phone:** (816) 997-2553
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Developing Film (Developer) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-560002 **Specific Waste Type:** Solvents

Date: 30-aug-1992 **Major Activity Type:** Service **Specific Activity Type:** Photographic Services

Description: Developing x-ray film in the medical department.AKonica QXFO Automatic X-ray Processor is used to develop the film.Kodak RP X-OMAT Developer Replinisher, MX 1275, Working Solution is used in the processor and prepared according to the process mixing instructions.

Options: Extension of solution life. Not recommended. This would leave too gray or fogging of films.Change developer. Not recommended. Cheaper or poor quality developers diminish archival capabilities for the film.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Eugene Sawyer
Phone: (816) 997-3673	**Phone:** (816) 997-2553
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Uni T-Pak for Coulter Counter **Major Waste Type:**

PPOA ID Code: KCP-Z951-560003 **Specific Waste Type:** Miscellaneous

Date: 30-sep-1993 **Major Activity Type:** **Specific Activity Type:**

Description:

Options: Change to a different process.Use a different reagent.Reuse Uni T Pak.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Eugene Sawyer
Phone: (816) 997-3673	**Phone:** (816) 997-2553
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Adhesive Film Bonding **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-58B013007 **Specific Waste Type:** Polymers

Date: 23-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: Adhesive film is used to bond insulators, printed circuit boards and spacers to major components. Five different shaped pieces of film adhesive are used. The vendor, Ablestik Laboratories, cuts them out of sheets of Ablefilm 517, freezes them to -40 degrees F and then ships the parts to the KCP. Ablefilm 517 is composed of epoxy and curing agent, supported by glass cloth. The adhesive film thickness is 0.006" with the glass cloth 0.002" thick. Parts are stored in a freezer until they are required. When needed, the adhesive film is removed from the freezer, allowed to thaw, placed between the parts to be bonded, pressure is applied with tooling, and finally the adhesive is cured in an oven at 165 degrees F for 4 to 5 hours.

Options: Extend shelf life. Current shelf life is one year. The material may be retested, but the pre-cut parts are too small to make a good test specimen. Materials Engineering will have to be consulted since they control the specification.Purchase smaller lots of material. Fifty is the minimum lot. The vendor feels this is the minimum number they can produce for viable production.Purchase a backup freezer. The freezer may inadvertently be turned off. The freezer is currently on the Delta 2000 system. An alarm sounds in the boiler house when the freezer gets above -40 degrees F. Backup refrigerators are available in a nearby department.Improper storage. The adhesive film may be stored improperly, creasing the film, making it unusable for proper bonding.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: A2 Epoxy Bonding **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-58B013008 **Specific Waste Type:** Polymers

Date: 30-jun-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: A-2 Epoxy resin adhesive comes as a two-part kit (2181065) consisting of base epoxy resin (2149060) and A curing agent, hardener, polyamide resin (2201225). The two components are mixed at a 4 to 1 ratio in a poly cup with a metal spatula while wearing polyurethane gloves. Minimum batch size is 50 grams. The adhesive is applied to the bonding surfaces with a metal spatula. Excess A-2 is removed with a foam pad or kaydrys and alcohol. A-2 may be air cured or oven cured. A-2 is cured in an oven set at 165 +/- 5 deg F for four to five hours. The excess A-2 is sent to waste management as solid waste along with the contaminated nonhazardous waste. The rest of the A-2 stays with and becomes part of the product.

Options: Prevent the waste of material scrapped for shelf life expiration by maintaining minimum quantities.Coordinate usage between operators so that excess mixed epoxy is shared rather than discarded.Reuse gloves rather than discard after each use since gloves are a significant part of waste cost and they can last for multiple uses.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Hand Mix Encapsulate with Silica Epoxy **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-58F062003 **Specific Waste Type:** Polymers

Date: 28-oct-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description: Silica-filled epoxy is used to encapsulate the solder connections on the back of connectors. The encapsulant prevents handling damage, protection from foreign material, and voltage standoff between the connector pins. Silica-filled epoxy is composed of an epoxy resin (2147165) and an amine curing agent (4604435). The two components are hand-mixed 87.3% resin to 12.7% curing agent deactivated in a vacuum chamber at a pressure of 3 torr maximum, transferred to a Semco cartridge, and injected into an RTV630 connector encapsulation mold. The mixed epoxy is allowed to room temperature cure for 2 hours minimum followed by an oven cure for 1 hour minimum at 165 deg F. Excess encapsulant and contaminated nonhazardous waste is discarded into a step-can and sent to waste management. The use of this encapsulating compound is controlled by SS377455, encapsulation procedure, silica filled epoxy. Operators are not required to be qualified or certified.

Options: Mix up only enough material to encapsulate the number of parts available. Fifty-five percent of the material is currently wasted because of the minimum batch requirement.Allow the use of different syringes depending on the amount of material mixed. This would cut down on the amount of waste produced.Freeze excess material to below -40 deg F. This would slow the reaction, allowing the material to be thawed and used again. This technique is already used on RTV 630.Redesign curing agent storage container from a glass jar to something else. The curing agent reacts with moisture in the air, making it hard to seal, making it progressively worse, until it must be discarded.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Repair Encapsulation With TDI Foam **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-58F066009 **Specific Waste Type:** Polymers

Date: 31-jan-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description: TDI foam patch is used to repair defects which occur after the encapsulation of electronic components. Voids which expose internal components are filled with the foam patch material then allowed to air cure for 12 hours, minimum. The material is prepared by Materials Polymer Lab, per 55330247. The ingredients are mixed, then the material is injected into 10 cubic centimeter plastic syringes, and finally is frozen at -40 deg F or below. Material is received frozen, it is stored in a freezer at -40 deg F until it is required. A syringe is removed from the freezer and allowed to thaw for 15 minutes minimum. After use the syringe and the excess material are discarded into a step can and sent to waste management. Each 10-cc syringe contains approximately 8 grams (.018 lbs.) of TDI foam patch material. The material is formulated from six ingredients: one epoxy resin, two curing agents, two fillers and a pigment.

Options: Excess material could be refrozen to below -40 deg F. Thus the material could be used more efficiently and then discarded after no more material can be extruded. Currently the material is packaged in 10-cc plastic syringes. Approximately 75% of the material is wasted; packaging in 3-cc syringes would cut waste to approximately 22%.Current shelf life is 6 months from the date of manufacturer, then the material is discarded. Extension could be made to save discarded material.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding

Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Hand Soldering **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-58J107013 **Specific Waste Type:** Solvents

Date: 22-sep-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Electronic components are joined to printed wiring boards with a manual application of tin/lead solder. This 63/37 alloy is molten through the component lead and plated through hole junction once it is heated with a 600 deg F soldering iron. The joint area receives rosin based liquid flux prior to soldering to release oxides from the metal surfaces and promotes good solder adhesion. The finished solder joints are brush-cleaned with isopropyl alcohol and later spray cleaned with alcohol to remove flux residue. The soldering is performed on subassemblies.

Options: Recycle solder balls that collect in wet sponges by adding the balls to a tinning pot.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Mold Release with Thalco 550 Paste **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-58K123017 **Specific Waste Type:** Polymers

Date: 31-may-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description: Thalco 550 paste wax (2654201) is applied to aluminum encapsulation molds to ensure they will release from the molded product. The paste wax is a mixture of paraffin and solvents. The solvents evaporate after application, leaving the paraffin wax. The mold release is applied using foam pads and texswabs at room temperature while using vinyl gloves. Excess paste wax is removed from the molds with a foam pad and texswabs. The molds are assembled around the production parts to be encapsulated, then they are placed in a preheated oven at 150 +/- 15 deg F, then allowed to cool. The aluminum molds are removed from the parts, leaving a residual layer of the paste wax on the surface. All of the solvent is evaporated during the process and the excess paraffin wax is sent to waste management as solid waste along with the contaminated nonhazardous waste. The rest of the paraffin wax is retained on the product.

Options: Change application technique and equipment used. From Worksheet 5, only about 17% of the paste wax stays on the mold (product), 83% goes to waste management in the solid waste.Keep the lid on the material container, except to remove paste wax. The volatiles used as a diluent may escape at a premature rate, rendering the past wax unusable.Use permanent mold release instead of waxing the mold each time. TEM-2 provides a service where they will apply a silicone mold release that would last several encapsulations.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952

Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Seal With Polysulfide **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-59B014017 **Specific Waste Type:** Polymers

Date: 31-mar-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Mask/Seal Mold **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-59B014025 **Specific Waste Type:** Polymers

Date: 02-jan-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description:

Options: Replenish developer solution.Treat waste water in the department.Use thinner solder mask.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: General Prep/CleanUp-Solv **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-59C025020 **Specific Waste Type:** Solvents

Date: 02-sep-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Encapsulate With Silica Epoxy **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-59F062003 **Specific Waste Type:** Polymers

Date: 02-oct-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description: The resin is weighed into a poly cup. The curing agent is mixed in and then the mixture is evacuated in a vacuum chamber. The mixture is put into a syringe and injected into the cavity of the part. The material is then either air or oven aired per instructions in the work directions. The cure time will vary depending on part geometry.

Options: Reduce minimum batch size. Both input materials will be affected. An evaluation will need to be done.Replace dispensers with ones that will prevent spills. Review shelf-life and extend it if necessary. Look at how stores handles to improve flow time.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Encapsulate With Epoxy **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-59F062004 **Specific Waste Type:** Polymers

Date: 31-jan-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description: This process involves weighing, mixing, evacuating, pouring and curing a mica-filled epoxy used to encapsulate electronic assemblies. Mica filler (8511024) is dried in an oven. Resin (2140045) and Mica filler are combined in a bowl and heated. Curing agent (4604020) is added. The mixture is then evacuated. A preheated assembly is partially filled with the mixture. The assembly is evacuated to remove trapped air. Additional epoxy is poured into the assembly. The assembly is then cured. Excess material is cured and discarded.

Options: Procure dispenser. Would reduce amount of curing agent used by 8%. This 8% goes directly into waste stream as raw curing agent .One polycup/process occurrence would also be saved (182 in FY90).Reduce batch size. Would reduce the amount of resin filler and curing agent used. Currently 50% of the mix is discarded.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297

Email: wschlosberg@kcp.com	**Email:**

Title: EncapsulateWith AlO Epoxy **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-59F062005 **Specific Waste Type:** Polymers

Date: 26-sep-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description: The process consists of weighing, mixing and pouring the mixture into a mold or injecting it into a cavity in the unit to be encapsulated. The mixture of filler and resin are preheated in an oven. The curing agent is poured into a plastic cup and weighed into the preheated mixture of filler and resin. The mixture containing the curing agent is then placed in a vacuum chamber and is evacuated, either poured directly into the mold from the plastic cup or put into a syringe and injected into the unit. The unit is then wiped clean and placed into an oven to cure. During the process the operators use paper wipes, plastic cups, tongue depressors and putty knife or other mixing too.

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Encapsulate With Epoxy per 9927074 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-59F062006 **Specific Waste Type:** Polymers

Date: 28-feb-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description: This process involves weighing, mixing, evacuating, pouring and curing an aluminum oxide-filled epoxy used to encapsulate cable assemblies. Aluminum-oxide filler (4500233) is dried in an oven set at 225 deg F resin (2644307) is heated in an oven set at 160 deg F. The resin and filler are combined in a polycup using a spatula. Curing agent (4604020) is added and dispersed throughout the resin-filler using a spatula.T he epoxy mixture is then evacuated. A preheated assembly is partially filled with the epoxy mixture. The assembly is placed in an oven to begin curing.Additional epoxy is prepared and used to top-off the assembly (two times). The assembly is then fully cured. Excess epoxy is discarded.

Options: Extend pot life. If epoxy pot life was longer, the initial batch could be used for the two top-off pours. Waste would be reduced by two-thirds.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Encapsulate With Epoxy per 9927085 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-59F062007 **Specific Waste Type:** Polymers

Date: 31-mar-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description: This process involves weighing, mixing, evacuating, pouring and curing a glass microballoon-filled epoxy used to encapsulate electronic assemblies. Resin (2140045) is poured into a mixing bowl and heated. Glass microballoons (6090014) are dispersed throughout the resin using a motor-driven mixing blade. This resin-filler mixture is heated. Curing agent (4604020) is added to the resin-filler mixture and the material is again mixed with the motor-driven blade. The mixture is then evacuated. A preheated assembly is partially filled with the epoxy mixture. The assembly is evacuated to remove trapped air. Additional epoxy is poured into the assembly. The assembly is then cured.Excess material is cured and discarded.

Options: Procure dispenser. Would reduce amount of curing agent used by 6%. Also would save 1 polycup per process occurrence.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Encapsulate With Epoxy per 9927088 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-59F062009 **Specific Waste Type:** Polymers

Date: 31-may-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description: Epoxy per 9927088 is used to encapsulate electronic assemblies. The purpose of this epoxy is to protect the assembly from hostile environments. This process involves weighing, mixing, evacuating, pouring and curing a beta-eucryptite filled epoxy. Beta-eucryptite filler (4535232) is placed in a shallow pan and dried in an oven set at 225 deg F. Epoxy resin (2140045) is heated to 160 deg F. The warm resin is weighed into a mixing bowl. Dry filler is then folded into the resin. The resin and filler are mixed together using a motor-driven mixer. This mixture is then placed into a 225 degree oven and heated for six hours minimum. The mixture is removed from the oven and mixed again. When the mixture cools to the 170-180 deg F, curing agent (4604020) is added. The epoxy is mixed for two minutes on the motor-driven mixer and then evacuated. Epoxy is poured from the mixing bowl into a polycup. From the cup, epoxy is poured into the assembly. The assembly is placed into a vacuum chamber and evacuated to remove trapped air. Additional epoxy is added to fill the assembly. The assembly is cured in an oven set at 160 deg F for 15 hours.

Options: Procure dispensers for raw materials. Could save(at best) a couple of polycups and 3% of raw material.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Encap. With Epoxy (Glass Microsph) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-59F062010 **Specific Waste Type:** Polymers

Date: 27-nov-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description: This process involves weighing, mixing, evacuating, pouring and curing a high-temperature, glass-filled epoxy used to encapsulate electronic assemblies. The curing agent used in this epoxy contains MDA -- a suspected carcinogen. Resin (2140045) is heated and combined with filler (6090014).C uring agent (4604085) is added. The mixture is then evacuated. A preheated assembly is partially filled with the mixture. The assembly is evacuated to remove trapped air. Epoxy is added to fill the assembly. If additional assemblies are available, they are encapsulated as described in the preceding paragraph. Excess material is cured and discarded.

Options: Reduce batch size. Would reduce amount of resin, filler and curing agent used. Approximately 60% of mixture is discarded.Procure dispenser. Would reduce amount of curing agent used. Approximately 33% of curing agent used is discarded as raw material due to dispensing method.Use non-MDA epoxy. Would eliminate 502 lbs.of protective clothing waste - not to mention time and inconvenience. Would also reduce waste disposal cost from $2.07/lb to $1.59/lb.Relax FM&TÕs MDA handling GPI. Full dress for suspect carcinogen that is easy to handle seems to be overkill, especially when only going into area to change oven temp, etc.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Encapsulate With Epoxy (Glass Filled) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-59F062012 **Specific Waste Type:** Polymers

Date: 20-dec-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description: This process involves weighing, mixing, evacuating, pouring and curing a high-temperature, rubber toughened, glass-filled epoxy used to encapsulate electronic assemblies. The curing agent used in this epoxy contains MDA -- a suspected carcinogen. Resin (2140646) is heated and combined with filler (6090014). Curing agent (4604085) is added. The mixture is then evacuated. A preheated assembly is partially filled with the mixture.T he assembly is evacuated to remove trapped air. The unit is partially cured. Two additional batches of epoxy is prepared and poured into the unit. The unit is then cured. Excess material is cured and discarded.

Options: Reduce batch size. Would reduce amount of resin, filler and curing agent used. Approximately 65% of mixture is discarded.Procure dispenser. Would reduce amount of curing agent used. Approximately 6% of curing agent is discarded as raw material due to dispensing method.Use non-MDA epoxy. PDO in work. Would eliminate 602 lbs of protective clothing waste -- not to mention time and inconvenience. Would also reduce waste disposal cost from $2.07/lb to $1.59/lb.Relax FM&TÕs MDA-handling GPI. Full dress for suspect carcinogen that is easy to handle seems to be overkill, especially when only going into area to change oven temp, etc.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Encapsulate With N{-Eucryptite Epoxy **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-59F062013 **Specific Waste Type:** Polymers

Date: 16-oct-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description: The process consists of weighing, mixing and pouring the mixture into a mold or injecting it into a cavity in the unit to be encapsulated. Filler is dried in an oven at 225 deg F for at least four hours. The resin and filler are mixed and placed in an oven and warmed for 2 hours at 225-250 deg F. The curing agent which is at room temperature is then added and the mixture is evacuated in a vacuum chamber at 0.5 to 3 torr for about 2 minutes. The filler, resin, and curing agent mixture are then poured or injected into the cavity of the electronic assembly. The temperature of the mixture is 140 deg at the time or pouring. The cavity is filled half full and evacuated once more. After the second evacuation, the cavity is filled and cured in an oven for 4 hours at 130 deg F plus at least 16 hours at 200 deg F. During the process, the operators use tongue depressors, paper wipes, plastic cups, a putty knife or a similar mixing tool.

Options: There is a PDO to search for an MDA substitute for curing agent 4604085. Most of the waste is caused by discarding excess material. If minimum batch size can be reduced - waste can be reduced. The current dispensers are too large to fit under the hood. Smaller containers would prevent spills and waste. Better dispensers will prevent spills.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Encapsulate With AlO Epoxy **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-59F062026 **Specific Waste Type:** Polymers

Date: 30-oct-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description: Epoxy is used to encapsulate electronic assemblies. The purpose of this epoxy is to protect the assembly from hostile environments. This process involves weighing, mixing, evacuating, pouring and curing an aluminum-oxide filled epoxy. Each step of the epoxy encapsulation process is described below.Aluminum-oxide filler (4500233) is placed in a shallow pan and dried in an oven set at 225 deg F. Epoxy resin (2140045) is weighed into a mixing bowl. Dry filler is folded into the resin. The resin and filler are mixed together using a motor-driven mixer. This mixture is then heated in a 180 deg F oven for one hour minimum. The mixture is removed from the oven and mixed again. When the mixture cools to the 155-165 deg F, curing agent (4604020) is added. The epoxy is mixed for three minutes using a motor-driven mixer and then evacuated. Epoxy is poured from the mixing bowl into a polycup. From the cup, epoxy is poured into a syringe and then into the assembly. The assembly is placed into a vacuum chamber and evacuated to remove trapped air. Additional epoxy is added to fill the assembly. The assembly is cured in an oven set at 160 deg F for 15 hours. Excess epoxy is cured and discarded.

Options: Procure dispensers for curing agent and resin. Three percent of resin and 12% of curing agent could be saved if excess material was not dispensed.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Patch Epoxy Using Curing Agent U **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-59F062029 **Specific Waste Type:** Polymers

Date: 31-jul-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Curing

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Encapsulation With Polyurethane Elastomer **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-59F069016 **Specific Waste Type:** Polymers

Date: 10-jan-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Encapsulate with TDI Foam **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-59F070001 **Specific Waste Type:** Polymers

Date: 27-nov-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description: Component R and T are withdrawn from their containers and weighed to a specific ratio in a mixing container. The combined materials are mixed thoroughly by spatula hand mixing or a motor-driven mixer. The mixer material is then transferred to a dispensing tube for encapsulation of product. The assembly that is encapsulated is then placed in a forced convection oven. The cure time and temperatures will vary according to size and type of assembly. In general, the unit will be cured at 130-250 deg F for a minimum of 4 hours.

Options: Metering dispensers for R and T components.

Site: Kansas City Plant

Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Encapsulate With PAPI Foam **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-59F070002 **Specific Waste Type:** Polymers

Date: 20-dec-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description: This is a process to encapsulate electronic assemblies using rigid polyurethane foam. The process involves preparing material, pouring or injecting the material into the mold or cavity of the assembly, and then curing the material in an oven. The mold or assembly housing is preheated to 160 deg F and maintained at this temperature until the encapsulating compound is poured. When the mold is not an integral part of the assembly, the mold is cleaned and coated with a thin, even film of mold release agent per 4702088. Components R and T are withdrawn from their containers and weighed to a specific ratio in a mixing container. The combined materials are mixed thoroughly by spatula hand mixing or a motor-driven mixer. The mixed material is then transferred to a dispensing tube for encapsulation of product. The assembly is encapsulated and then placed in a forced convection oven. The cure time and temperatures will vary according to size and type of assembly. In general the unit will be cured at 130-250 deg F for a minimum of 4 hours.

Options: Metering dispensers for R and T components.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Encapsulate With RTV 630 (2070069) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-59F071015 **Specific Waste Type:** Polymers

Date: 26-feb-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Mold Release **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-59K123023 **Specific Waste Type:** Polymers

Date: 02-jan-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description:

Options: Batch vacuum lamination.Recycle packaging product-ECOPACT.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Prime **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-59K131024 **Specific Waste Type:** Acid

Date: 02-jan-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description:

Options: Replinish stripper solution.Treat waste water in the department.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Slush Coat With RTV with GMB **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-59K134018 **Specific Waste Type:** Polymers

Date: 27-apr-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952

Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Bonding With Epoxy Adhesive **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-63B013005 **Specific Waste Type:** Polymers

Date: 22-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: Epoxy adhesive is used to bond or seal electrical components. Epoxy adhesive, 2180276, is composed of an epoxy resin (Part A) and a hardener (Part B). Part A and Part B are dispensed from squeezable tubes into an aluminum mixing dish, 10 grams of Part A to 4.4 grams of Part B. The components are hand-mixed. The mix is transferred to a syringe and injected onto the components to be bonded or sealed. The epoxy is oven cured at 160F for 1 to 2 hours.

Options: Mix smaller batches. Already try to mix smallest batch.Coordinate uses. The material is not widely used.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Semiconductor Vaseline Removal **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-645TRICHLORO01 **Specific Waste Type:** Solvents

Date: 05-mar-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options: Replace TCE with Actrel 4493L.Replace TCE with d-Limonene

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** David Curtin
Phone: (816) 997-3673	**Phone:** (816) 997-4646
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Solder Pot Tinning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-67001 **Specific Waste Type:** Solvents

Date: 31-mar-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description:

Options: Eliminated use of tricholorethylene.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** T. Joe Riehle
Phone: (816) 997-3673	**Phone:** (816) 997-7154
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: IPA Hand Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-67006 **Specific Waste Type:** Solvents

Date: 08-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: This process is used twice during assembly. The first is at subassembly level. The operator, using a lint-free cloth (99010355) saturated with alcohol (4601031), wipes the connector, feed foil, feed post, and cable assemblies. Then using alcohol and acid brush, they clean cable screws, feed foil screw, connector washers, connector screws, and cable support washers. The second time is at the final level. The operator uses a lint-free cloth lightly dampened with alcohol (excess removed from the cloth prior to use) and does a final cleanup of the antenna surfaces.

Options: Replace alcohol (in first clean) with soap and water of other types of water-soluble, nonhazardous cleaners.Use ultrasonic cleaner for first clean with soap and water, or alcohol, or other cleaner. This would affect lint-free cloth and plastic gloves waste.Use a basket and spray clean for first clean with alcohol. This would affect lint-free cloth and plastic gloves waste.Use sponge applicator in place of lint-free cloth for both cleaners.Buy smaller lint-free cloths. Those of 99010355 are ~ 1 foot square, could use 6" square.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** T. Joe Riehle
Phone: (816) 997-3673	**Phone:** (816) 997-7154
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Glyptal Staking **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-67009 **Specific Waste Type:** Polymers

Date: 23-oct-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Staking

Description: The operator pours approximately 30 grams of Glyptal (5020450) into 1-oz glass jar (98504000). The operator will use out of this jar until material becomes too thick to flow. This process is used to stake 6 locking pins. The operator opens jar and uses toothpick (99010401) to coat the surface of the exposed end of the locking pins and the sides of the threaded holes. Then the operator cures the Glyptal for 30 minutes to room temperature.

Options: Use syringe in place of toothpick and glass jar.Change to pint cans in place of quart cans.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** T. Joe Riehle

Phone: (816) 997-3673	**Phone:** (816) 997-7154
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Epoxy Bond **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-67011 **Specific Waste Type:** Polymers

Date: 23-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: The operator empties the contents of epoxy kit (2180975) into the mixing dish and mixes thoroughly with wooden stick. Mixing dish and wooden stick comes with the epoxy kit. Operator, using toothpick (99010401), applies epoxy to side of screw, washer, feed foil, and post. Cure epoxy at room temperature for 24 hours.

Options: Use the same toothpick to mix epoxy that is used to apply the epoxy.Adjust product flow so more parts run through process at one time. Cannot hold product or build ahead.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** T, Joe Riehle
Phone: (816) 997-3673	**Phone:** (816) 997-7154
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Hardware Staking **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-67017 **Specific Waste Type:** Polymers

Date: 28-jun-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Staking

Description:

Options: Order only one container at a time.Get shelf life extended for expired material.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** T. Joe Riehle
Phone: (816) 997-3673	**Phone:** (816) 997-7154
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Hardware Prime **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-67018 **Specific Waste Type:** Solvents

Date: 14-jun-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description: The operator takes the screws that need priming and places them on a lint-free cloth (99010355). Then using an eye dropper (14504000), removes some of the primer (4702694) from its bottle and applies it to the threads of the screws. The primed parts are laid aside on a clean wipe for use later. The primer must be dry prior to further use. During new assembly, there are 32 screws that need to be primed. During assembly of reworked units, there are usually only 11 of the screws that need to be primed.

Options: Because of the Tri-Party Agreement, an alternate material for the Loctite Primer T must be found.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** T. Joe Riehle
Phone: (816) 997-3673	**Phone:** (816) 997-7154
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Wedge Lubricate **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-67021 **Specific Waste Type:** Paper

Date: 20-oct-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** T. Joe Riehle
Phone: (816) 997-3673	**Phone:** (816) 997-7154
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Bond Pads **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-67022 **Specific Waste Type:** Polymers

Date: 25-oct-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: This work is performed on some reworked nose assemblies. The operator is instructed to do this work by a Factory Work Order. Listed below is a typical instruction from one of these work orders. "If pads are already bonded to energy absorber, it is not necessary to perform this operation. If not, position two compression pads P/N 369455-101 and two compression pads on the Energy Absorber in accordance with VA 369328 Aid 2. Bond pads to Energy Absorber using RTV 4115491-02 and allow to air cure a minimum of 15 minutes." To perform this operation the operator wore vinyl gloves (59206071) on both hands. The operator squeezed a small amount of RTV (4115491) on the back side of one compression pad. Then with the index finger, the operator spread the RTV out evenly over the pad, pressed the pad in place with his other gloved hand, and then repeated the process on the remaining three pads. When all four pads were in place, the operator cleaned his finger on a Kaywipe (99010240).

Options: Due to the shelf life, only order material when needed. NOTE: This change has already been implemented.Reuse the

vinyl gloves.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** T. Joe Riehle
Phone: (816) 997-3673	**Phone:** (816) 997-7154
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Absorber Lubricant **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-67023 **Specific Waste Type:** Oil

Date: 03-nov-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description: This work is performed on reworked nose assemblies. The operator is instructed to do this work by a Factory Work Order. These work orders can be written by several engineers. Listed below is a typical note from these work orders." As necessary, apply a thin coat of lubricant to the pads on the energy absorber, completely coating the side of the pads which will fit against the case. Avoid excessive amounts. Caution: Perform the following in a vented spray booth or wear dust mask when weighing, adding, and mixing the silicon dioxide. Prepare lubricant as follows: Thoroughly mix 100 +/- 2 PBW (parts by weight) of polyalkyene glycol 6500806-02 and 15.5 +/-.5 PBW of silicon dioxide 4551262-01. Mix by adding the silicon dioxide to the polyalkyene glycol in three portions, thoroughly mixing each portion with the polyalkylene glycol before adding the next. Store in poly or glass container with lid and mix before each use."

Options: Use metal spatula in place of tongue depressor.Reuse poly container and lid.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** T. Joe Riehle
Phone: (816) 997-3673	**Phone:** (816) 997-7154
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Reglue Label **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-67024 **Specific Waste Type:** Solvents

Date: 15-oct-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description: This process is only used on the old reworked noses where the identification plate is replaced and the new identification plate has poor adhesion. This work is called out in the Factory Work Order. The note in these Factory Work Orders read as follows: If adhesive on back of the I.D. plate is not pressure sensitive, dampen a paper wipe with cyclohexanone (6405010-00), then lightly wipe the adhesive on the back of the I.D.plate to make it tacky - not wet. During this PPOA it was noted that the operator used a sponge applicator (99012916) in place of the paper wipe.

Options: Don't use the label; ink stamp the product.Order new labels with good adhesive on the back.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** T. Joe Riehle

Phone: (816) 997-3673	**Phone:** (816) 997-7154
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Housing Prime **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-67028 **Specific Waste Type:** Polymers

Date: 06-oct-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description: The housing prime process is performed on one product. Procedure instructs the operator to pour a small amount of 2526629 into a foil cup (99012458). Then using a sponge applicator (99012917), apply a thin uniform coating on the surfaces that will be bonded later. The operator was wearing nylon gloves (59206 02) while performing this process. This process is performed on a workbench in the assembly area.

Options: Change package size of primer; presently packaged in 1-pound glass bottles.Rinse out sponge applicators and reuse. NOTE: Must be rinsed with isopropanol alcohol,thus creating more waste.Reuse nylon gloves.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** T. Joe Riehle
Phone: (816) 997-3673	**Phone:** (816) 997-7154
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Housing Glue **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-67029 **Specific Waste Type:** Polymers

Date: 10-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: The operator takes a polyethylene container (99012463) and adds 3 parts by weight of catalyst to 30 parts by weight of base compound. The operator then mixes thoroughly with a tongue depressor (99016165) and butters a thin layer of material (2070117) around the inside perimeter of polyethylene cup. Places cup in vacuum chamber (GENK 4197-A) and de-airs the material for 20 minutes at 77 MM HG or less, breaking the vacuum twice for approximately 1 minute. The material must be used within one hour of completing the de-airing process. The operator applies the adhesive mix to the primed metal and dielectric surfaces, firmly presses the dielectric into housing, sets locking pins, and removes excess adhesive. A metal spatula was used. The parts are then cured at room temperature with approximately 50% relative humidity for 5 days.

Options: Use metal spatula in place of tongue depressor.Change sealant to another material.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** T. Joe Riehle
Phone: (816) 997-3673	**Phone:** (816) 997-7154
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Housing Seal **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-67030 **Specific Waste Type:** Polymers

Date: 12-may-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: The operator takes a polyethylene container (99012463) and mixes 20 grams of base material with 2 grams of accelerator. The operator continues to stir this mixture for 7 to 10 minutes. The pot life of this mixture is 60 to 90 minutes. When complete, the mixture is placed into a plastic syringe (99016459). There are 8 screws on the antenna that require this polysulfide mixture to be applied. The operator loosens one screw at a time, then applies the polysulfide to the backside of the screw head, to the screw threads and to both sides of the lock washer. A toothpick (99010401) is used to move the material. When complete the operator tightens the screw, torques it, and repeats the process on the remaining seven screws. The unused material is kept until proper curing of the polysulfide has been verified. The product is cured for 24 hours minimum at room ambient temperature following by 4 hours in a oven at 160 degrees F.

Options: Use the syringe (99016459) to move the material, in place of using a toothpick (99010401).

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** T. Joe Riehle
Phone: (816) 997-3673	**Phone:** (816) 997-7154
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Polysulfide Bonding **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-69B013007 **Specific Waste Type:** Polymers

Date: 10-oct-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description: Polysulfide is generally used to join piece parts and covers to encapsulants and provides a moisture barrier between housing and encapsulant. Polysulfide is selected for its strong adherence and flexibility in environmental extremes. Polysulfide is stored in a flammable cabinet within the department, base and curing agent separated. The two components are mixed under a flammable hood, on a calibrated scale, in a plastic or wax-lined container. The material is then transferred to an applicator, such as a syringe, or applied directly to the part. Material is then processed with an oven cure at the maximum use temperature. Excess material is removed as needed before and after curing. Remaining waste and waste containers are discarded as solid waste.

Options: Material 4115550 and 4115060 are the same as "51"and "61" except for application time. Limiting material sources, eliminating redundant procurements and obtaining larger container sizes would reduce cost and waste.Specifying accurate amounts per process may reduce waste and could save material for latter use. Less material overall would need to be purchased.Using prepackaged cartridges would reduce waste of unneeded material and reduce input material use such as cups. Material left in cartridge can be capped for reuse.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Sealing With 2140015 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-69B013053 **Specific Waste Type:** Polymers

Date: 28-feb-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Staking

Description: The process of staking involves the covering of fasteners with a selected material for adherence in vibration and during thermal cycling. The selection of this material was made because of its durability under environmental extremes, strong adherence, and moisture resistance. The material is procured outside the plant and stored in a material cabinet within the department. The base and curing agent ingredients are packaged separately and mixed under a ventilated hood in a plastic container. The material is then applied directly to the part with a manual applicator. The material processing is completed with an oven cure at the maximum use temperature. Excess material is removed before curing.

Options: Eliminate material. There are other materials more widely used. Consolidation of a higher used material may save on procurement. Material 2149009 is used on one product in the department.Evaluate mix ratio. Reduction of material used would save greatly on disposal costs. Less material may be purchased. Concern exists on minimum batch ratio quality outside +/- 1%.UV curing. Evaluation under way to develop material cured with UV light. Curing time will be in seconds but capital equipment is high cost.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Staking With 2149009 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-69B013054 **Specific Waste Type:** Polymers

Date: 28-feb-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Staking

Description: The process of staking involves the covering of fasteners and threads with a selected material for adherence in vibration testing and during thermal excursions. The selection of epoxy 2149009 was made because of its durability, under environmental extremes, strong adherence to threaded surfaces and resistance to moisture. Epoxy 2149009 is procured outside the plant and stored in a material cabinet within the department. The base and curing agent ingredients are packaged separately and mixed under a ventilated hood in a plastic container. The material is then applied directly to the part with a manual applicator. The material processing is completed with an oven cure at the maximum use temperature. Excess material is removed as needed before and after curing.

Options: Eliminate material. Other material is more widely used in the department. Consolidation of a higher used material may save on procurement. Material 2149009 is used on one product.Evaluate mix ratio. Reduction of material used would save greatly on disposal costs. Less material may be purchased. Concern exists on minimum batch ration quantity outside +/- 1%.UV curing. Evaluations are under way to develop material cured with UV light. Curing time will be in seconds but capital equipment is high cost.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297

Email: wschlosberg@kcp.com	**Email:**

Title: Staking with 2180156 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-69B013056 **Specific Waste Type:** Polymers

Date: 31-mar-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Staking

Description: The process of staking involves the covering of fasteners with a selected material for adherence in vibration and during thermal cycling. The selection of this material was made because of its durability under environmental extremes, strong adherence, and moisture resistance. The material is procured outside the plant and stored in a material cabinet within the department. The base and curing agent ingredients are packaged separately and mixed under four ventilated hoods in a plastic container. The material is then applied directly to the part with a manual applicator. The material processing is completed with an oven cure at the maximum use temperature. Excess material is removed before curing.

Options: Eliminate material. Other material is more widely used in the department. Consolidation of a higher used material may save on procurement. Material 2149009 is used on one product.Evaluate mix ratio. Reduction of material used would save greatly on disposal costs. Less material may be purchased. Concern exists on minimum batch ratio quality outside +/1 1%.UV curing. Evaluation is unde rway to develop material cured with UV light. Curing time will be in seconds but capital equipment is high cost.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Staking with 2180355 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-69B013058 **Specific Waste Type:** Polymers

Date: 31-mar-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Staking

Description: Epoxy 2180355 is used to provide a metallic seal between threads of housing and setscrew after encapsulation. This provides a moisture barrier for internal components as well as protection from electromagnetic radiation. Use of this material is controlled by material standard. Epoxy 2180355 is stored in a cabinet within the department, base and curing agent are separated. The two components are mixed under a hood in a tin dish. The material is then applied directly to the part with a manual applicator. Material is then processed with an oven cure. Excess material is removed from the part, before oven cure usually. Remaining waste and waste containers are discarded as hazardous solid waste.

Options: Eliminate material. Other material is more widely used in the department. Consolidation of a higher used material may save on procurement .Material 2149009 is used on one product.Evaluate mix ratio. Reduction of material used would save greatly on disposal costs. Less material may be purchased. Concern exists on minimum batch ratio quantity outside +/- 1%.UV curing. Evaluation is under way to develop material cured with UV light. Curing time will be in seconds but capital equipment is high cost.Recycle silver. Material costs on this epoxy are higher because of its silver content. If recycling to extract the silver can be done, costs may be offset extensively.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952

Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Staking with 2181050 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-69B013060 **Specific Waste Type:** Polymers

Date: 31-mar-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Staking

Description: The process of staking involves the covering of fasteners and threads with a selected material for adherence in vibration testing and during thermal excursions. The selection of epoxy 2149009 was made because of its durability under environmental extremes, strong adherence to threaded surfaces and resistance to moisture. Epoxy 2181050 is procured outside the plant and stored in a material cabinet. The base and curing agent ingredients are packaged separately and mixed under a ventilated hood in a plastic container. The material is then applied directly to the part with a manual applicator. The material processing is completed with an oven cure at the maximum use temperature. Excess material is removed as needed before and after curing.

Options: Eliminate material. Consolidation of a higher used material may save on procurement. Apply directly to part. Reduction of material used would save greatly on disposal costs.Less material may be purchased. No need for dispense trays and applicators.UV curing. Evaluations are under way to develop material cured with UV light. Curing time will be in seconds but capital equipment is high cost.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Staking with 2181086 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-69B013061 **Specific Waste Type:** Polymers

Date: 31-mar-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Staking

Description: The process of staking involves the covering of fasteners and threads with a selected material for adherence in vibration testing and during thermal excursions. The selection of epoxy 2149009 was made because of its durability, under environmental extremes, strong adherence to threaded surfaces and resistance to moisture. Epoxy 2181050 is procured outside the plant and stored in a material cabinet. The base and curing agent ingredients are packaged separately and mixed under a ventilated hood in a plastic container. The material is then applied directly to the part with a manual applicator. The material processing is completed with an oven cure at the maximum use temperature. Excess material is removed as needed before and after curing.

Options: Eliminate material. Consolidation of a higher used material may save on procurement.Evaluate mix ratio. Reduction of material used would save greatly on disposal costs. Less material may be purchased. Concern exists on minimum batch ratio quality outside +/- 1%.UV curing. Evaluations are under way to develop material cured with UV light. Curing time will be in seconds but capital equipment is high cost.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding

Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Polysulfide Sealing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-69B014006 **Specific Waste Type:** Polymers

Date: 14-oct-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description: Polysulfide is generally used to seal components and encapsulants by providing a moisture barrier from external environments. Polysulfide is selected for its strong adherence and flexibility in environmental extremes. Polysulfide is stored in a flammable cabinet within the department, base and curing agent separated. The two components are mixed under a flammable hood, on a calibrated scale, in a plastic or wax-lined container. The material is then transferred to an applicator, such as a syringe or applied directly to the part. Material is then processed with an oven cure at the maximum use temperature. Excess material is removed as needed before and after curing. Remaining waste and waste containers are discarded as solid waste.

Options: Material 4115550 and 4115060 are the same as "51"and "61" except for application time. Limiting material sources. Eliminating redundant procurements and obtaining larger container sizes would reduce cost and waste. Material 4115069 is <.01% of total material. Specifying accurate amounts per process may reduce waste and could save material for latter use. Less material overall would need to be purchased. Using prepackaged cartridges would reduce waste of unneeded material and reduce input material use such as cups. Material left in cartridge can be capped for reuse.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: RTV 630 Mix and Apply **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-69B014038 **Specific Waste Type:** Polymers

Date: 19-nov-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: RTV involves mixing of two components before application. The two components are purchased together as a kit and must be mixed in a 10:1 ratio of component A (silicone rubber base) to component B (catalyst). Operators achieve this by putting 50 grams of base into a plastic pint cup by using a wooden tongue depressor like a spoon. Then an additional 5 grams of catalyst is added by pouring from the bottle into the plastic cup. The components are stirred together. Toothpicks are sometimes used to apply the RTV 630 to the product.

Options: If kit size of component B were increased, then component A would be scrapped due to loss of shelf life.Mixing smaller quantities would reduce the amount of leftover material that is going into waste stream. Materials Engineering is reviewing to see if smaller quantities can be mixed.Use UV adhesives in place of RTV. RTV is not always used as an adhesive, and many times the UV adhesive is not practical for RTV applications.Use of frozen RTV 630. Only need to thawout what's needed and leftover can be refrozen.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding

Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: RTV Coating Material Application **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-69B014047 **Specific Waste Type:** Polymers

Date: 14-may-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: RTV 3145 Application **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-69B014050 **Specific Waste Type:** Polymers

Date: 22-jan-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Polysulfide Staking **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-69B015005 **Specific Waste Type:** Polymers

Date: 17-oct-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Staking

Description: Polysulfide is generally used to cover fastener threads for adherence during vibration testing and during extreme thermal environments. Polysulfide is selected for its strong adherence and flexibility in environmental extremes. Polysulfide is stored in a flammable cabinet within the department, base and curing agent separated. The two components are mixed under a

flammable hood, on a calibrated scale, in a plastic or wax-lined container. The material is then transferred to an applicator, such as a syringe, or applied directly to the part. Material is then processed with an oven cure at the maximum use temperature. Excess material is removed as needed before and after curing. Remaining waste and waste containers are discarded as solid waste.

Options: Material 4115550 and 4115060 are the same as "51"and "61" except for application time. Limiting material sources, eliminating redundant procurements and obtaining larger container sizes would reduce cost and waste.Specifying accurate amounts per process may reduce waste and could save material for later use. Less material overall would need to be purchased.Using prepackaged cartridges would reduce waste of unneeded material and reduce input material use such as cups. Material left in cartridge can be capped for reuse.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Loctite, Grade C, Staking **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-69B015014 **Specific Waste Type:** Polymers

Date: 15-nov-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: Thread staking compound (Loctite Grade C) is applied to the threads of screws before the screws are installed and torqued in an assembly. A "drop" of compound is applied to the threads of the screw from the plastic squeeze bottle containing the Loctite. Excess material, if any, is then wiped off using a lint-free wipe (Handiwipe). The material has a shelf life of 3 years with no provision for extension.

Options: Screws could be purchased with Loctite preapplied.Purchase screws with Nyloc or other similar locking device.Replace outdated Loctite serves with up-to-date material and eliminate all old material. Stores amount could be reduced.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Loctite, Grade H, Staking **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-69B015016 **Specific Waste Type:** Polymers

Date: 15-nov-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: Thread staking compound (Loctite grade H) is applied to the threads of screws before the screws are installed and torqued into an assembly. A "drop" of compound is applied to the threads of the screw. The material is supplied from a 50-ml plastic squeeze bottle incorporating a long neck and small opening. It can easily and accurately be applied in this manner. Excess or squeeze out (if any) is cleaned using a lint-free wipe (Kaydry).

Options: Screws could be purchased with Loctite pre-applied.Purchase screws with Nylok or other mechanical locking

device.Replace the "old" Loctite with new grades that would not have to be specially ordered. No need to use primers.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Manual Clean with TCE **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-69C025036 **Specific Waste Type:** Solvents

Date: 20-mar-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The department primarily uses manual cleaning techniques with TCE to remove solder flux from printed wiring assembled (boards) and connectors after soldering. This process is also used to remove other contaminants such as oils, greases, mold releases, plasticizers, and fingerprints from electrical and mechanical assemblies. Trichloroethylene is normally dispensed from a four-ounce pump container and various applicators are used to apply the solvent to the part. Acid brushes, sponge-tip and cotton swab applicators, pipe cleaners, and nonabrasive wipers are common applicators.

Options: Replace TCE with a nonhalogenated solvent. Evaluations are under way to study the cleaning ability and compatibility of D-limonene. Trichloroethylene usage will be eliminated by July 1993.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Immersion Clean with IPA **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-69C028004 **Specific Waste Type:** Solvents

Date: 31-mar-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The department primarily uses immersion cleaning techniques with IPA to facilitate removing solder flux from printed wiring assemblies (boards) after soldering. Currently this process is only performed on subassembly boards. The alcohol is normally dispensed from a four-liter bottle of alcohol into a hinged-lid container. After soldering, the boards are placed in the container and soaked until ready to be spray cleaned. This is done to keep the flux from drying. The boards are then spray cleaned with IPA to remove flux and any other contaminants. This process was instituted because early in production a group of units had abnormally high leakage current. The cause was dried flux between the capacitors and ground plane which had not been removed during spray cleaning. Soaking the boards in alcohol proved to be a viable way to keep the flux soft so that it would be adequately removed when spray cleaned.

Options: New IPA container. Theoretically this container would allow zero fugitive emissions, both during the process and when not in use. This would reduce IPA waste through evaporation by about 6%.

Site: Kansas City Plant

Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Connector Cleaning with 4115755 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-69D035002 **Specific Waste Type:** Metal Debris

Date: 31-mar-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: This assessment deals with cleaning non-adhered debris from the interior of connectors using a tacky cured adhesive. The material is ordered from stores as a one-part adhesive (Dow Corning 281 adhesive). The adhesive is cured per the material specification in an air circulating oven at 160 degrees F for 3.5 to 4.5 hours. The xylene driven out of the adhesive exits an exhaust vent stack. Although the material specification is not the preferred venue for conveying instructions to manufacturing, it seems to be adequate in this instance. After curing, the high tack adhesive, which is commonly referred to as dum-dum, is cut into small tacky pieces and placed into small jars. The jars are distributed to operators and inspectors who indicate a need for the dum-dum. Empty jars are refilled, not discarded. To clean connectors with the dum-dum, a small amount of the adhesive is removed from the jar and stuck on the tip of a toothpick. The dum-dum-covered tip is maneuvered into the opening of the connector and against the debris in the cavity. The debris is held fast in the tack of the dum-dum. The debris can then be extracted and disposed of. The makeup of the debris is usually not examined, but it can include, but is not limited to, metal shavings, loose potting material, lint, soil and other metallic and non-metallic foreign materials. Little dum-dum is involved in this process as only a small percent of connectors actually contain debris. None of the dum-dum is left in the connectors.

Options: Purchase the high tack adhesive precured. Would add new part number to stores.Don't clean debris unless an electrical failure is noted.Investigate new high tack adhesive.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Marking With Ink (5096662) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-69H098013 **Specific Waste Type:** Solvents

Date: 28-nov-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Printing

Description: This material is used to mark part identification on the unit prior to shipment. This identification may contain part number, serial number, lot number, date code, manufacturer's code, part name and other information. The marking is usually sealed with a covercoat material. The ink is stored in a cabinet. Ink is dispensed onto a plate and spread out with a roller. A stamp with prepositioned characters is placed face down on the ink. The stamp is then placed on the part with even pressure and removed. The marking is checked for legibility and restamped if needed. Finally, the part marking is air dried for about 1 hour.

Options: Ink loaded stamps. Loaded stamps could eliminate dispensing of ink and input (other) materials. Equipment costs would increase and must be used on flat surface. Operation costs may decrease.Ink stamp sponge. A pad would eliminate ink dispensing but may not provide even material coating. Widely used in plant for other product marking. Easy to implement.Laser marking. Eliminate all need of input material but equipment costs, operating and maintenance costs are high. Cannot be used on

curved or nonmetallic surfaces.Computer generated. Ink jet marking. Capital equipment, operation, and maintenance costs moderate to high. Training needed. Holding fixtures needed for each piece.Eliminate redundant ink. Five different black inks are used for the same function and could be consolidated into one. Save on procurement cost.Use labels. Ink and input materials would be eliminated. Concern on adhesion and future legibility. Low cost and easy implementation.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Marking With Ink (5093002) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-69H098017 **Specific Waste Type:** Solvents

Date: 28-nov-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Printing

Description: This material is used to mark part identification on the unit prior to shipment. This identification may contain part number, serial number, lot number, date code, manufacturer's code, part name and other information. The marking is usually sealed with a covercoat material. The ink is stored in a cabinet. Ink is dispensed onto a plate and spread out with a roller. A stamp with prepositioned characters is placed face down on the ink. The stamp is then placed on the part with even pressure and removed. The marking is checked for legibility and restamped if needed. Finally, the part marking is air dried for about 1 hour.

Options: Ink loaded stamps. Loaded stamps could eliminate dispensing of ink and input (other) materials. Equipment costs would increase and must be used on flat surface. Operation costs may decrease.Ink stamp sponge. A pad would eliminate ink dispensing but may not provide even material coating. Widely used in plant for other product marking. Easy to implement.Laser marking. Eliminate all need of input material but equipment costs operating and maintenance costs are high. Cannot be used on curved or nonmetallic surfaces. Computer generated. Ink jet marking. Capital equipment, operation, and maintenance costs moderate to high. Training needed. olding fixtures needed for each piece. Eliminate redundant ink. Five different black inks are used for the same function and could be consolidated into one. Save on procurement costs. Use labels. Ink and input materials would be eliminated. Concern on adhesion and future legibility. Low cost and easy implementation.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Marking With Ink (5093004) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-69H098023 **Specific Waste Type:** Solvents

Date: 28-nov-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Printing

Description: This material is used to mark part identification on the unit prior to shipment. This identification may contain part number, serial number, lot number, date code manufacturer's code, part name and other information. The marking is usually sealed with an covercoat material. The ink is stored in a cabinet. Ink is dispensed onto a plate and spread out with a roller. A stamp with prepositioned characters is placed face down on the ink. The stamp is then placed on the part with even pressure and removed. The marking is checked for legibility and restamped if needed. Finally, the part marking is air dry for about 1 hour.

Options: Ink loaded stamps. Loaded stamps could eliminate dispensing of ink and input (other) materials. Equipment costs would increase and must be used on flat surface. Operation costs may decrease.Ink stamp sponge. A pad would eliminate ink dispensing but may not provide even material coating. Widely used in plant for other product marking. Easy to implement.Laser marking. Eliminate all need of input material but equipment costs operating and maintenance costs are high. Cannot be used on curved or nonmetallic surfaces.Computer generated. Ink jet marking. Capital equipment, operation, and maintenance costs moderate to high. Training needed. Holding fixtures needed for each piece. Eliminate redundant ink. Five different black inks are used for the same function and could be consolidated into one. Save on procurement costs. Use labels. Ink and input materials would be eliminated. Concern on adhesion and future legibility. Low cost and easy implementation.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Marking with Ink 5093162 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-69H098025 **Specific Waste Type:** Solvents

Date: 31-mar-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Printing

Description: This material is used to mark part identification on the unit prior to shipment. This identification may contain part number, serial number, lot number, date code manufacturer's code, part name and other information. The marking is usually sealed with a covercoat material. The ink is stored in a cabinet. Ink is dispensed onto a plate and spread out with a roller. A stamp with prepositioned characters is placed face down on the ink. The stamp is then placed on the part with even pressure and removed. The marking is checked for legibility and restamped if needed. Finally, the part marking is air dry for about 1 hour.

Options: Ink loaded stamps. Loaded stamps could eliminate dispensing of ink and input (other) materials equipment costs would increase and must be used on flat surface operation costs may decrease. Ink stamp sponge. A pad would eliminate ink dispensing but may not provide even material coating. Widely used in plant for other product marking - easy to implement.Laser marking. Eliminate all need of input material but equipment costs operating and maintenance costs are high. Cannot be used on curved or nonmetallic surfaces.Computer generated. Ink jet marking. Capital equipment, operation, and maintenance costs moderate to high. Training needed. Holding fixtures needed for each piece.Eliminate redundant ink. Five different black inks are used for the same function and could be consolidated into one. Save on procurement cost.Use labels. Ink and input materials would be eliminated. Concern on adhesion and future legibility. Low cost and easy implementation.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Marking with Ink 5093262 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-69H098027 **Specific Waste Type:** Solvents

Date: 30-apr-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Printing

Description: This material is used to mark part identification on the unit prior to shipment. This identification may contain part

number, serial number, lot number, date code, manufacturer's code, part name, and other information. The marking is usually sealed with a covercoat material. The ink is stored in a cabinet. Ink is dispensed onto a plate and spread out with a roller. A stamp with prepositioned characters is placed face down on the ink. The stamp is then placed on the part with even pressure and removed. The marking is checked for legibility and restamped if needed. Finally the part marking is air dried for about 1 hour.

Options: Ink loaded stamps. Loaded stamps could eliminate dispensing of ink and input (other) materials. Equipment costs would increase and must be used on flat surface. Operation costs may decrease.Ink stamp sponge. A pad would eliminate ink dispensing but may not provide even material coating. Widely used in plant for other product marking easy to implement.Laser marking. Eliminate all need of input material but equipment, operating and maintenance costs are high. Cannot be used on curved or nonmetallic surfaces. Computer generated. Ink jet marking. Capital equipment operation and maintenance costs moderate to high. Training needed. Holding fixtures needed for each piece. Eliminate redundant ink. Five different black inks are used for the same function and could be consolidated into one. Save on procurement cost.Use labels. Ink and input materials would be eliminated. Concern on adhesion and future legibility, low cost and easy implementation.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Solder Pot Comp Lead Tinning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-69J107040 **Specific Waste Type:** Lead

Date: 18-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description: This process deals with tinning the leads of components using molten 8331301 (high temperature) or 8330203 (standard temperature) bar solder using an electrically heated solder pot. The solder pot is operated and maintained in accordance with PES086103. As specified in the PES the solder pots are emptied, cleaned, and calibrated after 30 days of actual use. Days that the pots are not operating are not counted. The use of the solder pots has declined rapidly due to the reduced workload. It is currently estimated that the pots may not be recalibrated for 4-6 calendar months. The tinning operation is completed at either of two specifically designed adjoining work stations located at the north wall. The workstations are vented through a stack. The tinning process is accomplished by first applying flux to the lead(s) of the component and dipping the lead(s) into the molten solder. As the component is withdrawn, a fresh highly solderable coating is produced. If in the opinion of the operator a solderable condition is not obtained, the component lead(s) is fluxed and the tin dipping process is repeated. Only the use of solder is considered in this assessment.

Options: Extend the time period between cleanings.Only use pretinned parts.Scrap nonconforming material.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Hand Soldering (8330202/8330260) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-69J108003 **Specific Waste Type:** Lead

Date: 22-feb-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: High Temperature Soldering **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-69J108037 **Specific Waste Type:** Metal Debris

Date: 17-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Covercoat With Aerosol Acrylic **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-69K125015 **Specific Waste Type:** Aerosol Cans

Date: 28-oct-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description: Clear Acrylic spray coating is used to protect ink markings. The spray is applied from an aerosol can.

Options: Replace the spray-on covercoat with a brush-on covercoat. This would be limited to solvents and eliminate the aerosol propellants and overspray. Use inks that don't require covercoats.Replace ink marking with non-ink marking. The use of LASER marking is being investigated. Printed tags are currently used on several products.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Coating with Alodine 1200S **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-69K125018 **Specific Waste Type:** Acid

Date: 08-mar-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description: An alodine solution is procured. This solution is applied by two methods. The first is immersion in which the alodine is poured into a shallow pan and the aluminum to be coated is immersed until the desired finish (color) is obtained. Excess solution is daubed off with paper wipes or Q-tips. This method creates the largest waste streams. Assemblies using this technique are no longer in production. The second type of application is brushing of the solution. This method is used for scratch touch up and after welding operations. A small amount of the alodine solution is poured into a plastic container and is brushed over the area to be touched up. The brushing operation is repeated until the desired finish is obtained. The excess solution is daubed off with a Q-tip. Operators comply with 9904151 (chromate on aluminum coating) and P1257601 (grade 3 general purpose chromate coating on aluminum) for application. The solution is prepared in accordance with P1256275 (chromate conversion coating on aluminum solutions (alodine 1200S) and 9904151. Disposal is in accordance with the above work specifications. Operators wear protective equipment including rubber gloves and eye protection.

Options: Allow only plating personnel to complete touch-up process. Wouldn't reduce the amount of hazardous material.Send assemblies and piece parts to plating department for touch-up. Could reduce the amount of hazardous waste.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Coating with 2170115 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-69K125024 **Specific Waste Type:** Solvents

Date: 21-feb-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description: This process deals with sealing ink marking with clear polyurethane coating. The material is brushed over cured ink stampings then allowed to air cure for at least 1 hour. The used brushes are disposed of in a red step can. An average of three assemblies are marked with the same brush.

Options: Use ink that doesn't require overcoat.Use inkless methods of marking.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Lubricate With Alcohol **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-69K129011 **Specific Waste Type:** Solvents

Date: 31-oct-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description: Isopropyl alcohol (4601031) is sometimes used to lubricate items such as gages and o-rings. This process is used to reduce the friction and wear between two solid surfaces during assembly. Typically the isopropyl alcohol is obtained from a four-ounce pump container. The operator then applies the alcohol to the gage pins or o-rings by dipping them in the alcohol or by using an applicator such as a nonabrasive wiper or sponge-tip applicator. The applicator is then thrown away in a flammable waste step can.

Options: Dispensing isopropyl alcohol from the 4-ounce pump containers at all times would reduce fugitive emissions.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Lubricate With Grease (6520800) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-69K129022 **Specific Waste Type:** Grease

Date: 15-feb-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Primer Application **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-69K131001 **Specific Waste Type:** Solvents

Date: 06-mar-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952

Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Coat With Primer (4702692) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-69K131020 **Specific Waste Type:** Solvents

Date: 02-jan-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description: This process involves applying primer (Locquik) to clean and prepare the surfaces of threaded fasteners prior to mating. The material is applied from a squeeze bottle to the threaded portion of the fastener. The fasteners are air-cured for 1/2 hour before application of Loctite. The primer contains solvents to remove oils from the surfaces and add a metallic ion required for the Loctite to cure.

Options: Purchase hardware with dry sealants.Use mechanical locking devices.Use sealants that don't require primers.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Flux Using 4705010 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-69K131031 **Specific Waste Type:** Solvents

Date: 01-may-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Rosin flux is used during the hand soldering process to promote wetting of the solder and otherwise enhance solderability. Two types of flux are used, mildly activated (4705010 - 197 RMA) and activated (4705022 - 1544 RA). The quantity used is dependent upon which product is being built. The flux is usually diluted with 50% isopropyl alcohol (IPA) to keep it from hardening. One or two drops of flux is dispensed from a small bottle onto the solder termination. Terminations include printed wiring boards, connectors, studs, and terminals. Some of the solvent (IPA and other solvents contained in the flux) is vaporized during the soldering process and the rest evaporates into the department. Most of the rosin is removed during manual or spray cleaning and is eventually channeled into the flammable satellite waste can located beneath the spray booth. A very small amount of rosin is retained on product, either because it was not removed during cleaning or because it wicks up into stranded wires and sleeving and becomes trapped.

Options: Do not use additional flux if rosin core solder is used. Good solderability is usually achieved with rosin core solder; therefore, using additional flux is unnecessary. It is estimated that this could reduce flux usage by as much as 25%.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Flux Using 4705022 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-69K131035 **Specific Waste Type:** Solvents

Date: 01-may-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Rosin flux is used during the hand soldering process to promote wetting of the solder and otherwise enhance solderability. Two types of flux are used, mildly activated (4705010 - 197 RMA) and activated (4705022 - 1544 RA). The quantity used is dependent upon which product is being built. The flux is usually diluted with 50% isopropyl alcohol (IPA) to keep it from hardening. One or two drops of flux is dispensed from a small bottle onto the solder termination. Terminations include printed wiring boards, connectors, studs, and terminals. Some of the solvent (IPA and other solvents contained in the flux) is vaporized during the soldering process and the rest evaporates into the department. Most of the rosin is removed during manual or spray cleaning and is eventually channeled into the flammable satellite waste can located beneath the spray booth. A very small amount of rosin is retained on product, either because it was not removed during cleaning or because it wicks up into stranded wires and sleeving and becomes trapped.

Options: Do not use additional flux if rosin core solder is used. Good solderability is usually achieved with rosin core solder; therefore, using additional flux is unnecessary. It is estimated that this could reduce flux usage by as much as 25%.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Polysulfide Slushcoating **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-69K134063 **Specific Waste Type:** Polymers

Date: 30-sep-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description: Polysulfide is generally used to seal and coat components from encapsulants and provides a moisture barrier between housing and encapsulant. Polysulfide is selected for its strong adherence and flexibility in environmental extremes. Polysulfide is stored in a flammable cabinet within the department, base and curing agent separated. The two components are mixed under a flammable hood, on a calibrated scale, in a plastic or wax-lined container. The material is then transferred to an applicator, such as a syringe, or applied directly to the part. Material is then processed with an oven cure at the maximum use temperature. Excess material is removed as needed before and after curing. Remaining waste and waste containers are discarded as solid waste.

Options: Material 4115550 and 4115060 are the same as "51"& "61" for application time. Limiting material sources, eliminating redundant procurements and obtaining larger container sizes would reduce cost and waste. Specifying accurate amounts per process may reduce waste and could save material for later use. Less material overall would have to be purchased.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Emulsitone Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-71C025120 **Specific Waste Type:** Solvents

Date: 30-jun-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Tantalum Etch **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-71D031109 **Specific Waste Type:** Acid

Date: 24-aug-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description: Herman (4.5"x3.75" ceramic substrate) coated with tantalum and patterned with photoresist is etched in tantalum etch. Tantalum etch makeup includes 2400 mL of hydrofluoric acid (MS4528135), 6850 mL of acetic acid (MS4600015) and 685 mL of nitric acid (MS4528191). The mixture is stirred for 2 minutes and then stirred again after it is set for one hour. The unprotected tantalum is etched in tantalum etch solution for maximum of 10 second, then rinsed in a three-stage DI water cascade rinse for 5, 10 and 15 seconds, consecutively. Finally the Herman is blown dry with a nitrogen gun hooked to the plant nitrogen. Typically an etch-lot consists of 5 Hermans. The solution is discarded after 14 days or 25 etched lots, whichever is sooner.

Options: Reactive ion etch - The liquid hazardous waste generation, makeup solution and liquid waste processing, transportation, and potential of liquid spills will be reduced with dry etching of tantalum using CF gas and reactive ion etch technique.Increase solution life - The solution life of tantalum etch is currently 14 days/make-up. It can be increased (possibly doubled), thus reducing makeup chemical quantities and quantity of hazardous waste.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Palladium Etch **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-71D031115 **Specific Waste Type:** Acid

Date: 20-apr-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description: Hermans coated with Ti/Pd and patterned with either electroplated gold or photoresist are etched in palladium

etch. Hi Speed Circuit Etch (MS#4702762) is used as received for palladium etch. The etch is discarded every 25 etched lots or 14 days (which ever comes first) and then replaced with fresh solution. The solution is heated to 25 degrees C and is agitated with nitrogen flow through the solution. Palladium not covered with photoresist or gold is etched in palladium etch solution for 1 minute and 30 seconds, followed by titanium etch and then 30-second palladium haze etch. After each etch Hermans are rinsed in three-cycle dump rinse. Palladium etch is followed by titanium etch.

Options: Ion milling does not require hazardous chemicals. It is performed with argon gas. Thus implementation of this technique will reduce hazardous waste handling and disposal cost. The liquid chemicals used currently are Hi Speed Circuit Etch and DI water.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Emulsitone Coating **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-71K125117 **Specific Waste Type:** Polymers

Date: 23-apr-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description: A lint-free wiper is wetted with Emulsitone polyvinyl alcohol (PVA) from the manufacturer's bottle. The saturated wipe is used to coat an alumina (AL2O3) ceramic substrate on both sides by wiping the substrate surfaces. The substrates are then allowed to air dry.

Options: Do not coat substrates.Dip substrates in tank of Emulsitone PVA.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: CAP Assembly Bonding **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-72B013008 **Specific Waste Type:** Polymers

Date: 30-apr-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: The operator cleans each of the spacers in acetone, rinses in alcohol and lets them dry. The base plate and header assembly are then brush cleaned in acetone followed by alcohol. The bottom side of each power board is brushed clean with acetone followed by alcohol. All are allowed to dry. The film adhesive is removed from the freezer and cut to the shape of the spacers. The green backing is removed. The spacers are placed side by side on the film adhesive. While holding spacers down with the tips of tweezers, a knife is used to cut the adhesive to the shape of the spacers. Once cut, the spacer with film attached is set to the side. Each of the spacers is then brushed clean with alcohol. The operator then applies a primer to the bottom side of the board and to the surface of the spacers. The power board, spacers, and baseplate are then placed back in the container. This container is then set on a tray. A small tin filled with water is also placed on the tray. This tray is then placed in an empty nitrogen cabinet. The door is then closed and latched and the primer is allowed to dry, in this state, for 45 minutes. The tray is

removed from the nitrogen cabinet. Spacer tape is cut to fit each end of both ceramic spacers to .05 +/- .01 inches and applied to the ceramic spacers at each end. The tape is allowed to overhang spacer slightly. (The tape ensures a minimum thickness of RTV; overhang allowed to aid verifying its presence.) A small amount of RTV (from a syringe) is then applied on the spacer between the spacer tape cutouts. This is applied using a toothpick. Enough RTV is applied so a continuos bead of RTV is present on the edge of the spacers. The spacers are then attached to the power board per locations as shown in a visual aid. The spacers will only fit on direction, as well as, only in one location. One solder preform is then placed on each pin of the back row of the header pins. This is done to ensure the minimum amount of solder in the joint later. The pin protector is then removed and the assembly placed in the bonding fixture (BF369931-400) with the baseplate on the bottom and the power board on top. Each fixture holds four assemblies. There are four fixtures. However, the operator is restricted to performing all of the above in two hours time due to the adhesive. Because of this, the maximum that should be worked on at any time is five (5). This amount takes approximately two hours to complete. The fixtures with the assemblies are then placed in a 205 degree F oven (CE 56271) for a minimum of 6.5 hours. A small container (tin) of water is placed in the oven with the units to aid in curing the RTV. The assembly is then removed from the oven and allowed to cool. The pin protector/shorting plug is returned on the header pins. The time the assembly is removed from oven or the time oven is turned off is recorded on the KCD-1547 tag. The RTV is also used to stake the potting dam to the ECA. Here, the operator uses a toothpick to apply a small amount of RTV (from the same syringe as above) to the four corners of the underneath side of the potting dam. The dam is then placed on the ECA and allowed to cure at room temperature for two hours.

Options: Cut smaller piece from sheet of film adhesive. Current practice of operator is to cut a piece approximately 4.5" X 4.5". This could be reduced to a 1" X 12" or a 1" X 6" strip. To eliminate operator variability, the approximate size will be specified in the traveler. However the amount of waste due to shelf-life is not reduced unless the package size (option 2) is changed as well.This option only affects the distribution of waste among waste types 1 and 5 (Out of Shelf-life and Used Material-Solid). Obtain film adhesive in package of less than 6 -square-feet sheets, if possible (maybe 2 sq.ft). Six - square feet is the smallest package currently available from the vendor. It would be too costly to set up a smaller size compared to the cost of our waste per year.Extend the 1-year shelf-life of the film adhesive by reinspecting. The material specification does not allow extension of shelf-life.Obtain RTV in smaller tube if possible. A three-oz tube is smallest size currently available from the vendor.Extend 6-month shelf life of RTV by reinspecting. Although the material specification allows for extension, this really applies only to material residing in stores, if any remains. Purchased Material Quality Organization does not typically extend material on the manufacturing floor because they had no control over whether the material has been stored properly, exposed to moisture, etc. Obtain primer in smaller containers. One-pint container is smallest size currently available from the

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: CAP Assembly Laser Trim Resistors **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-72D038009 **Specific Waste Type:** Metal Debris

Date: 30-apr-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297

Email: wschlosberg@kcp.com	**Email:**

Title: CAP Assembly Bonding **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-72F067010 **Specific Waste Type:** Solvents

Date: 30-apr-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description: The operator removes a package of polystrene beads from the refrigerator. The beads are left at room temperature for 1 hour before being opened. The assembly is weighed with pin protector on. The assembly is located into the potting fixture. The fixture is placed onto a vibration table and a grounding lead attached to the fixture. The operator shakes the beads in the package. The vibration level is turned up, not exceeding 30, and the beads are poured into the fill fixture. A toothpick may also be used to help work the beads down. The vibration table is then set at a higher level, not exceeding 40, and is vibrated for approximately 15 seconds. The assembly is then topped off with additional beads to complete filling of the assembly. The assembly is then removed from the potting fixture and placed in a handling fixture. The assembly and fixture are then placed in a hood for 40 to 50 minutes and stabilized at 96 degrees C. The operator then removes the assembly and fixture from the oven and allows them to cool for one-half hour. The operator then weighs the assembly, with pin protector installed, and records the "post-fill" weight. The assembly is then placed in a vacuum oven which has the temperature stabilized at 71 degrees C.A vacuum of 25 mm Hg or less is pulled and the assembly baked for 4 hours to 24 hours. The operator then removes the assembly from the oven and records the removal time.

Options: Use a 100-gram package of beads (1463424-1) for more than one job or operation. The beads must be used within 4 hours of being opened. Obtain beads in smaller packages, i.e., 40, 45, and 50 grams, to accommodate job quantity. The beads are packaged in 100-gram size in-plant. Currently other users require the larger 100-gram bag. The materials engineer felt the beads were inexpensive enough that it would not warrant creating and maintaining a second size in stores.Order fewer packages of beads at one time. The current method of ordering is the operator predicts a one-month need, occasionally a two-month need, and the production planner orders the beads. This practice is seen as acceptable and helps ensure minimum waste. Pot a larger batch size at one time. Limited to the number of potting fixtures which is ten.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Leak Test, Nitrogen in Fluorinert **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-72L146003 **Specific Waste Type:** Solvents

Date: 08-apr-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Inspection

Description: After soldering of the metal can containing the CAP, the can is leak tested to ensure the integrity of the solder joint. The can assembly, loaded into a test fixture, is first evacuated then backfilled with nitrogen to 10 psi. While still under pressure from the nitrogen, the assembly is immersed in fluorinated liquid for two minutes. If no bubbles are observed coming from the solder joint, then the joint is good. Otherwise, the solder joint is reworked and the test procedure repeated.

Options: Use covered container instead of Pyrex measuring cup to hold fluorinert. This would reduce the amount of liquid lost to evaporation.Replace fluorinert with water. This would eliminate a CFC.

Site: Kansas City Plant	

Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: CAP Assembly Bonding **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-72M156014 **Specific Waste Type:** Polymers

Date: 30-apr-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Epoxy Attachment and Cure **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-73B013014 **Specific Waste Type:** Polymers

Date: 17-jun-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: Epoxy technology was used for component-to-hybrid attachment, lid sealing, and lead frame support. The epoxy was used for mechanical bonding of the component or lid to the hybrid. Three types of epoxy, Ablefilm 517, 517B and 550, were used. All three epoxies were one component, nonconductive preform material, pre-cut by the manufacturer to required dimensions. The method used for lid sealing and lead frame supports was a hand placement and clamping process. The epoxy preform would be hand placed on the substrate with the support or lid set on the epoxy and held in place by a spring clamp during cure. Component attachment was also a hand placement operation however, the components would be seated in the epoxy and not clamped. For components and supports, curing would take place in a K141 oven at 125 degrees C for 60 minutes. For lid sealing, curing was done in a vacuum oven at 125 degrees C for four hours and 1500 microns. Lid sealing was done in a vacuum oven to remove absorbed water from the hybrid. The epoxy was stored at -65 degrees C and has a shelf life of one year. The shelf life of the material could be extended once for 90 days provided qualification tests could be met. Once the material's shelf life has expired, the material was disposed.

Options: Purchase less material. Purchase only bulk material, cut our own preforms. Less waste would be generated because the smaller preforms could be cut from the leftover material.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297

Email: wschlosberg@kcp.com	**Email:**

Title: Hand Soldering **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-73J107006 **Specific Waste Type:** Printed Circuit Boards

Date: 15-aug-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description: Hand soldering is performed on printed wiring boards and hybrid microcircuits (HMCs). For the HMCs, hand soldering is used for touch up, rework and cover attachment. Either 63/37 SnPb, 50/50 Pb/In solder or 80/15/5 In/Pb/Ag solder is used; depending on if soldering is being done on thick film networks, thin film networks or covers. For printed wiring assemblies, 63/37 Sn/Pb solder is used for through-hole component attachment and hybrid attachment. Sn/Pb solder is also used for hand soldering flat cables to the radar channels. During each soldering process, a minimal amount of Kester 197 (4705010) mildly activated rosin flux is used. Operators consciously minimize the flux they use to aid the cleaning process. After hand soldering, hybrids and printed wiring assemblies are cleaned. The opportunity assessment for cleaning is J210073-C-026-001.

Options: Change from rosin-based flux to water-soluble or no clean.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Solder Pot Tinning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-73J115010 **Specific Waste Type:** Lead

Date: 04-feb-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description: Solder pot tinning is performed on all untinned components received. Two types of solder are used, 63/37 SnPb and 50/50 Pb/In. The Sn/Pb solder is for thick film networks and printed wiring boards, and the Pb/In solder is for thin film networks. The procedure followed by the operator is to dip the component in Kester 197 flux, 4705010, dip in the solder pot, and clean by rinsing in isopropyl alcohol, 4601031. Solder dross is scrapped from the pot prior to dipping parts. The dross is collected and sent to waste management as scrap material.

Options: Reduce the number of solder pots. Current production requirements require the use of two solder pots for each solder. The use of only one pot would have an adverse consequence on the flow time and ability to meet production schedules.Use smaller pots. No reduction in waste would be seen because of the variety of components which must be tinned. More pots would be required generating an equal amount of waste if not more.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Epoxy Attach and Cure **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-75B013009 **Specific Waste Type:** Polymers

Date: 12-jun-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: Epoxy is used to attach die to substrates and packages. The epoxy provides both the electrical connection or insulation and the mechanical bond for the hybrid microcircuits. Two forms of epoxy, either a one or two-component paste, or a preform are used. The materials used in processing include Epo-Tek H20E, Epo-Tek H61 and Furane 7200, Furane 7002 and Dupont 5504, and Ablefilm 517 and 550. The epoxy attachment process is either done by hand operation or by a pick and place machine. For the hand operation, paste epoxy is placed and/or mixed in small aluminum weighing pans. The operator transfers the paste with a microknife or toothpick. The operator then places the components into the epoxy dots and cures the material for 90 minutes at 165 degrees C in an oven. For preform epoxy, no mixing is required, preforms are placed directly on the substrate or package and the component or substrate is placed on the preform. The pick and place machine dispenses epoxy either by syringe or stamping. Epoxy received in 10-cc syringes is transferred to a dispensing syringe or to the stamping well. The dispensing syringe is then mounted on the pick and place machine. Air pressure is used to dispense the epoxy through the syringe. Various sizes of stamping collets are used to dispense epoxy from the well onto the substrate. The unused portions of the epoxy from the well are discarded. The epoxy in the syringe is returned to the freezer.

Options: Buy less epoxy. Only epoxy is affected. Currently the majority of waste is due to shelf life limits. Optimize build quantity. Currently the same quantity of epoxy is used regardless of the number of hybrids built.Implement pick and place. This would solve option2 and optimize quantity of epoxy on the hybrid.Better inventory control. May allow shelf life extensions and eliminate production down time due to lack of epoxy.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Package Sawing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-75D038004 **Specific Waste Type:** Polymers

Date: 02-mar-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description: Package sawing is a rework process for Joint Test Assembly (JTA) hybrids requiring new packaging. Two reasons exist for repackaging JTAs. First, the package may leak (these hybrids are to be hermetically sealed in an inert atmosphere) and second, an electrical failure may occur requiring lid removal for repair. The same package cannot be resealed because of leak failures. To remove any hybrid from a package, an Isomet low speed saw is used to cut away one side of the gold-plated kovar package. This saw is lubricated with a solution of DI water and Triton, 4702403, a wetting solution. After sawing is complete, the package and hybrid are cleaned in DI water followed by isopropyl alcohol (IPA) and blown dry with plant nitrogen. Once clean and dry, the substrate is removed from the kovar package and epoxy attached into a new housing. Package sawing and subsequent cleaning are controlled. The process is run approximately once each month with five to seven hybrids being repackaged. The gold-plated kovar packages that are sawed are scrapped and sent to gold reclamation.

Options: Pre-lid burn-in. Liquid burning to test chip components before sealing. Allows rework of components without requiring package replacement.Stop package replacement process. Laser cutting. Laser scribe the package side instead of sawing. Would make this a dry process.Use thermoplastic adhesive. This may allow package replacement without the need to cut away one side of the package. The package could be heated and the substrate lifted out.

Site: Kansas City Plant

Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Liquid Burn-In in Fluorinert FC-40 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-75L144006 **Specific Waste Type:** Solvents

Date: 04-may-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Burn-In

Description: Power liquid burn-in is an operation performed on lidded and unlidded hybrids to screen components for infant mortality. When burn-in is performed in air, hybrids containing power devices must be burned-in at lower temperatures because they self heat. The junction temperatures of those devices must not exceed the maximum temperature allowed. Other devices within the same package are therefore not burned-in at the temperature required to ensure proper reliability. Liquid burn-in is performed in an FTS Accelerator Liquid Burn-In Bath. Hybrids are power burned-in for a total of 168 hours. Eighty-four hours of the burn-in process must be on lidded parts. The fluid used as the heat transfer medium is Fluorinert FC-40, 4611154 and/or FC-5350, 57003765. The bath holds 50 gallons (782 lbs) of Fluorinert which is continually circulated through a carbon filter and cotton fiber filter. The vapor recovery portion of the equipment has an activated alumina scrubber to condense the vapors and return them to the bath. All filters are changed twice a year. Fluid loss occurs as fugitive emissions, liquid waste during filter changes, and drag out with product (which also becomes a fugitive loss).

Options: Lidded burn-in in air. This is current practice; however, rework expense is high and reliability is not as high as possible.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Epoxy Bond **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-76B013010 **Specific Waste Type:** Polymers

Date: 22-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: Epoxy bonding is done with epoxy resin 2140045 and curing agent 22001115. Operators mix 50 grams of epoxy resin with 29 grams of curing agent. The components are then mixed well using a tongue depressor. The mixed epoxy is applied to both the metal pin and the hole. The pin is then pressed into the hole. The part is then allowed to air cure for 24 hours.

Options: Reduce batch size. This would be a source reduction affecting both resin and curing agent.Try to waste less from each batch. This entails refining the process or automating it so that epoxy that will not be needed is not dispensed.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952

Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Hand Clean With Alcohol **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-76C025004 **Specific Waste Type:** Solvents

Date: 31-oct-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Hand cleaning with alcohol 4601031 is used for general cleaning purposes. Among its uses are cleaning dust and handprints from parts being assembled. To clean with alcohol the operator first places a lint-free wipe in a plastic cup. A small amount of alcohol is poured onto the wipe. The moistened wipe is then used to clean the surface. After use, the contaminated wipe is placed into a step can which is collected daily by waste management.

Options: Use an alternate cleaning solvent.Minimize use of alcohol.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Hand Cleaning and Immersion **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-77C025020 **Specific Waste Type:** Solvents

Date: 30-jun-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Immersion and hand cleaning applications are used primarily to clean weld joints prior to welding and to clean potting molds and mold release from product. Alcohol, toluene and acetone are the solvents used. The cleaning methods used are immersion, spray clean, hand wipe with cloth, and hand wipe with polyurethane or cotton swabs.

Options: Eliminate TCE from all travelers - specifically 370319-101 (operation 140).

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Helium and Argon Purge and Backfill **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-77E045014 **Specific Waste Type:** Compressed Gas Cylinders

Date: 15-oct-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Inspection

Description: Hermetic assemblies are purged and backfilled with either helium or a nitrogen/argon gas. The inert gases provide a known internal atmosphere for longevity and provide a tracer gas for leak testing purposes.

Options: Have pipe fitter leak check fittings after changing bottles. Sixty-seven percent of gas is leaked into room.Power down equipment (purge and backfill tester) when not in use. Saves electricity and prevents added heat load in summer.Have operators close gas bottle valve when not in use.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Polystyrene Bead Foam Encapsulation **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-77F067010 **Specific Waste Type:** Polymers

Date: 15-nov-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description: Polystyrene bead foam is used to encapsulate electronic assemblies. The bead material provides thermal and structural protection. Pre-expanded beads are poured into an assembly. The filled assembly is then placed into a convection oven and cured at 205 deg F. The blowing agent is pentane, which is released during the cure. A sample button is also formed during the process which after curing is sent to inspection for compression testing.

Options: Spilled beads are a tripping hazard. Place a tray under the vibrating table to collect spilled beads.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Bonding with UV Adhesive **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-79B013019 **Specific Waste Type:** Polymers

Date: 15-jul-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description:

Options: Mix a smaller batch size.Replace with 5-minute epoxy.Replace with super glue.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952

Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Manual Brush Cleaning With IPA **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-79C025004 **Specific Waste Type:** Solvents

Date: 06-jan-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Manual cleaning with alcohol is a process generally done at any operator's bench. The operator may use his or her own judgment as to when cleaning should take place and whether to use a brush, swab or pipe cleaner to clean the part. Small ES&H-approved containers are found at each work station and operators are generally responsible for their own alcohol maintenance.

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Manual Spray Clean With Alcohol **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-79C027001 **Specific Waste Type:** Solvents

Date: 12-jun-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Manual spray cleaning of parts often involves isopropyl alcohol with a nitrogen blow dry. The parts are sprayed with isopropyl alcohol (4601031) to remove contamination prior to soldering and to remove the rosin flux and contamination after soldering components to the boards. It is common for the same board or assembly to be spray cleaned many times before completion. As a general rule, parts that can be spray cleaned are cleaned by the operator prior to every inspection. The alcohol is forced through a DeVilbiss TGA or equivalent spray gun by dry nitrogen under 55 psi pressure in a flammable exhaust hood as called for in the Cleaning of Electronic Assemblies specification. The alcohol spray gun shares the same spray booth as the deionized water spray gun. Liquid waste from either cleaning process can flow through the same drain in the spray booth and into a waste can below. Operators are instructed to open the drain valve on the booth to the waste cans before using the spray booth and then to close it when finished with the hand spray cleaning process. The exhaust fan in the spray booth runs continuously.

Options: Redesign the spray booth. This option will reduce the amount of vapor emissions and increase the amount of liquid alcohol waste retained which could be recycled. Reduce the nitrogen pressure while spraying. The department operates the alcohol spray at 55 psi. T he firesets department operates their alcohol spray gun at 42 psi and the specification allows as low as 25 psi. A significant reduction of IPA could result.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297

Email: wschlosberg@kcp.com	**Email:**

Title: Manual Spray Clean With TCE **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-79C027002 **Specific Waste Type:** Solvents

Date: 08-nov-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Manual spray cleaning of parts sometimes involves trichloroethylene with a dry nitrogen blow dry. The parts are sprayed with trichloroethylene to remove any inorganic contaminants (such as flux or machine oil). The parts are cleaned after soldering components on the PW Boards. Boards may be cleaned several times during the course of being built, but mostly cleaning occurs prior to an inspection point. The trichloroethylene is forced through a DeVilbiss TGA or equivalent spray gun by dry nitrogen under 52 PSI of pressure in a flammable exhaust hood. Operators are instructed to follow the process as outlined in Cleaning of Electronic Assemblies Specification. In most cases, parts cleaned with trichloroethylene are then spray cleaned with alcohol to remove any chlorine residue. The exhaust fan in the spray booth is continuously on and operators are instructed to open the drain valve before using the booth and to close it when done.

Options: Redesign the spray booth floor; better drainage will capture more liquid.Reduce nitrogen pressure, as significant reduction of trichloroethylene could result.Find alternatives for flux and/or trichloroethylene.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: RTV 630 Mix and Apply **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-79F064028 **Specific Waste Type:** Polymers

Date: 19-aug-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description: RVT 630 is used for several purposes. All uses, however, involve mixing of the two components before application. The two components are purchased together as a kit and must be mixed in a 10:1 ratio of component A (silicone rubber base) to component B (catalyst). Operators achieve this 10:1 ratio by putting 10 grams of base into an aluminum weigh dish by using a wood tongue depressor like a spoon. Then an additional gram of catalyst is added by pouring from the bottle into the weigh pan. Finally, a new tongue depressor is used to stir the two components together and to get the RTV mixture into a plastic syringe. The operator makes a handwritten adhesive label for the syringe and then applies the RTV to the parts. This is a very clean and simple process. Parts receiving RTV are sometimes placed in a vacuum chamber to pull the air out of the RTV before curing. Most parts are then oven baked to cure the RTV for 15 minutes to 2 hours at 160 degrees F. Many parts must then undergo electrical testing to verify that no damage occurred.

Options: If operators were better trained on mixing the RTV so that they would mix only the amount needed for the job, then some savings could be realized. A simple ratio chart could help.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297

Email: wschlosberg@kcp.com	**Email:**

Title: Ink Stamp Marking **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-79H098010 **Specific Waste Type:** Solvents

Date: 15-jul-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Printing

Description: Ink stamp marking is a minor process to identify parts by part number and to distinguish different units of the same product. Four manufacturing identification elements provide a means for distinguishing different units of the same product. The four elements are 1) manufacturer's code, 2) serial number, 3) date code, and 4) lot or batch number. The necessary information is provided on a rubber stamp and is manually stamped onto the parts by an operator in the department. The ink itself comes in tubes similar to toothpaste. When it is time to ink stamp a part, the operator will squeeze out a small amount of ink from the tube onto a metal pad, spread it out with a roller, press the stamp onto the pad to get it "wet", test the stamp on a piece of paper, and finally the actual stamping of the part takes place. Then, a covercoat is applied over the ink stamp and cleanup begins. The pad, stamp, and roller are all cleaned with a paper towel and alcohol. The dirty towel is then disposed of.

Options: Laser marking of parts undoubtedly provides the best mark, but parts must be shipped out to another department to be processed. Marking parts with labels is a clean and fast way to replace ink stamping. However, it is not currently being done and labels would have to be bought and printed on the computer before use.Marking parts with dry transfer methods is easy but takes a long time for big stampings. Each letter or number is transferred individually. Also, a covercoat is still needed to make the mark last.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Hand Soldering **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-79J107015 **Specific Waste Type:** Solvents

Date: 24-apr-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Hand soldering is a method of forming a conductive bond between metals. Hand soldering is performed when automated methods are impractical. The operation consists of applying rosin flux (4705010) to the surfaces being joined, assembling the components, heating the area to be joined with a soldering iron, and applying solder (8330202) to form the joint. The joint is cleaned after cooling by brushing with alcohol (4601031). The operation results in two waste streams: solids and point source air. The solid waste stream is sent to waste management for disposal. The point source air waste stream is vented to the work area.

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297

Email: wschlosberg@kcp.com	**Email:**

Title: Tin Dipping Bar Solder/Flux **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-79J115014 **Specific Waste Type:** Lead

Date: 24-mar-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Cutting Wire **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-79M156008 **Specific Waste Type:** Metal Debris

Date: 18-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description:

Options: Cut to exact length needed.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Clipped Leads **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-79M156009 **Specific Waste Type:** Metal Debris

Date: 18-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description:

Options: none

Site: Kansas City Plant	

Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Compression Molding **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-7HULL001 **Specific Waste Type:** Polymers

Date: 22-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Curing

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Trevor Whitney
Phone: (816) 997-3673	**Phone:** (816) 997-5743
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Pumice Scrub **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-7PCB001 **Specific Waste Type:** Acid

Date: 07-jun-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The pumice scrub process is used to mechanically clean the surface of a printed circuit board prior to fabrication. Fremont 238 circuit board cleaner is the pumice used. The cleaner is made of silica flour and phosphoric acid. The abrasive powder is placed on a wet (city water) circuit board and scrubbed by hand using a brush. Waste media and water are disposed of through the Industrial Waste drain. Only two pounds of the Fremont 238 was used during the PPOA review period.

Options: Filter water to remove cleaner.Cleaner use is minimal (2 lbs.) and nonhazardous.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Trevor Whitney
Phone: (816) 997-3673	**Phone:** (816) 997-5743
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Electroless Copper Plating **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-7PCB002 **Specific Waste Type:** Acid

Date: 03-jun-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description: 231 cleaner for 5 minutes at 110 deg F. Rinse 1minute 30 seconds. Rinse 1 minute 30 seconds. 748 etch for 60 seconds. Rinse 1 minute 45 seconds. Rinse 2 minutes 30 seconds. 10% sulfuric acid for 70 seconds. Rinse for 2 minutes 30 seconds. Cataprep 404 for 70 seconds at 115 deg F. Cataposit 44 for 3 minutes 50 seconds at 115 deg F. Rinse 1 minute 45 seconds. Rinse 1 minute.Accelerator 240 for 3 minutes at 110 deg F. Rinse 1 minute 45 seconds. Rinse 45 seconds in DI water. Electroless copper plate for 20 minutes. Rinse for 1 minute 45 seconds. Rinse for 1 minute 30 seconds.

Options: Reduce number of new tank make-ups. The department performed the process only twice in the last year. Most tanks will not remain stable enough during the long period between uses.Use smaller tanks. The tanks used are just large enough to accept the standard 12" X 12" board and still allow agitation. Reduce chemical used in each tank. The tanks must be filled to a certain level to cover the boards. This forces a required amount of chemicals to be used to meet the makeup specifications.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Trevor Whitney
Phone: (816) 997-3673	**Phone:** (816) 997-5743
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Copper Electroplating **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-7PCB003 **Specific Waste Type:** Acid

Date: 09-aug-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description: This process electrolytically deposits a 0.001"thick layer of ductile copper to provide electrical contact between layers of a printed wiring board (PWB). The electrolyte used in this operation is an acid copper sulfate plating bath. The main reactions that take place in the solution are the oxidation of copper at the anode and the reduction of copper into the cathode (PWB).

Options: Replenish tank instead of new make-up. Too much time elapses between tank uses. The tank make-up breaks down too far to be reused.Do not rinse boards after plating. Chemicals cannot be left on boards for next process.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Trevor Whitney
Phone: (816) 997-3673	**Phone:** (816) 997-5743
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Hot Roll Lamination of Photoresist **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-7PCB004 **Specific Waste Type:** Plastic

Date: 16-aug-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Trevor Whitney
Phone: (816) 997-3673	**Phone:** (816) 997-5743
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Develop Photoresist **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-7PCB005 **Specific Waste Type:** Caustic

Date: 23-jun-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Trevor Whitney
Phone: (816) 997-3673	**Phone:** (816) 997-5743
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Strip Photoresist **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-7PCB007 **Specific Waste Type:** Caustic

Date: 25-jun-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Trevor Whitney
Phone: (816) 997-3673	**Phone:** (816) 997-5743
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Stereolithography Part Building **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-7SLA001 **Specific Waste Type:** Polymers

Date: 02-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Curing

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Trevor Whitney
Phone: (816) 997-3673	**Phone:** (816) 997-5743
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Safe Secure Trailer Change Out **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-7SST001 **Specific Waste Type:** Polymers

Date: 15-jan-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: SST change out process is the process required to perform a FPU change out on a SST.

Options: Use smaller bottles of Loctite so that we throw less material away due to expired shelf life. We are presently using the smallest containers.Reuse wire ties. Time required to try and disassemble wire ties is cost prohibitive.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Trevor Whitney
Phone: (816) 997-3673	**Phone:** (816) 997-5743
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Hand Soldering **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-80J107006 **Specific Waste Type:** Metal Debris

Date: 15-aug-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description: Hand soldering is performed on printed wiring boards (PWBs) and hybrid microcircuits (HMCs). For the HMCs, hand soldering is used for touch up, and rework. For PWBs hand soldering is used for through-hole component attachment, touch up and rework. All assemblies use 63/37 SnPb solder. During each soldering process, a minimal amount of Kester 197 (4705010) mildly activated rosin flux is used. Operators consciously minimize the flux they use to aid the cleaning process. Prior to and immediately following the hand soldering process, hybrids and printed wiring assemblies are cleaned. The pollution prevention opportunity assessment for cleaning is J210080-C-026-001.

Options: Change solder flux. This would not affect the waste stream of this PPOA but would have a major impact on the cleaning PPOA.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding

Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Solder Pot Tinning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-80J115010 **Specific Waste Type:** Lead

Date: 19-apr-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description:

Options: Reduce the number of solder pots.Use small solder pots.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Michael Gerding
Phone: (816) 997-3673	**Phone:** (816) 997-2952
Fax: (816) 997-4208	**Fax:** (816) 997-3297
Email: wschlosberg@kcp.com	**Email:**

Title: Cutting Fluid Additives **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-8115CUTFLDSMEL **Specific Waste Type:** Oil

Date: 30-jul-1992 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Treatment

Description: The following additives are administered to handle problems associated with water-based cutting fluids (a 5% mixture of concentrate in water) 3700T, Qual Star LF, and grinding fluid Cimtech 200 in the machine tool cutting fluid sump. In the case of excessive foaming, foam depressant is used, a dosage of 1 oz to 100 gals (not to exceed 250 ppm hardness of the cutting fluid solution) and Antifoam NS, dosage 1 oz/200 gals, to dissipate the foam already formed. Bacteria and mold spoors are in the air we breath and settle in the cutting fluids. They will propagate if specific additives are not present in the cutting fluid to keep them under control. All water-based cutting fluids have these additives in them initially; but they become used up (breakdown into simpler less harmful material as they destroy bacteria and mold) with time. In the case of bacteria or mold attack an assortment of materials can be used. They include: additive RY (97022462) a microbiocide, dosage between 8,000 to 16,000 to 1; 00 Wafers (97022468) a solid biocide, dosage 1 wafer/25 gallons of fluid; additive F (97022461) a fungicide, dosage 1,000 to 2,000 to 1; additive SO (97022490) a fungicide, dosage 1,500 to 1,000 to 1; additive MC a biocide/rust inhibitor, dosage between 2,000 and 1,000 to 1. Oderant B (97022460) masks the odor of sour cutting fluid, 1 oz.to 250 gals of cutting fluid mix. These materials are designed to be compatible with inplant disposal methods. Waste management thermal emulsion breaker or ultrafiltration will separate these materials from the waste water stream. These materials can then be disposed of with the used concentrate.

Options: Install oil skimmers on machine sumps to remove tramp oil. This removes the source of food for bacteria and mold growth. This would require collection of oil.Increase life of cutting fluid. Circulate cutting fluids on a daily basis at least 15 minutes to properly oxygenate fluid. Fluid in sump will not stratify and keep additives mixed. This will slow growth of bacteria and mold.Increase life of cutting fluid. Clean chips out of sump on daily basis. Cutting fluid additives are attracted to chips. This frees up additives to attack bacteria and mold.Increase life of cutting fluid. Repair leaks on machine tools and replace worn out way wipers reduces amount of oil flowing into machine sump. Oil is the source of food to bacteria and mold.Increase life of cutting fluid. When machine tool has soured cutting fluid, the sump should be cleaned, chips removed, sump buildup removed and lines flushed before being refilled with fresh cutting fluid. Sources of bacteria and mold eliminated and will not contaminate fresh fluid.Increased life. If schedules indicate machine tool will not be used for a couple of weeks or longer, the cutting fluid

should be removed and the sump and delivery lines left dry. When refilling cutting fluid sump, old cutting fluid in delivery lines and sump should be caught and sent to waste management and not allowed to contaminate fresh fluid.Reduce amount of soured cutting fluid. Check cutting fluid in machine tool on a weekly basis (concentration, pH, dissolved oxygen, rancidity test). Add additives if needed in maintenance doseages and circulate. Reduce amount of soured cutting fluid. Increased fluid life.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Automation Development **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-811AUTO **Specific Waste Type:** Lead

Date: 30-oct-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description: Automation systems, primarily involving industrial robots and computer machine vision systems, are developed in a laboratory environment. Most of the development work involves mechanical assembly of system components and computer programming. However, occasional soldering and bonding operations are performed during the assembly of automation system components. Soldering and bonding operations are performed on open workbenches with room ventilation. Soldering is by hand, with resin core tin-lead solder. Bonding operations are usually performed using small batches of quick setting adhesives. Minimal waste is generated.

Options: Terminate laboratory soldering operations. Utilize a secondary source of soldering to support the development of automation systems. This would eliminate the use of solder in the laboratory, but would likely not reduce total waste streams at FM&T.Eliminate the use of epoxy and adhesives in the development of automation systems. Utilize another department for bonding operations during system development. This would not likely reduce total waste streams at FM&T. Reduce the number of types of adhesives used in the development of automation systems. The current three types of adhesives might be reduced to one or two types.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Beryllium Copper Specimen **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-811BECUSPEC **Specific Waste Type:** Metal Debris

Date: 28-aug-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Machining

Description:

Options:

Site: Kansas City Plant

Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Bonding Assembly **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-811EPOXY **Specific Waste Type:** Polymers

Date: 01-apr-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: The process involves epoxying the connector and optic fiber cable together using EPO-TEK 330 (#96811922). The EPO-TEK 330 comes in a 4-gm bipak which houses the resin and hardener. The kit is premeasured at the vendor in the packets. An epoxy syringe with a flat point needle is used to dispense the epoxy. The kit is cut from the packet and layed flat, then mixed with the enclosed roller. The next step is to cut the kit after mixing and insert the syringe and dispense. After the epoxy has been applied to the optic fiber and connector, the two are crimped together with a metal sleeve. The assembly is placed in a preheated hot plate oven designed for the optic fiber uses (CE #119587). The assembly is heated for 30 minutes at 100 degrees C. This assembly goes to the potting process (Z951811POTTING).

Options: Use connector that requires no epoxy.New connector in design. The fiber will be fused into the connector body which eliminates epoxy, gloves and syringe with needle.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Glass Etching **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-811GLASSETCH **Specific Waste Type:** Acid

Date: 20-oct-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Cutting Tools-Tungsten Carbide **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-811PMLCARBIDE **Specific Waste Type:** Metal Debris

Date: 21-dec-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description: Perishable cutting tools are used in all machining processes. These tools are called perishable because they are used up in the manufacturing process and thrown away. At FM&T there are over 2500 store listings for cutting tools made from tungsten carbide in both the standard and special design categories. Anyone can requisition a toll from a stores crib. Cutting tools are used in all the machining departments at FM&T. Other areas such as electrical components manufacturing areas (circuit board fabrication), maintenance, and laboratories use cutting tools. Tools can be discarded by many different ways. They can be thrown in with the chips, scrap or turned back into the satellite crib. The tools are forwarded to the dull tool crib. At this crib tools that can be reground (carbide circuit board drills) are separated and sent to the outside vendors to be reground. Other tools are separated into carbide and HSS lots. Lots are accumulated and sent to recycling and recovery where they are sold for scrap.

Options: Regrind more tools. Currently only circuit board drills are being reground.Segregate all scrap cutting tools from turnings at machine tool. Allow stores to restock used tools. Currently, when setup on machine tool is taken apart (after a production run), tools are sent to dull tool crib and are scrapped or reground. A slightly used tool still has production life and could be used on another job.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Cutting Tools-High Speed Steel **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-811PMLHSS **Specific Waste Type:** Metal Debris

Date: 21-dec-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description: Perishable cutting tools are used in all machining processes. These tools are called perishable because they are used up in the manufacturing process and thrown away. At FM&T we have over 3000 store listings for cutting tools made from high speed steel (HSS) in both the standard and special design categories. Anyone can requisition a tool from a stores crib. Cutting tools are used in all the machining departments at FM&T. Other areas such as electrical component manufacturers, maintenance, and laboratories also use cutting tools. Tools can be discarded by many different ways. They can be thrown in with the chips, scrap or turned back to the tool crib and they are forwarded to the dull tool crib. At this crib tools that can be reground are separated and sent to the outside vendors to be reground. Other tools are separated into carbide and HSS lots. Lots are accumulated and sent to recycling and recovery where they are sold as scrap.

Options: Regrind more tools. Currently only circuit board drills are being reground.Segregate all scrap cutting tools from turnings at the machine tool.Allow stores to stock used tools. Currently when set upon machine tool is taken apart (after production run), tools are sent to dull crib and are scrapped or reground. A slightly used tool still has productive life and could be used on another job.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478

Email: wschlosberg@kcp.com	**Email:**

Title: Potting Process **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-811POTTING **Specific Waste Type:** Metal Debris

Date: 19-oct-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Encapsulation

Description: In the potting process, the fiber ends are held in position in a block that contains a recess at the fiber ends, and the molten alloy (CERROBEND) is poured into the recessed region. During the potting operation, the block and fiber are located in a hood. It cools at room temperature, the alloy solidifies and holds the fiber ends in place for subsequent lapping and polishing. While pouring the molten alloy into the recessed area around the fiber ends in the block, a small amount of spillage is sometime unavoidable. When the spillage falls on the supporting surface in the hood, it quickly solidifies. The spillage is collected and disposed in an orange 5-gal container labeled "segregated material."

Options: Use a smaller pouring device that would reduce spillage.Use a different potting material.Redesign the holder. Second generation design on connector will not require the alloy.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Fiber Preparation **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-811PREPARATION **Specific Waste Type:** Glass

Date: 30-nov-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: This process removes the polyimide coating from silica capillary tubes or optical fibers in seconds. The FM&T-built stripper is an AC-powered heating unit that is portable. The unit will heat up to 560 degrees C and maintains the temperature once it is warmed up. The amount stripped is about 1 1/4" from the end. The optical fiber is stripped and wiped off with a Kimwipe to get excess material off the surface. The stripper leaves a clean surface ready for cleaving. The optical fiber is ready for the second step, which is to cleave the end of the optical fiber to get a smooth surface on the very end without fracturing the optical fiber. The cleaver used is the York Model FK11, a calibrated cleaver. The FK11 can cleave 180 um to 400 um diameter optical fiber without fracturing the surface. The amount cleaved is 0.750" off the end of the optical fiber. Now the optical fiber is ready for bonding into connectors or bare optical fiber lapping.

Options: Replace the purchase heat stripper. This could mean purchasing a more reliable unit or building one. This would reduce down time in stripping, reduce repair cost, and scrapping of expense cable.Buy optical fiber cables pre-strip. The ends are fragile and require special handling packaging to be developed. Not pursued due to design not being suitable. TQ Team (#316) to educate customer how to purchase the desired type of cable.Design a catalog by the TQ Team to help customers on producing appropriate cable for the job. This will reduce scrapping unusable optical fiber cable and unnecessary tooling.Train one individual to procure optical fiber for the in-plant job or out-of-plant job. Too hard a job to do. This idea will reduce unusable fiber cable from being purchased and scrapped at a later date. Change cleaving from a ceramic piece/diamond blade to a calibrated cleaving device. This will reduce fracturing surfaces and the scrapping cable due to length too short from repeated cleaving.

Site: Kansas City Plant	

Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Depotting Process **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-8123DEPOTTING **Specific Waste Type:** Solvents

Date: 01-jul-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Depotting

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Video Head Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-812LOPHOTO **Specific Waste Type:** Solvents

Date: 10-jan-1992 **Major Activity Type:** Service **Specific Activity Type:** Cleaning

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Depotting **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-83701DEPOT **Specific Waste Type:** Solvents

Date: 05-jan-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Depotting

Description: The test plug depotting process begins with the addition of one gallon of NMP to the depotting vessel. The plugs

to be depotted are placed in the wire basket and the basket is lowered into the depotting vessel. The vessel is then placed on the hotplate, the vessel lid and condenser are fitted in place and the cooling water flow is initiated. Next, the hotplate is turned on, the thermocouple is inserted through the lid until it touches the test plugs, and the hotplate rheostat is adjusted until an NMP temperature of 200 +/- 25 degrees F is obtained. The progress of the depotting process is monitored until the adhesive on the plugs has dissolved in the NMP. Depending on the nature of the adhesive(s) involved, this step in the process can take as little as 24 hours or as long as several weeks. When the plugs are observed to be free of adhesive, the hotplate is turned off and the vessel is allowed to cool to room temperature. Once the vessel has cooled, the cooling water is turned off, the condenser and lid are removed and the wire basket is raised to the top of the vessel and allowed to rest so that residual solvent can drain into the vessel. As soon as the basket stops draining, it is removed from the vessel and the used solvent is poured into a 5-gallon waste solvent disposal container. Then the basket is placed in the depotting vessel and rinse water is added to remove any residual solvent adhering to the basket and test plugs. The basket is once again raised to the top of the vessel and allowed to rest so that residual rinse water can drain. When rinse water draining is complete, the basket is placed on the floor of the hood and allowed to dry overnight. Solvent-laden rinse water in the depotting vessel is poured into a 5 gallon waste solvent disposal container, completing the process.

Options: Eliminate the use of water rinsing and remove residual solvent with a vacuum bake operation.Obtain a still and recycle the solvent as part of the depotting process.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Glassware Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-83702 **Specific Waste Type:** Solvents

Date: 18-nov-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Cleaning

Description: Laboratory glassware is frequently solvent cleaned in the laboratory. This process involves adding an appropriate solvent to the vessel to be cleaned, agitating the vessel to dissolve its contents, pouring the resulting material into a temporary waste container, and repeating. The vessel is then inverted and allowed to dry on a glassware rack. The contents of the temporary waste container are emptied periodically into an approved waste receptacle, which, when full, is shipped to Waste Management for disposal. The solvent most widely used for this process is acetone. The solvents methylene chloride, toluene and isopropanol are used instead of acetone when the latter is ineffective.

Options: Solvent substitution. Purchase a laboratory dishwasher.Use disposable labware whenever possible.Perform second rinse with water instead of solvent.Store methylene chloride squirt bottles empty as opposed to storing them with contained solvent.Pour spent solvent directly into flammable liquid container, skipping intermediate container.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Gel Permeation Chromatograph **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-83702CHROMAT **Specific Waste Type:** Solvents

Date: 11-nov-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Organic Analysis

Description: A chromatograph is an instrument that is used to analyze chemicals. The chromatograph being addressed in this PPOA is one that is used primarily for the analysis of polymers, and is a gel permeation chromatograph (gpc). The solvent used in this chromatograph is tetrahydrofuran (THF). A pump is used to push THF through the chromatograph. Samples are dissolved in 10 mL THF and injected into the flowing solvent stream, where they flow through chromatography columns and a detector, then out into a spent solvent flask.

Options: Buy THF in 4-liter bottles.Re-use sample vials.Use different analytical method.Make smaller samples.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Aluminum Acid Etching **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-8371ETCH001 **Specific Waste Type:** Acid

Date: 06-jun-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Cleaning

Description: This process is referred to as the FPL etch process for preparing aluminum lap shear panels for adhesive testing. The aluminum panels are immersed to a depth of about 3/4 inch in a heated sulfuric acid/chromic acid solution. Once etched to roughen the aluminum surface, the panels are washed with distilled water and dried in air. The panels are then ready for adhesive bonding.

Options: Replace FPL etch with alternate etch.Partially substitute tap water for rinse.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Cleaning with Acetone **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-837CLEAN002 **Specific Waste Type:** Solvents

Date: 31-mar-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: To clean miscellaneous molds, parts and reactors using acetone as a solvent. Solvent is placed on K-Drys and the parts or mold are wiped clean. Acetone is placed into reactors, purged with nitrogen, then heated to dissolve miscellaneous polymeric materials. The polymeric materials are accounted for in separate assessments for their manufacture.

Options: Substitute materials. Use propylene carbonate for urethane foam component cleanup to replace acetone.Alternate

process. Solvent spray cleaning with solvent recirculation. Distillation of spent solvent.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Vapor Degreasing **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-837DEGR001 **Specific Waste Type:** Solvents

Date: 04-jun-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Cleaning

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: EN7&EN8 Polyurethane Test Prep **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-837ENC001 **Specific Waste Type:** Polymers

Date: 15-dec-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Molding

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: RN1501/Cyanacure Polyurethane Prep **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-837ENC002 **Specific Waste Type:** Polymers

Date: 15-dec-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Molding

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Flow Test for DAP and Silicone **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-837FLOW001 **Specific Waste Type:** Polymers

Date: 30-sep-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Molding

Description: This process is used to flow test transfer molding compounds. Thermoset materials are measured and placed inside a transfer pot and compressed under hydraulic pressure into a flow test mold. The plastic material is allowed to cure, then is removed from the mold. All flow test specimens, culls, and sprews are then scraped.

Options: Send entire drum of molding compound to materials engineering, use what is needed, then return the rest to stores.Send unused material back to stores to be placed back into original drum. Reduce quantity sent to materials.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Flow Testing Phenolic and Epoxy **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-837FLOW002 **Specific Waste Type:** Polymers

Date: 20-oct-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Molding

Description: This process is used to flow test transfer and compression molding compounds. For transfer molding compounds, the thermoset materials are measured and placed inside a transfer pot and compressed under hydraulic pressure into a flow test mold. For compression molding compounds, the thermoset materials are measured and placed inside a Williamson flow test mold and compressed under hydraulic pressure. The plastic material is allowed to cure, then it is removed from the mold.All flow test specimens, culls, and sprews are then scraped.

Options: Send entire drum of molding compound to materials engineering, use what is needed, then return the rest to stores. Send unused material back to stores to be placed back into original drum.Reduce quantity sent to materials.Install exhaust vents.

Site: Kansas City Plant

Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: R-Component (BKC 44402-10) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-837FOAM **Specific Waste Type:** Solvents

Date: 16-nov-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: This is the process for making 44402-10R-component. The 44402-10 R-Component is made from four ingredients: two resins (MS 2170294 and MS 2170295), distilled water (SS 98505000), and a surfactant (MS 6500615). All the ingredients are liquids and are typically mixed at room temperature in a planetary mixer. Depending on batch size, alternate mixing equipment may be used. The mixture is stirred for a minimum of 60 minutes, or until the blend is uniform, whichever is longer.The material is then drained from the mixing container into the containers desired for final packaging. Since the containers used for packaging vary (e.g., quart glass jars, gallon glass jars, 5-gallon metal containers), they will not be considered to be an input material to the process. After the mixing container is drained, it is cleaned by spraying down with hot city water. Then it is wiped down with acetone and paper tissues.

Options: Drain more MS2170294 and 2170295 resins from barrels before sending to Waste Management. Approximately 5 gallons remain in each container. This will not be considered at this time due to lack of manpower.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Thermoplastic Injection Molding **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-837LESTER **Specific Waste Type:** Polymers

Date: 20-apr-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Molding

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Compression Molding DAP **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-837MOLD001 **Specific Waste Type:** Polymers

Date: 30-sep-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Molding

Description: This process is used to compression mold plastic test specimens. Thermoset materials are measured and placed inside an electrically heated mold and compressed under hydraulic pressure. The plastic material is allowed to cure, then is removed from the mold. Any flash is then removed by filing.

Options: Send entire drum of molding compound to materials engineering, use what is needed, then return the rest to stores.Send unused material back to stores to be placed back into original drum.Reduce quantity sent to materials.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Compression Molding Phenolics **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-837MOLD002 **Specific Waste Type:** Polymers

Date: 20-oct-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Molding

Description: This process is used to compress mold plastic test specimens. Thermoset materials are measured and placed inside an electrically heated mold and compressed under hydraulic pressure. The plastic material is allowed to cure, then is removed from the mold. Any flash is then removed by filing.

Options: Send entire drum of molding compound to materials engineering, use what is needed, then return the rest to stores.Send unused material back to stores to be placed back into original drum.Reduce quantity sent to materials.Install exhaust vents.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Spray Mold Release Application **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-837MREL001 **Specific Waste Type:** Aerosol Cans

Date: 15-oct-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Coating

Description: This process covers the application of mold releases from aerosol cans. Regardless of the type of mold release, the process remains the same. An aerosol can of mold release is aimed at the mold, either steel or aluminum, the nozzle is depressed, and the spray is directed to the mold surfaces. This process is performed in a hood and overspray is drawn through

the exhaust stack. As the mold release film dries, residual solvent and carrier liquids evaporate from the deposited spray on the mold surfaces and are also drawn into the exhaust stack.

Options: Use Ram 225 in liquid form.Investigate other mold releases which are more environmentally compatible.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Elastomer Test Specimen Preparation **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-837RUBMIL **Specific Waste Type:** Polymers

Date: 15-dec-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Curing

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Transfer Molding **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-837TRAN001 **Specific Waste Type:** Polymers

Date: 26-oct-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Curing

Description: This process is used to mold transfer molding compounds into test specimens. Thermoset materials are measured and placed inside a transfer pot and compressed under hydraulic pressure into a mold. The plastic material is allowed to cure, then is removed from the mold. The culls, sprews and flash are then scraped. The test specimens are sent to the lab for testing.

Options: Send entire drum of molding compound to materials engineering, use what is needed, then return the rest to stores.Send unused material back to stores to be placed back into original drum.Reduce quantity sent to materials.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Ultrasonic Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-837ULTR001 **Specific Waste Type:** Paper

Date: 23-nov-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Cleaning

Description: Cleaning aluminum lap shear finger panels using ultrasonic cleaning. The cleaned finger panels go to the aluminum acid etch process.

Options: Reuse clean Kay Dry for miscellaneous cleaning.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Lab Equipment Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-837WCE-S,I,W **Specific Waste Type:** Solvents

Date: 31-mar-1991 **Major Activity Type:** Laboratory **Specific Activity Type:** Cleaning

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Ronald Koch
Phone: (816) 997-3673	**Phone:** (816) 997-4735
Fax: (816) 997-4208	**Fax:** (816) 997-2049
Email: wschlosberg@kcp.com	**Email:**

Title: Glytal Staking **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-855B015011 **Specific Waste Type:** Polymers

Date: 12-nov-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Staking

Description: The operator pours approximately 30 grams of glyptal (5020450) into a one-oz glass jar (98504000). The operator will use out of the jar until material becomes too thick to flow. The operator opens the glass jar and uses a toothpick (99010401) to apply the glyptal to surfaces between the screw head and base material, approximately 1/3 way around the screw head. The operator will cure the glyptal for 30 minutes minimum at room temperature.

Options: Use syringe in place of toothpick and glass jar.Change to pint cans in place of quart cans.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** T. Joe Riehle
Phone: (816) 997-3673	**Phone:** (816) 997-7154
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Loctite Hardware Staking **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-855B015012 **Specific Waste Type:** Solvents

Date: 04-oct-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Staking

Description: The operator will clean the parts first with alcohol 4601031, allow to air dry, add primer 4702692 to threads of part to be staked, allow to air dry, add Loctite 2502329 to threads, assemble and torque.

Options: Change to glyptal staking.Change to Nylock screws or nuts.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** T. Joe Riehle
Phone: (816) 997-3673	**Phone:** (816) 997-7154
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Engraving **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-855H093009 **Specific Waste Type:** Solvents

Date: 24-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description: Engraving is used to mark design agency suffix, serial number and date code on an identification tag. The operator will engrave an identification tag using a Hermes engraving machine. Black filling compound 5000241 is then added. A texswab 99012918 with alcohol 4601031 is used to clean off excess fill-in compound.

Options: Change to 1/2 pint or pint cans in place of quart cans.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** T. Joe Riehle
Phone: (816) 997-3673	**Phone:** (816) 997-7154
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Ink Stamp Marking **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-855H098010 **Specific Waste Type:** Solvents

Date: 20-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Labeling

Description: Component/assembly surface to be marked is cleaned using a kimwipe moistened with alcohol (4601031). Ink is selected (work directions) and rolled onto a smooth piece of cardboard or Plexiglas: -Epoxy ink is two-part 10-cc pkg that is mixed together (5097160 or 5097161). Ink 5096662/5096162 is rolled out from tube. Ink 5093162 is a stamp pad material. Rubber stamps are used to transfer ink to surface. Stamps are cleaned using kimwipes moistened with alcohol (4601031).

Options: Laser marking - marking of small components and plastic parts.Ink jet - Use jet dot method to eliminate rework and subjective acceptance requirements.Preprinted labels - Use labels and glue or use self-adhesive to attach labels to product.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** T. Joe Riehle
Phone: (816) 997-3673	**Phone:** (816) 997-7154
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Hand Soldering **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-855J107005 **Specific Waste Type:** Lead

Date: 04-dec-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description: Hand soldering for this PPOA is defined as and limited to the actual soldering of components into printed wiring assemblies, the verification of solder joints as may be required involving flux removal, the touch-up of solder joints as required, and the clipping of excess component lead and wire lengths.

Options: Drag solder instead of hand soldering. Build quantity is not high enough to be economically feasible compared with evaluation/prove-in time required.Solder using non-solvent type removable flux. Flux amount removed with foam tip swab using alcohol does not justify time/money expenditures.Do not "spot clean" solder joints with alcohol-saturated swab in order to verify solder joints.Spray clean entire PWB after soldering instead of swab cleaning before verifying solder joints.Do not remove/rework solder using solder wick. Use desoldering iron to remove solder instead of using solder wick, avoiding the cost of solder wick.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** T. Joe Riehle
Phone: (816) 997-3673	**Phone:** (816) 997-7154
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Component Tinning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-855J118004 **Specific Waste Type:** Solvents

Date: 23-sep-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Soldering

Description: Components are tinned to provide a solderable surface. First, the component terminations or leads are cleaned by

rinsing in d-limonene or alcohol. The leads/terminations are dipped in solder flux and then in molten solder at approximately 230 deg C. After solder dipping the terminations/leads are cleaned by dipping in d-limonene and isopropyl alcohol. The solvent is dried in an exhausted hood. The resulting solder surface must be 95% or the process is repeated. The solder is melted in a pot that holds about 3.5 lbs.of 63-37 tin-lead solder alloy, which is replaced after each 30 days of use.

Options: Change solder.Use alternative solvents.Procure solderable components and eliminate tinning.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** T. Joe Riehle
Phone: (816) 997-3673	**Phone:** (816) 997-7154
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Covercoat with Acrylic **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-855K125008 **Specific Waste Type:** Aerosol Cans

Date: 12-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description: Clean acrylic spray coating is used to protect ink markings. The spray is applied from an aerosol can. Cardboard masks are used to protect the assembly from overspray. The masks are fashioned by the operator at the time of application.

Options: Replace the spray on covercoat with brush on covercoat. Would limit the solvents and eliminate the aerosol propellants and overspray.Use inks that don't require covercoats.Replace ink marking with non-ink marking. Engrave tags, pre-marked tags and labels are currently being used.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** T. Joe Riehle
Phone: (816) 997-3673	**Phone:** (816) 997-7154
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Touch-Up Painting **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-855K130007 **Specific Waste Type:** Paint

Date: 24-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Painting

Description: Product requiring repair (painted aluminum case) is lightly sanded to remove raised metal edges and provide a surface for better adhesion. Repair area is wiped clean with cloth moistened with alcohol 4601031 and blown dry using nitrogen 4543001. Paint MS 5001101 (mint gray) is stirred or shaken to resuspend solids in paint. Paint is poured into an aluminum dish (approx.5 grams); material is applied using an artist brush (or equipment - pipe cleaner, foam swab, q-tips) to touch-up the exposed surface. Paperwide is used to remove excess material and/or used to blot the applicator.

Options: Plate the hardware with alodine. Eliminate need for painting and more resistant to scratches.Redefine product acceptance criteria.Use a paint pen to reduce amount of paint and generated solid waste.

Site: Kansas City Plant	

Site Coordinator: William H. Schlosberg	**Team Leader:** T. Joe Riehle
Phone: (816) 997-3673	**Phone:** (816) 997-7154
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Gross Leak Test **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-855L146016 **Specific Waste Type:** Solvents

Date: 11-aug-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Mechanics

Description:

Options: none - Fluorinert

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** T. Joe Riehle
Phone: (816) 997-3673	**Phone:** (816) 997-7154
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Clean Tape Drives **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-873001 **Specific Waste Type:** Solvents

Date: 01-jul-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Edward Welborn
Phone: (816) 997-3673	**Phone:** (816) 997-4788
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Lubricate Equipment **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-873002 **Specific Waste Type:** Grease

Date: 31-aug-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Equipment

Description:

Options: Substitute material

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Edward Welborn
Phone: (816) 997-3673	**Phone:** (816) 997-4788
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Freon TF **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-912-01 **Specific Waste Type:** Air Emissions

Date: 11-nov-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Building

Description: The Getz Marc VI is a self-contained testing and cylinder drying system designed for safety and simplicity of operation. 1) Hydrostatic testing of fire extinguisher cylinders. 2) Testing agent: trichlorotrifluoroethane. 3) Six-minute process (at 150 P.S.I. for 1 minute). 4) Empty cylinder. 5) Drying cylinder.

Options: Excess Equipment - Current process is contracted out to commercial vendor. Keep for future use. Manufacturer is developing a replacement test agent. Trade in "old" extinguishers for new ones.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Milton Bryant
Phone: (816) 997-3673	**Phone:** (816) 997-4111
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Fixed Foam Sprinkler Systems **Major Waste Type:** Sanitary Waste

PPOA ID Code: KCP-Z951-912-02 **Specific Waste Type:** Wastewater

Date: 11-dec-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Building

Description: The Fire Department maintains a ready supply of Aqueous Forming Foam (AFFF) in fixed sprinkler systems to provide for suppression of flammable liquid fires. In three areas of the plant automatic sprinklers are equipped with AFFF to cover high hazardous areas. They are: #2 Fuel Oil Tanks at the West Powerhouse, Central Heater Station, and the Chemical Stores Building. For the three automatic sprinkler systems the foam is isolated from the system when DOE and NFPA required testing is performed. However, there is residual AFFF solution in the system. The test water from all three areas is collected in carboys as a precaution to avoid a significant AFFF discharged to ground. This water is then disposed of into the sanitary sewer per current guidance from Waste Management.

Options: Test the system less frequently. This would not meet DOE and NEPA requirements.Remove the foam systems. Try to remove the water from the solution and reuse the foam concentrate.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Milton Bryant
Phone: (816) 997-3673	**Phone:** (816) 997-4111

Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Wet Pipe Sprinkler Systems with Antifreeze **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-912-03 **Specific Waste Type:** Antifreeze

Date: 21-feb-1993 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Building

Description: Antifreeze solution is added to portions of wet pipe fire sprinkler systems that are exposed to freezing temperatures. The antifreeze solution is tested annually in the fall. The small amount of test solution (about 1 quart) is given to Waste Management for disposal.

Options: Do not test antifreeze strength. Would place the KCP out of compliance with required DOE Orders and NFPA Codes.Reuse antifreeze solutions. Possible, but due to small amount and poor quality of Fire Protection water, this is not currently practical.Reuse "RV" type antifreeze. This option is currently under advisement by Fire Protection Engineering.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Milton Bryant
Phone: (816) 997-3673	**Phone:** (816) 997-4111
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Dry Chemical Fire Extinguishing Agents **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-912-04 **Specific Waste Type:** Chemicals

Date: 07-jul-1993 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Building

Description: The Fire Protection department provides dry powder fire extinguishers for the KCP in accordance with DOE Order 5480.7A "Fire Protection" and NFPA Requirements, CFR 1910.36(d)(2). To efficiently meet the requirements, a dry powder recharging facility is contained within the fire station. This facility is equipped to provide routine maintenance, refilling and recharging of 478 dry powder extinguishers. NOTE: Hydrotest of cylinders is currently conducted by an outside company.

Options: Halt operations. Continue operations as is.Do all hydrotest in house, increase operations.Consolidate all fire extinguishers to ABC type; this would eliminate BC and Super K chemicals from the process.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Milton Bryant
Phone: (816) 997-3673	**Phone:** (816) 997-4111
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Halon 1301 and 1211 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-912-05 **Specific Waste Type:** Air Emissions

Date: 08-sep-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Maintenance, Building

Description: Halon 1301 is used at the KCP in total-flooding fire extinguishing systems to protect high-value computer rooms and other areas from an extensive fire loss. All Halon 1301 systems are automatically activated by using dual or cross-zone fire detection and have an abort feature to prevent discharge in case of a false alarm. The systems also can be operated by a manual switch. Upon activation of the pre-discharge and discharge circuits, audible and visual evacuation alarms are provided to evacuate the protected area. The discharge alarm is typically activated 15 sec to 1 min prior to Halon release to allow for evacuation. Halon 1301 systems are located at: 1.Computer Data Center #2, 2.SECOM, 3.Tandem Computer Room, 4.Tandem Computer Room, 5.Flexible Manufacturing System Computer Room, 6.Patrol Console Room, 7.East Powerhouse Control Room, and 8.Polymer Production Facility. Halon 1211 is used in hand held portable fire extinguishers. At the KCP this type of extinguisher is used to protect the control room and electrical distribution equipment at the Industrial Waste Pretreatment Facility.

Options: Eliminate existing Halon Systems.Do not install new Halon Systems.Replace Halon with a more friendly agent.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Milton Bryant
Phone: (816) 997-3673	**Phone:** (816) 997-4111
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Carbon Dioxide Fire Extinguishing Agent **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-912-06 **Specific Waste Type:** Air Emissions

Date: 22-oct-1993 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Building

Description:

Options: Eliminate CO2 usage.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Milton Bryant
Phone: (816) 997-3673	**Phone:** (816) 997-4111
Fax: (816) 997-4208	**Fax:** (816) 997-3331
Email: wschlosberg@kcp.com	**Email:**

Title: Desiccated Cabinets **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-92DESICCATE **Specific Waste Type:** Inorganic Solid

Date: 29-jun-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Activation

Description: The desiccated cabinets provided a low humidity storage capability for any parts or assemblies which may need more protection from moisture than the 30 to 50% relative humidity in the clean rooms provide. Solenoid parts made from Hiperco 50 material and other parts such as Kovar, ceramics, and contacts are protected from moisture in the desiccated cabinets any time the parts are not in work. One department has about 47 small (1 cu ft.), 79 medium (4 cu.ft.), and 22 large (22 to 50

cu.ft.) desiccated cabinets. These cabinets are located throughout the entire department to make desiccated storage convenient from anywhere in the department. The humidity in the cabinets is reduced using desiccant bags (8500004-03-813) or by having dry nitrogen gas flowing through the cabinet. The desiccant material is silica gel in a sealed Tyvex bag. The desiccant bags are changed each week. Desiccant bags are also used in the dry nitrogen purged cabinets to guard against the possibility that the flow of nitrogen from the plant supply system might be shut down. A humidity indicator card (PN 605872-00) is placed in each cabinet to monitor humidity level.

Options: Use cabinets with built-in dehumidification equipment. Two types are available: 1) Refrigeration coils to draw off moisture and 2) automated desiccant dehumidifiers which regenerate the desiccant automatically. Attach dry nitrogen to each cabinet. Nitrogen gas can be used to purge and dry the air in a cabinet. Some cabinets are currently using nitrogen and all could be attached. We currently use desiccant as a backup in case the flow of nitrogen is cut off.Consolidate to larger but fewer cabinets. This would not be as convenient, but might give better utilization and reduce waste. Recycle desiccant. An oven bake will remove moisture and allow the desiccant to be reused.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Epon 828 / Versamid 125 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-92EPON828/125 **Specific Waste Type:** Polymers

Date: 02-jan-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: This process involves staking, bonding, and sealing of features on miniature mechanisms. The epoxy is generic versions of Epon 828 Versamid 125, and Car-o-sil. The equipment used includes exhausted work station, precision balance, miscellaneous tools for mixing and application, and convection oven. The general epoxy adhesive bonding specification (9916510) is a requirement.

Options: Change minimum mix requirement in 9916510 to something less than 50 grams.Supply material in smaller containers to prevent shelf life expiration prior to material being used up. Consolidate types of epoxies used.Procure epoxy in special dispenser-type packages with premeasured quantities or that premix upon application.Do not discard material in work, if shelf life of epoxy lot can be extended.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Epon 828 / Versamid 140 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-92EPON828/140 **Specific Waste Type:** Polymers

Date: 01-apr-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: This process is used to bond the eccentric bushing in place of the escapement assembly. This application is

different than similar operations because generic versions of the epoxy are not allowed. The equipment used includes exhausted work station, precision balance, miscellaneous tools for mixing and application, clean bench and convection oven. The traveler calls for 60 PBW Epon 828 (2140285) with 40 PBW Versamid 140 (2201225) and requires a 50-gram minimum mix.

Options: Supply material in smaller containers to prevent shelf life expiration prior to material being used up.Reduce size of minimum mix call out in traveler to something less than 50 grams.Consolidate types of epoxies used.Procure epoxy in special dispenser type packages with premeasured quantities or that premix upon application.Schedule work for improved utilization of the epoxy quantity mixed.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Lubrication (Vydax) **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-92LUBE **Specific Waste Type:** Solvents

Date: 05-aug-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description: Vydax AR is used as a lubrication on several miniature mechanisms assembled. Vydax AR fluorotelomers are white waxy particles of polytetrafiluoroethylene (PTFE). The fluorotelomer dispersions as supplied are diluted with Freon TF solvent. Additional dilution with Freon TF (or PCA) is required for application. A very thin film of the fluorotelmer material is left on the part when the Freon evaporates. The normal process of applying a Vydax coating is to dip the parts in the solution and then allow the parts to dry. The amount used is small because it is used on only a limited number of miniature parts. The most common use at this time is on miniature bearings.

Options: Investigate fluorotelomer lubricants which do not require CFCs. Vydax IPA is a new material which uses isopropyl alcohol instead of Freon as the material used to thin the lubricant for application. Other means of thinning such as super critical CO2 is also a possibility.Alternate types of lubricants to eliminate CFCs. Solid film lubricants (molybdenum disulfide, Dicronite, or TiC) could be applied to the race to provide lubrication. Vapor deposition of a diamond film is also a possibility.Change bearing design to eliminate need for lubrication. Consider using silicon nitride balls or redesign assemblies to put less load on the bearings. The need for lubrication should be reviewed to determine if lubrication is really necessary.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Miscellaneous Mechanical Assembly **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-92MISC **Specific Waste Type:** Paper

Date: 21-dec-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The assessment is designed to cover the miscellaneous operations performed throughout the department which use materials not covered by other specific assessments. Miscellaneous items such as the wipe down solution and the wiping clothes

used to wipe off clean benches each morning are included. Other items include hand tools, disposable garments, sticky mats, gloves and finger cots, assorted paper forms, isopropyl alcohol, and wire used on the tensile testers.

Options: Train people to be more aware of waste and teach methods to improve utilization of these miscellaneous materials needed to support mechanical assembly.Go to a paperless system where possible. Travelers are available on screen, except for illustrations. Copies of travelers are still required on certain jobs. When copies are ordered, several extra sheets are supplied which must be discarded.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Bond with Hysol 956 **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-94BOND956 **Specific Waste Type:** Polymers

Date: 09-oct-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: The adhesive bonding process is a process in which components are assembled into electromechanical matched machined housings. A HYSOL 956 adhesive bonding mixture (2180985) and Amino Silane (4604395) are mixed under an exhausted hood for application onto the housings. The purpose of the bonding process is to fill the gaps between the ferrite C-cores and the stainless steel housings. This procedure not only bonds the C-cores in place, but also seals the transformer assembly cavity, preventing contamination. The process directions instruct the assembler to mix the HYSOL 956 (50 grams of Part A and 29 grams of Part B) with 0.6 grams of Amino Silane. The mixture is weighed in a plastic cup, mixed with a tongue depressor, and placed in a plastic syringe. The syringe is then used to apply the adhesive bonding mixture to the components.

Options: Supply material in smaller containers to prevent shelf life expiration waste.Reduce the minimum mix batch size.Consolidate types of epoxies utilized.Supply special dispensers in kits that are either pre-weighed and/or premixed.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Bond with Polysulfide **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-94BONDPOLYSUL **Specific Waste Type:** Polymers

Date: 09-oct-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: The polysulfide bonding process is a process in which components are assembled into electromechanical match machined housings. A polysulfide adhesive bonding mixture (4115062) of 10 grams of Part A and 1 gram of Part B is mixed under a exhausted hood for applications as follows: 1. Ferrite C-cores are bonded to header assemblies and cured at room temperature. 2. Transformer windings are bonded on to the C-cores and cured at room temperature. 3. Polysulfide is painted onto the winding leads for insulation purposes and cured at room temperature. The polysulfide mixture is weighed in an aluminum tray, mixed with a tongue depressor, and placed in a plastic syringe. The syringe is then used to apply the adhesive

bonding mixture to the components.

Options: Supply material in smaller containers to prevent shelf life expiration waste.Reduce the minimum mix batch size.Consolidate types of epoxies utilized.Supply special dispensers in kits that are pre-weighed and/or pre-mixed.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Miscellaneous Processes **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-95ALL **Specific Waste Type:** Paper

Date: 13-mar-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description:

Options: Use reusable wipes as a replacement for the currently used paper wipes.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Alloy Machining **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-95ALLOY **Specific Waste Type:** Drilling Fluids & Muds

Date: 14-feb-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description: The alloy steel machining process uses a variety of stock materials. This includes castings, forgings, and bar stock. The bulk of the machining is performed with Numberical Control machine centers. Other machining such as lathes, drills, mills, gun drills, borematics and grinders are used to complete the machining.

Options: Powder metallurgy. Powder metallurgy would allow some parts to be produced with little or no machining.Make more parts from castings/forgings. This would reduce the quantity of waste material produced.Design parts to use as cast/forges surfaces. This could reduce machining and flow time.Eliminate one or more coolants. Eliminating a coolant will reduce storage, accounting, tracking and handling. Replace all coolants with one all-purpose coolant. More efficient disposal, long life, can be recycled.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016

Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Aluminum Machining **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-95ALUM **Specific Waste Type:** Drilling Fluids & Muds

Date: 14-feb-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description: The aluminum machining process uses a variety of stock materials. These include castings, forgings and bar stock. The machining is performed on Numerical Control machine centers, lathes, mills, drills, gundrills, borematics and grinders.

Options: Powder metallurgy - This would allow some parts to be produced with little or no machining. Make more parts from castings/forgings. This would reduce the quantity of waste.Design parts to use as cast/forged surfaces - this could reduce machining and flow time.Eliminate one or more coolants - eliminating a coolant will reduce storage accounting, tracking and handling, etc.Replace all coolants with one all-purpose coolant- more efficient disposal, long life, can be recycled.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Beryllium Copper Machining **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-95BECU **Specific Waste Type:** Drilling Fluids & Muds

Date: 03-jan-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description: Turn and cut off (lathe). Machine external features (mill).Machine internal features (lathe). Drill tube holes (gundrill). Machine piston holes (borematic).

Options: Use different sizes of material - more efficient sizes would reduce the quantity of chips produced.Eliminate one or more coolants.Eliminating a coolant will reduce storage accounting, tracking, handling, etc.Replace all coolants with one coolant for all equipment. More efficient disposal, long life, can be recycled.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Brass Machining **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-95BRASS **Specific Waste Type:** Drilling Fluids & Muds

Date: 14-feb-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description: Our brass product is primarily a lathe operation. Brass product like all other metal machining can be processed on lathes, mills, drills, Numerical Control machine centers and other specialty machines.

Options: Eliminating a coolant would reduce storage, accounting, tracking and handling. A single all-purpose coolant would allow more efficient disposal, less handling. It would be recycled and would have a longer life.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Contact Pin Machining **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-95PIN **Specific Waste Type:** Drilling Fluids & Muds

Date: 07-feb-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Plastic Machining **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-95PLASTIC **Specific Waste Type:** Drilling Fluids & Muds

Date: 14-feb-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description: We currently machine only one plastic part. The machining is performed using Numerical Control machine centers. This machining could be performed on conventional lathes, drills and mills.

Options: Injection molding of parts would produce the minimum amount of waste.Eliminating a coolant would reduce storage, accounting, tracking and handling. A single all-purpose coolant would allow more efficient disposal, less handling, could be recycled and may have a longer life.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick

Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Titanium Machining **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-95TITANIUM **Specific Waste Type:** Drilling Fluids & Muds

Date: 14-feb-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description: Titanium product is primarily machined on numerical control (NC) machine centers. However, titanium can be machined the same as other metals on NC machining centers, lathes, mills, drills and other specialty machines.

Options: Eliminating a coolant would reduce storage, accounting, tracking and handling.A single all-purpose coolant would allow more efficient disposal, less handling. It could be recycled and would have a longer life.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Conductive Bonding **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-96CONBOND **Specific Waste Type:** Polymers

Date: 18-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: Electroplating of certain types of precision machined parts requires attachment of a rod to support the part in the plating solution and provide electrical contact. A conductive epoxy adhesive, CHO-BOND (57004005), is used for this attachment. The two-component adhesive material is supplied in a small, sealed pack in which the materials are mixed. Adhesive is applied to the support rod which is placed against the part and held with a constant force. The material is cured in a low temperature oven. Unused epoxy cures in the package at room temperature and is discarded with normal refuse. The operation is performed by an operator trained and qualified in chemical handling operations.

Options: Maximize batch processing to allow more parts to be bonded from a single mix of material.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Solvent Surface Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-96SOLVENTCLN **Specific Waste Type:** Solvents

Date: 18-nov-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Small metal parts are cleaned of minor surface contaminants such as ink marks, masking material, and handling residue in preparation for packaging, inspection, or subsequent processing operations. The process involves application of acetone (4616011) by squeeze bottle spray or immersion in a small container. This is followed with a rinse in isopropyl alcohol (4601035) and air dry. The solvent operations take place in a flammable-rated fume hood and are performed by operators trained and qualified in chemical handling operations.

Options: Reduce alcohol use for general solvent rinsing and replace with water or detergent solution rinsing where feasible.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Roy Hedrick
Phone: (816) 997-3673	**Phone:** (816) 997-3016
Fax: (816) 997-4208	**Fax:** (816) 997-5478
Email: wschlosberg@kcp.com	**Email:**

Title: Loosen Nuts and Bolts - Maintenance **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z951-KNB014 **Specific Waste Type:** Paper

Date: 01-jun-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Coating

Description:

Options: none

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Kenneth Silvers
Phone: (816) 997-3673	**Phone:** (816) 997-3630
Fax: (816) 997-4208	**Fax:** (816) 997-7325
Email: wschlosberg@kcp.com	**Email:**

Title: OP Q5 **Major Waste Type:**

PPOA ID Code: KCP-Z999-83303 **Specific Waste Type:** Plating

Date: 25-sep-1992 **Major Activity Type:** **Specific Activity Type:**

Description:

Options:

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson

Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: CC-Adhesive **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z999-83310 **Specific Waste Type:** Polymers

Date: 30-sep-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: In the CC-Adhesive process, tabs are bonded to the part surface using Armstrong A-2 epoxy adhesive. Adhesive is prepared in 5-gm batches regardless of the number of tabs and parts to be bonded. Activator E is added to the resin at 6% of the weight of the resin. The resin and activator are mixed with a wooden tongue depressor. The mixture is degassed in a vacuum chamber for 30 seconds. The resin is now ready to apply. The resin is applied to one surface of each tab with a toothpick. Approximately 0.06 gm is applied to each tab. The tabs are set in place and allowed to cure at room temperature for 3 hours. The excess adhesive is also cured at room temperature for three hours and disposed in the regular trash.

Options: Smaller batch sizes.Freeze and reuse remainder of batch.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: CC-Silicone **Major Waste Type:** Hazardous Waste

PPOA ID Code: KCP-Z999-83314 **Specific Waste Type:** Polymers

Date: 30-sep-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:** Joining

Description: Parts are bonded to liners with the following procedure. 1. Solvent clean external surfaces of liners to degrease using alcohol. Handle the liners with clean gloves after cleaning. 2. Apply 1/4" diameter spacers on outside of liner, as required by part type, to maintain space between liner and processed part. Spacers can be made from plastic film or tape held to the surface of the liner. (Estimated thickness of spacers to use is 17-20 mils). 3. Tape aluminum foil or water-resistant paper to the outside of the processed container. This is to keep the overflow resin off the part. Also put a layer of tape around the inside of the liner along the top edge to prevent overflow resin from getting on the inside of the liner. Panels are mounted in a bonding fixture. 4. Mix 1:1 Dow 567 A&B resin. (Estimate batch size from the following table PANEL SET 50gm A : 50gm B ZERO 150gm A : 150gm B). 5. Level the container (panel fixture). Carefully pour mixed resin into processed container (onto panel) to avoid bubble formation. Allow to spread uniformly over the bottom of container (panel). 6. Carefully place liner inside the processed container (over each panel). Locate the cutout over areas where tabs are located. 7. Add weight to the liner to allow resin to slowly rise to the surface of the gap between the two parts. Allow excess to run over the sides. Clean excess if required so that the part can be put into the oven. 8. Cure material for 3 hours at 176 degrees F. 9. Remove part from oven when cured or allow to cool in oven. When cool remove the foil, tape and masking materials from the finished part. Cut away flash. (Do not Mill).

Options: Reduce batch size to minimum level required for mixing.Design fixture for bonding containers.Engineering will provide chart of quantity of resin to mix based on the number and type of jobs to be bonded in one session.Change adhesive to a one-part adhesive that requires no mixing.

Site: Kansas City Plant	
Site Coordinator: William H. Schlosberg	**Team Leader:** Donald Watson
Phone: (816) 997-3673	**Phone:** (816) 997-4092
Fax: (816) 997-4208	**Fax:** (816) 997-7068
Email: wschlosberg@kcp.com	**Email:**

Title: ,KCP-Z951-337ADHS001 **Major Waste Type:** Polymers

PPOA ID Code: Kansas City Plant **Specific Waste Type:** Laboratory

Date: **Major Activity Type:** Joining **Specific Activity Type:** 15-nov-1993

Description: none

Options: Hazardous Waste

Site: Kansas City	
Site Coordinator: (816) 997-3673	**Team Leader:** (816) 997-4735
Phone: (816) 997-4208	**Phone:** (816) 997-2049
Fax: wschlosberg@kcp.com	**Fax:** rkoch@kcp.com
Email: Ronald Koch	**Email:**

Title: Vapor Degreaser **Major Waste Type:** Hazardous Waste

PPOA ID Code: NTS-LAP21410.001 **Specific Waste Type:** Solvents

Date: 19-jul-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: The Fabricated Systems Support Section is using 1,1,1-trichloroethane in the Unique Industries, Inc. Vapor Degreaser (VD) to remove rosin base flux from PC boards, cables, and other components. The VD is comprised of a steel tank with two compartments, one for cleaning and one for rinsing. It comes equipped with an automatic roll-top cover and a ventilation system which assists to control air emissions. It is designed with sufficient capacity to generate the solvent vapor necessary to clean up to a specific workload in pounds per hour. The VD may be used as a dip tank or vaporization process for cleaning parts. In these processes, the work is positioned in a specially designed basked and suspended so the maximum amount of solvent or vapor contacts the work during the entire cleaning cycle. The time for cleaning depends on the amount of flux residue. Parts are removed from the VD, compressed air is used to dry off the remaining liquid or residue left on the finished product. Acid breakdown of solvent in a degreaser is accompanied by discoloration and a sharp pungent odor emanating from the machine. A pH level below 6.0 will result in solvent decomposition. At this time the solvent will be removed and placed in the original one-gallon container for disposal. The PPE requirement for workers, are rubber gloves and goggles. All activities are recorded in the VD log book.

Options: Option 1: An alternative for trichloroethane will reduce a RCRA/CERCLA hazardous waste stream, disposal cost, and liability. It will also reduce air quality permits, employee hazards, and the ash created when burning the spent solvent by the recycler.Option 2: Using a non-resin solder would eliminate the potential hazardous chemical that has been relied on for cleaning off the flux from circuit boards and other soldered assemblies.Option 3: The current vapor degreaser could be retrofitted with an aerator, changing to a non-heated process, and using a non-hazardous cleaner to clean off the resin flux.Option 4: Replace the vapor degreaser with a new process. This would involve the purchase of new equipment.Option 5: No Action.

Site: Nevada Test Site (NTS)	
Site Coordinator: Amo Sanchez	**Team Leader:** Amo Sanchez
Phone: 702-295-2985	**Phone:** 702-295-2985
Fax: 702-295-5229	**Fax:** 702-295-5229
Email:	**Email:**

Title: Fluorescent Light Tube Disposal **Major Waste Type:** Hazardous Waste

PPOA ID Code: NTS-NLVFD201.001 **Specific Waste Type:** Fluorescent Lamps

Date: 19-jul-1994 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Building

Description: Spent fluorescent light tubes are removed from their lighting fixtures and placed into their original containers less the packaging material. The tubes are then taken to storage until they can be crushed. DISPOSAL METHOD USED: A Proveda Fluorescent Tube Disposal Unit is used to crush 4 and 8 foot light tubes. The crushing mechanism is attached to a lid which fits on the top of a 55 gallon drum that will hold approximately 800, four-foot crushed tubes. The Proveda disposal unit comes equipped with a 3-stage filtering system for collection of mercury vapor and/or byproducts released during the resulting in the tubes being crushed into fine particles of glass and aluminum. This produces small particles of a large product in a more compact form for containment prior to final disposal. When the drum reaches capacity, the Proveda Unit is removed and a secure lid is placed on the opening of the drum. The drum is then taken to a 90-day accumulation waste pad, awaiting pickup for disposal. SAFETY PROCEDURES USED: The crushing process is done in a well ventilated area. The filtering system of the Proveda Unit is vented to the outside ambient air. The operator wears a full shielded face mask, and uses a respirator and gloves when changing out the three filters in the Proveda Unit filtering system. The waste is then disposed of in an EPA-certified landfill.

Options: Option 1: Pursue a recycling contract to eliminate the disposal to an EPA-certified landfill. The recycling company of LIGHTING RESOURCES, INC., located in Ontario, CA., has been chosen as the best recycler to handle the Fluorescent Light Tube recycling. They have developed proprietary equipment that allows the separation of fluorescent lamp components. The aluminum end caps are mechanically removed from the intact fluorescent tubes and sent for recycling.Option 2: Green Light Participation: EPA promotes energy-efficient lighting by requesting institutions to sign a MOU with the Agency. This MOU commits the institution to the installation of energy-efficient lighting in 90 percent of their space nationwide over a 5-year period. This applies only where it is profitable and where lighting quality is maintained or improved. The corporation will profit by increasing their workerÕs productivity. Air pollution will be reduced due to a decrease in electricity generation.

Site: Nevada Test Site (NTS)	
Site Coordinator: Amo Sanchez	**Team Leader:** Amo Sanchez
Phone: 702-295-2985	**Phone:** 702-295-2985
Fax: 702-295-5229	**Fax:** 702-295-5229
Email:	**Email:**

Title: Solid/Liquid Separation of Drilling Mud UGTA **Major Waste Type:** Low Level Waste

PPOA ID Code: NTS-UGTA **Specific Waste Type:** Aqueous

Date: 06-sep-1994 **Major Activity Type:** Environmental Restoration **Specific Activity Type:** Monitoring

Description: This PPOA is an Environmental Restoration (ER) process. This process will involve the Operations at the Underground Test Area (UGTA) Operable Unit Well Sites, and will include drilling through the unsaturated zone. The operation will include a drill rig, one or two lined sumps, and an infiltration/evaporation area. The drilling fluids used may

include water, drilling mud, and/or polymer solutions, and detergent introduced by compressed air. Drilling fluid additives are used to maintain bore hole integrity and an aid to remove cuttings from the bore holes. Currently the fluids generated during the drilling and initial well development operations are directed into the lined sump(s) through a discharge line. The sump(s) allow the cuttings and heavier solids to settle from the drilling fluids. The liquids remaining may be conveyed to an infiltration basin or a treatment disposal facility. Subsequent to drilling operations, cuttings and heavier solids are allowed to settle from drilling fluids. During this period, drilling fluids are also evaporating.

Options: Option 1: On-site adaptation of a solid/liquid separator. A solid/liquid separator breaks the return stream of the drilling fluids into liquid, solids and air. The solids collected range from 1Ó cuttings to coarse sand and are released onto a lined pad, keeping the solids separate from the liquid. Adapting an existing solid/liquid separator is the least expensive option and the most viable.Option 2: The solid/liquid separator can be manufactured off-site to the required specifications. The contracted manufacture may be required in the future to do any needed modifications or repairs to the unit at an extra charge.Option 3: Purchase of a new solid/liquid separator. A liquid/solid separator breaks the return stream of the drilling fluids into liquid, solids and air. The solids collected range from 1Ó cuttings to coarse sand and are dumped to the waste sump. The purchase of a solid/liquid separator from an outside vendor would have to be limited to the vendorÕs models on hand. Any modifications or repairs would be an additional expense.Option 4: Rental of a solid/liquid separator. A solid/liquid separator from an outside vendor would eliminate ownership and have a low initial cost, but over the time frame of one year renting would be the most expensive option.

Site: Nevada Test Site (NTS)	
Site Coordinator: Amo Sanchez	**Team Leader:** Debbie Krogbin
Phone: 702-295-2985	**Phone:** 702-794-1742
Fax: 702-295-5229	**Fax:** 702-794-1794
Email:	**Email:**

Title: Used Oil Management Implementation Plan **Major Waste Type:** Hazardous Waste

PPOA ID Code: ORR-10 **Specific Waste Type:** Oil

Date: **Major Activity Type:** Manufacturing **Specific Activity Type:**

Description: The study identified twenty recommendations. Some of the improvements suggested include reduced used oil generation at the source, burning used oil for energy recovery, reprocessing used oils, and incinerating used oils. Implementation and feasibility s

Options:

Site: Oak Ridge Y-12 Plant	
Site Coordinator: Sheila Poligone	**Team Leader:**
Phone: 423-241-2568	**Phone:**
Fax: 423-241-2857	**Fax:**
Email: poligonese@ornl.gov	**Email:**

Title: TSCA Operations PWA **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: ORR-5 **Specific Waste Type:** Sludge

Date: 27-jan-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Treatment

Description: Prepared TSCA Operations PWA.

Options:

Site: Oak Ridge National Laboratory	
Site Coordinator: Dave Tull	**Team Leader:** Steven Kirslis
Phone: 423-576-0126	**Phone:** (423) 483-0666
Fax: 423-576-6222	**Fax:** (423) 481-0003
Email: tullde@ornl.gov	**Email:**

Title: Fluorescent Lamps **Major Waste Type:** Hazardous Waste

PPOA ID Code: ORR-C001Y-12 **Specific Waste Type:** Fluorescent Lamps

Date: 01-feb-1994 **Major Activity Type:** Maintenance **Specific Activity Type:** Relamping

Description: Develop and review Energy Systems fluorescent light bulb PWA.

Options: Install reflectors. (Option 414). Increase light emitted from a fixture and allow fewer lamps (T-10s or T-8s).Use high-output lamps. (Option 413). Replacement of T-12 with T-10 fluorescent lamps could be used with existing ballasts. Fewer Lamps could be used in conjunction with reflectors to focus more light into the work area for an equal lighting quality.Use non-mercury lamps. (Option 412). Although use of conventional incandescent lamps is discouraged due to their high energy demand, research is currently underway to develop non-mercury fluorescent lamps and ceramic filament incandescent lamps that last longer and use less energy than conventional metal filament incandescent lamps.Reduce lighting. (Option 411). Fewer lamps could be used in work areas where lighting could be reduced without decreasing productivity or operations.Install occupancy detectors. (Option 415). Motion sensors could be installed in rooms that are empty for several hours at a time.Use smaller lamps. (Option 310). Currently used T-12 lamps could be replaced with T-8 lamps. T-8 lamps are recommended by EPA for energy conservation. Converting to T-8 lamps would reduce energy use and reduce lamp waste volume by one-third.On-site recycling. (Option 416). A fluorescent lamp recycling facility could be constructed on-site. The facility would include a lamp crusher and a mechanism to separate the glass, metal, and powder. A distillation unit for mercury recovery could also be installed. Off-site recycling. (Option 313). Lamps could be packaged in their original containers and shipped off-site for recycling of glass, aluminum, and mercury at one of several recycling facilities across the nation.

Site: Oak Ridge Y-12 Plant	
Site Coordinator: Sam Suffern	**Team Leader:** Kim Murray
Phone: 423-576-0126	**Phone:** 423-483-9870
Fax: 423-576-6222	**Fax:**
Email: suffernjs@ornl.gov	**Email:**

Title: PPOA of Solid Industrial Waste on the DOE Oak Ridge Reservation **Major Waste Type:** Sanitary Waste

PPOA ID Code: ORR-C002 **Specific Waste Type:** Solid Waste

Date: 15-jan-1995 **Major Activity Type:** All **Specific Activity Type:** All

Description: A three-site PPOA to assess opportunities for minimizing the disposal of solid, sanitary waste on ORR. The scope of this PPOA was based on the current ORR solid industrial waste pollution prevention and management activities and on the subsequent identification of the best improvements to avoid or minimize the amount of ORR solid industrial waste generated and sent for disposal in the commercially owned Chestnut Ridge Sanitary Landfill and in ORR Landfills II and V. Consequently,

because construction and demolition wastes and associated landfills were not part of the scope of this PPOA, these wastes and landfills were discussed only when they were related to solid industrial waste sent to Landfills II and V and to the Chestnut Ridge Sanitary Landfill. During the baseline time frame for this PPOA,the ORR sent a total of 24,805 yd3 of solid industrial wastes to the ORR Landfills II and V and the Chestnut Ridge Sanitary Landfill. The ORR Landfill V became operational in April 1994. Because the ultimate objective of this PPOA was to reduce the volume of solid industrial waste sent for disposal in landfills, volume was selected as the unit basis instead of mass.

Options: Cafeteria - Implement cafeteria and canteen operations pollution prevention planning. Compost degradable wastes off-site.Packaging - Determine the cost-effectiveness of off-site recycling of styrofoam.Waste Management - Procure and use reusable pallets. Chip pallets and scrap wood. Centralized waste segregation.Office - Addition of mixed paper recycling.Laboratory - Off-site recycling of plastic.Incorporate clauses in all future contracts to require affirmative procurement.Option 464. Modify procurement procedures to include affirmative procurement and pollution prevention, which relates to the packaging as well as the materials.Option 466. Procure and use reusable pallets.Option 467. Define packaging requirements for Accelerated Vendor Inventory Delivery (AVID) vendors to minimize excess packaging by vendors.Option 468. ESWMO to recommend to Shipping, Receiving and Material Control at each site that they establish a committee to evaluate defining packaging classification levels for various items received at the sites to allow removal of as much packaging as possible prior to leaving receiving.Option 469. Significantly increase the generator responsibility for pollution prevention, segregation, and proper solid industrial waste management by including a pollution prevention and waste management requirement in their personnel performance review criteria.Option 473. Compile a generic recycling efforts checklist for the readiness review process to facilitate off-site reuse or recycle of materials that would otherwise be solid industrial waste.Option 481. Continue support for evaluating the potential for using ORR wastepaper as pulp base for hydroseeding on the ORR.Option 484. ESWMO, the Biology Division, and the Human Resources Division are to establish a committee with representatives from Food Services, the Biology Division, Forestry, and Waste Management to evaluate the feasibility of composting animal bedding from the ORNL Biology Division located at the Y-12 Plant.Option 485. Chip ORNL pallets and scrap wood for recycle as mulch through the three ORR sites and ORR Forestry.Option 486. Study composting and associated storm water runoff. Once this study is complete, then the ORR will be able to determine what waste types can be effectively composted, what contaminants would be found in storm water run off, the required design of the composting operation, and the resulting technical and economic feasibility of this option.Option 487. Compost degradable waste off-site in Oak Ridge. (Degradable cafeteria waste, animal bedding , chipped wood wastes, and possibly animal food.)Option 527. Procure and use reusable pallets.Option 555. Off-site recycle of plastic and glass from laboratory operations.Option 559. Use of natural gas as primary fuel source in the Y-12 Steam Plant.

Site: Oak Ridge National Laboratory	
Site Coordinator: Dave Tull	**Team Leader:** Anne Ostergaard
Phone: 423-576-0126	**Phone:** 423-690-3211
Fax: 423-576-6222	**Fax:** 423-690-3626
Email: tullde@ornl.gov	**Email:**

Title: Personal Protective Equipment **Major Waste Type:** Low Level Waste

PPOA ID Code: ORR-C003 **Specific Waste Type:** Personal Protective Equipment

Date: 15-jan-1995 **Major Activity Type:** Environmental Restoration **Specific Activity Type:** Remediation

Description: A three-site PPOA to assess PPE usage on the ORR in general, and also explored P2 opportunities for specific ER/D&D projects.

Options: Option 336. Evaluate alternative work schedules to maximize the amount of time spent in the work areas and minimize the number of times PPE must be changed. The objective of this options is to practice source reduction and reduce the amount of PPE used.Option 338. Limit personnel and time spent in the exclusion zone. Work and personnel should be organized to maximize the limited time spent in an exclusion zone. Also prepare jobs to be performed in the exclusion zone in batches to allow the maximum amount of work to take place after entering the zone. The objective of this option is to limit the number of personnel working in the zone and reduce the amount of PPE waste generated.Option 340. Identify alternative yellow anti-C gloves. All ER sites are currently disposing of yellow anti-C gloves as rad-waste regardless of whether they are contaminated or not. This option allocates money to conduct a study to identify other glove options. The preferred option is to work with

manufactures or vendors that supply yellow anti-C gloves.Option 341. Use launderable anti-C clothing. Launderable anti-C clothing should be used whenever possible. Typical past practice for ER projects has been to use disposable PPE. This generates a large amount of low-level radioactive or mixed PPE waste.Option 343. Investigate the cause of the seemingly inadequate supply of launderable PPE available for ER projects. Option 346. Recycle latex and rubber. The possibility of recycling latex and rubber that is not contaminated should be investigated.Option 347. Create a clean surface from which to work whenever possible. Conduct a study to determine the technologies available to create clean work surfaces for indoor and outdoor work.Option 349. Change the C-zone boundaries as contaminated materials are removed or encapsulated to clearly indicate where the remaining contamination exists. This will eliminate some PPE waste streams.Option 352. Reevaluate the need for skull caps in ER/D&D projects. IF the caps are not required or do not serve an essential purpose, they should not be used.Option 354. Evaluate the reuse of respirator cartridges. Currently, most cartridges are used once and discarded.Option 357. Train all ER program managers in risk analysis and in pollution prevention according to DOE standards.Option 359. Recycle cardboard from PPE packaging.Option 360. Assign a Òtrash cop.Ó A person could assume the role of Ôtrash copÕ at the contamination reduction zone. This person would ensure proper disposal of trash as personnel exit or enter the zone.Option 361. Monitor PPE for radiological contamination prior to doffing and exiting the C-zone. Any items that scan clean should be re-used.Option 362. Use remote handling equipment whenever possible to alleviate or eliminate personnel contamination.Option 363. Evaluate monitoring results and upgrade or downgrade PPE required based on the results and work being performed.Option 364. Provide incentives for Project Mangers. Incentives should be provided for project supervisors/managers to use and identify waste minimization methods. Build in both financial and recognition incentives for the managers and programs.Option 365. Develop sufficient tracking records for tracking disposable and launderable PPE purchases, uses, and disposal.Option 366. Evaluate the PPE selection process. Each project should carefully evaluate and select appropriate PPE for each project site. Requirements for PPE that adequately meet the needs for each individual site should be established. This process should be part of project planning.

Site: Oak Ridge National Laboratory	
Site Coordinator: Christine Goddard	**Team Leader:** Susan Brooks
Phone: 423-576-4034	**Phone:** 423-483-9870
Fax: 423-241-2533	**Fax:** 423-483-9061
Email: goddardcm@ornl.gov	**Email:**

Title: Analytical Services **Major Waste Type:** Low Level Waste

PPOA ID Code: ORR-C005 **Specific Waste Type:** Chemicals

Date: 01-sep-1995 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Chemical

Description: A three-site PPOA to assess waste generation by analytical operations from procurement (HMIS) to disposal.

Options: Option 1000. Evaluate GC/MS, Semivolatile, SVOA Funnel Liquid generation activities for a Level II PPOA.Option 1005. Evaluate GC/MS, Semivolatile, DRO liquid generation activities for a Level II PPOA.Option 1006. Evaluate GC, Pesticides, PCB liquid generation activities for a Level II PPOA.Option 1008. Evaluate GC, PCB oil sample generation activities for a Level II PPOA.Option 1009. Evaluate GC, Waste PCB generation activities for a Level II PPOA.Option 1012. Evaluate GC, PCB dilution generation activities for a Level II PPOA.Option 1013. Evaluate proportional counting , total Strontium procedures for a Level II PPOA.Option 2095. Evaluate Wet Chemistry, Miscellaneous, Volume Density Liquids activities for a Level II PPOA.

Site: Oak Ridge National Laboratory	
Site Coordinator: Sam Suffern	**Team Leader:** Anne Ostergaard
Phone: 423-576-0126	**Phone:** 423-690-3211
Fax: 423-576-6222	**Fax:**
Email: suffernjs@ornl.gov	**Email:**

Title: Geological Subsurface Investigations **Major Waste Type:** Low Level Waste

PPOA ID Code: ORR-C006 **Specific Waste Type:** Core Samples

Date: 30-sep-1995 **Major Activity Type:** Environmental Restoration **Specific Activity Type:** Sampling & Characterization

Description: Geologic subsurface investigations. PPOA will include all investigatory-derived waste generated at the three ORR sites.

Options: Option 629. Recycle Plastic. Coordinate with current recycling effort to recycle plastic sheeting used for intrusive activities and decontamination.Option 636. Reuse plastic to the maximum extent possible. This may include using the same plastic for installation at multiple wells, sampling at multiple wells, multiple samples at one well, etc. This practice is currently in use in many projects. Concerns over potential cross-contamination would have to be evaluated in implementing this option.Option 639. Use a mobile, reusable contamination vessel. This vessel could be used in place of temporary plastic facilities that result in significant waste plastic for every investigation. This could eliminate the waste plastic resulting from decontamination activities.Option 642. Filter and reuse decontamination water. This water could be recirculated and used as an initial equipment rinse to reduce the quantity of clean water required to decontaminate a given piece of equipment, thereby reducing the amount of waste water generated. Filters may require disposal as a hazardous or radioactive waste.Option 648. Use more mechanical cleaning/less water. This includes using more mechanically oriented equipment and more manual removal of soil and contamination.Option 652. Use lab and field analysis to determine the need for decontamination. Depending on the contamination present at the site, such monitoring and analysis could provide sufficient verification that the equipment is not contaminated and could be reused without being contaminated.Option 656. Use vacuum pump sampling to reduce decontamination. This type of pump would not contact the potentially contaminated water, thus not require decontamination. This option would not be applicable to deep wells or where bailers might be used to capture VOCs.Option 660. Use dedicated equipment to reduce decontamination requirements. For wells that would be sampled frequently over an extended period, this would reduce decontamination requirements.Option 665. Reduce use of solvent rinse. Use a solvent rinse only if necessary (e.g. to remove grease).Option 669. Use disposable equipment to reduce decontamination requirements. Disposable bailers were used at ACAP for VOC sampling. These bailers could be used more extensively in place of pumping to reduce decontamination requirements.Option 672. Use recyclable equipment to reduce decontamination requirements. This option requires that non-contaminated bailers are recyclable as plastic.Option 678. Utilize direct push method for sampling. This method can be used in place of auguring for collecting soil and waster samples at discrete intervals without generating soil cuttings. It can also be used to install temporary monitoring wells and to locate sites for permanent monitoring wells. This option applies to soil borings and installation of temporary wells.Option 681. Utilize thin wall small diameter drill method. This method augers a 4Ó diameter hole and drives a 6Ó diameter casing into the hole. This method produces the same amount of cuttings as a 4Ó borehole. This applies to soil borings and installation of monitoring wells.Option 684. Use non-intrusive well site location. Aerial imagery, electromagnetic, ground penetrating radar, shallow reflection seismic, magnetometer, and thermal infrared (listed most effective to least effective) methods can be used to choose well site locations. Very effective when used in conjunction with low intrusive methods such as direct push and soil vapor surveys.Option 688. Replace soil cuttings in bore holes. This method refills bore holes with soil cuttings from the bore hole. A compaction method would have to be used to ensure that all soil from the bore hole would return into the bore hole.Option 692. Spread soil cuttings on ground in the area of contamination. Of soil cuttings do not pose an epidermal risk (field screen, soil sample results-level determined in work plan) the soil can be spread on the ground surface. Option 697. Place soil cuttings in an excavation in the area of contamination and cover with excavated soil. If soil cuttings would pose an epidermal risk (field screen, soil sample results-level determined in work plan) this option is best.Option 702. Store soil in area of contamination for use in remedial activities. Soil can be stored and used as fill prior to capping an area or stored and added to other contaminated material in a removal action.Option 707. Pour purge/development water on ground in area of contamination. This method can be used if the water poses no epidermal risk (field screen, water sample results-level determined in work plan).Option 716. Micro purge method. This well purging method pumps water from the screened interval until 5 parameters (Dissolved oxygen, turbidity, pH, temperature, and conductivity) stabilize.Option 720. Sample well immediately after development, utilizing development as first purge.

Site: Oak Ridge Y-12 Plant	
Site Coordinator: Christine M. Goddard	**Team Leader:** Chrissie Haretos
Phone: 423-576-4034	**Phone:** 423-483-9870
Fax: 423-241-2533	**Fax:**

Email: goddardcm@ornl.gov	**Email:**

Title: Building Decontamination & Decommissioning **Major Waste Type:** Low Level Waste

PPOA ID Code: ORR-C007 **Specific Waste Type:** Wood

Date: 30-sep-1995 **Major Activity Type:** Environmental Restoration **Specific Activity Type:** Construction

Description: PPOA to identify opportunities to prevent waste generation during building decontamination and decommissioning. The assessment covers residual materials and wastes, D&D operations waste, and construction and structural waste.

Options: Option 5000. Two waste streams flow from D&D operations: waste removed from the site and waste generated from material brought onto the site. Both waste streams should be segregated for recycling material on the reservation or by commercial release, metals, concrete, bricks, lumber, and process components may be candidates for decontamination and recycling. Materials remaining suspect irradiated are usable in other controlled areas. Recommend controlling incoming and generated waste streams for recycle/reuse opportunities.Option 5003. The performance of commercial absorbents is far superior to Òmake doÓ rags, blotter papers and wipes. Mixed waste disposal volumes can be effectively reduced by application of the correct absorbent. Recommend implementing the use of absorbents when practicable.Option 5006. Effective management and labor agreements can reduce the number of PPE changes to one half by schedule adjustments. Further reductions in disposable equipment can be achieved by utilizing launderable gloves, shoe covers, coveralls, work clothes, etc. Laundry costs are a fraction of the cost of a disposable and its subsequent disposal. Recommend using/reusing launderable PPE whenever practicable.Option 5009. Process wastes are commonly found at D&D facility sites; many of unknown origin and composition. Treating this waste in place, or at least stabilizing it for transport, offers this option for P2. Process equipment can be sealed and packaged on site for disposal transport. Waste minimization at this point will be determined by the selected treatment technology.Option 5012. This option offers the only opportunity for source reduction at a contaminated site. Through surface cleaning and selective surface removal of structural features such as walls and floors, the amount of contaminated mixed waste can be significantly reduced. Decontamination of process equipment, piping, and ancillary items will be in keeping with the site D&D objectives.Option 5015. A major opportunity for reduction of disposal waste arises by the decontamination of the site, the dismantling and removal of surface structures, and equipment, and the entombment of the remaining foundation mass and acceptable debris. Remote sites with extremely hazardous contaminants are excellent candidates for this option. The decontamination and containment result in a storage/disposal site with attractive economies and minimum exposures to the environment.Option 5018. The application of new and emerging technologies offers the option for increased remediation effectiveness and P2. The requirements and characterization for each site will support the selection of new and current technologies. Removal technologies appropriate to D&D debris are focused on removal of the minimum material to capture the required radioactivity.Option 5021. Segregation should begin with materials coming onto the site; identification and assignment to locations supports inventory control and waste disposal. Containers of appropriate size, specification and quantity must be strategically placed and the rules for container content clearly communicated. Periodic inspection of segregated waste streams will identify opportunities for waste minimization.Option 5040. Inspections by division management and consultants can contribute significantly to the identification of opportunities for waste minimization and pollution prevention at the current site, as well as providing insights for the future.Option 5045. Plastic sheeting and tarps should be used to contain D&D debris and decontamination materials.Option 5050. Appropriate containments will prevent the cross contamination of materials and areas. Hera yields of landfill waste can be achieved with adequate debris containment.Option 5056. Work with ER, D&D project managers and DOE representatives to incorporate pollution prevention into decision-making process (Record of Decision) by 12/96.Option 5057. Develop a training/lessons-learned module to ensure pollution prevention continues to be part of the planning processes by 12/97.

Site: Oak Ridge Y-12 Plant	
Site Coordinator: Christine M. Goddard	**Team Leader:** Ron Baker
Phone: 423-576-4034	**Phone:** 423-483-4376
Fax: 423-241-2533	**Fax:**
Email: goddardcm@ornl.gov	**Email:**

Title: K-25 Site Photographic Waste PIP Team Findings **Major Waste Type:** Hazardous Waste

PPOA ID Code: ORR-K001 **Specific Waste Type:** Metal, Precious

Date: 14-jul-1992 **Major Activity Type:** Service **Specific Activity Type:** Photographic Services

Description: Includes 5 divisions. Generators procured equipment, applied for and received a sewer ordinance permit, and six units are installed. Silver recovery implementation project has been completed.

Options: Option 2. Install silver recovery systems to recover silver from photographic development. Participate in the memorandum of understanding with the Defense Logistic Agency to furnish recovery equipment in exchange for silver collected. Inspect MSDSs to ensure that photo products without cadmium and chromium are purchased.

Site: Oak Ridge K-25 Site	
Site Coordinator: Belgin Barkenbus	**Team Leader:** Belgin Barkenbus
Phone: 423-241-2773	**Phone:** 423-241-2773
Fax: 423-576-7668	**Fax:**
Email: barkenbusdb@ornl.gov	**Email:**

Title: Solid Sanitary Waste at the Oak Ridge K-25 Site **Major Waste Type:** Sanitary Waste

PPOA ID Code: ORR-K002 **Specific Waste Type:** Cafeteria Refuse

Date: 15-dec-1994 **Major Activity Type:** Service **Specific Activity Type:** Cafeteria

Description: Contract was put into place in CY1993 for the sanitary waste cafeteria PWA document. PWA will be prepared in CY1994.

Options: Option 3. Purchase one 24 cubic yard rolloff container with three compartments for the segregation of glass, plastic, and steel cans, and install this container at the K-25 site cafeteria. The listed equipment dealers seem to have the most reasonable prices for purchasing the rolloff container (Kaegle Welding & Equipment [521-9000], Atlas Equipment [691-5050], or Dempster [637-9331]. Two companies are able to haul the wastes and/or lease equipment: BFI (522-8161) or Waste Management (525-0529).Option 6. Install a plastic container for collection of aluminum cans in the K-25 cafeteria.Option 8. Change from styrofoam to a more biodegradable polystyrene plastic ware in the K-25 Site Cafeteria.Option 43. Use reusable stoneware and silverware in the cafeteria.Option 45. Use a locally contracted recycler to provide the K-25 Cafeteria with 90-gallon containers and pickup services for collection and off-site transport of recyclables. Based on the volumes of waste generated, pickups would be needed twice each month. Forty-eight containers are needed to collect materials, and a crusher and bailer must be purchased.Option 47. Compost food waste from the cafeteria. Use composted material for landscaping and other agricultural activities.Option 49. Use wood chips from construction/demolition scraps for landscaping.

Site: Oak Ridge K-25 Site	
Site Coordinator: Belgin Barkenbus	**Team Leader:** Jeff Knight
Phone: 423-241-2773	**Phone:** NC AT&T State Univer
Fax: 423-576-7668	**Fax:**
Email: barkenbusdb@ornl.gov	**Email:**

Title: K-25 Site Used Oil PPOA **Major Waste Type:** Hazardous Waste

PPOA ID Code: ORR-K003 **Specific Waste Type:** Oil

Date: 15-jun-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Maintenance, Vehicle

Description: K-25 Site used oil PWA report (final draft delivered 9/30/93) was revised due to deficiencies. This document was incorporated into the ORR-wide used oil PWA to evaluate ORR-wide implementation options.

Options: Option 60. Replace RCRA-regulated oils with non-RCRA regulated ones.Option 62. Segregate all types and grades of oils and solvents from one another to prevent mixture of RCRA-regulated with non-RCRA regulated. Segregate solids from liquids as much as possible (rags, etc.) to maximize the potential for recovery and reuse of the oil.Option 63. Replace oil-using air compressors and transformers with oil-less counterparts when the equipment has reached the end of its useful life.Option 65. Use longer lasting synthetic oils.Option 68. For equipment that has oil circulating through the system, install filters on the recirculation line.Option 70. Develop and application-specific or site wide oil analysis program designed to monitor lubricating oil. Focus the program on oil quality as the change-out indicator as opposed to calendar, mileage, or hour-based service schedules.Option 71. Reclaim and reuse oils at the K-25 Site. Suggested suitable technologies include filtration, ultrafiltration and reverse osmosis, centrifugation, and vacuum dehydration. The specific technology chosen will depend largely on the nature of the oil involved and its contaminants. Portable reclamation units may be suitable for multiple similar applications, while fixed, closed-loop reclamation systems might best service larger pieces of process equipment. Greatest economic benefits of this option are when it is used in conjunction with an oil analysis program.Option 73. Recycle oils by burning them for energy recovery.Option 76. Reprocess used oils off-site for use as fuel or fuel supplements or re-refining into high-quality base oils.Option 78. Blend used diesel oils with diesel fuel for use in diesel engines.Option 79. Add re-refined oils to the list of available products on AVID.

Site: Oak Ridge K-25 Site	
Site Coordinator: Belgin Barkenbus	**Team Leader:** Ron Vogel
Phone: 423-241-2773	**Phone:** 423-483-9870
Fax: 423-576-7668	**Fax:**
Email: barkenbusdb@ornl.gov	**Email:**

Title: K-25 Used Antifreeze PPOA **Major Waste Type:** Hazardous Waste

PPOA ID Code: ORR-K004 **Specific Waste Type:** Antifreeze

Date: 15-jun-1994 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Vehicle

Description: K-25 Site Antifreeze PWA report was revised and issued.

Options: Option 51. Conversion to dry-pipe fire suppression systems.Option 53. Substitute propylene glycol for ethylene glycol in vehicle and building cooling systems.Option 55. Purchase and use of a single stage vacuum distillation unit for recovery ethylene glycol for reuse in the cooling systems maintained by the Refrigeration Service Department.Option 58. Incorporate recycled antifreeze into the AVID agreement and inventory.Option 355. Substitute propylene glycol for ethylene glycol in vehicle and building cooling systems.

Site: Oak Ridge K-25 Site	
Site Coordinator: Belgin Barkenbus	**Team Leader:** Ron Vogel
Phone: 423-241-2773	**Phone:** 423-483-9870
Fax: 423-576-7668	**Fax:**
Email: barkenbusdb@ornl.gov	**Email:**

Title: K-25 Chlorinated Solvents PPOA **Major Waste Type:** Hazardous Waste

PPOA ID Code: ORR-K005 **Specific Waste Type:** Solvents

Date: 15-jun-1994 **Major Activity Type:** Laboratory **Specific Activity Type:** Cleaning

Description: Contract was put into place in CY1993 for the chlorinated solvents PWA document. PWA was prepared in CY1994.

Options: Option 82. Install a Sea-Wash parts cleaning system to substitute for chlorinated solvents.Option 83. Use LPS PreSolve cleaner/degreaser instead of chlorinated solvents to clean adhesives from equipment and grease from high voltage cables.Option 86. Use Tech Spray (Envi-Ro-Tech 1671) or Electron from Ecolink to clean optics and electronic components using a non-CFC, non-HCFC, non-flammable product.Option 87. Use non-CFC, non-HCFC Chemtronics, Inc., E-Series products, ES1210 and ES1035 to clean, degrease, and remove flux on electric contacts and circuit boards.Option 89. Use aqueous fluxes to clean, degrease, and remove flux on electric contacts and circuit boards. Kester Solder manufactures a number of these products. Use of these products requires only a heated waster (deionized) container for cleaning and results in no hazardous residues.Option 91. Use nonchlorine-based defluxers to clean, degrease, and remove flux on electric contacts and circuit boards. Kester Solder manufactures a number of these products.Option 92. Substitute hexane for Freon 113 for use as a solvent at the TSCA Incinerator.Option 95. Substitute Tech SprayÕs Envi-Ro-Tech 1671 for isopropyl alcohol to clean circuit boards. The suggested substitute is nonflammable and does not contain any chlorinated solvents.Option 96. Substitute Fidelity Chemical CorpÕs Cleaner 3152 for ethyl alcohol.Option 98. Substitute DuPontÕs Axarel 9400 for Freon 113.Option 100. Substitute hexane for methylene chloride in PCB sampling.Option 102. Recover chlorinated solvents for reuse by installing a vapor capture hood.Option 353. Use LPS PreSolve cleaner/degreaser instead of chlorinated solvent to clean adhesives from equipment and grease from high voltage cables.

Site: Oak Ridge K-25 Site	
Site Coordinator: Belgin Barkenbus	**Team Leader:** Lauri Carter
Phone: 423-241-2773	**Phone:** 423-483-9870
Fax: 423-576-7668	**Fax:**
Email: barkenbusdb@ornl.gov	**Email:**

Title: Central Neutralization Facility Sludge PWA **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: ORR-K006 **Specific Waste Type:** Sludge

Date: 30-jul-1994 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Treatment

Description: Contract was put into place in CY 1993 for the Central Neutralization Facility PWA document. PWA was prepared in CY 1994.

Options: Option 9. Substitute caustic (sodium hydroxide) for Lime (calcium hydroxide) in the Neutralization of Wastewater. Based on the relatively low costs and ease in implementation, this alternative treatment option should be seriously considered. Prior to implementing, however, a treatability study should be conducted to evaluate the effectiveness of dewatering sludges resulting from sodium hydroxide neutralization.Option 11. Identify sources of stormwater infiltration at CNF. Some storm drains (secondary containment areas in K-1407H and other sumps open to the atmosphere) cannot be eliminated, but storm drains from other areas not associated with CNF operations can be eliminated. A dye tracer study has been performed to identify sources of stormwater infiltration at the CNF. The results of the dye tracer study would be used to evaluate which (if any) stormwater sources can be rerouted or which areas could be covered to prevent stormwater infiltration.Option 13. Neutralize sanitary steam plant waste waters separately from TSCA waste waters at the CNF. Do this by continuing to treat the hazardous waste stream in tank F240B as it is currently treated, and continue the neutralization of steam plant effluent in tank F240A, but purchase new thickener and new dewatering equipment to eliminate mixing of hazardous and nonhazardous sludges.

Site: Oak Ridge K-25 Site

Site Coordinator: Belgin Barkenbus	**Team Leader:** Belgin Barkenbus
Phone: 423-241-2773	**Phone:** 423-241-2773
Fax: 423-576-7668	**Fax:** 423-576-7668
Email: barkenbusdb@ornl.gov	**Email:**

Title: Spray Painting Operation in K-1095 **Major Waste Type:** Sanitary Waste

PPOA ID Code: ORR-K007 **Specific Waste Type:** Paint

Date: 15-nov-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Painting

Description: A wide array of items, varying in size and material of construction, are coated with paints or protective coatings at the Spray Painting Facility. Examples of these are forklifts, bookshelves, picture frames, aluminum storage crates, fire hydrants, and steel B-25 boxes for storing low-level, hazardous or mixed waste.In general, coatings are applied to the surface of an article (or substrate) for two reasons to provide: (1) surface protection such as enhanced corrosion resistance, weatherability, and durability; and (2) surface decoration and improved appearance. Because coatings are manufactured with a coating objective in mind, the substrate=s end use will, to a large degree, determine the type of coating it will receive.For each item coated at the Spray Painting Facility, the coating requester prepares a Maintenance Job Request (MJR) that identifies the substrate's coating requirements, if any (i.e., color of stain, temperature ranges the coating will need to withstand, or the thickness of the coating). The degree of detail on the MJR will vary with the requester. In some cases, the requester will be very specific and provide in detail the desired thickness and/or exact brand of coating preferred. In most cases, however, the MJR is quite general, often with no or minimal specifications. If needed, the Spray Painting Facility planner will obtain additional verbal guidance from the requester. Additional generic coating guidance is also provided in Sect. 09900, Painting, of the LMES Engineering Technical Specifications (LMES 1995b). With all written guidance being general, the planner and painters are the key decision-makers in choosing the majority of the substrates' coating type(s) and thickness. Their experience and/or training qualify them to make the se decisions, as is common practice for noncommercialized facilities where the craftsmen are skilled artisans. As a general rule, all painters working in the Spray Painting Facility have successfully completed an apprenticeship program established by the Painters and Decorators Local Number 437 labor organization, and have achieved the status of a trained journeyman painter. In many cases, the substrate will need some type of minimal preparation prior to coatingCfor example, sanding off the rusted areas of scaffolding or removing grease from the forklift forks. Routine cleaning materials used include recycled solvents, sandpaper, and jersey rags. The spent sandpaper and the jersey rags (after being air-dried), if not reusable, are disposed of as sanitary waste; the solvent is again recycled. Upon completion of any needed conditioning, the substrate is placed in the booth and the operator begins preparations to coat the item.The type of coating used in each individual coating process is dependent upon the substrates end use. Using the MJR, consultation with the requester, and professional experience, the Spray Painting Facility planner will select the type/brand of coating to be used. As a general rule, most items are coated with solvent-based coatings to achieve a desired end result. Metal substrates are pretreated with a solvent-based primer to ensure coating adhesion and prevent rust, and then coated with a top coat of enamel for additional protection and decoration. Before being sanded, most wooden items are coated with a solvent-based Sand-Seal-Finish product to preserve and raise the grain of the wood. After sanding, the wood may or may not be stained, but will in general always receive a top coat of solvent-based polyurethane varnish for protective and decorative reasons. This provides the substrate with a smooth and enhanced water-resistant cover. Latex coatings are occasionally used for decorative purposes on wooden items.

Options: Purchasing High-Volume/Low-Pressure Spray Guns (Option 1)Option 1 suggests purchasing HVLP guns to replace the Conventional guns used on both the pressurized pots and the portable cups to reduce overspray generation. HVLP guns are more efficient in reducing overspray because they operate by using a high volume of air at a low pressure to atomize the coating (McKinney 1995). The defined air-pressure limit is 10 psi at the spray gun compared to the 40B70 psi maintained with the Conventional guns. It is this reduced spray gun energy that reduces overspray and improves the transfer efficiency . Spray painting literature suggests that HVLP guns are 10B40% more efficient than Conventional guns and have an average transfer efficiency of 20B72%. The transfer efficiency for the Conventional guns averages 10B30% (MnTAP 1987, and DeVilbiss 1991). However, because the Spray Painting Facility operators are conscientious about reducing overspray and controlling waste as much as possible by steadily manually adjusting the air and fluid pressure on the Conventional guns, it is more likely that use of the HVLP guns will reduce overspray by about 20% rather than 30B40%. Using Water-Based Coatings (Option 2)The primary coatings used at the Spray Painting Facility are solvent-based. By substituting these coatings with water-based coatings for various objects, the VOC emissions that result from solvent volatilization at the Spray Painting Facility can be reduced by approximately 25%. In the past, the Spray Painting Facility has tried to use various water-based substitutes only to find after application and product use that the coating did not meet performance expectations. Another concern the Spray Painting Facility

operators have with the water-based coatings is a longer drying time. However, with VOC restrictions being tightened in many states across the U.S., coating manufacturers have made significant improvements in water-based coating performance, and use of these products should be reconsidered. Full or partial substitution for the following products are suggested: Derusto Rust Preventative Enamel J, Pittsburgh Plate Glass (PPG) Quick-Dry Wood Sand-Seal-Finish Oil J, and Devoe Woodworks Polyurethane Varnish J. Table 2 details the substitutions for the solvent-based coatings.Laundering Rags (Option 3)Coating-contaminated jersey rags are currently air dried to downgrade their wet RCRA waste status to a dried sanitary solid. After drying, if possible, the rags are reused. To extend their reuse, this option considers laundering the jersey rags to remove excess coating before drying them. The Spray Painting Facility uses approximately three 5-lb. boxes, or 6.8 kg, of jersey rags per year; one or two rags per day. Laundering the one or two rags before they dry would, at a minimum, require daily transportation to the laundry facility. Even with daily laundering, however, it is inevitable that some of the coatings would dry on the rags before they could be laundered, preventing coating removal. If wastewater from the laundry process is to be minimized, the two soiled rags would need to be laundered with rags or other items from different facilities. A potential problem with this would be having the noncoated items become soiled with coating during the laundering process. Another by-product of the wash cycle, along with the wastewater, will be generation of the laundry lint which is considered a low-level waste (LLW). In addition, the durability of the rags to withstand the wash cycle is questionable given the flimsy nature of the material. More durable rags could be purchased, but given the increase in rag cost, the small quantity of rags used, and the generation of additional waste from the laundering process.Substituting Hooded Tyvek Tops (Option 4)Currently, only the top half of a full-body Tyvek suit is used by the Spray Painting Facility operators. The entire bottom portion of the Tyvek suit is cut away and discarded in sanitary trash before use. This option considers purchasing hooded Tyvek tops rather than the full suit to reduce the waste and improve the convenience of use. DuPont manufactures the Tyvek fabric which Mar Mack and Lakeland use to manufacture the protective Tyvek wear. Consultation with the distributors revealed two possible substitutes, the Tyvek shirts or the lab coats. However, neither style of top has elasticized arms or a hood, which are required for operator protection against overspray. A jacket meeting these requirements was once produced; however, this product has been discontinued. Because of the lack of product availability and the small quantity of use, approximately 130/year, which would prohibit the remanufacture of the discontinued item, the current practice of altering a complete Tyvek suit seems to be the most practical option at this time. Recycling Respirator Cartridge Materials (Option 5)This option explores the possibility of recycling the spent sanitary respirator filter cartridge materials. Spray Painting Facility operators use Mine Safety Appliances (MSA) half-mask respirators with two combination MSA GMC-HJ (a trade name) filters during the coating application process. The GMC-H filter is a combination cartridge which protects the user from organic vapors, acid gases, and particulates. The filter is comprised internally of a scrimp paper, surrounding two types of carbon, and a high-efficiency particulate air (HEPA) filter. The outer casing consists of two tin alloy pieces crimped together around the internal contents.Purchasing Coatings in Larger Containers (Option 6)This option considers purchasing coatings and solvents in larger containers instead of the currently purchased 1-gal containers to reduce the quantity of metal waste generated from landfilling the empty coating containers. Because a 5-gal coating container consists of less metal than five 1-gal coating containers combined, purchasing the larger containers will reduce metal waste at the source of generation. Purchasing coatings in larger containers was considered for any coating of which 20 or more gal/year were used. Dap Derusto Minute-Solv Thinner No. 5, Derusto Rust Preventative Enamel with Built-In Primer, PPG Wood Sand-Seal-Finish, Devoe Polyurethane Varnish, and Devoe Bar-Ox Enamel J were the coatings used in quantities above 20 gal/year. Currently, upon drying off any excess coating or solvent, the empty coating containers are crushed for volume reduction, classified as sanitary waste and are landfilled at the Y-12 Site in Oak Ridge, Tennessee. An added benefit to this option would be a reduction in management time devoted to inventory supervision. Recycling Empty Coating Containers (Option 7)This option considers recycling empty coating containers as opposed to the current method of sanitary landfill disposal. Pittsburgh Coating and Supply of Oak Ridge, Tennessee, the Spray Painting Facility's coating vendor, has verified that both the metal and plastic coating containers are recyclable as indicated by the container's imprinted recycling identification. LMES currently does not have a recycling program establis hed for plastic materials, and because the quantity of plastic waste generated by the Spray Painting Facility is so small, it would be uneconomical to establish a program for this facility alone. Sanitary disposal is therefore the most practical disposal method for the plastic containers.

Site: Oak Ridge K-25 Site	
Site Coordinator: Belgin Barkenbus	**Team Leader:** Sherry L. Odom, PAI Corp.
Phone: 423-241-2773	**Phone:** 423-483-0666
Fax: 423-576-7668	**Fax:** 423-481-0003
Email: barkenbusdb@ornl.gov	**Email:**

Title: K-25 TSCA Incinerator Wastewater Stream **Major Waste Type:** Low Level Waste

PPOA ID Code: ORR-K008 **Specific Waste Type:** Wastewater

Date: 15-jan-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Treatment

Description: A Level III pollution prevention opportunity assessment of the Oak Ridge K-25 Site Toxic Substances Control Act (TSCA) Incinerator wastewater stream was performed to evaluate wastewater reduction options for the incinerator. The wastewater stream includes (1) wastewater from the quench chamber and from the ionizing wet scrubber, (2) excess cooling water, and (3) rainwater. The wastewater stream is currently treated at the Central Neutralization Facility (CNF) to removecontaminants. The main objective of this study is to identify and evaluate options to reduce the volume of this wastewater stream and, therefore, CNF influent, in order to realize significant environmental and economic benefits from pollution prevention (P2).For each of the three wastewater streams, P2 options were evaluated following the U.S. Environmental Protection Agency (EPA) hierarchy to (1) reduce the volume of water generated, (2) recycle the water, or (3) use alternate water treatment methods. Identified options are presented and evaluated in Sect. 3.

Options: Option 23. Upgrade the quench system capability and reliability by adding a second quench recycle pump. Operate the second quench recycle pump independently of the first pump, using separate spray rings, piping and instrumentation (principally a flowmeter) to recycle the water.Option 25. Recycle excess cooling water (used to cool hydraulic equipment and two cameras on the incinerator) back to the TSCA Incinerator as make-up waster in the pre-quench, IWS, or future cooling tower.Option 27. Construct a roof over the incinerator feel materials storage area.Option 29. Install additional wastewater storage tanks to allow composite sampling, thereby eliminating some laboratory-generated waste.Option 31. Recycle CNF-treated wastewater back to the incinerator for use as make-up water.Option 33. Install a condenser system using direct cooling of the IWS sump water.Option 36. Install an alternate water treatment facility.Option 37. Recycle camera and hydraulic cooling water through a heat exchange system to recover energy.Option 39. Treat rainwater to be used as make-up water.Option 41. Recycle rainwater to be used as seal water in the mix chamber.Calculations used in the evaluation of the identified P2 options show that implementation of the above recommendations will reduce the wastewater rate from the current average rate of 40 gal/min to approximately 8 gal/min, or by a factor of five. Modifications to the existing gas cleaning system (GCS) are scheduled for implementation upon expiration of the Resource Conservation and Recovery Act (RCRA) permit in the fall of 1997 and may possibly include a new condenser system; however, a final determination has yet to be made. Operation of this system (i.e., with a condenser as the worst case in terms of wastewater generation) would probably increase the incinerator wastewater rate by about 75%, or to approximately 70 gal/min. Calculations show that implementation of the recommended P2 options in conjunction with the proposed condenser will reduce the wastewater stream from the expected 70 gal/min to possibly as low as 8 gal/min, or by a factor of nine (based on feeds having similar salt generation rates). The actual benefits will depend on the selected alternative to modify the gas cleaning system.Implementation of the recommended P2 options could result in a savings of approximately $80,000 in utility costs annually. The primary cost currently associated with the wastewater stream is analysis for polychlorinated biphenyls (PCBs), which is required by waste acceptance criteria before the wastewater can be discharged to the CNF. The annual cost of these analyses, nearly $800,000 for FY 1994, is proportional to the number of gallons of water discharged to the CNF. Modifications to the GCS are expected to increase the wastewater rate by 75%, in turn increasing the analytical cost by approximately 75%.

Site: Oak Ridge K-25 Site	
Site Coordinator: Belgin Barkenbus	**Team Leader:** Steven Kirslis
Phone: 423-241-2773	**Phone:** 423-483-0666
Fax: 423-576-7668	**Fax:**
Email: barkenbusdb@ornl.gov	**Email:**

Title: K-25 TSCA Incinerator Operations **Major Waste Type:** Low Level Waste

PPOA ID Code: ORR-K009 **Specific Waste Type:** Sludge

Date: 15-sep-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Treatment

Description: PPOA to maximize the efficiency and minimize waste generation.

Options: Option 602. Lower Kiln Temperature - The primary combustion chamber is lined with refractory bricks that are

replaced periodically. Waste generation can be reduced by extending the life of the bricks (thereby reducing the frequency of replacement). A lower kiln temperature will (1) reduce the chemical reaction rate of the brick with the acid gases and salts inherent in the wastes, (2) reduce the number of eutectic phase combinations formed in the presence of salts that will dissolve (i.e. melt) the refractory, and (3) reduce thermal expansion that results in spalling and increased spacing between bricks that may cause them to dislodge. Changing the kiln operating temperature is an option that can be incorporated into the permit renewal process currently underway.Option 603. Reuse Drums for Waste Storage - After appropriate washing, recycled drums from raw material and waste storage could be used to store the ash. No current K-25 Site policy [e.g. standard practice procedure (SPP), standard operating procedure (SOP)] prohibits the reuse of waste storage containers. The K-25 Site Environmental Management Division (EMD) has been requested to evaluate the potential for reuse of drums to store ash. The use of plastic liners in waste storage drums might allow reuse of the drums (subject to EMD approval). The K-25 Site WMD is currently constructing a drum washing facility to decontaminate drums that stored TSCA waste. Empty drums that contained RCRA wastes are not regulated (except for acutely toxic wastes). These drums could be reused if washed. It is proposed that s similar drum washing station be constructed for RCRA drums as part of the current facility being constructed.Option 604. Reuse Camera Cooling Water - Use the same cooling water for both the secondary combustion chamber and kiln camera.Option 605. Reduce quench makeup water when not incinerating wastes. It is recommended that a higher interlock setpoint be evaluated to allow start-up and stand-by operation when not feeding wastes.Option 606. Test Tankers with inert gas instead of non-PCB contaminated water.Option 607. Substitute metal scaffolding for wooden scaffolding for use on the outside of the incinerator.Option 608. Provide Storage for Recovered Equipment - Purchase six PCB-capacitor shipment boxes for equipment storage and reuse equipment instead of disposing of it.Option 609. Recycle Activated Carbon - Regenerated carbon from each generator would be tested to ensure that the PCB concentration is less than 2 ppm and processed in he incinerator for reuse. The operating parameters of the incinerator would not be altered. Following the first regeneration, the carbon would be tested periodically to determine when it can no longer be used. Carbon stored before regeneration would meet all TSCA, RCRA, and RAD storage requirements; treated carbon would be handled as a RAD material.Option 610. Use Protective Slag Lining -Such a lining would lower the actual temperature of the inner brick face and would, therefore, improve both the reliability and availability of the kiln operations.Option 611. Ruse Refractory Brick - Some bricks removed during rebricking or brick repair work may be reusable.Option 612. Reduce Ash - Three methods to reduce incinerator ash were discussed: (1) compacting the feed, (2) using low-ash feed boxes, and (3) ash dewatering.Option 614. Control algae in the firewater sump by constructing a tarp to block sunlight to the sump.Option 615. Clarify Wastewater - Enhance clarification capability over and above that currently provided by the sumps. Use a clarifier to remove total suspended solids to meet the CNF limit.Option 616. Route Quench Purge to the IWA Sump, thus eliminating the need for make-up water to the IWA sump.Option 617. Reduce contamination of wastewater by decontaminating storm drains and/or process equipment areas.Option 618. Reuse sludge drums to store the sludge filter cakes.Option 619. Pressure Wash and Decontaminate Tankers - Use a recirculating pressure washer to decontaminate the tankers instead of using the three 600-gallon rinses. TSCA regulations allow reuse of solvent for decontamination until the PCB concentration exceeds 50 ppm. Each rinse of the tanker would be accomplished by recirculating diesel fuel from one 600-gallon tank. This fuel would be reused for subsequent rinses until the PCB concentration exceeded 50 ppm. This determination could be made based on process knowledge and/or field testing, and the equipment is available commercially.Option 620. Test tankers for leaks with liquid waste instead of non-PCB-containing water.Option 621. Compact Final Waste Streams - Compaction reduced the number of metal containers used for waste disposal and will reduce the overall mass and volume of waste for disposal.Option 622. Revise Tanker Decontamination Procedure - Standardize washing and decontamination procedures at the incinerator tank farm. A new procedure could be written to accomplish this to reduce the amount of diesel fuel generated during inspection and washing operations. Also consider using the pressure sprayer from a previous PPOA option may more efficiently remove PCB residues.Option 623. Substitute Metal Pallets for Wooden Pallets - Metal pallets are readily cleaned and provide long operational life.Option 624. Standardization of Spill Control Techniques.Option 625. Optimization of Tanker Loads Scheduling.Option 626. Reduction of Diesel Fuel Use from Tanker Decontamination Operations.Option 627. Reuse of Spill Response Materials.Option 628. Respirator Reuse.

Site: Oak Ridge K-25 Site	
Site Coordinator: Belgin Barkenbus	**Team Leader:** Steven Kirslis
Phone: 423-241-2773	**Phone:** 423-483-0666
Fax: 423-576-7668	**Fax:**
Email: barkenbusdb@ornl.gov	**Email:**

Title: K-25 Steam Plant **Major Waste Type:** Hazardous Waste

PPOA ID Code: ORR-K012 **Specific Waste Type:** Wastewater

Date: 15-sep-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Building

Description: Assessment of the steam plant operation to identify opportunities for the prevention of all wastes generated by the operation including aqueous waste streams, fuel, and miscellaneous trash.

Options: Option 4000. Reroute current air injection on all boilers through the flue gas exhaust system to preheat the influent air to approximately 250 degrees Fahrenheit.Option 4001. Install low NOx burners in all boilers. Option implementation could reduce NOx emissions by ~40%.Option 4002. Reclaim and blend ~50% of the 6% sulfuric acid with the necessary slow rinse wastewater to achieve a 2% solution can then be used in the following regeneration. Option implementation will reduce potable water use, sulfuric acid use, and wastewater generation.Option 4003. Install 10% Flue Gas Return system in Boiler 7 to reclaim and return the uncombusted organics and BTUs to the boiler furnace. Option implementation will result in reduced air emissions (40% for NOx) and fuel use.Option 4004. Replace the below ground steam distribution lines between the Administration Area and Building K-1007 with above ground piping to reduce heat loss. Option implementation will result in decreased steam production and reductions in raw material use, fuel use, and waste generation.Option 4005. Reduce the loss of steam through steam header traps by improving diagnosis of trap failure. Option implementation will result in decreased steam production and reductions in raw material use, fuel use, and waste generation.Option 4006. Install additional condensate recovery piping systems. Option implementation will result in a decrease in softener/demineralizer wastewater.Option 4007. Replace No. 2 fuel oil with propane as the backup fuel source. Option implementation will result in a decrease of permitted air emissions by 532 tons/year, saving $10K annually in permitting fees with additional savings in permit preparation and record keeping costs.Option 4008. Install an anion demineralizer bed downstream of the existing hydrogen cation bed and degasifier. Option implementation has two benefits - (1) this new system demineralizes the feel water to reduce the TDS from 94 ppm to 15-20 ppm, thereby reducing the continuous blowdown by the same ratio (80%), from 2, 182, 335 to 436,471 kg/yr; and (2) regeneration of the two beds will now occur simultaneously, allowing the hydrogen and anion regeneration waste to be blended, resulting in an effluent with a pH near 8 that will be classified as non-hazardous.Option 4009. In conjunction with the anion bed installed in option 9, install a cation/anion mixed bed polisher downstream of the proposed anion bed. Option implementation will further reduce TDS to achieve a level of 0.5 ppm (versus 15-20 ppm with only the anion bed) and again allow blending of the waste streams to achieve a non-hazardous waste.Option 4010. Store and reuse one-third of the brine regenerant. Option implementation will result in significant decreases in potable water use and wastewater generation.Option 4011. Repair leaky valves and cap off the open pipelines from the Steam Plant tot he CNF that were not completed during a repiping project in 1992. As a result of the infiltrating ground/rain water, the amount of wastewater sent to the CNF from the Steam Plant is artificially inflated. Option implementation reduces the amount of wastewater attributed to generation by the Steam Plant needing CNF treatment.Option 4012. Increase lapse time between slow and fast rinse during resin regeneration to approximately 20-30 minutes, which increases salt diffusion. Option implementation will result in decreased potable water use and wastewater generation. Option 4013. Contract out the softening and related regeneration services. The contractor will provide a portable mixed-bed system (cation and anion) that will be regenerated off-site. Option implementation will result in a zero discharge rate for all regeneration waste and will decrease the continuous and mud-drum blowdowns by 99.5% each.

Site: Oak Ridge K-25 Site	
Site Coordinator: Belgin Barkenbus	**Team Leader:** Jim Nelson
Phone: 423-241-2773	**Phone:** 423-483-0666
Fax: 423-576-7668	**Fax:**
Email: barkenbusdb@ornl.gov	**Email:**

Title: K-25 Identification of Waste Generating Activities and Processes **Major Waste Type:** All

PPOA ID Code: ORR-K013 **Specific Waste Type:** All

Date: 15-sep-1995 **Major Activity Type:** All **Specific Activity Type:** All

Description: Identification of all waste-generating processes and activities at the Oak Ridge K-25 site. Focus of document is on activity identification in order to prioritize for further assessments which will identify P2 options.

Options: Option 104. Minimize VOC emission to the atmosphere and possibly recover and reuse volatile components by using

chilling and/or installing carbon adsorption on selected vents (chiefly K-1200 Center bay).Option 107. Use methods that do not require full enclosure (glove bag technique) of an area in order to abate its asbestos.Option 108. Research alternate types of batteries - less hazardous or toxic.Option 110. Test batteries to ensure expiration. If the batteries are found to be excess, and not expired, surplus them for reuse.Option 113. Network extensively for continued use of surplus batteries.Option 115. Consult with Operations Division, Materials Management Department, for the off-site processing of batteries for recovery of lead, nickel, cadmium, etc..Option 117. Reevaluate Health Physic classification criteria versus radioactive metal recycler acceptance criteria; modify theses as appropriate.Option 119. Investigate the decontamination of ductwork to enable smelting at a radioactive metal recycling facility.Option 121. Advertise usable chemicals discovered during one-time cleanouts on the Swap Shop.Option 122. Review the decision to declare bulk corrosive liquids as waste. The liquids may be reusable as reagents, etc.Option 125. Advertise usable chemicals on the Swap ShopOption 126. Investigate the use of refillable propane tanks instead of disposable ones.Option 129. Characterize dioctyl phthalate-contaminated waste rags to ensure the proper category.Option 131. Consider using the HFATS system with other pieces of equipment that test the HEPA filter.Option 133. Recommend that radioactivity of waste liquids be confirmed prior to disposal as radioactively-contaminated. Non-radioactive materials should be publicized on the Swap Shop.Option 135. Onetime cleanout discovered flammable liquids that were disposed of as lab packs. It is recommended that this division investigate the substitution of non-flammable liquids for the flammable ones.Option 137. Flammable liquids are used by this division to clean the hard drives of their computers. It is recommended that the necessity of cleaning the hard drive be investigated. If cleaning is found to be necessary, investigate cleaning the drives based on performance rather than manufacturer recommendations. It is recommended that the substitution of an aqueous-based or citrus-based solvent for the hazardous one. Information on likely candidates for substitutes may be found in the Oak Ridge K-25 Site PPOA on Chlorinated Solvents.Option 138. If flammable liquids used in this division are not expired and can be reused, advertise their availability on the Swap Shop. Investigate pursing non-flammable substitutes.Option 139. Research the replacement of mercury vapor bulbs with electrodeless sulfur lamps (Fusion Lighting, Inc., Rockville, Maryland).Option 145. Revise the policy regarding wrapping spent fluorescent bulbs in plastic when an empty box is not available, or create an overnight accumulation area to prevent the generation of excess plastic and tape.Option 148. Replace only when ÒpotheadÓ fails.Option 149. Maintain segregation of liquids during D&D and one-time cleanout activities; some may be able to be recycled and/or reused on-site.Option 151. Educate all personnel on segregation practices. Consult with Waste Management Division personnel on a proposed policy to characterize low-level radioactive waste prior to bulking to eliminate unnecessary used B-25 boxes.Option 154. Research the use of a non-petroleum-using electrical configuration.Option 156. If materials found during one-time clean-outs are not expired, recommend publicizing their availability for use on the Swap Shop.Option 158. Segregate solids during one-time clean-outs.Option 160. Implement a policy to reevaluate the quantitative use of roofing cement to limit the surplus inventory.Option 162. Implement a policy to instruct workers in identifying P2 opportunities, and require the segregation of waste during D&D activities.Option 164. Consider the use of launderable PPE as opposed to disposable PPE in R&D activities.Option 166. Provide on-the-job radiological waste reduction training on an annual basis and consultation with Health Physics personnel to verify radioactivity of materials. Limit material entering a radioactive area to only that which will e immediately used.Option 168. Recommend separating items during a spill when possible to avoid mixing those with different characteristics (e.g. asbestos, lightbulbs, PCBs). Recommend consulting Waste Management Division personnel on their use of aqueous-based cleaner, Penetone Power Cleaner 155, for PCB spill cleanups instead of organic solvents.Option 169. Investigate use of lead-free light bulbs.Option 171. Pilot using compact fluorescent lightbulbs that do not require alteration of existing incandescent lightbulb fixtures. These bulbs are readily commercially available. Compact fluorescent bulbs would also be considered hazardous because of their mercury content, but are much more energy-efficient than their incandescent counterparts, therefore reducing annual bulb generation.Option 178. Revise the policies and procedures to allow radioactively-contaminated materials that are in good condition be reused in radioactive areas. These materials are in usable condition, but because of policy must be thrown away.Option 179. Research the feasibility of recycling the acids and bases from this division.Option 181. Investigate other methods of corrosion removal.Option 183. Segregate RCRA and non-RCRA acids when possible. Contact ASO regarding their effort and research the feasibility of recycling the acids.Option 185. Consult the EPAÕs Òsignificant New AlternativesÓ list or the Solvent Alternatives Guide (SAGE) for substitutes for organic liquids used in this division.Option 187. Research the possibility of collecting smaller sample sizes, and implement a policy for segregation of materials in the lab to decrease lab sludges and solids.Option 189. Recycle glass generated in the lab.Option 192. Send the used lead seals to Operations Division, Materials Management Department, Office of Property Sales for their off-site recycling. The Office of Property Sales is currently involved in the recycling of lead pieces generated by the K-25 site.Option 197. Donate circuit boards to local schools.Option 199. Provide on-the-job radiological waste reduction training on an annual basis and reuse of lead bricks as shielding in radioactive areas.Option 207. Survey asbestos, rubbish, and trash to verify the radioactivity prior to disposal.Option 209. Evaluate the possibility of using waste concrete as fill, riprap, etc., possibly after some decontamination.Option 212. Consult Health Physics personnel to confirm radioactivity of concrete.Option 215. Institute a policy to allow only those materials that are necessary, in the quantities that they are necessary, into RAD areas.Option 220. Consult a representative from the Maintenance Division regarding their purchase of a vacuum sandblast/media recovery system, to determine whether there is a similar system that uses shot. The vacuum sandblaster greatly reduces worker exposure to particulate matter, eliminating the need for enclosures during this type of activity.Option 222. Recycle LLW glass.Option 226. Install automatic hand dryers to reduce waste paper towels.Option 227. Size yellow radioactive plastic bags to fit lint collectors. Currently, an additional plastic bag must be used to collect lint before depositing in an approved radioactive bag, resulting in excess scrap radioactive plastic for disposal.Option 230. Investigate metals recycling by smelting at a radioactive metal

recycler.Option 232. Upgrade and evaluate existing equipment for greater reliability and longevity.Option 236. Research the possibility of decontaminating metal from ER activities and then recycling it, or sending the metal directly to a radioactive metals recycler to be smelted and recycled.Option 237. Review Health Physics procedures for declaring metals LLW; Review the feasibility of decontaminating then recycling the LLW metals; Segregate ferrous and non-ferrous metals; Recycle and reuse everything possible.Option 242. Assemble a task team to detect and repair all roof leaks.Option 243. Implement a policy to survey containers used to contain leakage from roofs prior to their use to segregate RAD from non-RAD.Option 253. Research liabilities and opportunities to donate material off-site.Option 256. Leave the radioactive sawhorses in the radiation areas permanently; institute a policy to only take necessary equipment and supplies into the exclusion zones.Option 258. Investigate the use of mercury-free thermometers.Option 259. Investigate the possibility of recycling mercury from spill cleanup of a broken thermometer.Option 261. Research the replacement of mercury vapor bulbs with new elctrodeless sulfur lamps (Fusions Lighting, Inc., Rockville, Maryland).Option 265. Recycle antifreeze/water mixture at the garage.Option 267. Recirculate water in the calling system, and/or purchase an air-cooled unit.Option 274. Install minimum water-usage toilets throughout K-25 site.Option 278. Launder oily rags.Option 280. Investigate the feasibility of reusable booms and diapers (i.e. fabric instead of paper) than can be laundered.Option 285. Diapers used to collect PCB leaks are 12Ó x 12Ó. Past policy indicates disposing of the diaper after one drop is collected. Recommend reducing the size of the diaper for shifting position to allow collection of more than one drop per diaper before disposal.Option 289. Reuse paint thinner, brushes, etc., dry out rags and buckets, etc., and limit the paint colors used to ensure that all paint is fully used.Option 293. Institute a policy to cover areas and waste accumulation containers to avoid addition of rainwater.Option 304. Consult Health Physics to verify that capacitors found are radioactive. If they are found to be non-radioactive, research the possibility of their off-site reuse.Option 317. Sell the collected silver to a recycler.Option 320. In the event that traditional film is again used, waste photo chemicals could be fed through Quality Division or Computing and Telecommunications Division silver recovery systems to remove the silver; then approval could be obtained to drain the remaining chemicals into the sanitary sewer.Option 321. Send any damaged film back to the manufacturer.Option 324. Investigate using a Rotasonic drill, which does not produce drill cuttings.Option 325. Research the possibility of using microchemistry techniques that utilize less glassware.Option 329. Research using more scrap wood for landscaping and grounds maintenance on-site and for off-site beautification projects sponsored by K-25, such as the ÒAdopt-a-HighwayÓ program.Option 337. Study process control and recycling options to reduce the amount of wastewater exiting the incinerator.Option 339. Research the reuse of decontaminated, decommissioned pumps.Option 342. Pursue the availability of non-hazardous oil substitutes; reevaluate the oil change-out schedule; filter the oil for reuse.

Site: Oak Ridge K-25 Site	
Site Coordinator: Belgin Barkenbus	**Team Leader:** Vicki Blitz
Phone: 423-241-2773	**Phone:** 423-483-0666
Fax: 423-576-7668	**Fax:**
Email: barkenbusdb@ornl.gov	**Email:**

Title: K-25 Prioritization of Waste Generating Activities and Processes **Major Waste Type:** All

PPOA ID Code: ORR-K014 **Specific Waste Type:** All

Date: 15-sep-1995 **Major Activity Type:** All **Specific Activity Type:** All

Description: Assembly of data in ÒIdentificationÓ study into Level I PPOA format, and prioritization - by waste stream - for further assessment. Focus of document was on prioritization for further assessments which will identify options to prevent pollution.

Options: No option information.

Site: Oak Ridge K-25 Site	
Site Coordinator: Belgin Barkenbus	**Team Leader:** Vicki Blitz
Phone: 423-241-2773	**Phone:** 423-483-0666
Fax: 423-576-7668	**Fax:**

Email: barkenbusdb@ornl.gov	**Email:**

Title: Metals & Ceramics Division Study of Human Carcinogens and Reproductive Hazardous Waste

Major Waste Type: Hazardous Waste

PPOA ID Code: ORR-X001

Specific Waste Type: Lab Packs

Date: 15-jul-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Chemical

Description: Assembly of data in ÒIdentificationÓ study into Level I PPOA format, and prioritization - by waste stream - for further assessment. Focus of document was on prioritization for further assessments which will identify options to prevent pollution.This study is included in an anthology of waste minimization studies completed at ORNL entitled ÒWaste Minimization/Pollution Prevention Study of High-Priority Waste StreamsÓ.

Options: Option 442. Replace Human Carcinogenic and Reproductive Hazards (HCRH) with non-HCRH materials, in proposed as well as on-going R&D activities.Option 443. Reuse/Recycle of Human Carcinogenic and Reproductive Hazardous Materials (HCRH).Option 444. Collect Human Carcinogenic and Reproductive Hazardous Materials (HCRH) in separate containers.Option 445. Minimize purchase and storage of HCRH chemicals to the quantities necessary to perform tasks. (Just-in-time purchasing). Experiment/work requirements should be scrutinized prior to ordering chemicals to ensure that the minimum amount of these materials is ordered. Inventories should be evaluated periodically to ensure that stocks of HCRH materials are kept as low as is reasonable. The expectation of carrying out minimization would before realistic if system like AVID and HMIS were dedicated to assist staff members in carrying out minimization activities. Criticisms of these systems were presented to ONRLÕs Fix-it Committee by the division.

Site: Oak Ridge National Laboratory	
Site Coordinator: Sam Suffern	**Team Leader:** Randy Ogle
Phone: 423-576-0126	**Phone:** 423-574-5744
Fax: 423-576-6222	**Fax:**
Email: suffernjs@ornl.gov	**Email:**

Title: Photoprocessing Facilities PWA **Major Waste Type:** Hazardous Waste

PPOA ID Code: ORR-X002 **Specific Waste Type:** Metal, Precious

Date: 15-sep-1992 **Major Activity Type:** Service **Specific Activity Type:** Photographic Services

Description: This evaluation included all liquid waste associated with photographic processing. The preferred option was photographic imaging, which would eliminate photographic wastes. Because this option requires a significant investment of equipment, it will be combined with an option to remove the silver from the liquid. The effluent can then be treated in the wastewater treatment plant.

Options: Option 327. Rinse Water Recirculating - Filters remove contaminants and create a closed-loop rinse water system.Option 330. Use of a silver recovery system that combines electrolytic cells and chemical recovery cartridges. Install twenty systems for the twelve organizations involved.Option 331. Participation in the Kodak Film container Recycling Program.Option 333. Development and use of a photographic negative retrieval database system to eliminate the need for photographing items for which photographs already exist.

Site: Oak Ridge National Laboratory	
Site Coordinator: Sam Suffern	**Team Leader:** J.W. Nave
Phone: 423-576-0126	**Phone:** 423-576-8478

Fax: 423-576-6222	**Fax:**
Email: suffernjs@ornl.gov	**Email:**

Title: Metals and Ceramics Study of Waste Oils and Oily Solids **Major Waste Type:** Hazardous Waste

PPOA ID Code: ORR-X003 **Specific Waste Type:** Oil

Date: 15-sep-1993 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Equipment

Description: The study identified twelve recommendations ranging from easily implemented to activities that will require more study. Options that can easily be identified will be pursued in 1994. The study was completed for ORNL specifically, but led to reviews of PWAs at Y-12 and K-25. The focus is now to address used oil as a reservation-wide stream in hopes that some economies of scale can be realized. The more complex recommendations will be incorporated as p[art of the reservation-wide initiative.This study is included in an anthology of waste minimization studies completed at ORNL entitled ÒWaste Minimization/Pollution Prevention Study of High-Priority Waste Streams.Ó

Options: Option 417. Use of oil-free vacuum pumps.Option 418. Use of helium to create a vacuum instead of a vacuum pump.Option 419. Install filter systems to remove particulate and water contamination from waste oil for on-site reuse. This option will require the purchase and use of an oil quality testing system to ensure that the recycled oil is of acceptable quality.Option 420. Off-site recycle of oil.Option 421. Use oil in space heaters. (1) Send non-RAD and non-PCB-contaminated Metals and Ceramics (M&C) oil to the garage which is planning to employ space heaters that burn used oil for energy recovery, or (2) buy space heaters for some of the M&C areas.Option 422. Distillation of waste oil into diesel fuel. Distillation systems are available through Waste Energy, Inc.Option 423. Treatment of oil at ORNL.Option 424. Treatment of oil at SEG.Option 425. Treatment of oils at TSCA Incinerator which requires that ORNL tanker their waste to K-25 or send it to Y-12 to be bulked and then sent to K-25.Option 426. Recycle/reuse blotter paper and wipes to clean up oil. 3M produces a reusable wipe that when soaked with oil is either put through a wringer system or a centrifuge to remove the excess oil and use the wipes again.Option 427. (1) Collect oil in 220-gal Tuff Tanks, (2) transfer this oil into a storage tank, and (3) return the Tuff Tanks to M&C. The waste drums associated with the oil would be eliminated and analytical costs would be decreased (i.e. one sample per Tuff Tank instead of 4 samples for four drums.)Option 428. Survey equipment to identify PCB-contaminated equipment.Option 429. Purchase and use of a PCB testing kit to test oil brought to the central oil storage area before bulking to avoid contaminating a 55-gallon drum of waste oil with a 5-gallon can of PCB-contaminated waste oil.Option 430. Review and challenge the Energy Systems PCB Limit of 2 ppm. (The federally regulated limit is 50 ppm.) If the 2 ppm limit of PCBs for deeming a waste TSCA-regulated were raised, M&C would have greater flexibility in managing much of the waste categorized as PCB-contaminated.Option 431. Use of contaminant traps in line in front of vacuum pump.

Site: Oak Ridge National Laboratory	
Site Coordinator: Sam Suffern	**Team Leader:** Millicent Clark
Phone: 423-576-0126	**Phone:** 423-576-2331
Fax: 423-576-6222	**Fax:**
Email: suffernjs@ornl.gov	**Email:**

Title: Metals and Ceramics Study of Acid Waste **Major Waste Type:** Hazardous Waste

PPOA ID Code: ORR-X004 **Specific Waste Type:** Acid

Date: 15-sep-1993 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Metallurgy

Description: Metals and Ceramics Division analyzed their acid waste stream for reduction opportunities. Because the project sponsor requires the use of acids, an alternative material was not an option. Ultimately, the most feasible alternative was elementary neutralization of the waste acid which will reduce RCRA waste generation by 590 kg.This study is included in an anthology of waste minimization studies completed at ORNL entitled ÒWaste Minimization/Pollution Prevention Study of

High-Priority Waste Streams.Ó

Options: Option 432. Replace acid with nonhazardous chemical or mechanical method for removing molybdenum.Option 433. Reuse/Recycle waste acid.Option 434. Collect different types of acids in separate containers.Option 435. Acid neutralization and discharge.

Site: Oak Ridge National Laboratory	
Site Coordinator: Sam Suffern	**Team Leader:** J.R. Mayotte
Phone: 423-576-0126	**Phone:** 423-574-8956
Fax: 423-576-6222	**Fax:**
Email: suffernjs@ornl.gov	**Email:**

Title: DOE ORNL Degreasing Solvent PWA **Major Waste Type:** Hazardous Waste

PPOA ID Code: ORR-X005 **Specific Waste Type:** Solvents

Date: 15-apr-1993 **Major Activity Type:** Maintenance **Specific Activity Type:** Cleaning

Description: Studied site solvent degreasing operations in garage and other parts maintenance areas. As funds become available, aqueous washers are being installed.

Options: Option 315. Parts degreasing using aqueous cleaners in Plant & Equipment (P&E) Division as well as Research Services and Building Maintenance - phase out current organic degreasers, test the new aqueous cleaners to find the best substitution for each operation, and identify those operations that can be consolidated. Begin pilot tests in Building 7012 and Building 2525.Option 316. Use ÒdishwasherÓ type parts degreasing process. This type of system currently exists in Building 2018. It is recommended that other division (Building Maintenance and Research Services) utilize this system to test its applicability for cleaning their parts.Option 318. Purchase an ultrasonic cleaning system to replace hazardous solvents used to degrease and clean parts currently. The rigid requirements needed to clean the electroplating equipment and circuit boards in Instrumentation and Central Services make this division the most applicable - two less expensive options, aqueous cleaners, and ÒdishwashersÓ would not delicately clean the equipment to acceptable levels.

Site: Oak Ridge National Laboratory	
Site Coordinator: Sam Suffern	**Team Leader:** Susan Michaud
Phone: 423-576-0126	**Phone:** 423-576-1562
Fax: 423-576-6222	**Fax:**
Email: suffernjs@ornl.gov	**Email:**

Title: Legacy and Surplus Chemicals **Major Waste Type:** Hazardous Waste

PPOA ID Code: ORR-X006 **Specific Waste Type:** Lab Packs

Date: 15-jun-1995 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Chemical

Description: This PPOA addresses all chemical/lab pack types of waste. The assessment primarily focuses on existing chemical purchase and storage procedures and outlines methods to keep chemicals from being stored beyond useful shelf life oar beyond usage requirement time lines. Chemicals stored beyond shelf life cannot be used and thus typically becomes classified as waste.

Options: Summer interns to perform division inventories.Division cleanup days.Between Use Storage (BUS) areas for divisions having duplicate chemical inventories.Surplus and usable legacy chemicals placed on Swap Shop.Chemical purchases and

inventories minimized.Review of BUS, Swap Shop, and HMIS excess inventories before chemical purchases.Legacy and Process Activity Code added to Waste Disposal Form.Segregation of waste streams.Recycle/reuse.Chemicals substituted to prevent generation of hazardous materials, or to use excess inventory.Chemicals are neutralized in process.Microscale applications.Chemicals/processes replaced with new technology/equipment.Internet set up between divisions.Training and education to increase knowledge.Request for Disposal form modified to reduce paperwork.Written procedure in place to sign-out/relinquish laboratory materials.

Site: Oak Ridge National Laboratory	
Site Coordinator: Sam Suffern	**Team Leader:** Ron Baker
Phone: 423-576-0126	**Phone:** 423-483-4376
Fax: 423-576-6222	**Fax:**
Email: suffernjs@ornl.gov	**Email:**

Title: Mercury-Contaminated Equipment **Major Waste Type:** Hazardous Waste

PPOA ID Code: ORR-X007 **Specific Waste Type:** Mercury

Date: 15-jun-1995 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Chemical

Description: This PPOA addresses all equipment using mercury. Equipment leakage and subsequent contamination resulting from equipment usage are studied. Contamination reduction and equipment replacement are included as objectives of the study. Sources of mercury contamination and leakage are identified as mercury switches, thermometers, manometers, and also includes legacy contamination.

Options: Division cleanup days.Between Use Storage (BUS) areas for divisions having duplicate mercury/mercury constituent inventories.Surplus and usable mercury and mercury constituents placed on Swap Shop.Mercury and mercury constituent purchases and inventories minimized.Review of BUS, Swap Shop, and HMIS excess inventories before mercury or mercury constituent purchases.Segregation of waste streams.Substitutions to prevent generation of mercury wastes.Microscale applications.New technology/equipment replacing chemicals/processes.Internet between divisions.Increase knowledge through training/education.Modify Request for Disposal form to reduce paperwork.Decontaminate/decommission mercury-contaminated constituents.Label contaminated constituents and leave in place.

Site: Oak Ridge National Laboratory	
Site Coordinator: Sam Suffern	**Team Leader:** Ron Baker
Phone: 423-576-0126	**Phone:** 423-483-4376
Fax: 423-576-6222	**Fax:**
Email: suffernjs@ornl.gov	**Email:**

Title: Acetone and Methanol Used in Cleaning **Major Waste Type:** Hazardous Waste

PPOA ID Code: ORR-X008 **Specific Waste Type:** Solvents

Date: 15-jun-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Cleaning

Description: This assessment addressed substitution of aqueous and non-regulated cleaners in place of hazardous solvents. Also included as options are elimination of need for cleaning and awareness training.

Options: Substitute isopropyl alcohol or ethyl alcohol for acetone or methanol.Substitute a less-hazardous solvent (such as Ashland Chemical Solvent 140) for acetone or methanol.Consider the use of aqueous and semi-aqueous cleaners for routine

degreasing and sample preparation.Reduce sample volumes to reduce acetone and methanol consumption during sample preparation.Consider the use of oil-less vacuum pumps.Review all new operations to minimize the use of hazardous solvents by substitution or process revisions.Reuse surplus acetone from critical operations for less critical ones (i.e., reuse acetone or methanol generated during research activities for degreasing).Re-distill used solvents.Increase user awareness of the downstream impacts (disposal requirements and cost) of regulated solvents.Develop and implement training information for computer-based pollution prevention tools such as the Solvent Alternatives Guide (SAGE) and the Department of Energy Pollution Prevention Clearing House (EPIC), as well as other pollution prevention bulletin boards and databases.

Site: Oak Ridge National Laboratory	
Site Coordinator: Sam Suffern	**Team Leader:** Ron Baker
Phone: 423-576-0126	**Phone:** 423-483-4376
Fax: 423-576-6222	**Fax:**
Email: suffernjs@ornl.gov	**Email:**

Title: Radioactive Waste Generated in Support of Research **Major Waste Type:** Low Level Waste

PPOA ID Code: ORR-X010 **Specific Waste Type:** Solid Waste

Date: 15-aug-1995 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Radiological

Description: The study focused on the causes of the LLW, and reportedly found PPE to be a main contributor to this waste stream. Reducing amounts of LLW generated through procedural changes is addressed.

Options: Administration:Division Cleanup Campaign - a periodic cleanup campaign to remove legacy and project radioactive waste to facilitate the segregation of like wastes and minimize the paperwork requirements.Quarterly Division Inspection for Pollution Prevention Opportunities - Opportunities for radioactive waste reduction can be identified by periodic inspections of the waste stream.Simplification of Request for Disposal Form - a suitable program/database could call up descriptive information such as MSDS and accepted analytical methods, while flagging prohibited items and confirming container and storage requirements.Legacy Location and Inventory - each division should establish and maintain an inventory for internal planning.Clean Area Policies - identify and maintain clean areas and structures at natural background radiation levels.Minimization:Radioactive Operations and Research Projects - future efforts may incorporate plans and costs to accommodate radioactive processing or research without remaining legacy obligations.Frequency of Radioactive Materials Production - planning a five year production cycle to reduce the waste generated by more frequent production.Microscaling Procedures, Tests, and Processes - procedures changes that require less radioactive material.Short-Lived Isotopes and in situ Decay - Unnecessary handling and low-level radioactive waste disposal can be avoided by having short-lived, isotope-contaminated, non-hazardous waste stored at the point of generation and allowed to decay to non-detectable levels.Segregation:Division Waste Segregation - each division should promote segregation of their waste streams and minimize mixed waste disposal.Evaporation of Low-Level Liquid Waste - where feasible, a low-level liquid waste should be evaporated to dryness for disposal as a low-level solid waste.Repackaging B-25 Boxes - a study of B-25 boxes indicated that less than 20% of the contents were radioactive, and of that amount, limited decontamination reduced the amount to less than 5%.Decontamination Facility for LLSW - Several techniques have successfully removed surface contamination leaving a minimum solid residue for disposal.Blotter Paper Reconstitution - using paper pulp technology, the paper could be digested, the liquid separated for disposal, evaporation, or filtration; and the paper refelted for incineration or reuse.Recycle:Vendor and Shipping Containers - containers can be returned to vendors for recycling or reuse.Blotter Paper Recycle - introduced into the hot cell for a final usage.Substitution:Commercial Absorbents - use commercial absorbents to reduce solid waste disposal volumes and increase fluid uptake.Nonabsorbent Floor Coverings - impervious, flexible floor coverings have been substituted for blotter paper.Launderable Personal Protection Equipment - launder of shoe covers, gloves, and c-zone coveralls.Compactable HEPA Filters - stainless steel frames can not be compacted and must be disassembled by hand within the controlled areas.Training:Minimization Methods - techniques for minimization of test samples, process quantities, and contamination should structure a training effort for professional and technological staffs.Isolation Methods - techniques and methods for isolating radioactive contamination by spill, work process, air transport, etc. should be offered for craftsmen, plant personnel, and technicians with a strong interface from HP.Waste Management Planning - combination of waste management principles with appropriate process technologies can lead to effective and creative planning.Segregation Procedures - procedures for establishing segregation activities, inspection and analysis of waste stream, and decontamination.Decontamination and Cleaning - principles and techniques for decontamination and cleaning will be included in the methodology for process

operations.Procedures:Precise Sample Size - excess radioactive scrap is generated when oversized specimens must be cut or machined in the hot cells.Pre-Radiation Equipment Proof Testing - Off-the-shelf equipment becomes a continuing liability after introduction into a hot cell. When it ceases to function, it becomes a space-filling legacy.Uniform Green Tagging for Release - basis for green tag decisions appear to be individual with each inspector.Monitoring:Automated Processing - automated radiological monitoring facilities for routine material and instrument surveys are virtually absent.Release Areas With Low Background - many areas have backgrounds that are too high for Òclean releaseÓ.Bag Monitors - bag monitors (instruments that monitor an entire bag) remain in short supply in most areas. These devices will increase the rate of characterization as well as their quality.Adequate Detection Equipment - detection equipment of various types have been noted to be in short supply. Several areas reported the need for updated instrumentation and the extended period required for instrument qualifications.Authoritative Review and Conflict Resolution - conflicting technical decisions concerning waste stream processing and material release are referred for professional authoritative review and resolution. Limits and specifications vary by RWP and site.Professional Review of RWPs - realizing that the RWP is a specific action plan, and that it should lean toward conservative action for safety reasons, a need remains for RWP review by a team of subject matter experts. Conservative radioactive practices may give rise to dangerous motion-limiting practices which impede human agility.

Site: Oak Ridge National Laboratory	
Site Coordinator: Sam Suffern	**Team Leader:** Ron Baker
Phone: 423-576-0126	**Phone:** 423-483-4376
Fax: 423-576-6222	**Fax:**
Email: suffernjs@ornl.gov	**Email:**

Title: Radioactive Soil and Asphalt **Major Waste Type:** Low Level Waste

PPOA ID Code: ORR-X012 **Specific Waste Type:** Soil

Date: 15-nov-1995 **Major Activity Type:** Environmental Restoration **Specific Activity Type:** Disposal

Description: The focus on this PPOA is on the methods and procedures utilized in environmental restoration generation and disposal of LLW, namely radioactive soil and asphalt. Alternative methods and procedures are outlined for future ER projects for reduced LLW generation.

Options: Not complete.

Site: Oak Ridge National Laboratory	
Site Coordinator: Sam Suffern	**Team Leader:** Shu-Yoo Chang
Phone: 423-576-0126	**Phone:** 910-334-7737
Fax: 423-576-6222	**Fax:**
Email: suffernjs@ornl.gov	**Email:**

Title: Metals and Ceramics Study of Waste Exhaust Filters **Major Waste Type:** Low Level Waste

PPOA ID Code: ORR-X013 **Specific Waste Type:** Filters

Date: 15-sep-1993 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Building

Description: This study addressed the accumulation of waste building exhaust filters and any P2 opportunities for reducing this waste stream. The study focused on Building 4508 because it is the source of most waste building filter generation.This study is included in an anthology of waste minimization studies completed at ORNL entitled ÒWaste Minimization/Pollution Prevention Study of High-Priority Waste Streams.Ó

Options: Option 436. Use of B-2000 filters to decrease the quantity of waste generated and conserve energy needed for the associated HVAC system.Option 437. Perform environmental and HP survey of duct work to provide a technical basis for determining whether the current HEPA filters are required or whether other B-2000 filters can be utilized.Option 438. Implement a laboratory policy that requires the installation of HEPA filters by area instead of by building. This option will reduce HEPA filter waste and reduce energy consumption.Option 439. Implementation of the variable speed fan control project would provide reduced, but balanced, air flow during back shifts and weekends. Filter load would be somewhat reduced, but the main benefit would be reduced energy usage.Option 440. Interim reduced flow configuration.Option 441. If an engineering evaluation of rebalancing the building air flow of areas collected in discreet modules with dedicated HVAC was performed, the energy usage and waste exhaust filter waste stream would be decreased.

Site: Oak Ridge National Laboratory	
Site Coordinator: Sam Suffern	**Team Leader:** J.N. Parks
Phone: 423-576-0126	**Phone:** 423-574-4094
Fax: 423-576-6222	**Fax:**
Email: suffernjs@ornl.gov	**Email:**

Title: Metals and Ceramics Study of Office and Miscellaneous Waste **Major Waste Type:** Sanitary Waste

PPOA ID Code: ORR-X014 **Specific Waste Type:** Office Trash

Date: 15-sep-1993 **Major Activity Type:** Service **Specific Activity Type:** Disposal

Description: This study was conducted to identify how non-hazardous waste generation is tracked in this division and to identify the P2 activities that are already in place, as well as identify additional P2 opportunities.This study is included in an anthology of waste minimization studies completed at ORNL entitled ÒWaste Minimization/Pollution Prevention Study of High-Priority Waste Streams.Ó

Options: Option 446. Survey of paper/miscellaneous materials usage and paper/miscellaneous waste generation. This information would then allow the division to further evaluate potential minimization and reduction options.Option 447. Pilot of mixed waste paper collection in M&C Division for use in aqua seeding system.Option 448. Use electronic mail system for distribution of regularly copied and mailed items such as division staff meeting minutes, management reports, miscellaneous memorandums, organization announcements, and seminar notices.Option 449. Recycle aluminum cans. Take steps to enhance voluntary division participation and communicate actions tot he ORNL Pollution Prevention Coordinator.Option 450. Use reusable plastic or metal pallets instead of wooden ones, or possibly send unusable ORNL pallets to Y-12 to be mulched, or procure a chipper for ORNL. Communicate these actions tot he ORNL Pollution Prevention Coordinator.Option 451. Take steps to enhance voluntary division participation in the Adopt-a-School Program and communicate actions tot he ORNL Pollution Prevention Coordinator.Option 452. Take steps to enhance voluntary division participation in the Toner Cartridge Recycling Program and communicate actions to the ORNL Pollution Prevention Coordinator.Option 453. Encourage divisional participation in the Swap Shop through promotional activities such as an articles in the divisional newsletter or a presentation and question and answer session with the Swap Shop Coordinator at a safety meeting.

Site: Oak Ridge National Laboratory	
Site Coordinator: Sam Suffern	**Team Leader:** P.T. Thornton
Phone: 423-576-0126	**Phone:** 423-574-4476
Fax: 423-576-6222	**Fax:**
Email: suffernjs@ornl.gov	**Email:**

Title: Metals and Ceramics Study to Reevaluate Photographic Waste **Major Waste Type:** Hazardous Waste

PPOA ID Code: ORR-X015 **Specific Waste Type:** Metal, Precious

Date: 15-sep-1993 **Major Activity Type:** Service **Specific Activity Type:** Photographic Services

Description: PPOA to reevaluate 1992 PWA on Photographic Processes in Metals and Ceramics Division.This study is included in an anthology of waste minimization studies completed at ORNL entitled ÒWaste Minimization/Pollution Prevention Study of High-Priority Waste Streams.Ó

Options: Option 454. Use photographic imaging techniques to replace standard photographic processes. This technology would eliminate all of the hazardous waste generated in developing film and making prints. The system uses a camera that contains a diskette instead of film.Option 455. Use metallic replacement system to recover silver from fixer solution. The system consist of two canisters installed in series in the discharge line and exchange iron ions from the steel wool in the canisters for silver ions in the solution. The silver in the canisters can then be recovered by an off-site vendor.Option 456. Electrolytic silver recovery from fixer.Option 457. Chemical precipitation of silver from fixer.Option 458. Silver recovery from rinse water using ion exchange.Option 459. Silver recovery from rinse water using reverse osmosis.Option 460. Silver recovery from scrap.Option 461. Use countercurrent rinsing methods to recover the silver.Option 462. Use evaporator to recover silver from photoprocessing wastes.Option 463. Reuse color developer.

Site: Oak Ridge National Laboratory	
Site Coordinator: Sam Suffern	**Team Leader:** Randy Ogle
Phone: 423-576-0126	**Phone:** 423-574-5744
Fax: 423-576-6222	**Fax:**
Email: suffernjs@ornl.gov	**Email:**

Title: Used Oil Study for ORNL **Major Waste Type:** Hazardous Waste

PPOA ID Code: ORR-X016 **Specific Waste Type:** Oil

Date: 01-jan-1993 **Major Activity Type:** Manufacturing **Specific Activity Type:**

Description: The study identified twelve recommendations ranging from easily implemented to activities that will require more study. Options that can easily be identified will be pursued in 1994. The study was completed for ORNL specifically, but led to reviews of P

Options: Source Elimination:Replacement of equipment such as air compressors, which presently use oil, with oil-less versions. Replacement of oil-using equipment with oil-less versions should be considered when the equipment reaches the end of its useful life and must be replaced.Segregation:Solvents, fuel, rags, water, trash, etc. must be kept out of the oil. All categories of oils should be collected separately from one another: radioactive, hazardous, PCB, and uncontaminated.Material Substitution:Synthetic oils reduce energy consumption in the production and use of the lubricants, generate less waste for disposal, are nonhazardous, and are more biodegradable.At least 32 different types of oils and lubricants were purchased by ORNL. A program to minimize the types of oil purchased should be considered.Non-RCRA oils exist that may be substituted for RCRA oils.Equipment Modification:When oil-filled transformers must be replaced, replacement with solid state transformers which do not use oil as a n insulating fluid should be considered. In the case of oil systems in which the oil recirculates through the system, installation of filters on the recirculation line will extend the life of the oil, albeit at the expense of generating waste filter media, which may be classified as hazardous and/or radioactive.Maintenance Programs:ORNL currently sends oil samples from its 47 backup generators, which usually only run for 30 minutes every two weeks for testing purposes, offsite for analysis at 6-month intervals. Analytical data is not tracked or trended.ORNL P&E personnel are considering implementation of a predictive maintenance program to supplant the current preventative maintenance program. The former is based on a regular schedule of analyses and a system to trend data. This can be used to anticipate potential failures in equipment and to determine appropriate time to replace lubricants. The lubrication portion of a preventative maintenance is based on scheduled replacement of oils to help prevent maintenance problems in the future. The only know program of a predictive maintenance type is offered by a company called Predict Technologies, which is used by Alcoa and by Tennessee Eastman.Administrative extension of the intervals at which oil is changed is an excellent method of reducing the generation of used oil. However, field engineers are reluctant to approve changes in PM intervals, especially on items which are considered to be critical equipment. A sampling

program, similar to that used for the generators but based onsite, could be used to establish that longer maintenance intervals are warranted.Personnel should be empowered relative to equipment maintenance. Authority should be delegated to individuals or teams which are responsible for taking care of various pieces of equipment to determine what the appropriate PM intervals should be.Education of P&E personnel relative to the science of lubrication is needed - lubrication methods, types of wear, reasons for oil changes, contamination pathways, etc.Appropriate Storage:Oil drums should be stored inside, rather than out in the weather. This would avoid contamination of the oil with water as the drums breathe.Recycling:Recycling may take the form of either material recovery or energy recovery. Material recovery involved processing the used oils that it can be reused for lubrication purposes. Energy recovery involves burning the oil for its energy content in the production of steam, heat for industrial processes, space heating, or as diesel fuel.A comparison for energy conservation purposes between reprocessing used oil for use as fuel as opposed to disposal show a savings of about 130,000 Btu/gal. Re-refining, therefore, has a significant advantage over reprocessing for use as fuel when viewed on a national scale.Material Recovery:Several types of recycling techniques exist; these include reclamation, reprocessing, and re-refining. Reclamation is a process by which water and solids are removed by the use of heat, settling, screening, centrifugation, and/or filtration. Reprocessing removes water, solids, and some oil-soluble contaminants using heat, surfactants, chemicals. clay treatment, filtration, and/or centrifugation. This results in oils that can be used as clean fuels, metalworking base stocks, non-critical lubricants, concrete form oil, or possibly lubrication oil. Re-refining is conducted on a large scale and involves processing of the used oil in a manner similar to that used for crude oil. The entire used stream is converted through re-refining to fuel, lubricant, or asphalt component, thus eliminating all long-term liability and achieving the highest form of resource conservation.Affirmative Procurement:The procurement and use of re-refined oils contributes to the conservation of both energy and raw materials.

Site: Oak Ridge National Laboratory	
Site Coordinator: Susan Michaud	**Team Leader:** Eric Harrington
Phone: 423-576-1562	**Phone:** 423-483-0666
Fax: 423-241-2843	**Fax:**
Email: michaudsr@ornl.gov	**Email:**

Title: Plating Facilities PWA **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: ORR-Y001 **Specific Waste Type:** Acid

Date: 21-oct-1991 **Major Activity Type:** Manufacturing **Specific Activity Type:** Plating & Surface Finishing

Description: Assessment of waste generation from plating and finishing operations at Y-12 plating facilities. Specific areas assessed included: Building 9401-2 General Production Plating, Building 9204-4 Nickel Plating on Uranium, Building 9201-5 Nickel Plating, and Building 9201-5N Ion Plating and Metals Recovery.

Options: Option 249. Install in-tank pumps, filters, and skimmers.Option 252. Install conductivity meters/solenoid valves on selected rinse tanks.Option 254. Convert automatic line in Building 9204-4 to cadmium plating.Option 255. Eliminate chromate passivation (use nitric acid passivation.)Option 257. Eliminate copper cyanide use, replace with copper pyrophosphate.Option 260. Eliminate cadmium cyanide use, replace with cadmium sulfate.Option 262. Install steam condensate returns for all steam heated tanks.Option 265. Install electroless bath monitors/automatic feed (extends the bath life, produces better product quality.)Option 266. Implement a Plating Shop database to track purchases, waste shipments, etc.Option 268. Design and install a new layout for passivation lines (add double counter flow rinses.)Option 270. Design and implement a new layout for copper plating (add double counter flow rinses and consolidate copper plating at Building 9401-2.)Option 271. Develop a new tank design for electroless nickel operation (heavy duty propylene construction, no outlets on the tank, and all in-tank pumps, filters, and heaters.)Option 273. Install a roof system over the outside dikes (dikes 5N, B4, 9401-2.)Option 275. Replace large tanks (tanks 1,2,4,7, and 8) with smaller tanks.Option 277. Investigate a new cyanide destruction process (generates less volume of treated waste.)Option 279. Investigate ion exchange/electrowinning technology.Option 281. Develop and implement a process to replace spent electroless nickel baths.Option 284. Build a new metal finishing facility.

Site: Oak Ridge Y-12 Plant	
Site Coordinator: Sam Suffern	**Team Leader:** Sheila Poligone
Phone: 423-576-0126	**Phone:** 423-241-2568

Fax: 423-576-6222	**Fax:**
Email: suffernjs@ornl.gov	**Email:**

Title: Lithium Operations Division PWA **Major Waste Type:** Hazardous Waste

PPOA ID Code: ORR-Y002 **Specific Waste Type:** Filters

Date: 03-feb-1992 **Major Activity Type:** Manufacturing **Specific Activity Type:** Cleaning

Description: Assessment to identify opportunities to prevent the generation of waste in the following areas of Lithium Operations Division: Wet Chemistry Operations, B-2 Forming Salt Operations, Salt Recycle Operations, and Rough Parts From Forming Operations.

Options: Option 203. Recycle evaporator condensate.Option 205. Recycle low assay water from the generator.Option 208. Recycle rotary dryer condensate.Option 210. Recycle Varsol by sending it to the Paint Shop.Option 211. Collect used shims to send back to Armco.Option 214. Reduce hydrochloric acid emissions.Option 216. Recycle Solvent 140.Option 218. Evaluate currently available filters to reuse if reusable and/or cleanable filters can be purchased and used.Option 219. Evaluate RCRA waste streams (oil is the largest waste stream) for potential reductions and/or the use of non-RCRA substitutes.Option 221. Recycle cutting tools.Option 224. Reduce the magnesium oxide stream and recycle the remaining waste.Option 225. Reduce the stainless steel can waste stream.Option 228. Wash an reuse sample bottles instead of throwing them away.Option 229. Launder and reuse oily rags.Option 231. Consider the potential for offsite sales and use in asphalt for PVC molds and Hydron rubber. Also possible for rubber tires, but may need to shred the tires first.Option 233. Evaluate the potential for the sale of scrap foam.Option 235. Reduce nitrogen and argon usage and waste.Option 238. Remove oil from waste streams or substitute non-RCRA oils. This became a recommendation calling for reuse of oily rags through laundering.Option 239. Reduce/eliminate RCRA oil in vacuum pumps.Option 241. Reduce/eliminate RCRA oil for machines.Option 244. Reduce/eliminate arsenic waste stream.Option 245. Reduce plastic bag usage.Option 247. Install electric hand dryers in the restrooms.

Site: Oak Ridge Y-12 Plant	
Site Coordinator: Sam Suffern	**Team Leader:** Sheila Poligone
Phone: 423-576-0126	**Phone:** 423-241-2568
Fax: 423-576-6222	**Fax:** 423-241-2857
Email: suffernjs@ornl.gov	**Email:**

Title: Quality Services Division PWA **Major Waste Type:** Low Level Waste

PPOA ID Code: ORR-Y003 **Specific Waste Type:** Chemicals

Date: 15-jul-1992 **Major Activity Type:** Laboratory **Specific Activity Type:** Sampling & Characterization

Description: Multidisciplinary effort that assessed waste generation in areas within 4 major areas of the Y-12 Quality Services Division. The areas assessed include the following: Equipment Testing and Inspection Department 9706-1A, 9709, 9201-1 (Equipment Testing Facility, Weld Test Shop, Receiving Inspection 9720-8); Plant Laboratories 9206, 9207, 9212, 9720-6, 9769, 9980, and 9995 (responsible for environmental monitoring, radiochemical analysis, spectroscopy, bioassay analysis, and material characterization in support of Environmental Restoration and Waste Management activities as well as quality assurance and quality control data for uranium operations); Product Evaluation Department (Physical Testing Department - includes the Metallurgical Services Laboratory, Mechanical Properties Laboratory, Ultrasonic Testing Labs 9204-4 and 9204-E, Positive Ion Accelerator Facility, Dye Penetrant Testing Lab, Filmless Radiography Lab, Radiation Testing Labs 9201-5N, 9204-2E, 9204-2, and 9204-4; and Dimensional Inspection 9201-1, 9201-5, 9201-5N, 9204-2, 9215); Waste Stream Characterization (Equipment Testing and Inspection Department Waste, Plant Lab which includes Plant Lab 9995 and Environmental lab 9769, and Product Evaluation Department Waste which includes Physical Testing Department and Dimensional Inspection Department.)

Options: Option 81. Decrease samples sizes so that the quantity of acids used for dissolution of laboratory samples is decreased.Option 84. Utilize microwave sample digestion, which uses smaller quantities of acids.Option 85. Substitute water-soluble, environmentally acceptable detergents for miscellaneous organics.Option 88. Use environmentally preferred reagents and recycle where practical.Option 90. Install hot air blowers to reduce the amount of hand towel waste produced in the rest rooms.Option 93. Change operating procedures to minimize the use of material containing PCBs.Option 94. Redistill and reuse methylene chloride.Option 97. Outdated and/or excess reagents need to be advertised for potential use by others (Swap Shop).Option 101. Use a different type of X-ray film, which would eliminate the RCRA status of the film wastes currently generated.Option 103. Institute good management practices - management support, waste minimization goals, program and policies, training, waste tracking, cost allocation, and returning surplus material.Option 106. Evaluate material substitution - using n-hexane and methyl tertiarybutylether instead of Freon 113, using a nonhazardous detergent instead of chromic acid, and using biodegradable scintillation fluids instead of toluene or xylene.Option 109. Perform process modifications (scale-down procedures, technology substitution.)Option 311. Purchase a glass cruncher to reduce the volume of glass waste.

Site: Oak Ridge Y-12 Plant	
Site Coordinator: Sam Suffern	**Team Leader:** Sheila Poligone
Phone: 423-576-0126	**Phone:** 423-241-2568
Fax: 423-576-6222	**Fax:**
Email: suffernjs@ornl.gov	**Email:**

Title: Enriched Uranium Production Operations at the Oak Ridge Y-12 Plant

Major Waste Type: Low Level Mixed Waste

PPOA ID Code: ORR-Y004

Specific Waste Type: Solvents

Date: 15-jan-1992

Major Activity Type: Nuclear Facility Operations

Specific Activity Type: Nuclear, Material Processing

Description: Assessment to identify opportunities to prevent the generation of additional wastes during the enriched uranium productions operations. Waste generation was assessed in the following five areas: Casting Operations; Rolling and Forming Operations; Machining Operations Building 9212 Chemical Recovery Operations; and Building 9206 Reactor Returns Processing Operations. The major waste streams targeted in each area area as follows: Casting (Chlorinated solvents, alcohol, oils, grease, carbon crucibles); Rolling and Forming (silicone soil, synthetic oil, and cutting coolant); Machining Operations (coolants: propylene glycol, sodium nitrite, sodium tetraborate; gloves, paper towels); Building 9212 Chemical Recovery Operations and Reduction (sodium hydroxide flakes, nitric acid, caustic filtrate, gloves and wipes, organic and aqueous waste solutions, anhydrous hydofluoric acid, distillate from nitric acid recovery operations, aluminum nitrate, biodenitrification sludges); Building 920-6 Reactor Returns Processing Operations (gloves, PPE, decontamination solutions, rain water). The three largest solid waste streams addressed in this study are trash, scrap, and metal. The following air emissions were also discussed in this study: Uranium, Freon-113, anhydrous HF, and NOx.The actual PPOA hard copy is unavailable. Y-12 supplied the summary report and review.

Options: Option 150. Improve the quality of waste generation information through education.Option 152. Minimize the volume of liquid waste by improving process efficiency.Option 153. Develop recycle criteria and perform necessary facility modifications.Option 155. Segregate radioactive and hazardous materials to prevent cross-contamination.Option 157. Require improved characterization of solid wastes.Option 159. Improve the segregation of materials used in production areas.Option 161. Minimize Freon emissions and develop an aqueous chip cleaning facility.Option 163. Develop an interface with the uranium accountability system to allow retrieval and manipulation of data.Option 167. Minimize the volume of scrap that must be processed. Develop an acceptable Economic Discard Limit (EDL) which considers the costs of waste treatment and disposal.Option 170. Reduce amount of scraps generated and the folling and forming operation.Option 172. Evaluate the use of noncarbon crucibles for enriched uranium casting.Option 174. Evaluate the feasibility of inert atmosphere machining operations to reduce oxide generation during the machining process.Option 176. Maximize aluminum nitrate recovery by removing ionic species from the feed stream.Option 177. Evaluate the feasibility of decreasing the generation of biodenitrification sludges through the use of alternative carbon sources.Option 180. Develop better methods for collecting purchase information.Option 182. Develop an inert atmosphere machining process, which would eliminate the formation of oxides on scrap metal.Option 184. Reduce the feed to the nitrate recovery facility through more efficient uranium recovery operations.Option 186. Improve the efficiency of the nitrate recovery and biodenitrification facility.Option 188. Reduce solid residue generation.Option 190. Recover and purify uranyl nitrate.Option 191. Modify process to convert UO2 to uranium metal. (Saltless Direct Oxide

Reduction.)Option 193. Recycle distillate from the nitric acid recovery column.Option 196. Increase the recycle of aluminum nitrate from the crystallizer.Option 198. Investigate the reduction of biodenitrification sludges using alternative carbon sources.Option 200. Use less toxic cleaning products to the greatest extent possible.Option 202. Investigate methods to control rainfall into the diked area.

Site: Oak Ridge Y-12 Plant	
Site Coordinator: Sam Suffern	**Team Leader:** Sheila Poligone
Phone: 423-576-0126	**Phone:** 423-241-2568
Fax: 423-576-6222	**Fax:**
Email: suffernjs@ornl.gov	**Email:**

Title: Y-12 Waste Management Division PWA Report **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: ORR-Y005 **Specific Waste Type:** Wastewater

Date: 01-jan-1992 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Handling

Description: Assessment to identify opportunities to prevent the generation of additional wastes during handling, transportation, packaging, treatment, storage, and disposal of wastes. This study focused on twenty areas within 6 major waste management areas under the jurisdiction of the Y-12 Plant. The areas covered in the study area s follows: Wastewater Treatment Facilities (Central Pollution Control Facility, West End Treatment Facility and West Tank Farm, waste Coolant Processing Facility); Organic Liquid Waste Transfer and Storage Facilities (Oil Dike-7, Building 9811-1; Oil Dike-8, Building 9811-1; Oil Dike 9, Building 9811-8; Oil Dike-10, Building 9720-45); containerized Waste Storage Waste Facilities (Containerized Waste Storage Area; Building 9720-9 RCRA and/or TSCA and Sanitary Storage Area; Building 9404-7 Mixed, LLW, and TSCA Waste Storage Area; Building 9720-44k Solid LLW Storage Area; Building 9720-31 RCRA-haz solid, liquid, and sludge Storage Area; Building 9720-58 RCRA nonreactive, nonignitable liquid and solid hazardous wastes that may be contaminated with uranium and PCB-contaminated equipment Storage Area; Interim Drum Yard; Building 9720-12 security classified waste Storage Area; Building 9201-4 RCRA Interim status Storage Facility); Sanitary Solid Waste Facilities; Metal Scrap Facilities; Depleted Uranium Chips and Uranium Oxide Facilities (Uranium Chip Oxidation Facility, Depleted Uranium Oxide Storage Vaults).Actual PPOA hard copy unavailable. Y-12 supplied the summary report and review.

Options: Option 56. Use quantitative measurement tools to consistently measure quantitatively waste. In addition, calibrate these tools regularly using certified standards.Option 57. Develop and implement accurate, reliable procedures to categorize the wastes that are generated.Option 59. Perform a cost versus benefit analysis on the Energy Systems policy regarding the classification of PCB limits. Energy Systems conservatively sets the maximum limit at 2 ppms, while the regulatory limit is established at 50 ppm.Option 61. Evaluate the opportunity to minimize the frequency y, quantity, and number of waste samples taken.Option 64. Replace combination respirator cartridges which fail TCLP for chromium.Option 66. Replace wood pallets with metal pallets.Option 67. Evaluate potential optimization of water treatment chemical usage in an attempt to reduce the quantity of sludge generated.Option 69. Conduct minor piping changes to CPCF to allow for additional recycle of CPCF effluent.Option 72. Segregate incoming wastewaters to CPCF. The WETF and ETF denitrify large volumes of wastewater annually, but only a portion oil RCRA-listed hazardous waste. Segregating this waste would decrease the volume of RCRA-listed sludge.Option 74. Evaluate potential optimization of water treatment chemical usage, in an attempt to reduce the quantity of sludge generated.Option 75. Evaluate feel chemical modification for the biodenitrification process.Option 77. Use reusable containers (dumpsters, tankers, and polytanks), and use larger size containers to minimize sampling and analysis costs.Option 80. Add a canopy or other covering over the diked area to reduce the collection of rainwater.Option 111. Institute administrative controls to minimize waste generation from the transfer operation of oils and solvent to Dike-7.Option 112. Purchase reusable Tuff Tanks to reduce annual wash water disposal costs.Option 114. Install a canopy or other covering over the diked area to reduce the collection of rainwater.Option 116. Design and construct a separate, segregated waste drum cleaning facility, including wastewater recycle and oil/grit separation, resulting in reduced wastewater generation.Option 118. Install a canopy or other covering over the diked are to reduce the collection of rainwater.Option 120. Enclose the sides of the domes, which would reduce the amount of rainwater collected.Option 123. Cover plastic to avoid the disposal of the pallets as PCB waste and to reduce incidental PCB contamination.Option 127. Participate in the toner cartridge recycling program.Option 128. Establish a used storage facility of reusable materials.Option 130. Segregate materials - nonregulated wastes should be isolated away from regulated wastes.Option 132. Send empty vermiculite bags to the sanitary landfill, instead of putting them in lab packs (i.e. segregate waste streams.)Option 136. Provide a sanitary waste weigh station to establish more accurate

measurements of waste.Option 140. Determine the feasibility of selling used pallets and railroad ties to the public.Option 141. Modify X-10 Steam Plant to allow the burning of combustible sanitary waste for energy recovery (Waste-to-Fuel Project).Option 143. Send scrap off-site for recycle.Option 146. Establish a Y-12 Depleted Uranium waste Minimization Program to test alternatives in chip generation and handling to allow possible recycling of the material through various processes.Option 601. Utilize a cardboard compactor truck and roll-off bins to decrease cardboard and paper volume.

Site: Oak Ridge Y-12 Plant	
Site Coordinator: Sam Suffern	**Team Leader:** Sheila Poligone
Phone: 423-576-0126	**Phone:** 423-241-2568
Fax: 423-576-6222	**Fax:**
Email: suffernjs@ornl.gov	**Email:**

Title: Reclamation Area of the Assembly Division PWA **Major Waste Type:** Low Level Waste

PPOA ID Code: ORR-Y007 **Specific Waste Type:** Solvents

Date: 08-apr-1992 **Major Activity Type:** Nuclear Facility Operations **Specific Activity Type:** Dismantlement

Description: Level II assessment of waste generation from dismantlement activities in Building 9204-4. Specific activities assessed include: the Vertical Broach used to part aluminum cases; Horizontal Lathes for aluminum, depleted uranium, and enriched uranium; and manual dismantlement activities performed in ventilated enclosures. Items specifically excluded form the review included components recycled at the time of the assessment and/or special nuclear materials which are reused (Returned to product streams) because they were not considered as ÒwasteÓ per say.Actual PPOA hard copy unavailable. Y-12 supplied the summary report and review.

Options: Option 286. Keep more detailed records of information.Option 288. Evaluate each program (rather than the whole assemble program) for P2 options.Option 290. Maintain records of procured items.Option 291. Program-specific mass balances should be implemented to gain an understanding of generation rates.Option 294. Utilize Trim-Sol and recycle/reuse the Trim-Sol.Option 296. Dismantlement activities should be performed in such a manner that materials can be reused, or easily handled by the next operation.Option 297. Improve equipment or containment and ventilation systems surrounding lathes and booths to reduce the need for air hammers and/or torches, both of which create airborne contamination.Option 300. Perform more decontamination of rad-contaminated material to decrease the volume of LLW.Option 301. Improve monitoring of rad-contaminated combustibles.Option 303. Segregate and launder equipment.Option 305. Design in-plant containers to transport depleted uranium to the Metal Preparation operations.Option 308. Machine coolant alternatives should be evaluated and implemented.

Site: Oak Ridge Y-12 Plant	
Site Coordinator: Sam Suffern	**Team Leader:** Sheila Poligone
Phone: 423-576-0126	**Phone:** 423-241-2568
Fax: 423-576-6222	**Fax:**
Email: suffernjs@ornl.gov	**Email:**

Title: Y-12 Materials Management Department PWA Report **Major Waste Type:** Sanitary Waste

PPOA ID Code: ORR-Y008 **Specific Waste Type:** Cardboard

Date: 15-jan-1993 **Major Activity Type:** Service **Specific Activity Type:** Shipping

Description: Multidisciplinary effort that assessed waste generation in 6 areas within Y-12 Materials Management Department.

The areas assessed and the major waste streams discussed are as follows: Delivery (packaging material, wood pallets); Material Control (paper, office trash); Stores (miscellaneous chemicals, metal chips and coolant); Receiving (cardboard, styrofoam packing material, oil-contaminated rainwater); Shipping (cardboard, styrofoam packing material); and Production Materials (wood pallets, inks, solvents, gloves, wipers, miscellaneous oil and oil-soaked items, styrofoam packing material).Actual PPOA hard copy unavailable. Y-12 supplied the summary report and review.

Options: Option 32. Eliminate the requirement for paper bags within the Material Management Department.Option 34. Return/exchange pallets within the Material Management Department.Option 35. Use returnable totes for small items within the Material Management Department.Option 38. Use shredded paper instead of SPM within the Material Management Department.Option 40. Purchase bulk cleaning products within the Material Management Department. The bulk items are available in cardboard containers, lined with plastic, which will reduce the amount of cans.Option 42. Use Go-Getter instead oÄ Formula 409 for cleaning purposes. Go-Getter is expected to be more economical and is available in refillable bottles.Option 44. Recycle cardboard of those items to be stocked in stores.Option 46. Remove Styrofoam packing material from incoming packages and send to shipping for use in outgoing packages.Option 48. Consider the use of Biodegradable packaging material in place of styrofoam.Option 50. Consider using plastic pallets over wood pallets.Option 52. Substitute RCRA inks with nonhazardous inks.Option 54. Evaluate the substitution of oils in the re-oiling operations.

Site: Oak Ridge Y-12 Plant	
Site Coordinator: Sam Suffern	**Team Leader:** Sheila Poligone
Phone: 423-576-0126	**Phone:** 423-241-2568
Fax: 423-576-6222	**Fax:**
Email: suffernjs@ornl.gov	**Email:**

Title: Y-12 Plant Maintenance and Utilities Division PWA Report **Major Waste Type:** Hazardous Waste

PPOA ID Code: ORR-Y009 **Specific Waste Type:** Wood

Date: 15-jul-1992 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Building

Description: Multidisciplinary effort that assessed waste generation in 9 areas within Y-12 plant maintenance and Utilities Division. The areas assessed and the major waste streams discussed include the following: Carpenter Shop (wood, construction hardware; Chilled Waster System (waste oils, wipes, absorbents, gloves, etc.); Cooling Towers (oil, water, rags and etc., and Òold bleachÓ); Demineralized Water system (wastewater, iron); Vehicle Service Center (wash water, rainfall runoff, scrap iron, tires); Metal Photo Shop (expired reagents, ink, rags, silver, rinse water); Paint Shop (paint, paint thinner, solvents, rags); Steam Plant Waste Water Treatment Facility (coal pile runoff, sludge); Steam Plant (cooling water, fly ash, bottom ash, water purification reagent).Actual PPOA hard copy unavailable. Y-12 supplied the summary report and review.

Options: Option 1. Improve the segregation of material used in all areas. Keep packing material from becoming contaminated wherever possible.Option 4. Review material purchases on a line-by-line basis to determine which purchases could be avoided.Option 5. Develop better methods to collect purchase information at the individual operation level. The data collection system should facilitate the retrieval of archived purchase information from the centralized databases maintained by the procurement organization.Option 7. Develop a standard method of data collection and reporting to improve the efficiency of the assessment process.Option 10. Regularly complete a PPOA to measure progress with waste minimization and pollution prevention.Option 12. Scrap wood is disposed of in the sanitary landfill. A wood-chipping machine has been ordered to be used to eliminate bulk wood waste and produce mulch chips. Leftover bulk materials (nails, etc.) are to be used in future projects.Option 14. Predictive/preventive maintenance group should investigate the possibility of decreasing the oil change frequency requirements.Option 16. Install a roof over the wash-rack and steam cleaning station north of Building 9712 to reduce the amount of rainfall runoff water that must be collected and sampled before treatment and disposal.Option 18. Modify the Car Wash to include a recycle-type operation similar to the one in use by the Transportation Safeguards Division truck-wash operation.Option 20. Use left-over paint from one job as a primer paint for another job.Option 22. Sponsor a voluntary program whereby leftover paint is remixed and used in public beautification projects.Option 24. Increase the use of latex-based paints, particularly as a substitute to oil-based paints.Option 26. Discourage the use of aerosol cans.Option 28. Eliminate once-through cooling water from the steam plant and use blended water from the steam plant as the working fluid.Option 30. Reroute cooling water for conversion to steam, thereby eliminating discharge into East for Poplar Creek.

Site: Oak Ridge Y-12 Plant	
Site Coordinator: Sam Suffern	**Team Leader:** James Bennett
Phone: 423-576-0126	**Phone:** 423-574-0505
Fax: 423-576-6222	**Fax:**
Email: suffernjs@ornl.gov	**Email:**

Title: HYDROTREATER FACILITY **Major Waste Type:** Hazardous Waste

PPOA ID Code: PETC-01 **Specific Waste Type:** Solvents

Date: 01-jan-1994 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Chemical

Description: The purpose of the process waste assessment performed in the Hydrotreater Facility at PETC was to first determine the types and quantities of all input and output materials to the process, and secondly to determine if any inputs, outputs, or the process itself can be changed to reduce or eliminate the generation of hazardous wastes.The hydrotreater facility consists of four bench scale test units for high pressure hydrocarbon conversion. A wide variety of experiments involving coal liquefaction, recycled oil and waste conversion, coprocessing, product upgrading, hydrotreating, hydrocracking and catalyst testing can be supported. Two of the units are configured for continuous mode operation while the other two units are configured for semi-batch operations. The continuous units are essentially single stage. One of the continuous units is equipped for studies employing supported catalysts. Provisions for feeding coal, high residual and/or waste hydrocarbon slurries requiring preheating to temperatures as high as 150-2000C are available.The second continuous unit is currently equipped with a pretreatment vessel for activating catalysts and provision for injection of such catalysts. Operating ranges are feed slurry rates of 50-400g/h, hydrogen (or specialty gases including 3% H2S/97%H2 pressures up to 3000 psig, flow rates of 1-10 SCFH, and reactor temperatures up to 4500C. One laboratory is dedicated to providing analytical support for the facility operations. This includes product recovery, distillations, and solvent separations. Gas samples are also collected and analyzed by gas chromatography. Products are distributed to other on-site laboratories for elemental, solubility, magnetic resonance, mass spectrometry and other analyses as required. A unit is operated for thirty two hour periods for ten days every two months due to manpower limitations.

Options: The Hydrotreater Facility is not a large generator of waste material at PETC. The quantities of chemicals and materials listed in Tables 1 and 2 are not significant. Several possible options to reduce waste have been reviewed and discussed here: 1) Reducing the size of the process would obviously reduce the amount of input material needed and waste material generated. However, the quantities of material used are the minimum needed to achieve a stable, functioning process.2) Substituting less hazardous and non-hazardous materials for these presently being used would reduce the quantity of hazardous waste generated. In the Hydrotreater Facility the solvents used are classified as hazardous materials and are necessary to proper cleaning of equipment. However, new non-hazardous materials should be reviewed as a possible substitute. 3) Eliminating or changing certain aspects of the process or how it is conducted could reduce the amount of waste generated. In Table 2, the waste listed are those that result from startup and shutdown of the process.If the running time for tests could be extended from ten days to say twenty days in which more experiments could be run, less startup and cleanup would be required for the total number of experiments conducted and less waste generated. It is therefore suggested this condition be considered in future plans for the facility.

Site: Pittsburgh Energy Technology Center	
Site Coordinator: David Schwartz	**Team Leader:**
Phone: 412-892-6298	**Phone:**
Fax: 412-892-4726	**Fax:**
Email:	**Email:**

Title: Laboratory and Sample Vacuum Pump Preventative Maintenance Procedures **Major Waste Type:** Hazardous Waste

PPOA ID Code: PNL-95-01 **Specific Waste Type:** Oil

Date: 01-apr-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Equipment

Description: The existing laboratory vacuum and laboratory sample vacuum pumps used in various PNL facilities are oil lubricated. Proper maintenance of these lubricated vacuum pumps require monthly preventative maintenance procedures that involve the change out of oil and oil filters. The spent oil, oil filters, rags and other associated solid wastes are presently being disposed of as low level waste. A viable means to reduce or eliminate this waste oil stream is being sought in the performance of this Pollution Prevention Opportunity Assessment.The following information is given for the existing oil lubricated vacuum pumps: Building No. of Vacuum Pumps Type of System 314 2 Lab vacuum and Lab Sample 331H 2 Lab vacuum only 3708 2 Lab vacuum and Lab Sample 3745 1 Lab sample only 3746A 1 Lab sample only TOTAL 8

Options: A. Replace existing lubricated pumps with oil-less pumps: This opportunity was chosen to be investigated further.B. Extend maintenance schedules: It was determined that this would not be a possibility since schedules were already extended up to and beyond manufacturers recommendations.C. Install hour meters on pumps: This opportunity was not investigated further due to the impracticality and cost of obtaining timely readings from each of the pumps and subsequently scheduling maintenance activities.D. Substitute conventional oils with synthetic oils: This opportunity was chosen to be investigated further.E. Better manage and segregate oils to prevent contamination: This opportunity was chosen to be investigated further.F. Oil recycling: This opportunity was not pursued since oil recycling is currently being performed on this waste stream when radioactive contaminants are below approved release limits.G. Oil Sampling: This opportunity was not investigated further since the cost to sample, ship and analyze the radioactive oil for specification data was prohibitive and outweighed any cost savings associated with subsequent extended oil life.H. Evaluate need for existing pumps: This opportunity was chosen to be investigated further in connection with opportunity A.

Site: Pacific Northwest Laboratory	
Site Coordinator: Donna Merry	**Team Leader:** Thomas E. Davis
Phone: 509-376-9773	**Phone:** 509-376-2752
Fax: 509-376-2195	**Fax:**
Email:	**Email:**

Title: Sanitary Solid Waste Generation **Major Waste Type:** Sanitary Waste

PPOA ID Code: PNL-95-02 **Specific Waste Type:** Solid Waste

Date: 01-apr-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Disposal

Description: As part of the daily activities and normal operations associated with business at the Environmental Technology Building (ETB), sanitary solid waste is generated. This waste is generated in offices, copy centers, lunch rooms and rest rooms throughout the building and conveyed daily to two large dumpsters at the dock area outside of the building. This waste stream consists of cardboard, paper, plastic, glass, metal, food waste, etc. A viable means to reduce or eliminate this waste stream is being sought in the performance of this Pollution Prevention Opportunity Assessment. Since the ETB is representative of most other PNL facilities with respect to this waste stream, this assessment can be applied to sanitary solid waste generating activities at these other facilities.

Options: A. Establish recycling program to collect and recycle applicable commodities: This opportunity was chosen to be investigated further.B. Reduce the frequency of the current refuse collection system: This opportunity was chosen to be investigated further.D. Initiate composting program of food waste: This opportunity was not pursued since this segment of the waste stream was not thought to be a significant contributor. Also, the collection of food material would cause problems with cleanliness, pests and odors. There are also no local recycling vendors interested in picking up this material for composting.D. Conduct and publicize re

Site: Pacific Northwest Laboratory

Site Coordinator: Donna Merry	**Team Leader:** Robert R. Nielson
Phone: 509-376-9773	**Phone:** 509-373-9833
Fax: 509-376-2195	**Fax:**
Email:	**Email:**

Title: Quantitative Extraction of Organic Chemicals from Solid Matrices **Major Waste Type:** Hazardous Waste

PPOA ID Code: PNL-95-03 **Specific Waste Type:** Solvents

Date: 01-aug-1995 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Organic

Description: Current PracticeCharacterization of organic chemicals in solid matrices first involves the extraction of the organic component. Currently, Soxhlet extraction is the primary process for extracting organic chemicals from solid waste and environmental samples. The technology is time-consuming, requires long periods of energy usage and generates large volumes of hazardous wastes in the form of solvents. Recommended ActionIt is recommended that the Microwave-Assisted Extraction Process (MAEP) be used in place of the Soxhlet extraction process. The Soxhlet extraction process uses 200 - 500 ml of solvents per sample and requires the use of extraction thimbles. The MAEP uses 30 ml per sample and does not require extraction thimbles*, which cost $3.00 each. The extraction thimbles, when contaminated, must be disposed of as hazard waste. The MAEP uses less energy, requires less analyst time, and generates less regulated hazardous waste. Furthermore, MAEP has been approved by regulatory agencies as a reliable substitution for the Soxhlet process*In special cases, disposable extraction cells might be required with the MAEP. For example, if you have problems cleaning the extraction cells from run to run, you can purchase disposable ones. Generally the process of cleaning the cell each time would generate more hazardous waste than if you merely had a disposable cell for each run. This would be especially true of analyses involving things like PCBs, Polycyclic Aromatics, etc. For most runs however, a stainless steel extraction vessel or a high density plastic digestion vessel which could be reused would be sufficient.

Options: Investigate alternative methods to extract organic chemicals from solid matrices.A. Supercritical Fluid Extraction: This method was chosen to be investigate further.B. Microwave Extraction: This method was chosen to be investigate further.

Site: Pacific Northwest Laboratory	
Site Coordinator: Donna Merry	**Team Leader:** Mike Hogan
Phone: 509-376-9773	**Phone:** 509-372-2526
Fax: 509-376-2195	**Fax:**
Email:	**Email:**

Title: Determination of Strontium-90 in High-Level Samples **Major Waste Type:** High Level Waste

PPOA ID Code: PNL-95-04 **Specific Waste Type:** Wastewater

Date: 31-dec-1995 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Radiological

Description: Current PracticeThe current method used to determine the concentration of strontium-90 in high-level samples is Procedure #PNL-ALO-476, found in PNL-MA-599 (ALO Procedure Compendium). The method is very time consuming and labor intensive. In addition, it generates significant quantities of radioactive toxic wastes in the process of doing the analysis.

Options: Recommended ActionIt is recommended that a new microscale procedure be used in place of the current procedure. The new method calls for instrumentation employing a technique called sequential injection analysis (SIA). Not only does SIA require significantly less resin for preparation of extraction columns, but it demands less analyst time, and generates less regulated hazardous waste.

Site: Pacific Northwest Laboratory	
Site Coordinator: Donna Merry	**Team Leader:** Jay Grate
Phone: 509-376-9773	**Phone:** 509-375-4547
Fax: 509-376-2195	**Fax:**
Email:	**Email:**

Title: High Performance Liquid Chromatography **Major Waste Type:** Hazardous Waste

PPOA ID Code: PNL-95-05 **Specific Waste Type:** Solvents

Date: 01-aug-1995 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Organic

Description: High Performance Liquid Chromatography (HPLC) is an analytical method based on selective adsorption of separated components in a mixed solution. It is used extensively to detect and quantify compounds of interest in environmental samples. All HPLC systems require a fractionating column, a means of sample introduction, a detector, a moving solvent, and a means of producing solvent motion. Columns in the HPLC must be flushed continuously with solvent to produce a favorable environment for the sample to be analyzed. However the conditioning process results in a high generation of hazardous and mixed waste. The scope of this Pollution Prevention Opportunity Assessment (P2OA) is to seek viable means to reduce solvent waste associated with five HPLC units located in laboratories within the facilities listed above.

Options: Recommended ActionPurchase five Solvent Recycler 3000 Recovery Units manufactured by Alltech for the HPLCs in question. The Recycler attaches to the HPLC waste line and connects to the HPLC signal output. It monitors the HPLC detector signal to determine when peaks and other contaminants are eluting from the system. As soon as contaminants are detected, the Recycler's switching valve diverts contaminants to waste. When no contaminants are detected, the Recycler's switching valve sends clean solvent back to the mobile phase reservoir for reuse, and solvent can be recovered several times in this manner. Recovered solvent is high in purity and does not affect the chromatography results, as proven by UV spectrophotometric analysis.

Site: Pacific Northwest Laboratory	
Site Coordinator: Donna Merry	**Team Leader:** Robert R. Nielson
Phone: 509-376-9773	**Phone:** 509-373-9833
Fax: 509-376-2195	**Fax:**
Email:	**Email:**

Title: Laboratory Analysis **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: PNNL-96-01 **Specific Waste Type:** Solvents

Date: 30-jan-1996 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Organic

Description: Most of the activities for the Hanford Site Laboratories are supporting efforts to characterize the waste stored in single- and double-shell tanks in the 200 Areas. In addition to this, the laboratories provide analytical services for Hanford Site waste management and processing plants, the tank farms, environmental monitoring and surveillance programs, and activities involving essential materials, research and development. The laboratories perform radioanalytical, inorganic, and organic chemistry analyses in support of these activities.

Options: Recycle the used solvents by distillation and present it again at industrial grades for use on the Hanford Site and other DOE facilities.

Site: Pacific Northwest Laboratory	
Site Coordinator: Donna Merry	**Team Leader:** Johnetta Best
Phone: 509-376-9773	**Phone:** 509-373-7369
Fax: 509-376-2195	**Fax:**
Email:	**Email:**

Title: 306W Facility Transition **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: PNNL-96-02 **Specific Waste Type:** Oil

Date: 27-sep-1996 **Major Activity Type:** Manufacturing **Specific Activity Type:** Waste Management, Disposal

Description: The 306W Building has approximately 40,000 ft2 that was used for nuclear research for 30-40 years, but has not been in full use for several years. The building is the site of an ongoing classified U.S. Army project, USCar project, and a couple of other small research projects, but remains largely vacant. 306W contains unknown quantities of chemicals, different types of oils (both in storage and within the equipment), and machinery and equipment of all kinds. Currently, the operation costs for about $1,000,000 annually. To reduce PNNL's operation costs, 306W is being transitioned from its current state to a cheap-to-keep status. It will be necessary to address a significant quantity of hazardous, mixed, and low-level waste generated in the transition activities of 306W.Opportunities from this P2OA may be expandable to other transition facilities. Army and USCar may remain for 3-5 years. The building will be reconfigured to reduce utility costs such as shuting off the steam and other utility reconfiguration. Waste management will retain some office space.

Options: Current PracticeAll materials disposed as Low Level Rad Waste or redeployed to other radiological areas.Recommended ActionMaterials be reviewed prior to disposal against Rad Criteria.

Site: Pacific Northwest Laboratory	
Site Coordinator: Donna Merry	**Team Leader:** Stan Jones
Phone: 509-376-9773	**Phone:** 509-376-7449
Fax: 509-376-2195	**Fax:**
Email:	**Email:**

Title: Relocation of Chemicals during Staff Relocation to EMSL **Major Waste Type:** Hazardous Waste

PPOA ID Code: PNNL-96-03 **Specific Waste Type:** Chemicals

Date: 20-aug-1996 **Major Activity Type:** Waste Management **Specific Activity Type:** Laboratory, Organic

Description: Beginning October 1, 1996, PNNL staff will be moving into the Environmental Molecular Sciences Lab (EMSL) from the PSL, RTL, Math, ESB, Sigma 5 and LSL II buildings. In addition to the researchers, this move will involve laboratory equipment, chemicals, and supplies. This P2OA will address the waste streams that will be generated due to the move to EMSL.Hans Vogel, the Environmental Compliance Representative for EMSL, is working with the EMSL operations staff, management, researchers and waste management staff to determine the best way to implement this move so as to generate minimal hazardous waste.Currently, researchers have the responsibility to determine what parts of the chemical and equipment inventory of their labs are moved. Often researchers use this as an opportunity to clean out their cupboards and then to purchase new materials when they are relocated. It is the goal/intent of this P2OA to identify and implement approaches to moving chemicals/researchers/equipment that will reduce the waste stream generated by the move.It would be difficult to know exactly how many chemicals would be disposed of during the staff relocation to EMSL. Therefore, the following assumptions have been made for return on investment calculation purposes.Approximately 30% of the total EMSL chemical inventory (8347 lbs; 3790 kg), that would have been dealt with as hazardous waste, would have been disposed of (2504 lbs; 1140 kg). Approximately half

of the chemicals disposed of (approximately 15% of the chemical inventory or 1252 lbs; 570 kg) would have been re-purchased after the relocation to the new facility had taken place. The cost of purchasing a replacement chemical is assumed to have an average cost of $100 per kilogram.To ease the calculation of overall savings, the associated inventory has been treated as a bulk quantity, requiring similar handling and disposal costs regardless of being hazardous or non-hazardous. When actual waste streams are identified, better resolution of the actual savings will be realized. Estimates of savings due to these assumptions should be accurate to +/- 20%.

Options: Get up-to-date Chemical Management System (CMS) reports for each employee moving to the EMSL building. Distribute a memo to each employee responsible for chemicals emphasizing the need for waste reduction while requesting information on which chemicals are expected to be moved, used prior to the move, left behind for future use, or disposed of (and why). Follow up with the researchers that are planning on disposing of or leaving behind quantities of chemicals to determine if there is a future use for these chemicals in another laboratory, if there is justification for the disposal, and if the chemicals must be disposed of, what options for treatment are available. The general emphasis of this memo and the followup discussions is to make researchers aware that disposal of chemicals should be the last resort; researchers should always be looking for chemical redeployment opportunities.

Site: Pacific Northwest Laboratory	
Site Coordinator: Donna Merry	**Team Leader:** Hans Vogel
Phone: 509-376-9773	**Phone:** 509-372-6380
Fax: 509-376-2195	**Fax:**
Email:	**Email:**

Title: Wood Pallets and Wood Scraps **Major Waste Type:** Sanitary Waste

PPOA ID Code: PNNL-96-04 **Specific Waste Type:** Wood

Date: 30-sep-1996 **Major Activity Type:** Manufacturing **Specific Activity Type:** Waste Management, Disposal

Description: There are two kinds of wood wastes from the maintenance department at PNNL: 50% are wood pallets and 50% are scrap woods. PNNL is currently paying craft labor to cut up the pallets so they fit into the wood lugger. Once the wood lugger is full, PNNL pays WHC $250 each time to empty the lugger at Richland landfill where the waste wood will be turned into wood chips.The initial goal of this P2OA was to identify opportunities to reduce the source of the waste stream. It was concluded that source reduction was not feasible for the following reasons:- The wood pallets are coming from the deliveries made by shipping companies. Half of the wood pallets, about 25% of the total wood waste, are from the WHC warehouse. The maintenance department has no control over what is being used by the shipping company.- Scrap wood is from different wood work orders. Each order is unique, sometimes the order is to make wood boxes in various sizes, sometimes is to make a door frame, and sometimes is to make coat hangers, etc. Therefore, the maintenance department is not mass producing any single wood product and it would not be economical to streamline every single unique procedure to minimize wood waste. The maintenance department only responds to requests from clients and has no control over what wood works will be needed in the future from each department. It is not feasible for the maintenance department to plan ahead and coordinate each department's needs, so that they could use each piece of wood in a most efficient way.Therefore, the focus was switched to recycling the wood waste. The following three recycling opportunties were examined in this P2OA:- WHC To Recycle Pallets- Give the Wood Waste to Local Charity, and- Sell the Wood Waste to a Local Company.

Options: Current PracticeScrap wood from the 350 Building is transported by WHC to the Richland landfill where they will turn the scrap wood into wood chips. PNNL pays WHC $250 each time the lugger needs to be emptied. Also there is about $500 each month of PNNL craft labor to cut up the wood pallets, so that it would fit the lugger. Many of them are still in good condition.Recommended ActionSuggest WHC to reuse or recycle the wood pallets. PNNL will no longer cut apart the wood pallets, the remaining wood scrap waste would still be disposed of through WHC.

Site: Pacific Northwest Laboratory	
Site Coordinator: Donna Merry	**Team Leader:** Alan Y. Gu
Phone: 509-376-9773	**Phone:** 509-372-4321

Fax: 509-376-2195	**Fax:**
Email:	**Email:**

Title: Biological Research within the Molecular Biosciences Department (MBD) **Major Waste Type:** Hazardous Waste

PPOA ID Code: PNNL-96-05 **Specific Waste Type:** Medical, Infectious

Date: 14-aug-1996 **Major Activity Type:** Service **Specific Activity Type:** Laboratory, Biological

Description: The Molecular Biosciences Department (MBD) consists of 17 professional staff members involved in a variety of basic biological research activities. At this time, 11 of these staff mem-bers are actively performing laboratory work in the 331 Building and Annex. Without exception, each investigator's work is best characterized as the integration of multiple, small-scale processes utilizing a number of reagents which are performed intermittently. Typically, the individual pro-cesses result in the production of waste in the range of a few hundreds of grams to several kilo-grams per year. In many cases, the wastes generated over time by a number of small processes are collected in a single vessel for storage in a Satellite Accumulation Area (SAA). All of the re-search activities are to be examined in this P2OA. The performance of a P2OA typically starts with identifying Priority Streams and Activi-ties based on a variety of historical data bases such as procurement records or disposal requests. This was considered unrealistic for two reasons. First, the very nature of the activities in the de-partment make a search of these types of records very labor intensive requiring far more labor hours than available. Second, the MBD is currently undergoing a major reprogramming in terms of research activities which has resulted in substantial changes of professional staff. Moreover, the remaining staff tend to be pursuing lines of investigation which differ from their previous efforts. As an alternative to the more typical approach, each staff member was interviewed using a standard form to identify 1) their production of LLW, LLMW, and hazardous wastes; 2) the three processes contributing the largest volume to their individual waste streams; and 3) their use of the process sewer system. Due to time limitations, no effort was made to systematically char-acterize the production of sanitary waste. In addition to the interrogatories, several departmental walk-throughs were performed by the Team as well as MBD management in an effort to identify any unappreciated waste streams from support functions which are the direct responsibility of the MBD. These are summarized as Miscellaneous Waste Issues Identified by the Team.

Options: Current PracticeAt least three different groups within the MBD routinely measure protein levels in biological samples using either the method of Lowry or Bradford. Current sample throughput is 2000 Lowry's and 1000 Bradford's per year. The Lowry assay generates 4.0 mL hazardous waste/assay and requires ~2 minutes of technical time per sample for set-up and analysis; the Bradford assay generates 5.0 mL waste per sample and also requires ~2 minutes of technical time per sample.Recommended ActionPurchase an automated Microplate Reader which would allow the performance of both assays on a microscale reducing the amount of hazardous waste for both to 0.2 mL and reducing handling time to 1 minute per sample.

Site: Pacific Northwest Laboratory	
Site Coordinator: Donna Merry	**Team Leader:** Kevin M. Groch
Phone: 509-376-9773	**Phone:** 509-376-3043
Fax: 509-376-2195	**Fax:**
Email:	**Email:**

Title: Water Use for Irrigation in the 3000 Area **Major Waste Type:** Sanitary Waste

PPOA ID Code: PNNL-96-06 **Specific Waste Type:** Wastewater

Date: 23-sep-1996 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Grounds

Description: Water is used in a variety of ways throughout the Pacific Northwest National Laboratory complex. Some uses include heat transfer, laboratory processes, waste disposal, material transport, and irrigation. Reports which document the amount of water being used, suggestions for decreasing or eliminating some water use, and the anticipated water savings do exist. Implementation of water-saving opportunities has been slow or nonexistent due to the low cost of water and perceived lack

of value for changing current practices.In the 3000 Area, landscape and agricultural irrigation practices use over 8 million gallons of water per week. A 300 hp pump supplies water from the Columbia River used to irrigate the landscape surrounding the buildings, the sycamore trees lining the streets, and the alfalfa fields. PNNL pays the energy costs for pumping and distributing the irrigation water. City water is used to irrigate landscapes for the ESB, CEL, and MRC buildings. EMSLÕs landscape will use an additional 1 million gallons per week. PNNL is responsible for maintaining the landscape surrounding the PNNL-owned buildings. Sigma Corporation is responsible for maintaining the landscape surrounding ISB1, ISB2, EESB, and ETB.

Options: Current Practice - The sycamore trees surrounding the Battelle property use approximately 5 million gallons of water for irrigation each week. The trees are spaced 25 and 40 feet apart along George Washington Way, Stevens Drive, and the roadways around the ROB, EMSL, ISB1, ISB2, EESB, and ETB. Open spigot irrigation heads are at the base of each tree. There are fifteen irrigation circuits which operate between 24 and 72 hours per week. Each circuit has 17 to 76 open-spigot heads operating at 85 to 380 gpm. Circuits T-6, 50% of T-9 and T-10, and T-11 have been disconnected.Recommended Action - Disconnect the spigots and discontinue watering the trees. If the leaves show signs of water stress, return water to the trees but reduce the amount of water by a factor of 10.

Site: Pacific Northwest Laboratory	
Site Coordinator: Donna Merry	**Team Leader:** Sandi Edgemon
Phone: 509-376-9773	**Phone:** 509-372-4583
Fax: 509-376-2195	**Fax:**
Email:	**Email:**

Title: 325 HEPA Filter **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: PNNL-96-07 **Specific Waste Type:** Solid Waste

Date: 30-aug-1996 **Major Activity Type:** Nuclear Facility Operations **Specific Activity Type:** Nuclear, Material Processing

Description: High Efficiency Particulate Air (HEPA) filters are used to capture radioactive particulate effluents from radioactive research facilities. Changing the filters creates a significant expense because the filters cost approximately $800.00 apiece and are disposed as a Low Level Radioactive Waste. Also, the fume hoods, glove boxes, and/or hot cells serviced by the HEPA filter must be shut down when the HEPAÕs are not operational and until they can be replaced. HEPA filter operation and efficiency is impacted by other facility HVAC systems: airborne dust drawn through building ventilation systems can clog the HEPA filters, causing chargeouts of the filters before their efficiency is reduced. This P2OA is examining the operation & changeout of HEPA filters in the 325 building.

Options: Current PracticeHigh efficiency particulate air (HEPA) filters are currently disposed of by placing them into 4X4X8 wooden burial boxes. Each burial box can hold 6 HEPA filters resulting in an appreciable amount of unoccupied volume visible in the box and a much larger amount of unoccupied volume within each HEPA filter. When small size waste material is available, it can be used to fill some of the voids around the HEPA filters, however this requires handling contaminated or low level radioactive waste with some risk of personal contamination.Recommended ActionPurchase and install a commercially available low level radioactive solid waste compactor into the 325 Building. The compactor would be used to compact low level radioactive solid waste like HEPA filters into burial containers so that a minimum of handling of the material is required. The compactor would have a continuously welded and polished stainless steel lined chamber to aid in decontamination. The compactor chamber would have a HEPA filtered exhaust system which maintains the compaction chamber at a negative pressure to prevent dispersal of contamination.

Site: Pacific Northwest Laboratory	
Site Coordinator: Donna Merry	**Team Leader:** Keith Peterson
Phone: 509-376-9773	**Phone:** 509-372-4540
Fax: 509-376-2195	**Fax:**

Email:	Email:

Title: Photography and radiography film processing **Major Waste Type:** Hazardous Waste

PPOA ID Code: PNNL-96-08 **Specific Waste Type:** Solid Waste

Date: 02-may-1996 **Major Activity Type:** Service **Specific Activity Type:** Photographic Services

Description: Film related wastes at PNNL come from both photography and radiography sources. Primarily, black and white photography is used for a variety of research functions, so the discussion of photography will be limited to black and white images only. Photography is the process of exposing photographic film to light (an image). Radiography is the process of exposing film to x-ray images. Film is made up of clear plastic coated with a emulsion of fine silver halide crystals in a matrix of gelatin. Exposure to light causes a chemical change in the silver halide crystals, converting the silver ions in the exposed crystals into metallic silver at a faster rate than unexposed crystals. Developing is started by immersing the film to developer solution (an alkaline solution of organic reducing agents) which converts the exposed silver halide crystals to metallic silver. The silver is dark in color which produces a negative image. When the person doing the developing determined the development is complete, the film is transferred to a stop bath solution (a mildly acidic solution usually acetic acid) which stops the conversion of crystals to metallic silver. After the stop bath, the film is immersed in a fixer solution which removes the remaining silver salts and makes the image permanent. Finally, the film is rinsed with water to remove any remaining fixer solution. This process yields a negative. X-ray and other negatives are used as the final product in many processes at PNNL. Sometimes printing is required and a positive print is prepared by exposing a sheet of photographic paper to a light source passing through a negative film image. The paper is then processed through a similar set of operations (developer, stopbath, fixer and rinse). (EPA 1991) Several of the waste streams from film related processes are considered hazardous due to the silver content. According to RCRA, materials containing greater than 5 ppm leachable silver are classified as characteristic hazardous waste. Leachability is determined using Toxicity Characteristic Leaching Procedure (TCLP) which subjects the material to a dilute acid solution. Liquid wastes containing greater than 5 ppm of silver are also classified as characteristic hazardous waste (EPA hazardous waste code D011). Thus, hazardous wastes from film related activities include waste fixer and waste rinse water (which contains fixer). In addition, waste developer and stopbath is managed as hazardous at PNNL, since they sometimes can contain greater than 5 ppm of silver. Wastes such as unexposed film, unexposed photographic paper, black and white negatives and black and white photos contain silver, but generally below regulatory limits. These are tested on a case by case basis. Non-regulated wastes include color negatives and color photos. (Kodak 1996) PNNL Film-related Waste Generation At PNNL, waste is generated on a routine basis from daily activities, as well as in large single time amounts from lab cleanouts. Routine film related waste is primarily generated in 326, PSL, and LSLII. The 326 and PSL film labs generate waste from photography for metallurgy work. Historically metallurgy was done for nuclear fuel making research, now it is done for a variety of projects, including alloys for automobiles. Metals samples are polished, then a photograph is used to analyze grain structure and other features of the metal. LSLII generates waste from radiography. Radiography is used to study features of biological samples. Film labs in 331, MSL5 (Sequim), and 325 have generated waste in the past, but have either eliminated waste generation through pollution prevention (331 and a large quantity from LSLII) or from changed work scope (MSL5 and 325). The waste streams from 326, PSL, and LSLII were used for waste quantities for this P2OA. Waste from cleanouts comes from various labs on a sporadic basis. One example is a 4,000 pounds of X-ray negatives in 331G, which were stored for many years as historical data. If non-hazardous, these will be disposed of to the landfill. A variety of P2 activities have already been done. Environmental Microbiology in LSLII purchased a phosphoimager to replace their x-ray process. This device uses fluorescent dyes or radioactivity which produce an electronic image, eliminating any chemical use, as well as all hazardous and mixed waste. Additionally, the resulting computer file provides more accurate data, is easier to use, and allows the researcher to take more images. The system, manufactured by BioRad, costs about $80,000. The Microbiology department in 331 purchased a fluorimager which works in a similar fashion, but for fluorescent images only. The operators of 326 have significantly reduced waste through careful monitoring of chemical use, maximizing the life of the chemicals to the greatest extent possible. Other information important to this P2OA LSLII has a evaporator which could be used to reduce developer and fixer to a silver cake which could be disposed of as hazardous waste (volume reduction) or recycled (as silver). The evaporator is manufactured by Environmental Solutions and needs to be ventilated. Purchased about 2 years ago, the evaporator has not been installed since researchers have not been able to get permission and/or labor to do so. Boeing Computer Services Richland (BCSR) has a large photography lab in 3705. The process their fixer through a small silver recovery unit manufactured by Hallmark Refining Corporation. Fixer from 326 used to go to BSCR for recovery but no shipments have been received in 1994. Once a year in the fall, BCSR sends all silver containing materials (regulated and non regulated) to Eastern Smelting for silver recovery at a cost of about $1/pound, except for silver flake which costs $75/container. Through this recycling, they reduce their waste stream by 52,000 kgs per year at a savings of $17,770 annually. BCSR is willing to accept materials from PNNL at a cost of $1/pound, except for fixer which it will take for a nominal charge.

Options: 1. Reinstate fixer recycling through BCSR (used to be done, potential cost savings)2. Recycle slides, photos, negatives through BCSR contract with Eastern Smelting (potential for large waste reduction, especially with legacy waste)3. Neutralize developer with stopbath and treat to dispose to sewer (done by BCSR already so has precedent)4. Get evaporator in LSLII installed in LSLII or give evaporator from LSLII to Larry or purchase evaporator for 326 (use of existing equipment, so potential for good payback)5. Use SafetyKleen for chemical disposal, if they do recycling (potential one-stop shop, potentially cheaper, BCSR is considering)Ideas not to be Researched:6. Purchase electronic microscopes for imaging in metallurgy research (researchers report images not good enough for their work, may need to be investigated in another year)7. Purchase fluorimagers and/or phosphoimagers for those needing them (labs needing them have already purchased them)8. Purchase electronic cameras (no photography of this kind being done)9. Use non-silver containing film such as diazo, vesicular photopolymer, electrostatic (these types of film inappropriate for long term storage, which is generally required)10. Start plastic parts recycling from Kodak in 326 (not enough volume)11. Buy automatic film developers which recirculate (operators do not feel this would have enough accuracy)12. Purchase silver recovery unit (redundant with BSCR, which has enough capacity)

Site: Pacific Northwest Laboratory	
Site Coordinator: Donna Merry	**Team Leader:** Jill Engel-Cox
Phone: 509-376-9773	**Phone:** 509-372-0307
Fax: 509-376-2195	**Fax:**
Email:	**Email:**

Title: Increased Collection of Recyclable Materials **Major Waste Type:** Sanitary Waste

PPOA ID Code: PNNL-97-01 **Specific Waste Type:** Paper

Date: 27-nov-1996 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Disposal

Description: The purpose of this P2OA is to evaluate opportunities to increase the number of secondary materials beneficially recycled by the Pacific Northwest National Laboratory. Currently, PNNL has a recycling contract for collection of the following materials from its major office buildings:1. High-grade office paper2. Newspapers and magazines3. Corrugated containers4. Mixed grades of paper5. HDPE and PET plastic containers (SPI resin label types 1 and 2)6. Glass7. Tin (steel) cansThe PNNL World Wide Web site prominently includes a Greenguide for describing opportunities to reduce, reuse, and recycle materials in the workplace. An outdoor recycling collection container for tin, aluminum, glass and paper, serviced by the City of Richland, also is located across from the ballfield area in the central PNNL campus. Wood pallets are delivered to the PHMC for refurbishing or recycling. Obsolete software and magnetic storage media can be recycled via plant mail to Software Recycling at mail code G1-10. PNNL Shipping Dept. (375-5999) will pick up unneeded packing filler materials for reuse. PNNL staff are also encouraged to reuse moving boxes, 3-ring binders, and other similar items.Additionally, PNNL organizations that generate significant quantities of certain other materials make arrangements for those materials to be reused or recycled, including:1. Surplus chemicals2. Lead-acid batteries3. Used oil and antifreeze4. Solvents5. Thermoplastic test partsA previous P2OA (PNNL-96-08, Photography and Radiography Film Processing, May 2, 1996) examined the feasibility of recycling photography and radiography film processing materials.The purpose of this P2OA is to examine the feasibility of recycling additional secondary materials generated in PNNL operations, specifically:1. Printed circuit boards and other electronic components2. LDPE plastic wrap and bags3. Light bulbs 4. Dry cell batteries

Options: Current PracticeHistorically, lead-bearing electronic components that were not excessed as part of electronic equipment, have been disposed of as hazardous waste. Recommended ActionNow that PNNL has developed a Chemical Redeployment Center, staff will segregate printed circuit boards and other precious-metal bearing electronics components for packaging and shipment to a metals reclamation facility. This will reduce hazardous waste disposal costs and reduce the potential that the boards will be improperly disposed in the trash bins. The Department of Ecology has also encouraged the recycling of these materials.

Site: Pacific Northwest Laboratory	
Site Coordinator: Donna Merry	**Team Leader:** Tapio Kuusinen
Phone: 509-376-9773	**Phone:** 509-372-4234

Fax: 509-376-2195	**Fax:**
Email:	**Email:**

Title: 325 ACL and PCL Waste Reduction **Major Waste Type:** Hazardous Waste

PPOA ID Code: PNNL-97-02 **Specific Waste Type:** Solid Waste

Date: 20-nov-1996 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Organic

Description: The Analytical Chemistry (ACL) and Process Chemistry (PCL) Laboratories operate in the 325 building. This assessment reviewed the activities of the ACL and PCL to find opportunities for waste reduction from their operations. The operations explored included the procedural activities for navigating in the laboratories, the sample and standards preparation, and the actual analytical procedures that take place in the laboratories.

Options: Current PracticeCurrent preparation of soil, sludge, organic/oil, and filter samples for chemical analysis uses traditional hot plate and beaker digestion methods. These methods generate large sample volumes, which become mixed waste upon completion of analysis. These methods also require long periods of an analyst's direct attention to avoid sample loss due to boil over or sample charring, as well as an excessive amount of reagents to insure complete digestion of difficult matrices. The current methods generate 100 mL of volume for each sample, ~30% of which is consumed during analysis. The rest is eventually disposed of as waste. The current sample throughput for this type of preparation is ~460 samples per year.Recommended ActionProcure two sets of CEM Heavy Duty Vessels (HDV) and install a 30 deep fume hood, which will dramatically reduce the amount of analyst time needed to digest difficult matrices, as well as sharply reduce reagent volumes and final sample size. The fume hood has already been purchased but has not been installed. The fume hood will house a CEM Microwave Digestion System (MDS) 2000, this too has already been purchased. The 30 deep fume hood is needed to allow full clearance to the MDS 2000. Within this hood the system will be able to operate without breaching the radiological barrier of the fume hood. With the proposed system, the disposal costs could practically be eliminated by digesting only the amount of sample needed for analysis.

Site: Pacific Northwest Laboratory	
Site Coordinator: Donna Merry	**Team Leader:** Keith Peterson
Phone: 509-376-9773	**Phone:** 509-372-4540
Fax: 509-376-2195	**Fax:**
Email:	**Email:**

Title: Chemical and Inventory Management and Usage **Major Waste Type:** Hazardous Waste

PPOA ID Code: PNNL-97-03 **Specific Waste Type:** Chemicals

Date: 30-sep-1997 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Chemical

Description: Background on Chemical Inventory and UsageChemical purchases at PNNL are conducted through the use of the Chemical Management System (CMS). The CMS consists of a set of policies, procedures, and tools to manage the purchase, inventory, use and finally the disposal of the chemicals. The principal objectives of the CMS is to make it convenient to locate chemicals, communicate safety and health information, and to minimize chemical waste.Chemicals are obtained either through the Field Service Representatives (FSR) or the Hazardous Material Custodians (HMC). Upon receiving a request for chemicals, the FSR or HMC will access the Chemical Inventory System (CIS) which is a part of CMS to check whether the requested chemicals are in the PNNL inventory. The chemicals are ordered if they are not in the inventory. If the requested chemicals are listed in the inventory, there are three ways of obtaining the chemicals. One option is to contact the custodian of the excess chemicals listed in the inventory and request the needed quantity. This excess chemical inventory storage has been operational for about a year and consists of about 500 to 600 containers of chemicals that were excessed from various PNNL laboratories (Ryan Lokken - personal communication). During its first year of operation, the excess chemical inventory system has

distributed about 200 containers of chemicals. The second option is to contact one of the custodian and request the needed chemical. If the custodian is willing, the chemical can be acquired either gratis or on a replacement basis. The third option is to order the required chemical from a vendor irrespective of its current availability in PNNL inventory. The latter choice may be based on the fact that 1) the required chemical listed in the inventory may be of a grade (purity) which does not meet

Options: Current PracticeCurrently, when there is a need for chemicals, the FSRs, HMCs, and researchers check POPCHEM or POPCAS. Because of limited amount of information available from these subset data bases of CMS, decisions about chemical acquisition or purchase cannot be made without additional information. Currently, the additional information can only be obtained from logging on to CMSRecommended ActionAddition of grade (purity), expiration date (for chemicals with limited shelf-life), and availability information to POPCHEM or POPCAS will save time and money. If these critical pieces of information are readily accessible, one can quickly determine whether the chemical with desired purity and shelf life is currently in the PNNL inventory and also whether the custodian of the chemical is willing to release it on either gratis or exchange basis. This action is expected to result in cost savings in two ways. One is by saving time required to search and access critical information for each chemical separately in CMS. Second by easily locating a PNNL source for quick and often gratis acquisition (more efficient use of the existing chemical inventory), the cost of initiating and purchasing a new supply of chemical can be saved.

Site: Pacific Northwest Laboratory	
Site Coordinator: Donna Merry	**Team Leader:** Shas Mattigod
Phone: 509-376-9773	**Phone:** 509-376-4311
Fax: 509-376-2195	**Fax:**
Email:	**Email:**

Title: Organic Analytical Laboratory **Major Waste Type:** Hazardous Waste

PPOA ID Code: PNNL-97-04 **Specific Waste Type:** Chemicals

Date: 30-jul-1997 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Organic

Description: This pollution prevention opportunity assessment focuses on techniques for reducing or eliminating the use of methylene chloride in analytical procedures for quantifying contamination of marine samples with hazardous organic compounds. Spent methylene chloride from the organic analytical laboratory is the largest single waste stream generated by the PNNL Marine Sciences Laboratory. Methylene chloride also is a human carcinogen, has been subject to stringent regulatory controls over the past several years, and is expected to be subject to additional regulatory controls in the future. Alternatives examined would replace or reduce the use of methylene chloride in the analysis of organic contaminants. Figure 1 outlines the current organics analysis procedure.

Options: Current Practice Organics analysis typically is conducted per the process outlined in Figure 1. Approximately 800 liters per year of methylene chloride reagent is consumed, and roughly 500 liters of spent methylene chloride waste is generated. The annual purchase cost of methylene chloride is approximately $20, 000. The annual disposal cost of spent methylene chloride waste is about $10,000.Recommended ActionThe organics laboratory should re-examine the potential to use supercritical solvent extraction (e.g., carbon dioxide) equipment to replace methylene chloride solvent extraction of organic contaminants from marine samples. An evaluation of supercritical solvent extraction was conducted approximately 4 years ago, and unsatisfactory results were achieved. However, significant advances in the technology have been achieved in the interim, and new trials should be conducted.

Site: Pacific Northwest Laboratory	
Site Coordinator: Donna Merry	**Team Leader:** Tapio Kuusinen
Phone: 509-376-9773	**Phone:** 509-372-4234
Fax: 509-376-2195	**Fax:**
Email:	**Email:**

Title: Use of HF and its laboratory procedures to clean residual glass melts from platinum

Major Waste Type: Hazardous Waste

PPOA ID Code: PNNL-97-05

Specific Waste Type: Acid

Date: 13-aug-1997 **Major Activity Type:** Laboratory **Specific Activity Type:** Cleaning

Description: Hydrofluoric acid, classified as a hazardous chemical because of its toxicity and corrosive properties, is used in approximately 50 laboratories at PNNL. Even though HF is technically a weak acid, it is able to penetrate the skin and destroy tissue and bone. Despite potential occupational hazards, HF is widely used because of its ability to attack glass and concrete at room temperature and its usefulness as a metal cleaner that produces quality results. Since HFÕs toxic and corrosive properties make it difficult and somewhat dangerous to handle, an effective alternative to its use should be sought. If an acceptable alternative cannot be found, lab practices, including inventory and disposal procedures, should be examined to see if safer more efficient lab practices can be implemented. This P2OA will examine one of the many common uses of hydrofluoric acid (silica removal) and seeks to identify an effective alternative that is safer to handle. In addition, safer lab practices involving HF in situations where it cannot be replaced will be examined.

Options: Current PracticeAt 326-40C, the hydrofluoric acid (HF) is presently being used to clean residual elements from platinum (Pt) crucibles after Si-blend glass melts. Residual elements include silica, lithium, sodium, magnesium, aluminum, boron,(isotopically pure), cerium and lanthanum. Because the Pt crucibles will be re-used for future melt, they must be completely cleaned of residue. Therefore, HF is used as a dip for removing residual glass melts from the Pt crucibles. After donning appropriate personal protective apparel (goggles, face shield, acid apron, neoprene gloves, calcium glutamate on hand) lab personnel place contaminated Pt crucible, lid, bushing, and rod in a container of HF and allow them to soak overnight or longer. (typically 24 hr.) Forceps are used to slowly take the crucible, bushing, lid, and rod out of the HF container and time is allowed for the HF to drip back to its original container. The materials are then rinsed with running water and are ready for re-use. Recommended ActionIdentify and test chemicals or procedures that could effectively replace HF for glass-melt residue dissolution. The most likely substitues would be other acids, such as citric and phosphoric, because they possess many of the same properties as HF and they are widely used in industry for cleaning applications. Sodium hydroxide is another possible alternative because when heated it attacks silica. Alternatives to HF that were brainstormed, researched and tested as part of this P20A are listed below. The procedures used are also listed. The tests did not identify any chemical or process that could be used as an effective substitute for HF Results are listed on the next page.

Site: Pacific Northwest Laboratory	
Site Coordinator: Donna Merry	**Team Leader:** Amy Fishburn & Kathy McGu
Phone: 509-376-9773	**Phone:** 509-372-1133
Fax: 509-376-2195	**Fax:**
Email:	**Email:**

Title: Interfacial Geochemistry and Vapor Deposition Methods Groups

Major Waste Type: Hazardous Waste

PPOA ID Code: PNNL-97-06

Specific Waste Type: Solvents

Date: 30-jun-1997 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Metallurgy

Description: The primary waste generators in the RTL building are the Interfacial Geochemistry group and the Vapor Deposition Methods Group. The building houses a few staff members of the Atomic and Molecular Chemistry Section and a few EMSL staff. The EMSL staff are in the process of moving into that facility. Chemical usage by these groups is limited primarily to alcohols used to clean optical components and ethylene glycol for their dye lasers. The Vapor Deposition Methods Group utilizes a number of chemicals needed for vacuum deposition of thin films and coatings. The Interfacial Geochemistry Group maintains an extensive holding of laboratory chemicals for geochemical research. The Vapor Deposition Methods Group in the RTL building consists of 12 staff members specializing in development of thin film coatings by vapor deposition, polymer multilayer, and electrospark deposition processes. Monomers are the primary chemical used in deposition processes. Other chemicals used include trichloroethane for the vapor degreaser, common solvents such as acetone and alcohols, and a variety of

acids and bases. These chemicals are used primarily to clean substrates, etch coating materials, and remove coatings from deposition chamber shields. Microfabrication processes involve small amounts of photoresists, developers, solvents, acids and bases.The Interfacial Geochemistry Group consists of 9 professional staff members primarily involved in basic geochemical research for the DOE and for the Electric Power Research Institute (EPRI). Research for DOE and EPRI focuses on the transport and fate of subsurface contaminants, by utilizing studies of mineral-interfacial reactions to develop models to test reaction mechanisms and thereby predict contaminant fate. Most geochemical research utilizes small volume reaction vessels, however, intermediate scale reaction vessels are also utilized. Extensive geochemical modeling is performed prior to initiation of laboratory research, particularly for the intermediate scale studies. One of the two existing intermediate scale cells is currently permitted to dispose waste to the City of Richland wastewater treatment plant. The second intermediate scale cell utilizes radioisotopes and therefore utilizes the PNNL Waste Management System. The Interfacial Geochemistry group also operates an analytical chemistry laboratory which supports needs within and external to the group.The priority task of this pollution prevention opportunity assessment was the evaluation of waste hazards and waste volumes generated in RTL. Of secondary importance was the task of assessing the chemical inventory in RTL because the building was listed as the third largest user of chemicals at PNNL. Therefore, this assessment included a comprehensive evaluation of the inventory of chemicals in the Interfacial Geochemistry Group, and to a lesser extent the building. The assessment of waste streams in the RTL building was conducted similarly to the P2OA performed in the 331 building by Dr. Groch (PNNL-96-05). Individual labs were assessed through the use of staff interrogatories, with lab monitors identifying the primary waste streams in their labs. And similarly to that P2OA, the Interfacial Geochemistry Group is undergoing personnel changes. The geochemistry group will be relocating to the 331 building within the next year or two.Initiatives in Environmental and Health Sciences Division (EHSD) have implemented waste reductions in the methods of procurement of chemicals and use and reuse of recyclable products. The EHSD has also matrixed an Environmental Compliance Representative and Field Service Representative to aid in waste compliance and disposal issues, which facilitates research activities. The RTL building also has well utilized recycling stations for staff to recycle office products.

Options: Current PracticeThe vapor degreaser is used daily, and some days more than once by members of the Materials and Chemical Research Section. The vapor degreaser uses a chlorinated solvent 1,1,1 Trichloroethane (TCA) to remove residual contaminants on the surface of metal parts used as substrates for vacuum deposition of thin films. The TCA waste is listed under RCRA and is an Ozone Depleting Substance (ODS). TCA is a standard for this source category of the national emissions standards for hazardous air pollutants (NESHAP). The annual estimated volume of solvent used is 210 liters (55 gallons), however, only approximately 38 liters is placed in the hazardous waste stream for disposal annually. The difference between the amount consumed and the amount disposed of as hazardous waste is presumed to be lost to the atmosphere.Recommended Action Replace the outdated vapor degreaser with an automated aqueous ultrasonic degreaser capable of cleaning to the same level of cleanliness as the vapor degreaser. An aqueous degreaser is preferred over substitution of TCA by another chlorinated solvent, or terpene based solvent on the consideration of waste disposal costs alone. Some of these other solvents may be phased out of production and use in the near future. Air emissions from TCA and other chlorinated compounds have been linked to stratospheric ozone depletion. An incalculable human and environmental cost of the use of the chlorinated solvents like TCA is typified by the 3% annual increase in human skin cancers associated with ozone depletion. Additionally, conversion to an aqueous system eliminates the health risks associated with the use of the hot solvent degreaser and eliminates the labor and reporting costs associated with the EPA reporting requirements effective December 2, 1997.Aqueous degreasing systems require an ultrasonic detergent bath, one or more ultrasonic rinse baths of deionized water, followed by a parts dryer. The actual number of rinse baths or spray heads needed for detergent removal and final cleaning is application dependent. Drying of cleaned parts is a critical finishing step in the process and it can be accomplished using either a vacuum oven or a recirculating air oven. An automated sample handler would be advantageous because it would offset the somewhat longer cleaning times required by an aqueous degreaser. Some vendors offer all in one console cleaners with built in sample handling robotics and drying ovens. An automated system would have the advantage of not increasing labor costs over those realized with the current solvent system.The actual return on investment associated with replacing the existing hot vapor degreaser with an aqueous ultrasonic degreaser can not be accurately determined until the end users determine the absolute level of cleanliness needed for their application, and thereby defined the system requirements. User defined system requirements may be determined by testing of individual degreaser systems with varying surfactants or detergents as needed by submitting sample articles for cleaning to vendors of aqueous ultrasonic degreaser systems. It is proposed that the process of evaluating degreasing systems be completed within the next four months and a return on investment be calculated for the proposed aqueous degreaser at that time.

Site: Pacific Northwest Laboratory	
Site Coordinator: Donna Merry	**Team Leader:** Paul Gassman
Phone: 509-376-9773	**Phone:** 509-375-3883
Fax: 509-376-2195	**Fax:**
Email:	**Email:**

Title: Materials and Chemical Science Research in the 326 Facility **Major Waste Type:** Hazardous Waste

PPOA ID Code: PNNL-97-07 **Specific Waste Type:** Solvents

Date: 30-jun-1997 **Major Activity Type:** Laboratory **Specific Activity Type:** Cleaning

Description: The Materials Research Building is home to both materials research and chemical research activities. While most of the staff is under the Environmental & Health Science Division, there is a small group from the Energy Division. Major support for research comes from the Department of EnergyÕs Basic Energy Science Division in Materials and Chemical Research, as well as DOEÕs Fusion program and the Tritium Target program. Typically each of the research activities results in the production of waste ranging from a few grams to several kilograms per year. The Fusion program and Basic Energy Science Irradiated Stress Corrosion Cracking program (BES-IASCC) generate both LLW and LLMW products. Most of the waste products are placed in a Satellite Accumulation Area (SAA) or a 90 day clock storage. All the research activities that generate waste products will be examined in this P2OA assessment. Performance of a P2OA typically starts with identifying priority streams and activities based on variety of historical data bases such as procurement records or disposal requests. Under this P2OA assessment, we have selected an approach to interview Lab Monitors and researchers on individual processes.

Options: Current Practice: The Advanced Organic and Physical Organic groups use acetone and methanol to clean experimental equipment. Both groups use minimum amounts of solvents in cleaning their equipment. The Advanced Organic group generates a small amount of corrosive and toxic waste. Recommended Action: Substitution of ethanol for methanol would reduce the listed waste output about 25% or ~ 4 litres/year.

Site: Pacific Northwest Laboratory	
Site Coordinator: Donna Merry	**Team Leader:** Bruce Arey
Phone: 509-376-9773	**Phone:** 509-376-3363
Fax: 509-376-2195	**Fax:**
Email:	**Email:**

Title: EH&S Research in the 329 Facility **Major Waste Type:** Hazardous Waste

PPOA ID Code: PNNL-97-08 **Specific Waste Type:** Wastewater

Date: 20-jun-1997 **Major Activity Type:** Laboratory **Specific Activity Type:** Waste Management, Treatment

Description: The 329 facility is currently occupied by 3 technical research groups the Advanced Organic Analytical Methods Group, the Advanced Inorganic Analysis Group, the Chemical Processes and Environmental Technology Group and a machine shop group. The work of one group consists primarily of the development High Performance Liquid Chromatography (HPLC), gas chromatography (GC), and gas chromatography / mass spectrometry(GC/MS) analytical methods for the organic analysis of samples from the Hanford waste tanks and other non-DOE clients. Two of the groups are involved in the development ion chromatography (IC), inductively coupled plasma (ICP), HPLC, and inductively coupled plasma / mass spectrometry (ICP/MS) inorganic analytical methods for the analysis of water samples, samples collected from the Hanford waste tanks and non-DOE clients. Any radioactive samples analyzed by the three groups described are classified as low-level radioactivity. The fourth group develops radioanalytical procedures for hard to measure radionuclides. A wide variety of radioanalytical techniques are employed including ion-exchange chromatography. All radioactive samples analyzed are considered to be low level. The scope of this pollution prevention opportunity assessment (P2OA) is confined to the description of activities performed by the four technical research groups described above. The team members chosen are the Hazardous Materials Coordinators (HMCs) for each group, with the exception of the team leader. In the interest of the limited labor costs available for this evaluation, the HMCs were asked to review waste requisitions for the past year generated for their technical group. The identification of Priority Streams and Activities for this P2OA was determined by a review of past waste requisitions and an estimate of waste contributions for laboratory activities performed in the first three months of 1997. A monthly average for each waste stream was determined from these sources. In the determination of costs for each waste stream, utility factors (building electricity) were not considered. The machine shop activities were not evaluated for this P2OA. Staff members and HMCs interviewed were asked to describe the activities and processes generating the waste streams for individual laboratories. The categories of wastes generated

in the 329 building are low level radioactive waste (LLW), low level mixed waste (LLMW), hazardous wastes, and the process waste which are disposed of in the process sewer system. Processes contributing to sanitary waste streams were not evaluated in this P2OA. Due to past pollution prevention efforts by each group, it was found that much of the LLMW and hazardous waste streams were reduced either by changing analytical methods to reduce the use of hazardous chemicals in HPLC and IC analysis, or by installing commercial devices to allow for the reuse of chemical eluents for selected processes. Generally, the major waste stream for three of the groups were contributions to the process sewer system from HPLC, IC, and ICP activities.

Options: Current PracticeIon chromatography and inductively coupled plasma / mass spectrometry analysis are performed on water samples for the detection of trace metal analytes. Eluent waste from IC and ICP/MS analyses are not caustic. The molarity of the waste stream is .008 M NaOH which is a weak base. This waste is disposed of through PNNLÕs waste management organization. Glass syringes can only be used once and are discarded. The solid waste from discarded syringes is disposed of through PNNLÕs waste management organization. Any sample remaining after the analysis is returned to the client.Recommended ActionEluent waste from IC and ICP/MS analyses should be candidates for disposal through the process sewer system. It is recommended that Ryan Lokken be contacted to determine if this waste is eligible for treatment by the generator. It may be recommended that the pH of this waste be determined and content of priority pollutant metals (eg., Hg, As, Pb) are at levels which do not exceed permissible limits for process sewer disposal.

Site: Pacific Northwest Laboratory	
Site Coordinator: Donna Merry	**Team Leader:** Therese R.W. Clauss
Phone: 509-376-9773	**Phone:** 509-376-8051
Fax: 509-376-2195	**Fax:**
Email:	**Email:**

Title: Hazardous Waste Management **Major Waste Type:** Hazardous Waste

PPOA ID Code: PNNL-97-09 **Specific Waste Type:** Solvents

Date: 11-jun-1997 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Treatment

Description: This assessment reviewed the PNNL hazardous waste management practices in the 305B RCRA Part B permitted interim storage facility. The day-to-day activities of hazardous waste management operations as well as typical special events were reviewed for pollution prevention opportunities. 305B is a RCRA Part B permitted facility that is responsible for processing chemical waste that is generated by the research organizations. Liquid wastes are not treated at this facility. When compatible, flammable and corrosive materials are consolidated, resulting in a 5 to 1 volume reduction. In processing chemical wastes, the facility repackages the liquid and solid wastes for transportation off-site to be incinerated. The packaging process entails placing sealed containers in lab pack containers and filling the void area with vermiculite so that the waste can be transported to the incinerator without the original container breaking. The facility generates wastes three ways:1. Adding packaging materials (vermiculite) for the purpose of regulatory compliant transportation to the incinerator (10,000 kgs/year). The quantity of packaging material is very specifically defined. However, the type has been selected through the contract with the incinerator.2. Containing and collecting spills (5 kg/year).3. Disposal of batteries and other items that the Laboratory does not currently have a recycling contract for.The 305B facility is already doing an outstanding job of managing their waste inventory, keeping it to a minimum while maximizing the quantity in each drum within the compliance levels. The facility staff work to identify opportunities for improvement on a daily basis and to immediately implement opportunities that will save money and time. Launderable rags are used for spill cleanup when possible. Launderable personal protective equipment (PPE) are used when PPEs are necessary. No pallets are being used to stack or store the empty drums. Fluorescent light tubes and lamp ballasts are currently being recycled. Chemicals that have the potential for being reused or recycled automatically go to the Chemical Redistribution Center rather than the 305B interim storage facility.

Options: Current PracticeHazardous waste is packaged into DOT approved 55 gallon steel drums for shipment to hazardous waste incineration contractor. The current contract does not specify requests for reuse or recycling for those drums.Recommended ActionInclude language in the incineration contract that calls for the return of the steel drums for reuse by the Laboratory or for reuse or recycle by the incineration contractor. The Laboratory could see cost savings in two ways: 1) the return of the drums to the Laboratory for reuse, or 2) decreased cost per drum for the Laboratory due to shared savings with the incineration contractor. These opportunities would need to be negotiated with the incineration contractor.

Site: Pacific Northwest Laboratory	
Site Coordinator: Donna Merry	**Team Leader:** Gene Grohs
Phone: 509-376-9773	**Phone:** 509-373-7759
Fax: 509-376-2195	**Fax:**
Email:	**Email:**

Title: Hazardous Material/Chemical Purchasing **Major Waste Type:** Hazardous Waste

PPOA ID Code: PNNL-97-10 **Specific Waste Type:** Chemicals

Date: 30-jun-1997 **Major Activity Type:** Laboratory **Specific Activity Type:** Purchasing

Description: Hazardous materials and chemicals are purchased at Pacific Northwest National Laboratory (PNNL) using either purchase requisitions or P-Cards. Hazardous materials and chemical purchases are governed by the UserÕs Guide to Acquisitions (PNL-MA-67) and the PNNL Purchasing Card (PNL-MA-66) subject area guidance documents. Staff can acquire chemicals without purchasing them by using PopChem or the Chemical Management System to locate available chemicals in other researcherÕs laboratories or from the Chemical Redistribution Center.Currently, when a PNNL staff member needs a chemical, they go through the following process:1. Search PopChem for the chemical and contact another researcher to use a portion of their inventory. If no chemical is available, step 2.2. Contact the Hazardous Materials Coordinator, Field Service Representative, or administrative staff regarding need for chemical.3. Hazardous Materials Coordinator and Field Service Representative check the Chemical Management System for availability and then order the chemical using a P-Card. Administrative staff order chemical using purchase requisition.4. Chemical arrives on-site and is immediately bar-coded and entered into the Chemical Management System, where it will be tracked until it is disposed of.PNNL has taken considerable strides to manage its chemical inventory and purchases. All laboratory chemicals are tracked with bar-codes from purchase through disposal in the Chemical Management System database. The PNNL Chemical Redistribution Center (CRC) was established in 1996. The CRC accepts unused chemicals from researchers (that were bound for disposal) and redistributes them to researchers in need of those chemicals (at not charge). The redistribution of chemicals reduces the quantity of chemicals that need to be purchased and avoids disposal of those excess chemicals. The exchange of chemicals occurs informally with neighboring laboratories, and this practice has been enhanced by the introduction of PopChem. PopChem provides researchers an on-line chemical inventory of all the laboratories at PNNL. Also included on PopChem is the quantity of chemical potentially available, the location of the chemical, a point of contact, and a phone number. This system supports an estimated, 6000 chemical exchanges annually (1995 user survey). Since 1995, PNNL research staff have had increased access to support staff specializing in chemical waste management and environmental compliance. Field Service Representatives, Hazardous Materials Coordinators, and Environmental Compliance Representatives have been assigned to all organizations generating hazardous and radioactive wastes. By working in the field with the researchers, these staff have increased the credibility of compliance and waste management staff, provided increased access to researchers, and have increased control over the safety and compliance of the research laboratories.

Options: Current PracticePollution Prevention information is currently provided in the generator/hazardous waste management training, but not in the P-Card training.Recommended ActionEnhance the pollution prevention section in the hazardous waste management training and add pollution prevention into the P-Card training. Items to be considered for inclusion in the training are:- General pollution prevention definitions- How to take advantage of the Chemical Redistribution Center- How to use PopChem- Use of non-hazardous chemical alternatives- Costs associated with storing chemicals (including space)- Ask the question: Do I really need this and in this quantity?

Site: Pacific Northwest Laboratory	
Site Coordinator: Donna Merry	**Team Leader:** Kim Fowler
Phone: 509-376-9773	**Phone:** 509-372-4233
Fax: 509-376-2195	**Fax:**
Email:	**Email:**

Title: Inadvertent Disposal Issues **Major Waste Type:** Hazardous Waste

PPOA ID Code: PNNL-97-11 **Specific Waste Type:** Solid Waste

Date: 30-jun-1997 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Disposal

Description: At Pacific Northwest National Laboratory, research staff are responsible for disposing of the hazardous and radioactive waste that they generate, appropriately. Waste generators get formal training on proper disposal practices and have field support as needed from Hazardous Materials Coordinators, Field Service Representatives, and Environmental Compliance Representatives. Despite these measures, occasionally items have been placed in waste drums without being included on the waste inventory sheet.The scope of this assessment is to identify the key items that are raising disposal issues and look for opportunities to eliminate the inadvertent disposal of these items. Items that have been identified as potential disposal issues include: lead ties/seals, batteries, light bulbs, stir rods, sheet rock, lead tape, platinum foil, circuit boards, un-punctured aerosol cans, paint pens, and contained liquids. Leaded wire ties or leaded security ties are presently used for tags attached to Safety Relief Valves, Special Nuclear Material Drums (for tamper indication), and Security Door or Gate seals (for tamper indication). Sheet rock is non-hazardous but is so dense when x-rayed that it can raise suspicion. Platinum foil is non-hazardous but appears to be the shape and density of lead tape when x-rayed.

Options: Current PracticeThere are typically two electronic items that cause disposal issues; they are dry-cell batteries and circuit boards.The common uses of small dry-cell batteries at Pacific Northwest National Laboratory include small flashlights, pagers, calculators, and other portable electronic devices. Currently, the Laboratory disposes of dry-cell batteries as hazardous waste. In radiation zones, if staff are disposing of electronic equipment containing batteries, they must remember to remove batteries from equipment prior to disposal.Circuit boards, like those found in computers and other electronic equipment, have lead-bearing electronic components. Currently, the Laboratory disposes of circuit boards that were not ÔexcessedÕ as part of electronic equipment, as hazardous waste. In radiation zones, if staff are disposing of electronic equipment containing circuit boards, they must either remove the circuit board and dispose of it as hazardous or mixed low-level waste, or do not disassemble the equipment (i.e., leave the equipment in tact).Recommended ActionThe recommended action is to raise awareness for all Pacific Northwest National Laboratory staff on the proper disposal or recycling paths for dry-cell batteries and circuit boards. Suggested actions for implementing this opportunity include:- Discussing the issue at Field Service Representative and Hazardous Materials Coordinator meetings. Requesting the FSRs and HMCs pass this information on to the researchers they interact with.- Posting new signs near all low-level waste drums sharing details on the proper disposal of electronic equipment.- Sending electronic mail to all waste generators describing the proper disposal of batteries and circuit boards in radiation zones.- Adding details on electronic equipment disposal to the radioactive and hazardous waste management training. Recycling options and possible programs for dry-cell batteries and circuit boards not in radiation zones were discussed in the Increased Collection of Recyclable Materials Pollution Prevention Opportunity Assessment (Tapio Kuusinen, 11/27/97, PNNL-97-01).

Site: Pacific Northwest Laboratory	
Site Coordinator: Donna Merry	**Team Leader:** Kim Fowler
Phone: 509-376-9773	**Phone:** 509-372-4233
Fax: 509-376-2195	**Fax:**
Email:	**Email:**

Title: Building 566 **Major Waste Type:** Low Level Waste

PPOA ID Code: RF-1 **Specific Waste Type:** Personal Protective Equipment

Date: 27-mar-1995 **Major Activity Type:** Service **Specific Activity Type:** Laundry Operations

Description: Considers the impact of reducing the boundary of Building 566, the Cold Laundry, Radiological Material Management Area (RMMA). As the Laundry's RMMA shrinks, waste minimization benefits expand. By shrinking the Building's RMMA, 87% of the waste will be reclassified from low level to non-hazardous. Laundry equipment includes washing machines, dryers, laundry carts, and radioactivity monitoring equipment. The Laundry cleans worker protective clothing and respiratory protection equipment. The first year cost savings associated with shrinking Building 566 RMMA is $41K.

Options: Recommended actions to implement this cost savings are to: 1) Indoctrinate the Laundry's management staff and crew on the new radiological practices allowing waste minimization; 2) Properly sign the various work areas in the building; and 3) Properly dispose of the existing backlog, for example most of the backlog is managed as low-level waste not because it is radioactive but because the backlog is in an RMMA.Radiological Engineering modifications to the RMMAs and new procedure for surveying incoming laundry. No contamination has been found on items or areas in the Laundry since 1993, which is when the Laundry stopped laundering cloth booties. Rubber booties are still being washed. For this reason, RadiologicalEngineering now has the option to survey a representative fraction of incoming laundry to unconditional release limits.

Site: Rocky Flats Environmental Technology Site	
Site Coordinator: Colburn Kennedy	**Team Leader:** LaVelle Knight
Phone: 303-966-7543	**Phone:** 303-966-4293
Fax: 303-966-6406	**Fax:** 303-966-3578
Email:	**Email:**

Title: Re-Evaluation of the Building 123 and 881 Laboratories **Major Waste Type:** Low Level Waste

PPOA ID Code: RF-2 **Specific Waste Type:** Solvents

Date: 01-dec-1994 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Radiological

Description: PPOAs were conducted on four specific processes within the Building 123 and Building 881 Laboratories. These processes, Sample Digestion, Urine Co-Precipitation, Water Analysis, and Radiochemistry represented a majority of the waste producing operations. Inputs to these processes include various acid solutions, radioactive standards, solvents, glassware, sample containers, and combustibles.

Options: Attitude and Awareness: a strong continuing awareness of pollution preventionconcepts exists. Doing it right the first time had the effect of dramatically reducing the number of repeat analyses required due to operator error and equipment malfunction. Procedures and Operations: Many procedures that previously called for double aliquot testing have been changed to allow single aliquot analysis. Extension of reagent expiration dates, which allows for a longer usage period for these materials. Also, reagents are made in smaller quantities. Reassessment of Radioactive Material Management Areas (RMMA). During some of the analyses conducted in Building 123, a low concentration of radioactive standard was added to the sample. This workwas always conducted inside a fume hood, within one room of the Laboratory, which resulted in the whole room being designated as a RMMA. Through a reassessment process, it was determined that only the fume hoods required the RMMA designation. Material Substitution: elimination of toluene and isopropyl alcohol from effluent air filter analyses. Facility and Equipment: improved housekeeping reduced the need for repeating analyses. Installation of a dishwasher for cleaning glassware.Recycling Opportunities: recommended recycling of the glass and cardboard that the reagents are shipped in.

Site: Rocky Flats Environmental Technology Site	
Site Coordinator: Colburn Kennedy	**Team Leader:**
Phone: 303-966-7543	**Phone:**
Fax: 303-966-6406	**Fax:**
Email:	**Email:**

Title: Form R Report - Operable Unit 1 **Major Waste Type:** Low Level Waste

PPOA ID Code: RF-3 **Specific Waste Type:** Acid

Date: 30-jan-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Treatment

Description: Focuses on Operational Unit 1 (OU1) at Rocky Flats. OU1 was chosen due to high acid use.

Options: Option 1: Discharge Untreated Influent Directly to Building 374: Option 1 consists of storing and sampling the incoming liquid. This option is not feasible due to the presence of organic compounds in the influent that cannot be treated by Building 374.Option 3: Shutdown the Ion Exchange Treatment Unit and Discharge the Ultraviolet/Peroxide Treated Water to Building 374. The main pollution prevention problem with this option is that the decrease in waste production would not be significant. Low-level mixed waste would still be produced because Building 374 is part of the treatment process. Option 5: Discharge the Ion Exchange Regeneration Solution to the Sanitary Treatment Plant. The purpose of Option 5 is to test the regeneration solution for organic compounds metals and radionuclides. Option 5 is attractive because it offers the possibility of significantly reducing waste in the form of saltcrete from Building 374 and this option is not difficult or expensive to implement. Additionally this optionis very flexible in that if a more hazardous waste stream is treated at OU1 with radionuclides; then the regeneration waste stream can be redirected to Building 374 without any changes to the current system. Option 6: Shutdown Ion Exchange Unit number 4. This option would decreaseBuilding 374 costs, transportation costs, operations, and maintenance costs.

Site: Rocky Flats Environmental Technology Site	
Site Coordinator: Colburn Kennedy	**Team Leader:** Thomas Blackman
Phone: 303-966-7543	**Phone:** 303-966-8370
Fax: 303-966-6406	**Fax:** 303-966-5713
Email:	**Email:**

Title: Print Shop **Major Waste Type:** Hazardous Waste

PPOA ID Code: SNLNM-ORG13418 **Specific Waste Type:** Solvents

Date: 14-oct-1994 **Major Activity Type:** Service **Specific Activity Type:** Printing

Description: PhotolithographyIn this process, images of text and graphics are transferred to photographic negatives. Large cameras are used, and the negatives must be developed using developer and fixer, both of which are corrosive chemicals. The exposed film is placed in the developer unit. Here, developer and fixer solutions are automatically dispensed from storage sumps within the unit. When the pH level of these solutions falls below the optimum levels for photo quality, more chemicals are dispensed into the unit via an automatic bulk storage/dispensing system located within the same room. Occasionally, the sumps must be cleaned of sludges, which contain small amounts of silver.In an adjacent room, negatives are stripped (cut into strips and pasted onto goldenrod-colored paper) for transfer to metal plates. Thin metal plates, made from aluminum and small amounts of zinc and nickel, are prepared for use on the press. The goldenrod strips are placed on a plate, which is coated with a thin film. The entire assembly is then exposed to an arc light, which burns the image from the negative onto the plate. The plate is then processed through a developer unit, which removes the burned surface coating from the plate using a developing solution. The coating that remains matches the positive image and will carry the ink onto the paper.A color proofing processor will soon be in operation in the Print Shop. This processor will allow an electronically created image to be examined for clarity and accuracy without going all the way through the photolithography process. Proofing will further minimize the number of metal plates that are prepared for a print job, and, therefore, the amount of corrosive chemicals used.PrintingThe plates, prepared as above, are affixed to the rubberized blanket that overlays the revolving press drum. The ink is placed in a repository and passed through a series of rollers, which ensures that it will be evenly distributed across the plate. The press drum bearing the plate revolves against the last roller in the series and the positive image on the plate picks up the ink. As the drum revolves further, it contacts the printing surface, the paper, and lays down the ink. Reservoirs dispense solvents and ink conditioners onto the rollers so that the rollers do not become sludgy with ink, and so the ink may be conditioned to dry more quickly.After the printing process is complete, the plates are removed from the press and stockpiled. Next, the press is cleaned with a blanket wash, a solvent that removes ink from the press blanket and the rollers.BindingMost of the documents are printed on white stock paper that is correctly sized from the outset. However, some trimming of the pages may be required prior to binding. Because there is so little white paper that is required to be trimmed, and because the majority of trimmings are colored paper, paper is not recycled from this facility. Also, restrictions on the handling of classified and sensitive materials preclude recycling this paltry amount of white paper. Binding consists of Perfect-brand binding and stapling.High-Speed DuplicationHigh-speed duplication (130-140 pages per minute) is currently carried out on one leased machine, a Xerox 5390. A special grade of paper, available only from Xerox, is required for use is this machine to avoid continual jamming problems arising for static electricity formation. The toner and other chemicals associated with this machine are disposed of by the Xerox dealer as a part of the equipment

lease.WASTE STREAMSThe photolithography and printing processes produce the following wastes: developer, fixer, and stabilizer, as well as some solvents (e.g., naphtha). In CY 1993, the total quantity of wastes produced by the Print Shop was 3,300 kg. The largest waste streams quantities from this operation during CY 94 (through July) are as follows: Trimethylene chloride (dichloropropane)/ barium-contaminated lab trash 254.0 kg Photo developer (pH = 6-9) 248.2 kg Photo developer (pH = 12.5) 230.9 kg Photo developer (10 ² pH < 12.5) 122.7 kg 3M Onyx Film Plate Stabilizer 121.1 kgThese five wastes comprise approximately 60% of the waste stream from the Print Shop. The remainder of the waste is composed of similar materials, in lesser quantities and having varying pH levels, as well as contaminated trash, used oil, and less than 3 kg of lead.The metal plates used on the press drum can be recycled, if their classified or sensitive nature is first negated. However, there is currently no foundry or smelter onsite that is accepting classified metals for melting. The plates used by the print Shop are currently stockpiled onsite.Binding produces miscellaneous paper trash, miscellaneous adhesive trash (tape, glue-contaminated trash), and perhaps some oil-contaminated lab trash resulting from cleaning and maintenance operations on the binding equipment.High-speed reproduction produces only paper trash. The toner and fixers used in the Xerox 5930 are disposed of by the company that has the maintenance contract for the machine's service. Paper trash is created when a jam interrupts the reproduction process.

Options: 1. One alternative to the processes that generate chemical waste would be to replace the majority of the printing now done on photolithography presses with high-speed electronic printer, such as are manufactured by Docu-Tech. These printers operate similar to the Xerox 5930, but are capable of printing from electronic copy. High-speed electronic printing bypasses the use of the hazardous chemicals required for photographic processing. Suggestion: Procure a Docu-Tech high-speed electronic printer. Investigate, in close cooperation with the Security Department, the possibility of using the restricted computer network to allow customers to transmit documents for publication electronically. If security concerns do not allow this option, investigate the possibility that customers could submit their documents for publication via a diskette, bypassing the computer network. Suggestion: Prepare a Return-on-Investment (ROI) proposal for submission to DOE for possible funding.2. The metal printing plates, which are currently being stockpiled in the Print Shop, can be recycled, if they can be defaced to the degree that they are no longer considered to contain classified information. Suggestion: Coordinate with John Garcia (Org. 2483-3), supervisor of the Precision Metals, Metal Preparation, and Explosive Processes Team in Building 841, to melt down the printing plates, in batches of less than 50 lbs. each, when the foundry is hot from melting classified parts from the Weapons Hardware Inventory Reduction group (org. 5111).3. The blanket wash used to clean the press contains a hazardous solvent (trimethylene chloride). Although solvent use is kept to a minimum in the Print Shop, the paper toweling used to clean the press, which is contaminated with the solvent, comprises the largest waste stream in the shop. Suggestion: Investigate the possibility of substituting a less-toxic solvent, such as d-limonene, as a blanket wash. Although such a substitution will not reduce the kilograms of waste produced, it will lower the toxicity of the waste stream, and will make the work environment less hazardous for the employees.

Site: Sandia National Laboratory / New Mexico	
Site Coordinator: Maria L. Walsh	**Team Leader:** Teri Wilkins
Phone: 505-848-0342	**Phone:** 505-881-9228
Fax: 505-848-0998	**Fax:** 505-881-9357
Email: mlwalsh@envc.sandia.gov	**Email:**

Title: STAR Facility **Major Waste Type:** Hazardous Waste

PPOA ID Code: SNLNM-ORG1433 **Specific Waste Type:** Lead

Date: 26-jan-1995 **Major Activity Type:** Laboratory **Specific Activity Type:** Cleaning

Description: The STAR Facility performs shock wave experiments on a variety of materials using a number of different guns in support of internal and external customers. Samples to be tested are obtained premachined or prepared on site through machining and/or lapping. The samples are then assembled into targets and projectiles. The projectiles are fired through the following gun barrels:¥ 2-Stage Gun¥ Powder Gun¥ TBF Gun¥ Starfire Gun¥ Air GunAfter each shot, the gun barrels are thoroughly cleaned to prevent damage during subsequent shots. In addition, the inside surface of the barrels must be completely dry and free of any film layer shortly after cleaning.Projectiles shot through the Powder Gun are received in a large (6 ft. diameter by 15 ft. long) vacuum chamber. A vacuum pump is employed to maintain vacuums of 100 microns Hg. After each firing, the vacuum chamber must be washed sufficiently to minimize the replacement frequency of vacuum pump oil.Waste StreamsThe following major waste streams are identified in descending order of importance:¥ Powder Gun Waste Water. By far, the largest quantity of waste is generated during the cleanup of the powder gun. After the gun is fired, the cleanup of the

vacuum chamber is initiated. The door of the vacuum chamber is opened and the inside of the chamber is rinsed with tap water to dislodge the bulk of the powder residue and to sweep up the larger metal fragments. The chamber is then washed with a high pressure stream of soapy water. The washing is followed by another clean water rinse. Chemical analysis of the waste water show trace quantities of lead (3-9 mg/l). However, a recent analysis of the waste water after installing a filtration system shows no detectable level of lead. The primer used in the powder gun process is lead styphnate. Once the primer is ignited and exposed to water during the cleaning process, water soluble lead ions are released. A mass balance of lead suggests that the quantity of lead originating from the primer does not account for all the lead detected in an unfiltered sample of waste water. Particulate lead originating from the walls of the vacuum chamber and powder gun barrel is another probable lead source. Prior to 1977, primers used in the powder gun had significantly larger quantities of lead, and lead particles might have been embedded into pores of the carbon steel vacuum chamber. Since a recent chemical analysis of the filtered waste water did not contain detectable concentrations of lead, it is likely that the majority of the lead is particulate, originating from the chamber walls, and is filterable. However, additional analyses of filtered water samples would be required to determine if this is in fact the case. The resulting potentially lead-contaminated waste water represents approximately 90% of the chemical waste.¥ Waste Photography Chemicals. X-ray photography is employed to document and analyze data obtained during the shock physics experiments. Waste chemicals include developers, fixers, and bleach solutions. This waste accounts for approximately 3 percent of the chemical waste.¥ Acetone/Alcohol-Contaminated Lab Trash. The aluminum residue deposited on the inside of certain gun barrels is generally cleaned with acetone-laden rags followed by a rinse with isopropyl alcohol. Acetone/alcohol contaminated lab trash accounts for approximately 3 percent of the chemical waste.¥ Waste Hi-T Degreasol. Hi-T Degreasol, a kerosene-based solvent, followed by an isopropanol rinse is used to clean most of the gun barrels at the STAR Facility. Approximately one 55 gallon barrel is used each year. Waste Hi-T Degreasol now accounts for approximately 3 percent of the chemical waste.¥ Used Oil. The oil from various vacuum pumps at the STAR Facility is changed on a quarterly basis. Waste oil accounts for approximately 2 percent of the chemical waste.¥ Miscellaneous Wastes. Through the machining process, scrap material is produced along with waste. During assembly, glue wastes, solder wastes, and, if lapping is necessary, solvent-soaked wipes are generated. When the target is mounted into the gun, waste epoxy is generated and if lasers are used, cooling water from the lasers is discharged to the sanitary sewer. If the gun requires a powder charge, propellant waste may be generated as the charge is assembled. During cleaning operations of the powder gun vacuum chamber, workers wear full-face respirators to protect themselves from airborne particulate potentially containing soot, lead, phenolic dust and cadmium. The air filtration cartridges are managed as hazardous waste.

Options: To reduce or eliminate the lead-contaminated waste water, it is suggested that the STAR Facility management consider one of the following five options:¥ Evaporate Powder Gun Waste Water and Condense for Reuse. The waste water from powder gun cleaning activities can be evaporated, resulting in a volume reduction of greater than 95%. The size and supplier of the evaporator/condenser unit should be determined by the STAR Facility. However, inexpensive units may be purchased for under $5,000. For example, Environmental Management Technologies, Inc. of Lake Forest, California is marketing the Electrovap 150 unit that fits smugly around a 55 gallon drum. The EMTEC Electrovap is a thermostatically controlled electrical evaporator that controls the air temperature around the sides of the drum. Purchase of an atmospheric condenser is also recommended that will allow reuse of the water evaporated. Since the Electrovap 150 unit is capable of evaporating and condensing up to 3 gallons of water per hour, it is anticipated that water evaporated will be available for reuse in the process the following day. Since evaporator units operate at temperatures above 500¡F, an unpainted, high quality steel 55 gallon drum should also be purchased to avoid release of toxic volatiles from paint, and wear to the drum structure as a result of continual heating and cooling. Before proceeding with this option; the waste water must be classified as either hazardous or not. If the waste water contains less than the EPA regulatory limit (less than 5 parts per million) for lead, a RCRA permit will not be required. However, if the concentration of lead is above the regulatory limit, then SNL/NM must claim exemption under 40 CFR 270.1(c)(2)(iv) by totally enclosing the system and recovering the water for reuse. For evaporators, this can be done by installing a condenser to recover the evaporated water, and directly piping the condensed water to a reservoir tank for use within the process. If the waste water is above this regulatory limit for lead, it cannot be poured down the drain or moved off site--it must be used in the process, since it is considered a hazardous waste. However, the residue from the evaporator should be treated as a hazardous waste.¥ Filter Lead and Other Particulate from Powder Gun Waste Water Using Filter Press Already Located at the Hazardous Waste Management Facility (HWMF). Monitrol Inc. makes a Process Water Conditioner (PWC) unit, which is designed to filter process water for sanitary sewer disposal or reuse within a process. The PWC 410 filter unit specifications are 42 long x 26 deep x 30 high, which is small enough to be operated indoors. It has the capacity to process 30 gallons per hour. The PWC 410 uses a non-leaching filter web, which conditions approximately 6000 gallons of water per roll. The used filter may be incinerated or disposed of in accordance with applicable EPA regulations. Monitrol Inc. sells the PWC 410 for $6980.¥ Chemically Extract Lead Contamination for the Powder Gun Vacuum Chamber. The PPOA Team has reviewed literature provided by DOE-AL and believes that EET's TechXtract Technology deserves consideration. EET, Inc. has developed a chemical -based approach to removing surface and near surface radioactive, PCB, organic, and heavy metal contamination for concrete, metals, and other solid materials. If successful, this technology may reduce lead contamination levels of the waste water below EPA and SNL/NM action levels.¥ Replace contaminated vacuum chamber. Prior to 1977 , primers used in the powder gun contained large quantities of lead. As a result, the walls of the vacuum chamber are contaminated with lead. The lead contaminated water waste stream could be eliminated by replacing the vacuum chamber. The cost to purchase and install a new vacuum chamber would be $75,000. Another benefit to procuring a new vacuum chamber would be that the STAR Facility

would have two chambers to work with. The STAR Facility is anticipating some tests in the future that will involve testing toxic materials, such as cadmium and beryllium. The STAR Facility could use the already contaminated vacuum chamber for use with tests that involve toxic materials.To reduce toxicity of solvents and compounds used in gun cleaning processes:¥ Complete Solvent Substitution Studies of Hi-T Degreasol and/or Acetone. Solvent substitution studies should be completed that will determine whether less toxic (non-hazardous) solvents meet performance standards established by the STAR Facility. Glidco Organics Corporation produces several terpene based grease and oil solvents that are used for many cold cleaning applications. These solvents, which are refined for natural terpenes, exhibit low toxicity and are biodegradable. Limonene DL would be a suitable substitute for Hi-T Degreasol. Limonene DL has maximum solvency, a low odor intensity, and works well as a hard surface cleaner. In 1992, a solvent reclaimer was installed, which resulted in a significant reduction in solvent usage. Terpene solvents should be compatible with the existing solvent reclaimer. Glidco Organics sell their solvents in 55 gallon drum quantities, but offer five gallon trial sizes. Archem is another company that manufactures and sells terpene based solvent, and other environmentally friendly products. The Organic Materials Department recommends that if terpene solvents are used, the isopropyl alcohol rinse should also be used, to remove any residue.¥ Vacuum Chamber Cleaner Substitution. A biodegradable and non-toxic detergent could be substituted for the present laundry detergent that is being used in the vacuum chamber cleaning process. Use of biodegradable cleansers, such as Simple Green, would make any dry wastes (either after evaporation or filtration) more environmentally friendly.To eliminate wet photography hazardous chemicals:¥ Investigate the Feasibility of Replacing Conventional Photographic Equipment with Digital Equipment. Conventional photography requires the use of hazardous chemical to develop and fix photographic images. Digital photography, however, does not require chemical processing. Rather, images are stored on magnetic media and can be printed on standard color or black-and-white printers. The use of digital photography may have even more beneficial uses than the elimination of photochemical wastes.

Site: Sandia National Laboratory / New Mexico	
Site Coordinator: Maria L. Walsh	**Team Leader:** John Killoran
Phone: 505-848-0342	**Phone:** 505-881-9228
Fax: 505-848-0998	**Fax:** 505-881-9357
Email: mlwalsh@envc.sandia.gov	**Email:**

Title: Manufacturing Technologies Center **Major Waste Type:** Hazardous Waste

PPOA ID Code: SNLNM-ORG2481 2483 2484 **Specific Waste Type:** Oil

Date: 29-aug-1994 **Major Activity Type:** Manufacturing **Specific Activity Type:** Machining

Description: The Manufacturing Technologies Center machines metals, composites, and plastics. Raw materials entering the process are received in large pieces and cut to more manageable sizes for the next operation. The next operation may consist of turning, boring, milling, grinding, cutting, or other machining operations. Machining operations are supported by maintenance and repair activities, instrumentation and calibration activities, and quality assurance activities.Raw feed stock is brought into the department and rough cut with saws to the approximate size required for the machined piece. Feed stock may include aluminum, magnesium, titanium, brass, copper, steel, or plastic (e.g., Lucite, Lexan).Each machine tool uses a lubricant to facilitate the cutting process and to cool both the cutting tool and the piece being cut. Saws use a cutting oil, plastics machining uses Boelube 90 (an oil), newer electrical discharge machines (EDMs) use deionized water, and older EDMs use a light oil. However, the majority of the machine tools use an aqueous solution called Blasocut 2000.Composite (e.g., fiberglass, ceramics) machining operations are mostly performed dry, which creates a dusty airborne effluent that must be drawn off by a vacuum system. The vacuum system is located outside Building 840 with intakes at the individual cutting and grinding stations inside the building. Wet composite machining can use either Blasocut 2000 or oil as the coolant, as well as misted deionized water, depending on the material.Inspection and calibration activities involve cleaning and inspecting finished pieces for quality and for compliance with specifications. This activity includes cleaning with solvents and making casts of the machined piece out of soft, quickly cast epoxy products.Lapping and polishing operations use a variety of abrasive compounds and carriers (e.g., glycol, water) to achieve a mirror finish or optically clear finish on metal or plastic pieces, respectively.Maintenance and repair activities are regularly scheduled for the machines in the organization according to a preventive maintenance plan, and involve changing oil, adjusting equipment, cleaning and lubricating machine parts, etc., all of which are performed using hand tools, which are cleaned in an aqueous cleaning solution. Some parts must also be cleaned before they are reinstalled in the machines.There is a centrally located deionizer system that prepares water for use in the EDMs by filtering it through a column of deionizing resins.Waste Generation DescriptionCutting large pieces of stock materials into more manageable ones requires the use of a cutting oil to lubricate and cool the saw blades. Oily rags result from wiping excess oil off the cut pieces. Metal

chips and fragments contaminated with cutting oil result from the sawing operations.Turning, boring, and other machining operations that use the aqueous coolant Blasocut 2000 contaminate the coolant with tramp oils, that is, oils that either drip into the stream from the machine or oils resident on the pieces to be cut. The coolant is also contaminated with small bits of metal or plastic from the pieces being machined. These bits of material are filtered out of the coolant as it is recycled within the individual machine for reuse. The majority of metal and plastic scrap that results from these operations is larger chips contaminated with coolant. These can be subjected to centrifugal spin-drying to remove most of the coolant from the chips. The recovered coolant is pumped to a holding tank. Each of these machines may have a small amount of oil leaking from it to the floor. Oily rags, coolant-contaminated rags, and Floor-Dry absorbent granular clay are used to clean up these small spills.Dry composite machining operation use the vacuum system to draw off the fine dust that results. The system collects the grit and bits of composite material in filters and in a collection bin outside the building. The composite machining operations that are conducted using a liquid coolant use the coolant most appropriate to the material being machined. This may be either a cutting oil, Blasocut 2000, or deionized water. Much of the time, the liquid is used in a spray mister, resulting in little or no liquid runoff.Grinding operations use Blasocut 7804 and some cutting oils (e.g., Long-life 20/20). Oily and coolant-contaminated rags and contaminated coolants result from these operations.EDM uses a brass or copper wire to precisely cut small pieces according to a graphite pattern that is aligned with the product material. The cutting mechanism itself is an electrical arc. In newer EDMs, deionized water is used to cool these operations; older machines use a light cutting oil. Each newer machine recycles and filters the deionized water until the filters indicate a change-out is needed. The deionized water is removed, re-filtered through the deionization system, which uses ion exchange resin beads. The older EDMs that use a light oil instead of deionized water are being phased out of use.Inspection and calibration operations use cleaners, some of which are adjustable flow aerosol cans of pure air, solvents such as acetone and alcohol, and some potting materials. Epoxy-type potting materials are used to create casts of small, interior spaces of machined pieces which are easier to inspect. Acetone and/or alcohol are used to wipe oils from the surface of machined pieces. Some solder-type material, which may contain lead, is used in calibration operations to seal setting screws. In addition, battery-powered flashlights are used to inspect both the machines and the pieces. Some of the calibration and inspection equipment is also battery-powered.Lapping and polishing operations, which take place in a clean room environment, use fine grits suspended in a liquid carrier medium. As the piece is polished, the compound is dripped onto the piece, resulting in very little run-off. Also, some compounds use glycol as the liquid carrier medium. Contaminated lab trash composed of paper toweling results from these operations, as well as some disposable personal protective equipment.Maintenance and repair activities result in oily rags, dirty tools, parts that must be cleaned and reinstalled, and oil removed from parts and machinery. Floor-Dry is used to soak up drips and small spills, shop rags are used to wipe hands and tools and parts, and a parts washer is used to clean parts. The parts washer contains an aqueous cleaner called EPA 2000 Degreaser. There is a fume extraction system that uses fans to draw off the fumes while the lid to the washer is open. The solvent is used many times before it is considered dirtyand replaced with a fresh supply. Used cleaner and used oil are drummed and sent to the HWMF.Deionizer resins are replaced periodically when they become saturated with filtered materials (e.g., water-soluble minerals).Management of Waste StreamsOil- and coolant-contaminated rags resulting from cutting and machining operations are placed in receptacles (small drums with lids) stationed near each work area. The rags are taken to contract laundry for laundering. The use of washable shop rags was recently instituted to replace a larger waste stream, paper toweling.The oil- and coolant-contaminated clay absorbent (Floor-Dry) is swept up and placed into open drums prior to disposal through the HWMF.The oil- and coolant-contaminated cuttings from machining operations are collected in drums at the appropriate output point for each machine tool. The cuttings are then taken to a centrally located centrifuge which recovers the majority of the cutting oil or coolant. Recovered oils and coolant are pumped to a sump for holding.Scrap metals produced by this facility include the following: aluminum, titanium, copper, brass, steel (stainless, carbon, and others), and magnesium. Bins located outside the building are used to collect aluminum, titanium, brass and copper, and magnesium, steel materials are not being recycled. When the bins are filled, they are transported to the Property Reapplication Area and that organization arranges for their sale as salvage.EDM produces waste cutting oil and spent graphite patterns.The aqueous coolant (Blasocut 2000) used in the majority of the machine tools is recycled onsite. The recycling system is located within an airlock. A two-sided, portable tank/pump is wheeled to the machine tool selected for coolant recycling. The coolant, approximately 100 gallons per machine, is pumped into the dirty side of the portable tank by inserting a hose into the machine coolant sump. The tank is wheeled into the airlock, and dirty contents are pumped into the recycling unit. A series of filters and a settling tanks separate the particulate matter and the oil from the aqueous coolant. The clean coolant is pumped into the clean side of the portable tank and returned to the machine. Additional coolant is then added into the sump as needed to maintain proper coolant levels, and the machine filters are replaced. The recycling system pumps the recovered oils, via a skimmer system, into a drum for holding until transfer to the HWMF. Dirty filters are also disposed of through the HWMF.One formulation of coolant, Blasocut 7804, which is used in grinding operations, is recycled differently. The dirty coolant is transported to a water treatment system located in an attached building. This flocculating system uses a precipitating agent to remove all solid matter from the liquid. The moist solids are then loaded into a drying chamber and are heated until the water has evaporated. The dry solids may then be disposed of in the sanitary landfill as non-hazardous waste. The clean water, that which remains after the flocculating process, has been approved by the Water Quality Department for disposal into the sanitary sewer system.Empty containers resulting form aerosol cans, acetone, and alcohol, among others are disposed of through the HWMF.Deionizer resins are bagged and disposed of through the HWMF.

Options: 1. The PPOA Team has researched hydraulic oil recycling equipment that is designed to filter hydraulic oil as it is

replenished during preventive maintenance. The oil has enough new oil added to it to ensure that fill levels are met, and that viscosity meets that required by specification. Organization 2482-1 disposed of 208 kg of hydraulic oil during CY 1993. There is another waste item for 208 kg that is also listed as used oil that may actually have been hydraulic oil. This would mean that the Machine Shop disposed of 416 kg of hydraulic oil during that year. At a current charge-back fee of $5 per kilogram of used oil, the cost of sending this waste to the HWMF is $2,080 each year. The cost of replacement oil, at $162/55 gal drum (or 226 kg), is approximately $300 per year. The cost of the hydraulic oil recycler is $4,078. Implementation of this option would pay for itself in just less than two years, or at an approximate annual rate of return on investment of 51%.2. Waste skimmer oil consists of a mixture of grades of oil, bioslime, and water. The hydraulic oil recycler could also be used to separate the oils from the bioslime and water. Skimmer oil is currently disposed of as chemical waste. By removing the water and bioslime from the oil, the HWMF can send it to an oil recycler instead of to an incinerator. The charge to the organization is less ($2/kg vs. $5/kg), and there is a long-term beneficial effect on the environment.3. The granular clay Floor-Dry currently used to soak up minor spills from machines and around catch-drums for chips could be replaced with special absorbent toweling. This would significantly reduce the weight of the waste stream. The Motor Pool currently uses a 3M product that comes on a roll and can be cut to any size, as appropriate to the use.4. Alkaline batteries used in flashlights and instrumentation could be replaced with rechargeable batteries. Rechargeable batteries are now available that provide the brightness and quality of light required in the Machine Shop, without losing a charge too rapidly. Recharger units could be located in the tool crib, which is a central location convenient to all. Employees currently deposit spent batteries in bins at the tool crib prior to disposal.5. Steel scrap can be recycled. Property Reapplication is currently locating two new bins for addition to the group at the north end of Building 840 to hold scrap stainless steel and other steel prior to pick-up.6. Oil filters are used in the heavy machining equipment, and are currently disposed of as oil-contaminated material. The Motor Pool has an oil filter crusher that recovers the oil from the filter, then crushes the steel into a flattened puck. The HWMF is currently exploring sources to recycle the steel filters into reinforcing steel bars for use in construction. The PPOA Team suggests that the Machine Shop install a filter crusher, with corresponding oil-recovery drum, and coordinate with the HWMF on recycling oil filters.7. Acetone- and alcohol-contaminated lab trash is created when oils are cleaned off machined pieces. The PPOA Team suggests reviewing the Bio-T and ISP lines of products for an appropriate substitute. These products have lower flash points than either acetone or alcohol and produce few vapors hazardous to workers. This waste stream totals only 22 kg/yr, and is neither expensive nor burdensome to handle. However, the elimination of some, if not all, of the acetone and alcohol used in the ship will also eliminate some of the empty containers in the waste stream and will minimize vapor emissions.

Site: Sandia National Laboratory / New Mexico	
Site Coordinator: Maria L. Walsh	**Team Leader:** Teri Wilkins
Phone: 505-848-0342	**Phone:** 505-881-9228
Fax: 505-848-0998	**Fax:** 505-881-9357
Email: mlwalsh@envc.sandia.gov	**Email:**

Title: Electromagnetic Test Facility Processes **Major Waste Type:** Hazardous Waste

PPOA ID Code: SNLNM-ORG2753 **Specific Waste Type:** Oil

Date: 12-oct-1994 **Major Activity Type:** Laboratory **Specific Activity Type:** Field Analysis

Description: Organization 2753 evaluates the effects of electromagnetic radiation on hardware and electronic components in three buildings. Building 872 contains a variety of test facilities, including Direct-Drive testing, Cable testing, and a Microwave Pulser with an anechoic chamber. Building 871 contains the Electromagnetic Environments Simulator. Building 888 contains the Lightning Simulator.Building 872The Direct-Drive Facility uses signal generators and high-power radio frequency amplifiers to inject current into weapon circuitry or cables. This facility provides high-level test capability for both the continuous-wave (CW) and the damped sinusoidal signals associated with an electromagnetic pulse (EMP) resulting from a high-altitude nuclear detonation.The Microwave test Facility uses several CW and pulsed sources radiation into an anechoic chamber. A vertical-axis, remotely controlled turntable can be used to rotate the test object to provide varying aspect angles. The highest power CW sources are klystrons. Because these sources radiate large amounts of power, special high-temperature absorber and heat-removal mechanisms are used in the anechoic chamber. A directional coupler between the microwave source and the horn antenna allows for measuring both forward and reflected power. The pulsed sources consist of moderate power, off-the-shelf units and a high-power, custom-designed relativistic device.The Cable Test Facility is used to measure the electromagnetic (EM) attenuation provided by the shield on a shielded cable. The facility is designed to test finished, unbranched cables with connectors on each end. Shield in this context includes the connector's exterior conducting shell and

grounding spring fingers, if present.Because the requirements of El ectromagnetic Interference (EMI) and Electromagnetic Compatibility (EMC) testing are similar, the EMI/EMC Test Facility contains the following equipment: ¥ a large shield room to suppress EM emanations other than those from the equipment under test; ¥ antennas to pick up radiated energy; ¥ current probes to sense conducted energy; and ¥ radio receivers, spectrum analyzers, and computers to detect and process the output of the antennas and current probes.EMI/EMC testing determines whether the equipment under test emits information-bearing EM energy that, if intercepted and analyzed, might compromise national security. This type of testing requires no time correlations with sensitive data transmission (as opposed to TEMPEST testing, which does).Building 871Building 871 is the Electromagnetic Environments Simulator (EMES). This facility is used for electromagnetic radiation (EMR) tests and for EMP tests. EMR tests involve exposure to continuous wave radiation to measure EM energy inside the test object and to check for upset or damage. EMP tests involve an EMP from a simulated high-altitude nuclear burst to determine the susceptibility of the test object.In EMR testing, the CW signal is generated by a frequency synthesizer, switched to the appropriate amplifier and injected into the EMES feed by means of a coaxial cable. Amplifier control, switching and data taking are computer-automated.The EMP test setup uses a fast-rise, high-voltage pulser attached to a gas-filled feed section. A Marx generator produces several hundred kilovolts, which charges the peaking capacitors. When the voltage on the peaking capacitors reaches a high enough value, the output switch breaks down to drive the feed. The EMP feed is filled with high-voltage breakdown gas (sulfur hexafluoride [SF6]) to prevent premature arcing. Waveform amplitude can be varied by adjusting the Marx generator voltage, the electrode gap of the self-breaking output switch, and the fill-gas pressure. The marx generator is contained within a 5,000-gallon tank of oil to prevent arcing between the capacitor banks. This oil is transferred to underground storage tanks outside the building on weekends and over holidays. The oil is filtered as it is pumped back into the tank.After several shots, the SF6 is diminished in its dielectric properties and must be replenished inside the switch. The gas is vented to the atmosphere from the switch, fresh gas takes its place and the switch remains in service.Building 888The Lightning Simulation Facility subjects equipment under test to unusually severe direct strokes of simulated lightning. The special characteristics of natural lightning (e.g., fast rise time and long-duration pulse, high peak current, double pulse, continuing current flow following each pulse) can be incorporated into a single test. The principal components of the lightning simulation facility are Marx impulse generators; voltage-triggered, pulse isolation switches, filled with SF6; and an electric motor-generator set. Each Marx generator can produce up to 1.6 MV by charging capacitors in parallel and discharging them in series. The erection of the Marx generator breaks down the pulse isolation switch, passing current through the coaxial feed to the output terminal and the test object. When most of the energy had been transferred to circuit inductance, and the current approaches its peak, the Marx generator is short-circuited with the crowbar switch, which is driven by laser trigger beams, to produce a slowly decaying waveform typical of natural lightning. Continuing current is obtained from the kinetic energy of the motor-generator set. Two Marx generators provide the double-pulse capability. As with the switches in Building 871, the laser-fired switches in this facility are also filled with SF6, which is vented to the atmosphere when spent.The capacitors and switches for the Marx generators are contained in two 16,000-gallon tanks filled with a mineral/castor oil mixture. The presence of the oil prevents arcing between capacitor banks. During the time the facility is shut down, such as on weekends and holidays, the oil is transferred from the tanks into underground storage tanks outside the building. When the oil is pumped back into the tanks the morning of the next working day it is filtered through a series of paper-filled filters to remove impurities and carbon build-up.A small machine shop attached to Building 888 is used to manufacture or modify small-to-medium-sized metal and plastic parts, such as fixtures used to hold test objects and the switch cases. The machine ship contains five machine tools, including lathes, drills, and grinders.Waste DescriptionThe activities conducted in Building 872 produce very little waste. Solvents are not used in any appreciable quantity. Batteries, adhesives, and paint products may be used there in very small quantities.The activities conducted in Building 871 are, likewise, virtually free of waste. However, the capacitors used to generate the EM energy in this building are immersed in a 5,000-gallon tank of oil, similar to the tanks in Building 888. Oily lab trash is the most common waste product. Oil is never drained and replaced; oil levels are simply replenished, as necessary. Oil is filtered regularly to remove impurities and carbon build-up. When the oil is contaminated with carbon products and begins to allow current to flow between the banks, the oil is circulated through the filter system. If the problem does not abate, the filters are changed and the oil is recirculated. Change out is required approximately once each year, depending on the level of activity in the facility. Oil filters are included in the waste stream. Sulfur hexafluoride (SF6) gas is periodically vented to the atmosphere.Building 888 produces the majority of the waste sent to the Hazardous Waste Management Facility by this organization. The Lightning Simulation Facility regularly removes the banks of Marx capacitors from the oil-filled tanks for cleaning and inspection. Oil on the surface of the capacitor banks is allowed to run off the banks onto a drain pad that empties back into the tanks. Spills, drips, and splashes are controlled using absorbent toweling. Currently, liquid freon is used to clean the oil off the capacitor banks. However, only 10 gallons of freon remain onsite. Following the depletion of the freon supply, soap and water will be used to remove the oil from the generator banks.The second-largest waste stream for Building 888 is copper sulfate in solution. Resistors used in the lightning generation equipment have customarily been manufactured in this facility using flexible plastic tubing and copper sulfate (CuSO4) solution. The solution is made as required. Extra solution spills and solution from spent resistors are dumped into a sink in the upper deck of the building, and drained, via a hose, into a catch drum on the first floor. This drum is labeled and, when full, is sent to the HWMF.The SF6 gas contained within the switches breaks down with time and use, losing its dielectric capacity. When spent, it is allowed to vent to the atmosphere. The Air Quality Department has determined that such small amounts of this gas vented to the atmosphere carry no risk to the facility workers, the public, or the environment. In addition, SF6 is not a regulated material, and there are no compliance requirements associated with its use or disposal. However, because SF6 is characterized by the EPA as a greenhouse gas with high global warming potentials, it would

be prudent to capture the gas for recycle, reuse, or filtering.

Options: The PPOA Team suggests that Organization 2753 work with the Air quality Department to reevaluate the release of SF6 to the atmosphere. If a way can be found to recycle or reuse the gas, or if a filter can remove the greenhouse component of the gas, Organization 2753 would be seen as taking a proactive stance in regard to greenhouse gases. The Pollution Reduction Group currently has other organizations that use SF6 targeted for pollution prevention opportunity assessments. If any alternative to releasing the gas is found in the process of assessing their facilities, this information will be provided to Organization 2753 and the Air Quality Department.

Site: Sandia National Laboratory / New Mexico	
Site Coordinator: Maria L. Walsh	**Team Leader:** Teri Wilkins
Phone: 505-848-0342	**Phone:** 505-881-9228
Fax: 505-848-0998	**Fax:** 505-881-9357
Email: mlwalsh@envc.sandia.gov	**Email:**

Title: Environmental and Energetic Testing Burn Site **Major Waste Type:** Hazardous Waste

PPOA ID Code: SNLNM-ORG2761 **Specific Waste Type:** Solvents

Date: 28-dec-1994 **Major Activity Type:** Laboratory **Specific Activity Type:** Heat Treating

Description: The Burn Site conducts open burning that produces large amounts of smoky emissions. The Burn Site mission is to test items, such as shipping containers for nuclear materials, to determine their responses to the type of fire encountered in an airplane crash or other transportation-related accident. Because the test items are often quite large, and because such intense fire testing cannot be conducted within any existing operational facility, the burning takes place in the open.The site contains the following facilities/activities:¥ LARK, a metal enclosure based on the structure of a Butler Bin--an early attempt at emissions containment; out of service.¥ SWISH, a conical metal structure fitted with water spray nozzles on the exterior surface--another early attempt at emissions containment. The SWISH is still occasionally used for tests involving emission-free burning.¥ SMERF (Smoke Emission Reduction Facility), the latest version of a smokeless fire facility (still under development and testing).¥ An out-of-service Bomb Burner facility, which is currently scheduled for decontamination/decommissioning.¥ Large burn pool measuring 30' x 60; not used for approximately 3 years, but available if needed.¥ Small burn pool, measuring 20' x 20'.¥ Three holding tanks north and uphill of the burn pool. One (25,000 gal) holds jet fuel (JP-4 or JP-8), one (30,000 gal) holds burn pool water, and one (30,000 gal) holds an antifreeze/water mixture used for cooling the SMERF.A burn test consists of three phases: preparation, operation, cleanup. During preparation, the test item is received from the client. Occasionally, a test item must have a temperature gauge or other instrument attached to its surface. These items are usually small, and are prepared in a mobile s hop adjacent to the burn pool. Instrumentation is either welded to the surface of the item or attached with heat-resistant NiChrome wire. Areas to be welded are cleaned with a grinder (usually a hand-held grinder). The test item is then taken to the test stand and placed in position for the test.During test operation, the pool is filled with enough water to maintain a 1-meter spacing between the surface of the pool and the test item. The water is stored an a 30,000 gallon holding tank north and uphill of the pool. Between 3 and 6 inches of jet fuel (JP-4 or JP-8) is piped from an adjacent 25,000 gallon holding tank onto the top of the pool and ignited. Water from the pool is pumped through the instrumentation towers to keep them cool, and the liquid nitrogen system is engaged to ensure that data signals sent to the monitoring station are undistorted by the heat. The fire, which creates a large plume of black smoke, is allowed to burn until the fuel source is exhausted. Occasionally, the test item must be extinguished using fire extinguishers.The cleanup phase is initiated once the fire is out and the test assembly is allowed to cool. The water in the burn pool is pumped back into the holding tank. Any solid materials are removed from the bottom of the tank and disposed of as hazardous waste based on the likely presence of ceramic insulation fibers washed off the insulated towers by the cooling water. The test item is removed from the test stand and returned to the client for analysis. If necessary, based on engineering judgment and the number of tests that have been conducted, the ceramic fiber insulation is removed from the instrumentation towers and the thermocouples on the towers are replaced. The insulation is disposed of as hazardous waste.Approximately once each year, the holding tank for burn pool water is drained, cleared of sludge, and refilled. The sludge, which consist of jet fuel residue and ceramic fibers, is sent to the Hazardous Waste Management Facility (HWMF) as hazardous waste. Sometimes, however, there is such a small amount of residue that it is allowed to remain in the tank until the next disposal. Under the supervision of the Water Quality Department, the water is discharged to the sanitary sewer at a metered rate. The water discharge is not considered significant. The Burn Site reuses the burn pool water until the Water Quality Department requires that it be disposed of, and the disposal to sanitary sewer is permitted by the city. Jerry Meloche stated that at the time he

began working at the Burn Site, the burn pool water had been reused for approximately five years without replacement.The waste streams from the Burn Site also include water disposed of through the HWMF and air emissions. The amount of solid or liquid waste disposed of through the HWMF is also not considered significant. The total amount of such waste in FY 1994 was 128 kg. [Note: This amount did not include any sludge from the holding tank. In FY 1993 the site disposed of approximately 631 kg of sludge.] The large quantity of air emissions form the Burn Site are the primary reason for conducting the PPOA.Air emissions continue to be a major concern for the Burn Site. Each burn test requires the notification of numerous air quality agencies, including the Sandia/NM Air Quality Department, which reports that this facility burns approximately 40,000 lbs of jet fuel that contains benzene/toluene/ethylbenzene/xylene (BTEX) annually.

Options: The duration of each test is defined by the client, and, often, by the regulations, such as 49 CFR, that require a qualified item to be able to withstand a specified temperature, under specified test conditions, for a specified period of time. In addition, the primary type of testing conducted at the site simulates an aircraft accident with fire. Aircrafts use JP fuels; therefore, the test must use JP fuels to accurately simulate the fire. The amount of fuel used depends on the temperature and time requirements of the individual test. Therefore, the type and amount of fuel used to generate the fire at the Burn Site cannot be altered.¥ Increase testing and development efforts on the SMERF to bring it online as soon as possible. Conduct as many burn tests as possible in the SMERF, taking into consideration the sizes and configurations of test items.¥ Schedule any open burn testing for seasons when the atmospheric inversion is less of a problem.¥ Discuss with the Water Quality Department the reasons for discharging water annually, and investigate the possibility of using the burn pool water for a longer period of time, e.g., indefinitely, until the tank accumulates enough sludge to impair operations.It is anticipated that approximately 80% of the burn testing conducted could be conducted within the SMERF, based on the size and configuration of items tested in the past. This has the potential of reducing the BTEX emissions by a significant amount.

Site: Sandia National Laboratory / New Mexico	
Site Coordinator: Maria L. Walsh	**Team Leader:** Teri Wilkins
Phone: 505-848-0342	**Phone:** 505-881-9228
Fax: 505-848-0998	**Fax:** 505-881-9357
Email: mlwalsh@envc.sandia.gov	**Email:**

Title: Sandia Hazardous Waste Management Facility **Major Waste Type:** Hazardous Waste

PPOA ID Code: SNLNM-ORG7577 **Specific Waste Type:** Solvents

Date: 25-jul-1994 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Handling

Description: The Hazardous Waste Management Facility's (HWMF) process consists of two parts: 1) processing chemical waste that is generated by line organizations; and 2) managing the Chemical Exchange Program (CEP).In processing chemical wastes, the facility repackages the liquid and solid chemical wastes for transportation offsite. The HWMF does not commingle or reconsolidate liquid wastes. The packaging process entails placing the sealed containers in lab pack containers and filling in around them with vermiculite so that the wastes can be transported to disposal facility without the container breaking. The facility handles both RCRA-regulated and nonregulated wastes.The CEP receives and stores unused and unopened chemicals, that are not expired, so that they may be reused by other organizations.The vast majority of waste comes from contaminated soils resulting from Haz Mat Responses. The facility generates only about 850 kg/yr of chemical waste, predominately due to expired CEP materials.Site operations generate waste in four ways:1) adding packaging materials to the sealed waste. This increases the amount of material shipped to the disposal facility (amount unknown);2) containing and collecting waste spills (240 kg/yr);3) disposing of expired chemicals from the CEP (600 kg/yr); and4) disposing of spent batteries generated by mobile phone usage at the HWMF (10 kg/yr).

Options: 1. Although they do not generate this waste, the HWMF could greatly assist in the recycling of fluorescent lamps. This would reduce the pollution caused by the incineration of fluorescent lamps. Although the lamps are going to be recycled for the change-over, they are not going to be recycled for regular maintenance due to lack of storage space. In response to this lack of storage space problem, we have arranged for the 928 storage yard to lend us the space necessary to store fluorescent lamps for recycling. Since Sandia has generated 7.302 kg (8 tons) of fluorescent lamps between October 1992 and December 1993, a great deal of waste can be prevented by recycling these lamps.2. The HWMF could reduce the amount of wastes generated by the CEP by acquiring a controlled temperature storage facility. This would reduce the quantity of chemicals which are prematurely disposed of due to the fact that they need to be stored at a particular temperature.3. The HWMF could also reduce wastes from

the CEP by linking the program with Organization 10220, the Just In Time Purchasing Department (JIT). Since linking the CEP and JIT would probably increase the demand for CEP chemicals, this would reduce the amount of chemicals that become waste due to the fact that they have past their expiration date during storage. in 1993, the CEP disposed of approximately 600 kg of materials that expired while being stored for reuse.

Site: Sandia National Laboratory / New Mexico	
Site Coordinator: Maria L. Walsh	**Team Leader:** John Killoran
Phone: 505-848-0342	**Phone:** 505-881-9228
Fax: 505-848-0998	**Fax:** 505-881-9357
Email: mlwalsh@envc.sandia.gov	**Email:**

Title: Sandia Motor Pool **Major Waste Type:** Hazardous Waste

PPOA ID Code: SNLNM-ORG7614 **Specific Waste Type:** Oil

Date: 22-mar-1994 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Vehicle

Description: The first Motor Pool area observed contains the parts cleaner solvent bath. The bath, which uses a naphtha-based solvent, is leased from, and maintained by, the Safety Kleen company. The Motor Pool is currently testing a substitute for the Safety Kleen solvent called ShopMaster. The preliminary results look promising, and they will soon move Shopmaster into a heated bath (where they have been testing Simple Green, with poor results) for further testing.A general pollution prevention activity that was shown to the team was the substitution of absorbent toweling to mop up spills and to wipe hands and parts for the clay floor dry. This action has resulted in far fewer pounds of waste contaminated with oil being sent to the Hazardous Waste Management Facility. Another such initiative is replacing disposable Kim-wipes with red rags, which are laundered instead of discarded.The next area reviewed was the TSD service area. The freon recycling unit was examined. Mark Crawford stated that the Motor Pool is transitioning into the use of R-134 refrigerant (instead of freon), and that although R-134 is ozone friendly.The oil filter crusher is located in the TSD area. This device consists of a crusher apparatus above an oil collection drum. Oil filters removed from engines are crushed to a fraction of their original volume, the excess oil is recovered into the barrel, and the crushed filters are placed in a drum that will be sent to the Hazardous Waste Management Facility for disposal. The crush apparatus is also used to reduce the volume of aerosol cans. Each can, when totally empty of all product and propellant, is punctured in an OSHA-approved device and placed in the crusher. After an aerosol can has been crushed, it is placed in a steel scrap recovery bin for recycling.The antifreeze (ethylene glycol) used in the vehicles is recycled through a GLYCLEAN recycling unit. The waste resulting form this operation is an occasional filter from the recycler. All antifreeze used in the Motor Pool is recycled, chemicals added to restore pH, and returned to the vehicle it came from, or to another vehicle.All used oil removed from engines is recycled. The TSD vehicles are fitted with quick-connect hose connections so that an oil/fuel blender unit may be attached. This device removes used oil from the engine, blends it with diesel fuel drawn from the vehicle's fuel tanks, and replaces the mixture in the tanks. The filters inside the unit are about the only waste resulting from this process. All oil used in the Motor Pool, including that recovered from drip pans, the oil filter crusher, etc., is recycled in this way. However, hydraulic oils cannot be recycled into fuel mixtures because they contain additives that would clog or foul the engine. Because approximately 20% of their unrecycleable oil is hydraulic oils, the Motor Pool would like to find a way to recycle it.The Motor Pool maintains underground storage tanks to dispense both gasoline and diesel fuel. They recently had a facility installed to service natural gas-fueled vehicles. None of the pump nozzles is yet fitted with the vapor recovery equipment mandated for use in 1995 or 1996. However, the Motor Pool dispenses gasoline that contains added alcohol (gasohol) year-round.Oil and lubricating fluids are dispensed throughout all facility buildings (except one) via a dispensing system. The remaining building is currently being fitted with the equipment. Oil is also sometimes dispensed to customers in bottles. These bottles are returned to the Mot or Pool and drained of all contents on an innovative rack designed and fabricated by the Motor Pool. The drained oil goes into the oil recycling system. The empty bottles are refilled with oil and reused until they are no longer leak-tight. They are also made of plastic, so it it possible that they can be recycled when their life-cycle is over.The wash bay is very efficient, recycling 85% of the water used. This not only reduces the amount of water used, but cuts down on the amount of detergent that must be used for each subsequent vehicle. The water sprayed onto the vehicle drains into a sump, where sludge is allowed to settle out. The water is then pumped to three large holding tanks, each of which will hold 1,000 gallons. The impurities continue to settle out of the water, so that the water in the final tank is suitable for reuse. The sludge is sampled at regular intervals. If it is found to be free of contaminants (e.g., heavy metals, organic chemicals), the sludge is removed and disposed of in the landfill.The steam cleaning pit is similar to the wash bay in that the water form the process drains to a primary sump, where chunks of material collect, and then to a secondary sump that contains an oil/water separator. At intervals, the oil/water

separator is skimmed to remove oil. The heavy impurities settle out, and are sampled at intervals. If the samples are acceptable, the water is released into the sanitary sewer and sludge is cleaned out of the secondary sump.As a result of the Motor Pool Smart Buying program, all tires and batteries are returned to the vendor on a one-for-one basis. For each new item bought, the vendor is required to receive one old item for recycle. One type of part that is currently not being recycled or reused is the shock absorber. Most of these are filled with oil. Depending on the age of the shock, the oil may or may not be contaminated with PCBs. Shocks are currently being stockpiled at the Motor Pool.

Options: 1. Recover and Recycle R-134 Refrigerant. The team was able to procure information on a unit to recover, recycle, and reuse R-134 refrigerant. This equipment ranges in cost between $1,700 and $3,600.2. Filter Hydraulic Oils for Reuse. The team was also able to procure some information on equipment designed to filter hydraulic oils. This equipment averages approximately $4,000 per unit. As a result of conducting a cost-benefit analysis, the payback period for this equipment was calculated to be 1.5 years.3. Use Pump-spray Bottles to Dispense Window Cleaner. Reduce the number of aerosol cans used by substituting hand-operated pump-spray bottles to dispense window cleaner. The cleaner could be bought in bulk and the bottles refilled as needed.4. Devise a Cowling to Prevent Oil Spillage in the Filter Crusher. It was noted that there was a good amount of oil on top of the barrel placed to capture waste oil in the oil filter crusher. It would appear that the oil from a filter sprays in various directions during the crushing process. A funnel-shaped cowling that fits into the square opening in the barrel top and that rises to nearly meet the bottom of the crushing chamber would catch the sprayed oil and direct it into the barrel, thus reducing clean-up wastes.5. Replace Ethylene Glycol with Propylene Glycol. Although this substitution does not reduce the amount of waste generated during the antifreeze recycling process, it does reduce the toxicity. The GLYCLEAN recycling unit will readily process propylene glycol, so there would be no loss in recycling efficiency. The cost of propylene glycol per gallon is comparable to the cost of ethylene glycol. According to the manufacturers of your GLYCLEAN recycler, the procedures for recycling propylene glycol are the same as for recycling ethylene glycol.6. Install Vapor Recovery Systems on the Gasoline Pumps. This recommendation may already be addressed the five-year plan for the Motor Pool. From researching this issue, the team has discovered that there must be certain built-in features on the tank and dispensing system for a vapor recovery system to be installed (e.g., stub-ins for a vapor return flow to the tank).7. Recycle Shock Absorbers as Scrap Steel. In researching this recommendation, the team found that there is currently only one scrap company in Albuquerque that will pick up shocks, and then only from already established customers. This company currently has approximately 30 tons of shocks at their facility, because environmental regulations prohibit them being melted down as scrap if there is a possibility that they may contain oil contaminated with PCBs. There is one company in Phoenix that will accept and dispose of shock absorbers, in a landfill, but it is the customer's responsibility to pay the shipping. In such a circumstance, and considering the relatively small number of shocks stockpiled at the Motor Pool, the team is further researching this issue.8. Continue to Test the Buckeye ShopMaster Solvent Substitute. The team is very interested in learning how successful ShopMaster is as a naphtha substitute. During the follow-up phase, the team will be in touch with Motor Pool personnel to see how well ShopMaster performs. The team is also uncertain about the recyclability of this product and would be interested to know how it is cleaned for reuse and how long it remains in service before it must be disposed.

Site: Sandia National Laboratory / New Mexico	
Site Coordinator: Maria L. Walsh	**Team Leader:** John Killoran
Phone: 505-848-0342	**Phone:** 505-881-9228
Fax: 505-848-0998	**Fax:** 505-881-9357
Email: mlwalsh@envc.sandia.gov	**Email:**

Title: Predictive Maintenance Team **Major Waste Type:** Hazardous Waste

PPOA ID Code: SNLNM-ORG7809 **Specific Waste Type:** Fluorescent Lamps

Date: 22-nov-1994 **Major Activity Type:** Maintenance **Specific Activity Type:** Relamping

Description: The Predictive Maintenance Team (PMT) was assessed because they were the largest generator of fluorescent lamps. Fluorescent lamp waste is of interest because the lamps are currently being incinerated instead of recycled. One of the largest sources of mercury releases to the environment results from the incineration of mercury-contaminated wastes such as fluorescent lamps. During the Pollution Prevention Assessment of the Hazardous Waste Management Facility (HWMF) it was discovered that they also did not recycle fluorescent lamps due to a lack of storage space. The PMT has a storage yard (928) that is adjacent to the HWMF and has available space. Through a joint effort the HWMF will be able to use part of the 928 storage yard. This will provide enough storage space for the fluorescent lamps to be recycled.

Options: 1. Recycle the fluorescent lamps.2. EPA Green Lights Program (Green Lights) could be an excellent way to prevent pollution at Sandia/NM.

Site: Sandia National Laboratory / New Mexico	
Site Coordinator: Maria L. Walsh	**Team Leader:** John Killoran
Phone: 505-848-0342	**Phone:** 505-881-9228
Fax: 505-848-0998	**Fax:** 505-881-9357
Email: mlwalsh@envc.sandia.gov	**Email:**

Title: Facilities Fire Alarm/Protection Systems **Major Waste Type:** Hazardous Waste

PPOA ID Code: SNLNM-ORG7811 **Specific Waste Type:** Batteries

Date: 10-nov-1994 **Major Activity Type:** Maintenance **Specific Activity Type:** Fire Protection

Description: The Fire Alarm/Protection System Team (7811-3) is responsible for maintaining the fire protection systems at Sandia/NM. This includes maintaining the fire alarms, emergency lighting, smoke detector and sprinkler systems. Wastes are generated from basically three activities: maintenance of emergency power supply; maintenance of the sprinkler systems; and disposing of the wastes generated by 7734, the Fire Protection Department. The Fire Protection Department conducts fire extinguisher training.Maintenance of Emergency Power SupplyEmergency power supplies at Sandia/NM consist of approximately 3000 battery-powered lights, 170 power invertors, and 120 fire alarm systems. A power invertor is a centrally located electricity generator, which in most cases contains 10 large lead-acid batteries. The batteries provide a power supply that is independent of utility generated power. Most buildings at Sandia/NM are fitted with a power invertor system. The emergency power supply process generates waste in the form of spent batteries. The average lead acid battery will only last approximately 8 years.Sprinkler System MaintenanceSprinkler system maintenance also generates waste in the form of antifreeze (ethylene glycol) and glycerin. Traditionally, ethylene glycol has been mixed with the water in the sprinkler to prevent freezing of the piping. However, during 1993, it was discovered that glycerin can replace ethylene glycol in this situation. Since glycerin is effective and less toxic, it is a preferable alternative.Fire Extinguisher TrainingA waste mixture consisting of gasoline, diesel and extinguishing compound resulted from the OSHA required Hands-on Fire Extinguisher Training for individuals through out Sandia who have been assigned a fire extinguisher. The training is performed by fire protection specialists in Department 7734, Fire Protection. The training program would simulate a flammable liquid fire by filling a pan with water and gasoline and then igniting the gasoline which was floating on the surface. Then, trainees would practice using an extinguisher on this fire. After each training session, the pan would be emptied into a 55 gallon drum for disposal at the Hazardous Waste Management Facility (HWMF). In 1993, thirty nine (39) training sessions were conducted and each session generated about 5 gallons of contaminated water. Although the waste generating activity is performed by Fire Protection (7734), the Fire Alarm & Protection Systems (7811-3) assumes responsibility for the waste.Miscellaneous ActivitiesAccording to the HWDMS database, Organization 7811-3 appears to generate used transformer oil. However, the transformer oil is actually generated by Organization 7811-4, Electrical Utility Systems Team. Due to a funding shortage in 7811-4, this waste was disposed of by 7811-3.

Options: Lead acid batteries are currently used to power the fire protection systems. Large nickel cadmium batteries last for about 20 years while the large lead acid batteries last only about 8 year. By using nickel cadmium instead of lead acid, the waste stream from used batteries can be reduced by up to 75%. Both nickel cadmium and lead acid batteries are recycled by the HWMF. The PPOA Team suggests consideration of changing to nickel cadmium as batteries are replaced.

Site: Sandia National Laboratory / New Mexico	
Site Coordinator: Maria L. Walsh	**Team Leader:** John Killoran
Phone: 505-848-0342	**Phone:** 505-881-9228
Fax: 505-848-0998	**Fax:** 505-881-9357
Email: mlwalsh@envc.sandia.gov	**Email:**

Title: Operations Engineering Department **Major Waste Type:** Hazardous Waste

PPOA ID Code: SNLNM-ORG7816 **Specific Waste Type:** Lead

Date: 05-oct-1994 **Major Activity Type:** Maintenance **Specific Activity Type:** Painting

Description: Operations Engineering refurbishes cooling towers at Sandia/NM. In most cases, this requires the stripping of lead-based paint from the surface of the cooling towers.To accomplish this, Operations Engineering uses the traditional sandblasting process to strip the lead-based paint from cooling towers. The process uses a copper slag as the sandblast media. The copper slag is propelled by compressed air to remove the paint. This process generates a mixture of copper slag and lead based paint which is managed as chemical waste. To perform this activity, Operations Engineering must enclose the cooling tower in accordance with Industrial Hygiene (IH) requirements, and conduct air monitoring.The sandblasting process, for one cooling tower, generated 11,478 kg (12.6 tons) of lead contaminated sandblast media in 1993.

Options: ¥ Replace the current sandblasting practice with a dustless paint stripping system similar to that manufactured by Pentek, Inc. of Coraopolis, Pennsylvania. The dustless system has been successfully used by EG&G Rocky Flats to remove surface radioactive contamination. Most importantly, this process will drastically reduce the waste since it does not utilize a sandblast material like copper slag. The resultant waste will be reduced from 12.6 tons to less than 600 lbs. Additionally, Rocky Flats has used this system outdoors, without an Industrial Hygiene enclosure, and the technicians did not need to wear respirators. Therefore, the waste management and IH costs can be significantly drastically reduced. From a preliminary investigation, the cost of the dustless system appears to be comparable to the traditional sandblasting process. Operations engineering contracts the cooling tower paint stripping work, and this stripping service is provided by Pentek and other contracting companies.

Site: Sandia National Laboratory / New Mexico	
Site Coordinator: Maria L. Walsh	**Team Leader:** John Killoran
Phone: 505-848-0342	**Phone:** 505-881-9228
Fax: 505-848-0998	**Fax:** 505-881-9357
Email: mlwalsh@envc.sandia.gov	**Email:**

Title: 235F RBA Waste Paper Disposal /Recycling **Major Waste Type:** Low Level Waste

PPOA ID Code: SRS- 030 NMSP 235-F **Specific Waste Type:** Paper

Date: 15-jun-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Disposal

Description: At 235F all waste paper originating from RBAs is currently considered Low Level Waste (LLW) and is disposed of accordingly.

Options: With the issuance of Procedure 517 of Manual 5Q1.1, which states in Section 2.0 that ÒEquipment/material stored or used only in an RBA and the owner/custodian/user believes has no potential for contaminationÓ is Ònot required to be evaluated or surveyed in accordance with this procedureÓ (referring to 517) it will be possible to treat all office, chart, and computer paper generated in 235F RBAs as clean waste and recycle it accordingly.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** P. J. Spitzer
Phone: 803-952-7145	**Phone:** 803-952-4535
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: HWCTR Asbestos Abatement **Major Waste Type:** Hazardous Waste

PPOA ID Code: SRS-001 D&D HWCTR **Specific Waste Type:** Asbestos

Date: 24-jan-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Abatement

Description: Containment tents are erected around the area of asbestos removal. An air lock is required for control purposes. Four (4) workers dressed in yellows(since contamination could be present), tyvex suits, gloves,respirators, and shoe covers enter the tents with tools and waste handling bags and work in 4 hr shifts. One worker removes the asbestos, a second bags the waste, the third wets the asbestos as it is cut to prevent airborne, and the fourth holds a vacuum hose to minimize airborne. The asbestos is doublebagged, removed from the tent, and placed in a B-25 to be disposed of as LLW. After all asbestos is removed the tents are removed and discarded as Low Level Waste (LLW).

Options: Option 1: Grind the asbestos utilizing an ÒAsbestos GrinderÓ to reduce the overall volume that will be taken up in the disposal facility. This is especially desirable when dealing with LLW as in the HWCTR Project. THIS OPTION AS WELL AS OPTION #8 REQUIRES FURTHER STUDY. P.L. NOWACKI TO CARRY OUT. THIS WILL REPRESENT A SAVINGS IN DISPOSAL SPACE. COST, SAVINGS, AND REDUCTION DATA ARE UNAVAILABLE.Option 2: Radiologically clear asbestos. A suggested method would involve glove-bagging and surveying the areas around flanges and joints, where leaks would occur, for the presents of radioactivity. Utilize information gained to aid in the clearing of the asbestos to a radiologically clean status. RCO INVESTIGATED 5Q MANUAL. 5Q REQUIRES THAT NO POUROUS MATERIAL CAN BE CLEARED. OPTION REJECTED.Option 3: In RBAs use foam in place of water to keep the generation of air born particles of asbestos at an acceptable level. UTILIZING THIS WOULD BE COUNTERPRODUCTIVE AS IT WOULD TEND TO GENERATE AIRBORNE PARTICLES DUE TO THE FOAM PROPELENT BLAST.Option 4: Use a cutter that utilizes a localized low volume water spray to keep the generation of air born particles of asbestos at an acceptable level. ASBESTOS ABATEMENT GROUP NEEDS TO STUDY AND FOLLOW UP ON THIS OPTION . COST, SAVINGS, AND REDUCTION DATA ARE UNAVAILABLE.Option 5: Do major asbestos abatement projects during the cool months of the year so as to reduce the number of suit changes required by the workers. More changes required during hot months. This amounts to an estimated average 7 versus 3 suits per man/day. THIS WILL RESULT IN WASTE SOURCE REDUCTION. IN THE CASE OF THE HWCTR PROJECT 867 SUITS WORTH AN ESTIMATED $6500. ALSO, DISPOSAL SPACE CAN BE SAVED. AMOUNT DEPENDS ON ACM COMPACTION FEASIBILITY.Option 6: For asbestos going into a B-25 utilize a single B-25 form fitting bag as opposed to a large number of double bags of asbestos to fill the B-25. THE USE OF A SINGLE FORM-FITTING BAG LINER IS VIABLE; HOWEVER, KNOWLEDGE OF LINER AVAILABILITY AND COST IS UNAVAILABLE. SAVINGS SHOWN REPRESENTS THAT OF BAGS THAT WOULD NOT HAVE BEEN USED DURING THE HWCTR PROJECT.Option 7: Compact LLW asbestos going to the Burial Grounds utilizing the LLW compactor. IT IS FELT THAT THIS OPTION IS VIABLE; HOWEVER, FURTHER STUDY IS NECESSARY TO BRING IT TO REALITY. STUDY TO BE CARRIED OUT BY THE SW DEPARTMENT. COST DATA UNAVAILABLE. WILL REDUCE REQUIRED LLW VAULT SPACE, @ $22/ft3, BY 80%Option 8: For LLW asbestos. Grind it, place it in a single bag lined B-25, and vacuum seal the bag.THIS OPTION AS WELL AS OPTION #1 REQUIRES FURTHER STUDY. P.L. NOWACKI TO CARRY OUT. THIS WILL REPRESENT A SAVINGS IN DISPOSAL SPACE. COST, SAVINGS, AND REDUCTION DATA IS UNAVAILABLE. SAVINGS OF LLW VAULT SPACE IS $22/ft3.Option 9: Vacuum all asbestos filled bags be they Rad or Clean. This will decrease the amount of space required for disposal. THIS OPTION RESULTS IN A REDUCTION OF REQUIRED DISPOSAL SPACE; HOWEVER, THE AMOUNT IS UNKNOWN. SAVINGS OF LLW VAULT SPACE IS $22/ft3. VACUUM EQUIPMENT IS CURRENTLY AVAILABLE ON SITE.Option 10: Launder and reuse suits worn by asbestos workers. REGULATIONS REQUIRE THE USE OF DISPOSABLE APPAREL BY ASBESTOS WORKERSOption 11: Current asbestos abatement projects utilize 8 mil poly bags as opposed to the standard 6 mil bag. Look into the use of 6 mil bags which are allowable for asbestos disposal. RECOMMEND NOT IMPLEMENTING DUE TO THE HIGH BAG BREAKAGE HISTORICALLY EXPERIENCED WITH 6 MIL BAGS. 8 MIL BAGS COST INCREASE +$0.20 PER BAG. Option 12: Utilize reusable tent panels along with disposable tent material in an effort to reduce the amount of material to be disposed of. IT IS FELT THAT THIS OPTION IS VIABLE; HOWEVER, FURTHER STUDY IS NECESSARY TO BRING IT TO REALITY. STUDY TO BE CARRIED OUT BY J.K. BARRINEAU AND P. L. NOWACKI. COST, SAVINGS, AND REDUCTION DATA IS UNAVAILABLE.Option 13: Develop and utilize a radiological asbestos test lab so as to make definitive decisions as to the presents of asbestos in RCAs. IDEA IS CURRENTLY BEING IMPLEMENTED BY SRTC. COST, SAVINGS, AND REDUCTION DATA IS UNAVAILABLE.Option 14: Single bag asbestos as opposed to double bagging. THIS IS AN ACCEPTABLE OPTION SO LONG AS THE SINGLE BAGGED ASBESTOS WASTE IS PLACED IN A B-25 CONTAINER. IF THE ASBESTOS WASTE IS TO BE DISPOSED OF IN BAGS ONLY THIS OPTION IS UNACCEPTABLE FROM A REGULATORY STANDPOINT.Option 15: In order to control and minimize airborne asbestos inject water into the area to be cut prior to the performance of the cutting operation.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** F. M. Smith
Phone: 803-952-7145	**Phone:** 803-644-5183
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: BSRI Lead Melter **Major Waste Type:** Hazardous Waste

PPOA ID Code: SRS-002 BSRI LEAD MELTER **Specific Waste Type:** Lead

Date: 15-feb-1995 **Major Activity Type:** Manufacturing **Specific Activity Type:** Recycling

Description: Clean (non-radioactive) unneeded or scrap lead, a RCRA Hazardous Material, collected across the SRS, is accumulated for melting, molding, and subsequent distribution for reuse, at the Construction Lead Melter, 711-4N. The melter consists of two (2) fuel oil/air fired melting pots having a capacities of 5000 and 7000 pounds, respectively. The melter is operated in such a manner so as to isolate it from the environment and filter all emissions through a two (2) stage HEPA Filter System. Pieces of lead are placed in the pot(s), melted at 7000F utilizing a fuel oil/air fired burner, and when melted poured into molds having the desired shape. The fuel oil comes from an unmetered bulk system, the temperature is monitored and controlled manually with a hand held thermometer, and when melted the lead is poured into molds manually. Filter changes are governed by pressure changes noted on an in-line pressure gauge. Operators wear reusable boots dedicated to the melter area, discardable single use coveralls and gloves, and reusable respirators with discardable canisters. The major wastes resulting from the process is lead dross (slag), used HEPA filters, and secondary job control waste all of which is handled as RCRA hazardous waste.

Options: Option 1: To address Health & Safety and Waste Minimization needs, provide a Personnel Change Facility that can be used for clothing storage and changes, personnel showering, and coverall laundry. The facility shall be such that shower and laundry effluent is kept isolated from the environment. This will provide for needed personnel clean-up as well as stop the generation of coverall waste. Water water will be collected and tested for hazardous constituents .Option 2: In the past temp. monitoring was accomplished automatically using a permanently installed instrument which is no longer available. It must now be done manually thereby affording less effective temp control while exposing the operators to higher concentrations of lead fumes. Poor temp control causes higher levels of lead dross (slag). Reinstall the automatic temp monitoring device.Option 3: Due to line plugging or system malfunction, filter changes are at times indicated when not necessary. This results in additional job control waste and at times unnecessary filter changes. Provide a more fool proof method to determine the need for filter changes.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** J. E. Lumpkin
Phone: 803-952-7145	**Phone:** 803-557-5429
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: STEEL TAPING **Major Waste Type:** High Level Waste

PPOA ID Code: SRS-003 HLW TANK FARMS **Specific Waste Type:** Metal Debris

Date: 28-feb-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Monitoring

Description: The process undergoing assessment, STEEL TAPE MEASUREMENT OF LIQUID LEVELS IN WASTE TANKS (U), is described in Procedure 241-FH-113, Rev 20, of Manual SW9, dated 03/03/94.

Options: Option 1: Develop a mechanical tape device to be permanently installed and manually operated through a small hole in a riser plug to take measurements. The device will utilize a conductivity sounding mechanism to indicate liquid contact and an Òindex pointÓ as a measurement reference. The taking of a measurement will not require the removal of a plug therefore the work will not require dress-out, etc. thus eliminating waste, exposure and time spent to complete a measurement.Option 2: Reduce the frequency of measurements taken where feasible.Option 3: Reuse the inner step-off pad associated with a measurement job for all measurements taken within that RBA thus eliminating step-off pad waste.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** R. B. Althoff
Phone: 803-952-7145	**Phone:** 803-952-3359
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: DIP SAMPLING **Major Waste Type:** High Level Waste

PPOA ID Code: SRS-004 HLW TANK FARMS **Specific Waste Type:** Core Samples

Date: 02-mar-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Monitoring

Description: The Dip Sampling process is described in the following procedures:241-F-185, Rev 1 - TAKING A DIP SAMPLE FROM F-AREA WASTE TANKS and 241-H-185, Rev 4 - TAKING A DIP SAMPLE FROM H-AREA WASTE TANKS

Options: Option1: Develop and utilize the same procedures for Òdip samplingÓ at both the F and H Area Tank Farms. Currently the process is accomplished using different procedures. H Area Tank Farm generally uses a more conservative approach which results in a higher level of waste.Option 2: When doing Òdip samplingÓ at the F-Area Tank Farm a windbreak is utilized whereas at the H-Area Tank Farm a hut is utilized resulting in a higher level of waste. Develop consistency between the two tank farms utilizing an acceptable method which generates the least waste. i.e. windbreaks.Option 3: When using windbreaks or huts utilize reusable units such as those currently being evaluated by Heatherly Dukes of RxWMOps at 7-3729, Bpr 4096.Option 4: The SS Sample Vials are currently engraved with the Tank No. and other pertinent data prior to use thereby rendering them unusable for future sampling. They become waste after use. In place of engraving utilize a tagging process to id the vials, discard the tag after use, and decon and reuse the vials. This will result in tag and decon waste but will save the expense of SS Vials and lids. REJECT, NOT COST EFFECTIVE.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** R. B. Althoff
Phone: 803-952-7145	**Phone:** 803-952-3359
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: WarnerÕs Pond/281-3H/HA8 Outfall **Major Waste Type:** Low Level Waste

PPOA ID Code: SRS-005 ER TREE REMOVAL **Specific Waste Type:** Trees, Limbs & Brush

Date: 10-mar-1995 **Major Activity Type:** Environmental Restoration **Specific Activity Type:** Removal

Description: Radioactively contaminated vegetation, resulting from an uptake of contaminates from soil, growing in the area of WarnerÕs Pond, the 281-3H Retention Basin, and along the stream between the HA8 Outfall in the vicinity of the ITP parking lot, located across E-Road from 704-56H, and 4 Road is scheduled to be removed and disposed of as LLRW. This operation will require removal of the vegetation and placement in B-25 boxes with subsequent storage or disposal at the E-Area Burial

Grounds. All vegetation is to be removed and the area treated with herbicides to control the rejuvenation of plant species

Options: Option 1: Chip vegetation and place in B-25 boxes as opposed to cutting into logs and placing in B-25 boxes. Estimated disposal volume 46,080 ft3 unchipped. Assume chipper presently on site can be made operational with a minimum expense. It is estimated that chipping would result in a 50% reduction in the volume requiring vault disposal.Option 2: Rather than disposing of wood chips in the LAW Vault, hold them until the CIF is permitted to burn LLW. Burning the chips would significantly reduce the volume of the waste requiring disposal in the E-Area disposal facilities. Assume an 8/1 volume reduction and an $8/ft3 generator cost for processing at the CIF.Option 3: Rather than disposing of wood chips in the E-Area Vault dispose of them in the H-Area Retention Basin when it is closed. Chips would require stabilization with grout when disposed of in this manner. Anticipated Reduction Qty represents the reduction in volume requiring vault disposal.Option 4: Rather than disposing of wood chips in the E-Area Vault dispose of them in the Soil and Rubble Slit Trenches utilizing grout stabilization. This option would save vault disposal space. Anticipated Reduction Qty represents the reduction in volume requiring vault disposal.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** J. M. Griffith
Phone: 803-952-7145	**Phone:** 803-644-6951
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Steam Decon of Shipping Casks **Major Waste Type:** Low Level Waste

PPOA ID Code: SRS-006 Rx RBOF **Specific Waste Type:** Aqueous

Date: 11-apr-1995 **Major Activity Type:** Environmental Restoration **Specific Activity Type:** Deactivation

Description: Casks of a variety of sizes are transported to the RBOF Facility for the loading and unloading of fuel. This process is outlined in a number of cask specific procedures which cover the specifics as related to the various cask configurations. In general, the procedure is as follows: From the transport vehicle the casks are transferred to the Cask Wash Pit (CWP) by crane and suspended in order to enable venting and sampling. In the event that it is determined necessary to wash a cask down prior to processing because of surface contamination or cleanliness concerns, the cask is then rinsed with deionized (DI) water. The DI water drains into the cask wash pit and is pumped into the facility waste tank so that it does not become part of the basin water. The casks are then moved by crane to an unloading basin where they are lowered into the basin so that the fuel rods can be loaded/unloaded. The casks are then closed, rinsed with DI water as they are removed from the basin and drained. This DI water becomes part of the basin water. The cask is then transferred to the CWP for steam cleaning with a Clayton Steam Cleaner per RBOF Misc. Procedure 244-H-7020, Rev 2, dated 09/09/94, and possible final wipe-down and hot-spot cleaning as deemed necessary by RCO and RBOF personnel based both on radiological survey information and process experience. Cleaning of the casks are continued until cleared by RCO.

Options: Option 1: Currently two (2) pair of coveralls are worn under the plastic suit. Reduce this to one (1) pair. This will result in less laundry work.Option 2: Use clean frit from DWPF to shot blast the casks clean and subsequently return the contaminated frit to DWPF for disposal with the DWPF blasting frit. CANNOT BE IMPLEMENTED UNDER CURRENT DWPF PERMIT WHICH ALLOWS FOR DISPOSAL OF ONLY THAT MATERIAL GENERATED WITHIN THE DWPF PROCESS.Option 3: Utilize a stippable coating sprayed on the casks to remove the contamination. This method while doing away with the liquid waste would generate solid waste. This option will require further investigation.Option 4: In place of decontaminating the casks utilizing a Steam Cleaner utilize a CO2 Blaster which will do away with the contaminated condensate. This option may however create other contamination problems and therefore requires further investigation.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** T. O. Oliver
Phone: 803-952-7145	**Phone:** 803-557-3192
Fax: 803-952-8383	**Fax:**

Email: BX940@cleveland.freenet.e	**Email:**

Title: SRFS Electrostatic Plotter **Major Waste Type:** Hazardous Waste

PPOA ID Code: SRS-007 SRFS Plotter **Specific Waste Type:** Paint

Date: 15-mar-1995 **Major Activity Type:** Service **Specific Activity Type:** Photographic Services

Description: Process consists of plotting computer generated images on a CALCOMP 58000 Series Color Electrostatic Plotter. Set-up of the plotter requires that separate containers of CALCOMP Toner Clear Mix TCM-58 be mixed with 4 basic colors (Yellow, Magenta, Cyan, and Black) to make the pigmented toners used in the plotting process. Also used in the process are four (4) pigmented toner replenishers. Periodically the quality of the pigmented toner and toner replenishers deteriorates to a point that they require replacement with a fresh supply. The MSDS sheet for CALCOMP Toner Clear Mix TCM-58 lists the waste generated during plotting or as a result of replacement as a ÒD001 Ignitable Hazardous Waste.Ó The SRFS collects the waste in a 55 gallon drum stored in a designated hazardous waste Òsatellite areaÓ located at the rear of 760-1G.

Options: Option 1: Replace the CALCOMP 58000 Electrostatic Plotter with a unit that does not generate a hazardous waste. THE HAZ WASTE GENERATED IN THIS OPERATION HAS A DISPOSAL COST OF $800.00 PER 55 GAL DRUM AS SHOWN AS SAVINGS BELOW.Option 2: Utilize the CALCOMP 58000 Electrostatic Plotter only for those images requiring a high quality print and utilize a low quality image plotter currently available for all other prints. This can be done; however, its cost effectiveness is questionable as the toner mix looses its potency within 3 months and requires replacing. this will result in hazardous waste generation. The quantity of this waste will most likely offset the amount not generated by not plotting.Option 3: Use a variety of paper widths to reduce the quantity of waste paper generated. Current paper width is 32 inches while most plots are of a lesser width. FURTHER INVESTIGATION REQUIREDOption 4: Use the ignitable waste as an additive to the fuel used in drip torches during prescribed burns on site. The current fuel used is a 30/70 mix of gasoline/diesel. CONSULTATION WITH EPD HAS RESULTED IN REJECTION OF THIS OPTION DUE TO REGULATORY CONSTRAINTS.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** R. G. Crais
Phone: 803-952-7145	**Phone:** 803-725-4488
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: A/M Area Monitoring Well Sampling **Major Waste Type:** Hazardous Waste

PPOA ID Code: SRS-008 ER WELL SAMPLING **Specific Waste Type:** Aqueous

Date: 21-mar-1995 **Major Activity Type:** Environmental Restoration **Specific Activity Type:** Monitoring

Description: The A/M Area Post-Closure Care Ground Water Monitoring and Corrective Action Plan requires the periodic analysis of samples taken from related monitoring wells. SRS well sampling procedures require the purging and subsequent containerization and/or treatment of the purge water from RCRA-listed waste sources such as the A/M Area. For A/M Area sampling in 1994 this purging resulted in 102,952 gal. of water which required containerization or pumping into a tank truck for subsequent processing through the A/M Area air stripper.

Options: Option 1: Reduce the number of times wells related to the A/M Area Post-Closure Care Ground Water Monitoring and Corrective Action Plan are sampled by 50%. This reduction in sampling, which has been approved by the SCDHEC, is a result of analysis results which show insignificant change in monitored constituent concentrations from sampling to sampling. This action will result in a reduction of approximately 51,476 gal/yr of water requiring containerization and/or treatment.

Site: Savannah River Site

Site Coordinator: Peter L. Nowacki	**Team Leader:** J. M. Griffith
Phone: 803-952-7145	**Phone:** 803-644-6951
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: FTF CATCH TANK SAMPLING **Major Waste Type:** High Level Waste

PPOA ID Code: SRS-009 HLW TANK FARMS **Specific Waste Type:** Aqueous

Date: 21-mar-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Monitoring

Description: The process of obtaining a sample from tank farm Catch Tanks and their associated Encasements is described in Procedure 241-FH-552, Rev 10, of Manual SW9, dated 06/09/93.

Options: Option 1: Utilize a custom constructed glovebag as a method of minimizing waste generated during catch tank sampling. This will result in significant waste reduction.Option 2: Minimize the intrusion of rain water into the catch tank by providing covers and/or rain deflectors in appropriate places. REJECT, NEITHER FEASIBLE NOR COST EFFECTIVEOption 3: Provide automatic monitoring instrumentation to determine the level of radiation present in collected water.Option 4: Determine the use to which sample test results are put. If the test results supply only historical information or are put to no significant use, eliminate the test and utilize test results obtained from the water at a later stage of handling. This will result in the elimination of all waste associated with this process. SAMPLING REQUIRED FOR TECHNICAL STANDARDS, CANNOT BE ELIMINATEDOption 5: When using windbreaks or huts utilize reusable units such as those currently being evaluated by Heatherly Dukes of WMOps. at 7-3053, Bpr 4096

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** R. B. Althoff
Phone: 803-952-7145	**Phone:** 803-952-3359
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Catch Tank/Encasement Rodding **Major Waste Type:** High Level Waste

PPOA ID Code: SRS-010 HLW TANK FARMS **Specific Waste Type:** Metal Debris

Date: 21-mar-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Storage

Description: The process of rodding tank farm Catch Tanks and their associated encasements is described in Procedure 241-FH-553, Rev 07, of Manual SW9, dated 09/09/92.

Options: Option 1: Discontinue the rodding operation except on an as needed basis as there doesnÕt seem to be a creditable reason for doing it on an ongoing basis.Option 2: Do the rodding operation at the time when a sample is taken from the Catch Tank and/or the Encasement. By combining the operations one jobÕs worth of waste will be eliminated. OPTION No. 1 IS BEING IMPLEMENTED THEREFORE OPTION No. 2 IS A MOOT POINT.Option 3: For rodding jobs where the rod does not have measurement marks utilize a rod with these marks to eliminate the need for the use of a tape measure. ALL RODS HAVE MEASUREMENT MARKS.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** R. B. Althoff

Phone: 803-952-7145	**Phone:** 803-952-3359
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: HEPA Filter Replacement - Purge Vent **Major Waste Type:** High Level Waste

PPOA ID Code: SRS-011 HLW TANK FARMS **Specific Waste Type:** Filters

Date: 23-mar-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Storage

Description: The process of replacing purge HEPA filters in waste tank purge vents is described in Procedure 241-FH-210 S, Rev 12, of Manual SW9, dated 04/04/94.

Options: Option 1: Stage Materials going in the Enclosure Contamination Area (CA). Take minimum tools and job coverage materials. Supply more if needed.Option 2: Rain Covers for all filter enclosures without them. Potential liquid contamination release and expensive cleanup.Option 3: Delete plastic booties - use rubber boots.Option 4: Delete plastic wrapping of used filter housing.Option 5: Operations - Maintenance Training/Communication to emphasize essential nature of Waste Minimization. Option 6: Delete annual DOP Test. Use CAM and pressure drop across filter to assay filter condition and replacement requirements.Option 7: Do not operate purge exhaust without reheater - alternate steam/heat supply.Option 8: Rough texture plastic sheeting for improved footing - delete paper.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** R. B. Althoff
Phone: 803-952-7145	**Phone:** 803-557-1657
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: HLW BRAINSTORMING SESSION **Major Waste Type:** High Level Waste

PPOA ID Code: SRS-012 HLW TANK FARMS **Specific Waste Type:** Personal Protective Equipment

Date: 27-mar-1995 **Major Activity Type:** Environmental Restoration **Specific Activity Type:** Deactivation

Description: No specific HLW process was addressed during this session. A generic look at HLW was taken with waste minimization in mind. A number of options were identified as indicated on subsequent pages.

Options: Option 1: Publicize waste costs; post within HLW facilities. Option 2: Define employee recognition mechanisms; emphasize group/team accomplishments.Option 3: Publicize why employees should care about WMin, e.g. reduced waste, reduces costs thereby leaving more money for jobs.Option 4: Create a WMin ÒObserversÓ program similar to the Safety Observer program.Option 5: Provide weekly status vs. allocation to L1s and FMs.Option 6: WMin ÒrhetoricÓ needs to be backed-up by supervision in the field.Option 7: Provide generators with an alternative to 21Ó cardboard boxes for shipping compactable waste.Option 8: Schedule a commercial supplier of radiological protective clothing to demonstrate waste efficient options.Option 9: Evaluate and optimize type and location of waste receptacles.Option 10: Ensure that the use of reusable huts, windbreaks, and glove bags is maximized.Option 11: Initiate practices within HLW to implement the guidelines spelled out in Manual 5Q1, Procedure 517, ÒRadiological Release of MaterialÓ to maximize the WMin benefits.Option 12: Establish a CA material inventory mechanism that tracks inputs and outputs (waste).Option 13: Develop CA Tool Control Procedures.Option 14: Control issuance of Òyellow bags.ÓOption 15: Merge WMin considerations into ALARA procedures (SCD-6). WMin and ALARA are similar in concept and there is a strong link between exposure and waste quantities.Option 16: Improve waste tracking systems to provide more timely data on waste sources and quantities.Option 17: Verify that SCD-4 is being effectively utilized as a WMin Tool.Option 18: Step up oversight of work being performed in CAs.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** K. A. Stone
Phone: 803-952-7145	**Phone:** 803-557-6317
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: H-Area Diversion Box 2 **Major Waste Type:** Low Level Waste

PPOA ID Code: SRS-013 HLW TANK FARMS **Specific Waste Type:** Aqueous

Date: 29-mar-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Storage

Description: H-area diversion box 2 is a 5-cell, sub-grade, concrete structure, dating from the 1950Õs. Rainwater accumulates in the cells and becomes contaminated with radioactivity. The dewatering equipment in some of the cells does not function. To pump out the contaminated rainwater from those cells, the cell cover must be removed and a portable pump lowered. The pump discharges into another cell in which the dewatering equipment works. The cell cover on the receiving sump must also be removed. Removal of the cell covers necessitates surrounding the 300 foot periphery of the 5-cell unit with a wind break, and covering the cell covers that are not removed with plastic sheeting. When the cell covers are off during the transfer of rainwater gusts of wind have been known to spread contamination throughout the surrounding area. Remediation of contamination can take weeks and generate more waste. Rainwater is transferred on an average of four times per year.

Options: Option 1: Repair equipment so each cell has operational dewatering pumps. Rejected because the cells in which the dewatering equipment is located ARE too hot to permit entry for repair or replacement of equipment.Option 2: Install a permanent airlock in the cell cover so that pump and transfer hose can be installed without removing the lids. Rejected because a tight seal on the lids is needed to prevent spread of contamination. Also designing and manufacturing new lids with airlocks would be prohibitively expensive.Option 3: Seal the cells involved utilizing flexible plastic sleeves with loose accordion-like folds so that the cell covers can be lifted with out breaching containment. Add glove bag to both sleeves so the pump and transfer hose can be installed. This technique has already been successfully implemented. The wind break, plastic sheeting and some personal protective equipment can be eliminated. Waste volume has been reduced from 5-8 B-25s to one B-25 box. Set up time reduced from about 188 mhrs to 72 mhrs.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** R. Althoff
Phone: 803-952-7145	**Phone:** 803-952-3359
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Rotation of Riser Plugs **Major Waste Type:** Low Level Waste

PPOA ID Code: SRS-014 HLW TANK FARMS **Specific Waste Type:** Wood

Date: 29-mar-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Construction

Description: In the top of a HLW tank a riser plug rests in a riser (plug socket). The plug contains a connection to attach to one of two pipes that terminate in the riser. The plug and pipe connections divert flow from one particular source into the tank. About four times a year the riser plug must be disconnected from one pipe, pulled out of the tank, rotated 180 deg., reinserted into the riser, and connected to the other pipe, so that flow from the other source can go into the tank. This procedure necessitates erection of a 12X12 windbreak and multi-layer floor covering around the riser. Installation and removal of the windbreak and floor consume approximately 180 mhrs and generate a B-25 box of waste.

Options: The wind break and floor covering have been replaced by a flexible plastic sleeve that is sealed to the riser and the plug. The plastic sleeve is arranged in loose, accordion-like folds that allow the plug to be lifted, rotated, and reseated without breaching the containment. Use of the accordion sleeve reduces waste volume to 1 or 2 bags of waste. Installation and removal of the sleeve takes about 28 mhrs.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** R. Althoff
Phone: 803-952-7145	**Phone:** 803-952-3359
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Dust Bag Removal **Major Waste Type:** Low Level Waste

PPOA ID Code: SRS-015 RX Vacuum Stripper **Specific Waste Type:** Filters

Date: 31-mar-1995 **Major Activity Type:** Environmental Restoration **Specific Activity Type:** Deactivation

Description: The vacuum stripper is an abrasive blaster, which simultaneously abrasive blasts and sucks up the abrasive and attrited material from the target surface. The blaster recirculates abrasive for reuse, separates the attrited material (ÒdustÓ), and deposits the dust in a bag for disposal. The blasting unit sits outside the controlled area in which blasting takes place. When the dust bag is half full, an operator clad in two sets of coveralls, gloves, etc, and respirator removes the half full bag and replaces it with an empty bag. The operator closes the half full bag with tape and places it, and the plastic spread on the floor to contain spillage, in another bag, which the operator also seals with tape. When the bag of dust is sampled, the operator, also clad in two sets of coveralls, etc. , removes the tape from the outer and inner tape seals, draws a sample and reseals both bags.

Options: Option 1: Put several half full bags in one big over-pack bag. Note Options 1 and 2 are mutually exclusive.Option 2: Use smallest over-pack bag practical.Option 3: Fill dust bag more than half full. This option requires research into the reason for filling the bag just half full in the first place. Savings based on 400 hours of operation per year, with one bag change every 10 hours of operation. Filling the bag two-thirds full would result in roughly 34 change-outs per year instead of 40.Option 4: Sample the bag at the time it is changed. Mark both the bag and the sample so that it can easily be determined what bag the sample came from. Saving based on 400 hours of operations per year, one bag change every 10 hours of operation. Option 5: Put unit in controlled area so blasters can change the bag, which would eliminate having another person suiting up to change the bag or take the sample. REJECTED BECAUSE OF THE EXPENSE OF MAINTAINING AND MOVING A CONTAMINATED VACUUM BLASTING UNIT.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** K. Rumsey
Phone: 803-952-7145	**Phone:** 803-557-3034
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Emptying Abrasive Bin **Major Waste Type:** Low Level Waste

PPOA ID Code: SRS-016 RX Vacuum Stripper **Specific Waste Type:** Abrasive

Date: 31-mar-1995 **Major Activity Type:** Environmental Restoration **Specific Activity Type:** Deactivation

Description: The abrasive from the vacuum blaster periodically requires replacement. The used abrasive is dumped out of the bin into a ÒreceptacleÓ, and new material is added. About 25 pounds of abrasive is replaced. The procedure to replace the

abrasive calls for a forklift to raise the blaster unit to give access to a plug under the abrasive hopper. When the plug is removed, the abrasive dumps into a receptacle. The ÒplugÓ is assumed to be similar to a threaded pipe plug that is removed by unscrewing with a wrench.

Options: Option 1: Amend procedure to specify:1) Type of receptacle to receive waste abrasive2) Containment to prevent spread of contamination during dumping waste abrasive3) Provision to sample the waste abrasive at the time it is dumpedOption 2: Replace abrasive bin plug with a valve, so that the bin can be opened easily while the dump line is enclosed with a containment to prevent spread of contamination. Consideration should be given to a rotary valve designed for handling solids.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** K. Rumsey
Phone: 803-952-7145	**Phone:** 803-557-3034
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Radiological Waste Box Usage **Major Waste Type:** Low Level Waste

PPOA ID Code: SRS-017 NMSP 247F **Specific Waste Type:** Containers

Date: 04-apr-1995 **Major Activity Type:** Environmental Restoration **Specific Activity Type:** Disposal

Description: The process of set-up and loading of yellow B-25s with non-compactable low density Low Level Waste (LLW) in the 247-F Facility is described in SOP 247-DS-005, Rev 3, dated 11/11/94.

Options: Option 1: Take bag out of box after assay, reuse box, and load bag without box into B-025Option 2: Take bag out of box after assay, load bag without box into B-25, collapse box and load into B-25. Reduces number of B-25s required for same waste quantity.Option 3: Take bag out of reusable plastic box after assay, reuse box, load bag without box into B-25. Delete Cardboard Boxes.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** Penny Spitzer
Phone: 803-952-7145	**Phone:** 803-952-4535
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Introduction of materials - HB-Line **Major Waste Type:** Transuranic Mixed Waste

PPOA ID Code: SRS-018 NMSP HB-LINE **Specific Waste Type:** Lead

Date: **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Equipment

Description: During the day to day operations of the HB-Line, glove ports are routinely used to introduce materials into the HB-Line cabinets. This is accomplished by placing the object within a glove and then replacing the glove. Glove replacement is accomplished per SOP 221-HB-4922, Rev 5, Changing Gloves/Bags Using Glove Ejection Tool (U). Gloves that have reached or are approaching their 60-day life limit are the ones generally used for this purpose; however, when the need arises and such gloves do not exist newer gloves are used. Due to the level of radiation present and the fact that the gloves are lead-lined, the removed gloves are classified as mixed TRU waste.

Options: In place of entering objects into line cabinets utilizing gloves, which generate mixed-TRU waste, use a 12-mil poly

bag, which has been installed into an unused glove port. While a single 12-mil poly bag costs $14.41 more than a single glove the waste resulting from a transfer involving a bag will be classified as TRU rather than mixed-TRU. While the disposal costs of the two kinds of waste are very nearly the same, it takes significantly more poly bags to make up a cut of waste whereas it only takes 3 gloves to make a cut. Thus bags will result in significantly more material transfers to generate the same volume of waste.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** B. S. Bush
Phone: 803-952-7145	**Phone:** 803-557-8893
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Ammonium Hydroxide Reuse **Major Waste Type:** Hazardous Waste

PPOA ID Code: SRS-019 SRFS CHEM RECYCLE **Specific Waste Type:** Caustic

Date: 11-apr-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Grounds

Description: The SRFS has, on occasion, agreed to utilize excess, unneeded ammonium hydroxide in their soil fertilization program. This was accomplished by mixing the ammonium hydroxide into hydromulch utilized by the SRFS as a planting medium. Problems have arisen with this process due to the highly caustic nature of the ammonium hydroxide and the need to wear a respirator when it is handled.

Options: Due to its caustic nature handling of ammonium hydroxide requires the use of a respirator and can be considered dangerous. To make this job less of a problem it is recommended that the ammonium hydroxide be mixed with excess sulfuric or nitric acid to yield either a sulfate or a nitrate to be used as a non-hazardous fertilizer.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** R. G. Crais
Phone: 803-952-7145	**Phone:** 803-725-4488
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: H-Canyon Battery Management **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: SRS-020 NMSP H-CANYON **Specific Waste Type:** Batteries

Date: 14-jun-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Handling

Description: At H-Canyon batteries that are no longer useful are relegated to waste status on a regular basis. Lead acid batteries are used in both clean areas and RBAÕs to start diesel generators. NICad batteries are used in clean areas for emergency diesel generators and emergency switch gear. They generally end up as mixed waste regardless of the presence of contamination. This holds true for all batteries be they sealed ÒGelCell BatteriesÓ or acid filled Òstorage Batteries.Ó

Options: Option 1: When dealing with sealed ÒGelCelÓ type batteries originating from RBAs release them as directed in Paragraph 2.0 of Procedure 517 of 5Q1.1. When dealing with sealed ÒGelCelÓ type batteries originating from CAs release them as directed in Section 5.4 of Procedure 517 of 5Q1.1. This will allow release of these batteries as hazardous waste as opposed to mixed waste.Option 2: When dealing with lead storage batteries originating from RBAs release them as directed in Paragraph 2.0 of Procedure 517 of 5Q1.1. When dealing with lead acid storage batteries originating from CAs test and release them as directed in Section 5.4 of Procedure 517 of 5Q1.1 and outlined in the attached AIO from H. Lee Martin dated

15JUNE93.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** R. W. Jackson
Phone: 803-952-7145	**Phone:** 803-557-8954
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Decontamination of Floors **Major Waste Type:** Low Level Waste

PPOA ID Code: SRS-021 NMSP F-CANYON **Specific Waste Type:** Aqueous

Date: 07-jun-1995 **Major Activity Type:** Environmental Restoration **Specific Activity Type:** Deactivation

Description: The decontamination of floors discussed in this PPOA is related to areas in F-Canyon. These areas are as follows: Hot Crane Maintenance Area, Warm Crane Maintenance Area, Decon Cell, Hot Shop There is no specific procedure covering the operation which as a rule proceeds as follows: The supervisor, operators(an operator & a stand-by), and RCO conduct a pre-plan meeting to discuss the rates that can be expected, the need for a RWP or SRWP, the type of clothing to be warn, and a discussion of the way the clean up will proceed. The needed supplies, i.e. mop handles and heads, cleaning solution(Durabrite 18), waste bags, and other materials needed are assembled and taken into the area to be cleaned. In some cases the mop heads are prewetted in a waste bag and in other cases the solution is taken in and the mop heads wetted as needed. The area is cleaned a 5Õx5Õ section at a time. After cleaning it is swiped and read and if necessary recleaned This proceeds until the entire area to be cleaned is complete. The waste is bagged by the stand-by operator, smeared by RCO, and then released to the RBA.

Options: Option 1: Do not take containers of duraBrite 18 into the contaminated area. For all floor cleaning operations, at all times, take the duraBrite 18 cleaning solution into the contaminated area as prewetting on the needed number of mop heads. This will eliminate contaminated containers.Option 2: When taking preestimated cleaning supplies into a contaminated area take in 10% less than the estimated amount. Additional needs can be fulfilled as required when required. This will force the stretching of supplies and the minimization of overages.Option 3: When exiting the area that has been cleaned utilize the bags used to bring in the mop heads for mop head, plastic suit and other related waste disposal. This will minimize the number of waste bags generated during the floor decon process.Option 4: Currently the floor decontamination process used at the F-Canyon is not supported by a procedure. In order to implement ongoing waste minimization practices it will be necessary to develop procedures describing the process and calling for the use of waste minimization efforts.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** L. Turner
Phone: 803-952-7145	**Phone:** 803-952-3215
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: HB-Line Lab **Major Waste Type:** Low Level Waste

PPOA ID Code: SRS-022 NMSP HB-LINE **Specific Waste Type:** Personal Protective Equipment

Date: 01-may-1995 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Radiological

Description: The process of Bag In/Out Operations is described in Procedure SOP 221-HB-4927, rev 6, dated 10/17/94. The process of fitting bags in glove ports is described in Procedure SOP 221-HB-4922, rev 5, dated 08/31/94.

Options: Option 1: Utilize bags in glove ports to introduce samples and other material into HB-Line Laboratory glove cabinet. Use gloves only when a glove in a useful area of the cabinet requires replacement due to age or wear.Option 2: Replace gloves in selected non-active glove ports of the HB-Line Laboratory glove cabinet with bags to provide convenient material insertion points.Option 3: The introduction of large objects into the lab cabinets requires insertion through the large bag-out ports located on the maintenance side of the cabinet. This procedure requires removal/replacement of two (2) pair of outer protective clothing resulting in additional time and LLW. To circumvent this additional time and LLW provide an air lock on the laboratory side of the cabinet for the insertion of large objects.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** Bettie S. Bush
Phone: 803-952-7145	**Phone:** 803-557-8893
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Atlas-Copco Air Compressor Oil Changes **Major Waste Type:** Hazardous Waste

PPOA ID Code: SRS-023 DWPF SALTSTONE **Specific Waste Type:** Oil

Date: 23-may-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Equipment

Description: Routine preventative maintenance (PM) of Atlas-Copco air compressors in Z-Area currently require an oil change be done on an annual basis. The process involves the replacement of the used oil with new as well as general maintenance and filter/separator replacement.

Options: Change to synthetic oil and in place of changing the oil on an annual basis test it after 18 months and change if test results indicate sufficient degradation of the oil to warrant its change. If not test again at six (6) month intervals until such time that an oil change is indicated. Change the PM Card accordingly and treat all Atlas-Copco Air Compressor oil changes accordingly.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** W. Taylor
Phone: 803-952-7145	**Phone:** 803-557-2413
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Waste Paper Recycling & Reuse **Major Waste Type:** Sanitary Waste

PPOA ID Code: SRS-024 SRFS WASTEPAPER **Specific Waste Type:** Paper

Date: 14-jun-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Recycling

Description: The softer the paper, the harder it is to recycle. The recycling of soft paper with elevated clay content often poses problems at the SRS (can not be recycled). Non-recyclable paper can be converted to pulp and the pulp utilized as a binding medium for Hydro-Mulch. Additionally classified documents cannot be recycled for security reasons and due to the fact that they are cross-cut and reduced to a fine particle size which does not lend itself to recycling. The proposed process will convert classified documents and other non-recyclable papers (soft and colored paper) into pulp and utilize it as a binding medium for Hydro-mulch which will be utilized exclusively at SRS by SRFS.

Options: Option 1: Rather than buying sod for various projects, resort to seeding and hydro-mulching.Option 2: Currently

non-recyclable waste paper is shipped to a landfill (expensive process). Recycle non-recyclable wastepaper mixed 10/90 with wood fiber as an ingredient in hydro-mulch.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** Robert G. Crais
Phone: 803-952-7145	**Phone:** 803-725-4488
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: FB-Line Hut Decon, Removal, Disposal **Major Waste Type:** Low Level Waste

PPOA ID Code: SRS-025 NMSP FB-Line **Specific Waste Type:** Wood

Date: 25-may-1995 **Major Activity Type:** Environmental Restoration **Specific Activity Type:** Decontamination

Description: When a panel is removed from the FB-Line a containment hut complete with air-lock is built in the room around the panel area to preserve cabinet integrity. After the work is completed and the panel replaced - the hut is surveyed and decontaminated as necessary down to less than room posting; usually around 2,000 dpm or less, dropped, and disposed of as LLW. Any item surveyed <270,000 dpm is considered LLW. Decontaminating the interior of the hut between 270,000 dpm to the RC designated level (ca. 2000 dpm) creates an extraordinary amount of waste and takes an incredible amount of time to complete.

Options: Proposed hut decontaminated to <270,000 dpm, painted to fix contamination, and disposed of as LLW. If <270,000 dpm to start with, no decontamination is necessary, paint and hut can be disposed as is. Elimination of deconning and associated waste between 270,000 dpm and the level RC determines the hut should be prior to removal (usually below room posting - level depends on room hut is in).

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** Kris Steeg
Phone: 803-952-7145	**Phone:** 803-952-4960
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Blowing Down Sampler Lines **Major Waste Type:** Low Level Waste

PPOA ID Code: SRS-026 F-Canyon Sampling **Specific Waste Type:** Aqueous

Date: 09-may-1995 **Major Activity Type:** Environmental Restoration **Specific Activity Type:** Sampling & Characterization

Description: Separation process liquids are periodically sampled from a loop of tubing that extends from and returns to the canyon vessel, some 40 feet from the sample point. Normal operation calls for the operator to get the fluid in the tubing loop circulating with an air jet. The operator usually finds that the circulation loop has plugged with crystals formed in the liquid or solids that have settled out of the liquid. If the normal troubleshooting procedure fails to dislodge the plug, the operator must resort to SOP 221-F-38116 ÒBlowing Down the Sampler Lines with Needles Installed.Ó This procedure requires 2 operators, the supervisor, health protection personnel, a special blowdown rig, and takes 4 or more hours.

Options: Reduce or eliminate the cause of pluggage by flushing the sample lines immediately after the sample is collected with enough water or acid to purge all liquid with dissolved or suspended solids back to the canyon vessel. SOP 221-F-38000 Section

5.5 calls for flushing with one liter of water or acid, but that quantity may not be enough.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** Levi Turner
Phone: 803-952-7145	**Phone:** 803-952-3215
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: ÒLÓ Area Compaction Operation **Major Waste Type:** Low Level Waste

PPOA ID Code: SRS-027 RX COMPACTION **Specific Waste Type:** Cardboard

Date: 13-jun-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Handling

Description: The process of compacting waste at the L-Area Compactor is outlined in Procedure DPSOL 105-1923-L, Waste Compactor Operation. This operation requires full dress-out including plastic suits with breathing air.

Options: Option 1: RWM operations should request RCO technical support to perform a further radiological review of L-Compactor operations to determine whether dress-out requirements could be further relaxed to minimize job related waste. Compactor operators have no record of experiencing a Kanne alarm during compaction operations. Therefore, if no Tritium is detected and therefore not present during compaction operations the option of ÒNo Dress-outÓ could be reconsidered.Option 2: RWM operations should request RCO support (tritium expert) to perform a further radiological review of L-Compactor operations to determine why Tritium contamination occasionally shows up on waste boxes when surveyed w/a hand held instrument on hot, humid days. This waste which is sent to the L-Compactor for compaction does not subsequently cause the Kanne alarm to sound. Apparently different instruments designed to do the same job, i.e., detect the presence of Tritium, are reacting differently; therefore, if Tritium is not there, compaction can take place at 253H.Option 3: The current breathing air compressor being used is frequently found to be providing air containing moisture in excess of the maximum amount permitted by WSRC SPEC 40-4-1. This results in a stop work situation which generates job control waste. Efforts should be initiated to repair the current air compressor or provide an air dryer capable of providing usable breathing air on a continuous basis. Option 3A: Additionally, ensure that the breathing air supply piping is sloped properly to avoid moisture retention in the piping. A method should be provided for the removal of condensate at various points in the system to help ensure the availability of dry air. This option is a continuation of the above option.Option 4: While the L-Compactor is designed to be operated by compacting the waste in a 21Ó cardboard box the use of such boxes is costly and takes up additional disposal space. Investigate other methods to operate the compactor w/o a cardboard box and use less costly and lower volume methods to hold the waste in a compacted state, e.g., shrink-wrap.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** Ken Rumsey
Phone: 803-952-7145	**Phone:** 803-557-3034
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Fluorescent Tube Waste **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: SRS-028 NMSP H-Canyon **Specific Waste Type:** Fluorescent Lamps

Date: 25-may-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Building

Description: H-Area fluorescent tubes are treated as hazardous waste. Used tubes are stored in clean and contaminated satellite

areas until transported to Central Shops for crushing and disposal. The tubes from the contaminated satellite area are individually checked for contamination. If cleared, they are transported with the rest to Central Shops. Any contaminated tubes that cannot be successfully decontaminated are mixed waste and are stored in satellite areas.

Options: Option 1: Obtain EPA/DOE Ruling fluorescent tubes are not classed as hazardous.Option 2: Improve decontamination methods to essentially eliminate contaminated tubes.Option 3: Investigate availability of longer life tubes.Option 4: Seal fixtures in contaminated areas to prevent tube contamination.Option 5: Convert lighting back to incandescent lights which would not be hazardous.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** Donna Kruzner
Phone: 803-952-7145	**Phone:** 803-557-0154
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: D-Area Oil Seepage Basin **Major Waste Type:** Hazardous Waste

PPOA ID Code: SRS-029 ER D-AREA **Specific Waste Type:** Oil

Date: 16-may-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Storage

Description: An interim remedy selected for the D-Area Oil Seepage Basin is to remove the threat of continuing release of contaminants to the environment. The waste unit, constructed in 1952, received waste oils and other fluids unsuitable for burning in SRS powerhouse boilers. An unknown number of drums were in the basin when it was removed from service and backfilled in 1975. The scope of the interim remedial action is to uncover these drums through careful excavation, transfer drum contents into new drums and disposition through the SRS-operated Hazardous Waste Storage Facility. Excavated debris and other principal threat source material will be dispositioned according to hazardous/nonhazardous characterization. Excavated soils will be replaced in the basin.

Options: Option 1: The waste generated by an experienced and highly reputed contractor is expected to be less than the amount generated using less experienced site personal and supervision.Option 2: Debris encountered during the interim remedial action will be evaluated according to whether or not the debris in question is considered removable (versus nonremovable) based mainly on size. This on-the scene waste identification process will result in a minimization of waste that may ultimately be categorized as hazardous.Option 3: Related to option 2 above, it is recommended that some sort of guidance (e.g. decision trees, waste descriptions, technical resources, etc.) be prepared ahead of time to assist the project manager who will be making these waste categorization decisions. Planning and documenting the decision making process will lend consistency if more than one project manager categorizes the waste.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** Doug Weaver
Phone: 803-952-7145	**Phone:** 803-644-6764
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Elimination of 21Ó Cardboard Boxes **Major Waste Type:** High Level Waste

PPOA ID Code: SRS-031 HLW TANK FARMS **Specific Waste Type:** Cardboard

Date: 16-jun-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Handling

Description: Current practice within HLW is to ship all compactable waste to the compactor in 21Ó cardboard boxes. The boxes of waste are loaded into a B-25 and are then compacted at a 4 to 1 ratio. The loading and compacting of boxes of waste is continued until the B-25 is full of compacted waste boxes. As a reference note that an empty 21Ó box takes up 1 ft3 when compacted.

Options: Instead of placing bags of compactable waste into 21Ó cardboard boxes, put them into an approved B-12 for delivery to the compactor. At the compactor transfer the bags of waste to the B-25s used for compacting and do the compaction without using 21Ó boxes. This practice will eliminate the space taken by the compacted 21Ó box (1 ft3/box) as well as the cost of the 21Ó box itself. These are estimated at 4200 ft3 /yr and $12726.00/yr, respectively.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** R. B. Althoff
Phone: 803-952-7145	**Phone:** 803-557-8243
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: 60 Ton Crane Disposal **Major Waste Type:** High Level Waste

PPOA ID Code: SRS-032 HLW TANK FARMS **Specific Waste Type:** Metal Debris

Date: 19-jun-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Disposal

Description: The disposal of the 60 Ton Crane will be via burial in an ELLT. The dimensions of the crane are 10Õ1Ó x 10Õ11Ó x 48Õ6Ó or 5216 ft3. The estimated cost to bury the crane @ $25/ft3 is $130, 400.00.

Options: Develop a subcontract for a vendor to take the crane, disassemble, decontaminate, and sell as clean scrap.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** R. B. Althoff
Phone: 803-952-7145	**Phone:** 803-557-8243
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: SCM Crane Cab Disposal **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: SRS-033 HLW TANK FARMS **Specific Waste Type:** Metal Debris

Date: 19-jun-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Disposal

Description: The SCM crane cab if left as is will have to be disposed of as mixed waste due to the presence of six (6) leaded windows as well as radioactivity present on the cab. The cost for storage of an object of mixed waste of this size (1000 ft3) would be $45,300.00.

Options: To bring the SCM crane cab to a clean unmixed state several actions will have to be accomplished: 1) remove air conditioning intake and filter, 2) dispose of the filter as LLW, 3) decon the intake until clean, 4) remove the six (6) clean leaded glass windows and sell as salvage, 5) cut the remaining clean cab assembly into four (4) pieces and dispose of as salvage.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** R. B. Althoff
Phone: 803-952-7145	**Phone:** 803-557-8243
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: F-Tank Farm Jumper Disposal **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: SRS-034 HLW TANK FARMS **Specific Waste Type:** Metal Debris

Date: 19-jun-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Disposal

Description: Three (3) boxes, each containing multiple F-Tank Farm counterweighted jumpers and having a total volume of 3728 ft3, require disposal, if left as is they will be placed in storage on a mixed waste storage pad at a cost of $168,878.40. The waste is considered mixed because of the lead counter weights that are attached to the jumpers.

Options: Utilizing remote handling equipment it is possible to remove the jumpers from the waste boxes and then remove the lead counter weights from the jumpers. The jumpers can then be cut up and be disposed of as LLW in an estimated four (4) B-25 boxes (384 ft3) and the lead counter weights as mixed waste in one (1) B-12 box (48 ft3).

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** R. B. Althoff
Phone: 803-952-7145	**Phone:** 803-557-8243
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Phase 1 Dissolver Operation **Major Waste Type:** High Level Waste

PPOA ID Code: SRS-035 NMSP HB Line **Specific Waste Type:** Filters

Date: 30-may-1995 **Major Activity Type:** Manufacturing **Specific Activity Type:** Recycling

Description: Scrap Pu-238 is returned to the HB line in double containers: EP 61 outer container and EP 60 inner container. In a glove box the EP 60 is removed from inside the EP 61. Then, the Pu-238 is emptied from the EP 60 into the dissolver. A total charge of about 400 grams of Pu-238 is put in the dissolver. 400 grams is about the contents of three EP 60Õs. After addition of chemicals and agitation, the dissolved Pu is transferred from the dissolver through a bag filter to the product hold tank. After transfer of the dissolved Pu-238, the bag filter has been destroyed and must be removed, neutralized, and replaced. Neutralization generates waste in the form of a Òneutralization kitÓ.

Options: Option 1: Because the filter dissolves in the material it is supposed to be filtering, it performs little, if any, function. Eliminate the filter from the process, which would eliminate all the neutralization kits needed to process the waste filter. ÒAnticipated reductionÓ refers to filter change-out related waste only.Option 2: Because the filter dissolves in the material it is supposed to be filtering, it performs little, if any, function. Design a new filter made from material that is chemically resistant to the dissolved Pu-238. Then, the filter could be changed when it reached the end of its service life (originally 3 batches of dissolved Pu-238). (Note: Options 1 and 2 are mutually exclusive.) ÒAnticipated reductionÓ refers to filter change-out related waste only.Option 3: Objects are placed into the interior of the glove boxes by placing them inside lead-lined gloves. The glove containing the object replaces the glove then attached to the glove box. This process ejects the previous glove into the box and causes it to become waste. Replace the lead-lined glove with a bag which is available, and would serve the same purpose. The bag has a about 20% of the volume of the lead-line glove and is not lead-lined; therefore, is not mixed waste.Option 4:

Decontaminate and reuse the EP 61 outer container. Rejected because time to decontaminate a EP 61 container that has been inside the process glove box (per experience in Phase 3) is 4+ hours. Furthermore, decontamination generates secondary TRU wastes.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** Betty Bush
Phone: 803-952-7145	**Phone:** 803-557-8893
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Deionizing Resin Regeneration **Major Waste Type:** Hazardous Waste

PPOA ID Code: SRS-036 Rx 245H RRF **Specific Waste Type:** Aqueous

Date: 26-jun-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Treatment

Description: The regeneration of deionizing resins at the 245H Resin Regeneration Facility (RRF) is covered in Procedures 245-H-104 and 245-H-105.

Options: Option 1: Rinse times in the procedures for the regeneration of the 100 Area and 244H deionizers are different; therefore, the amount of waste generated during the rinse phases are different for each. In order to minimize the amount of waste generated during the rinse phase, rinse both deionizers the shorter of the two times. This will result in a lower level of waste generation.Option 2: Use higher air pressures when making transfers during the resin regeneration process. This should lower the amount of water required to make the transfer and therefore lower the amount of waste generated.Option 3: It is the opinion of operators working in the 244H RRF that an upgrade of the facility, i.e. new valves, etc. will result in the generation of a lower level of waste.Option 4: The percent of caustic or acid used for the regeneration of anion or cation resins, respectively, has an effect on the amount of waste generated. The SRTC should determine the optimum percent of caustic or acid needed to minimize waste generation during resin regeneration.Option 5: When transferring resin from both EP57 and EP59 back to the portable deionizer do so from one at a time. Run water only to the tank that resin is being transferred from. These practices will result in a lower level of waste water being generated.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** T. O. Oliver
Phone: 803-952-7145	**Phone:** 803-557-3192
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Unloading HLW Trailer to Tank 808 **Major Waste Type:** High Level Waste

PPOA ID Code: SRS-037 NMSP F-CANYON **Specific Waste Type:** Personal Protective Equipment

Date: 26-jun-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Handling

Description: The process of unloading the SRTC HLW trailer to Tank 808 is outlined in Procedure SOP 211-F-1264, UNLOADING THE HIGH-LEVEL WASTE TRAILER TO TANK 808 (U). This unloading, which is carried out on the order of two (2) times per month, requires three (3) operators, including two (2) that are fully dressed out, in full plastic suits w/air. Also required is one (1) or two (2) RCO technicians depending on the stage of the operation. RCO dress varies from minimal to full, again depending on the stage of the operation. The entire process which takes approximately 8 hours to complete is generally done across a two (2) day time frame.

Options: Option 1: Cut and position kraft paper so as to catch any drips to avoid contamination.Option 2: Redesign the truck stall HLW unloading & vent lines to be comparable to the LLW tank set-up. The current design requires two (2) operators whereas a redesign will only require one (1). New design transfer lines need to be more flexible. Currently may have to call T&T several times to reposition trailer to facilitate hook-up.Option 3: Reuse fresh-air hoses with RCO clearing prior to each additional use.Option 4: Develop and implement a program for the coordination of trailer movement as trailer movement has long been a problem. This is because the trailer cannot be left outside of the unloading stall for an extended period of time. Should the trailer become unmovable because of coordination it must be put back into the stall thereby necessitating the generation of additional waste.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** L. Turner
Phone: 803-952-7145	**Phone:** 803-952-3132
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Z-Area is going Green **Major Waste Type:** Sanitary Waste

PPOA ID Code: SRS-038 DWPF Z-AREA **Specific Waste Type:** Paper

Date: 17-jul-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Recycling

Description: Under current practices Z-Area is doing some recycling; however, no specific effort is being put forth to eliminate all waste possible.

Options: Designate Z-Area facilities as a Green Bldgs. eliminating as much unnecessary waste as possible. This will be done through the total recycling of all white paper possible, the distribution of office supplies from a locked location, and the elimination of disposable drinking cups, in particular styrofoam. Further, efforts will be made to use recycled paper whenever possible. All Z-Area employees will be trained accordingly.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** J. G. Townson
Phone: 803-952-7145	**Phone:** 803-557-2295
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Clean excess Equipment from Fab Lab **Major Waste Type:** Low Level Waste

PPOA ID Code: SRS-039 SRTC FAB LAB **Specific Waste Type:** Wood

Date: 25-jul-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Handling

Description: A number (13) of wooden boxes of brand new, never been used equipment which originated at the Rocky Flats Site were given to the SRTC due to the cancellation of a project at Rocky Flats. The boxes and the equipment contained within, which were radiologically clean upon receipt, was stored in the SRTC Fabrication Laboratory RCA. This lab has since been reclassified as a RBA. A portion of the equipment contained in the boxes, a furnace, is to be installed in the Fab Lab. It is desired, based on its clean history, that the remaining equipment be declared radiologically clean and released as excess from the Fab Lab. If this is not done the equipment will have to be disposed of as LLW.

Options: Based on its past radiologically clean history and the fact that the equipment was only stored, in boxes, in the Fab

Lab., utilize the guidelines in Procedure 517, Rev 0 of Manual 5Q1.1 to Òfree releaseÓ the equipment and packing boxes as clean.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** P. D. Tu
Phone: 803-952-7145	**Phone:** 803-725-5854
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Glove Usage in Contamination Areas **Major Waste Type:** Low Level Waste

PPOA ID Code: SRS-040 SRTC CAs **Specific Waste Type:** Personal Protective Equipment

Date: 25-jul-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Disposal

Description: Rubber gloves used in the Shielded Cells are used and thrown away.

Options: In place of throwing away rubber gloves after use do the following so as to allow reuse of the gloves: 1) Survey the gloves; 2) If necessary decontaminate the gloves; 3) Resurvey the gloves; 4) Launder the gloves; 5) Reuse the gloves.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** P. D. Tu
Phone: 803-952-7145	**Phone:** 803-725-5854
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Designated CAs in High Level Cave **Major Waste Type:** Low Level Waste

PPOA ID Code: SRS-041 SRTC HIGH LEVEL CAVE **Specific Waste Type:** Personal Protective Equipment

Date: 24-jul-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Disposal

Description: Due to personnel contamination cases, the E-Wing of Bldg. 773A, Shielded Cell Operations, has been posted as a contamination area (CA). This posting has resulted in a significant increase in the amount of LLW generated since entry into this area requires protective clothing such as lab coats, coveralls, shoe covers, and gloves.

Options: An effort to reduce the LLW volume was started by fixing and posting contamination areas in the E-Wing of 773A by painting. This painting will allow certain areas to come off of the need for protective clothing. Due to a lack of funding only half of the E-Wing was completed. Efforts should be put forth to obtain the funding necessary to complete the job due to the significant reduction in LLW generation that will be accomplished.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** P. D. Tu
Phone: 803-952-7145	**Phone:** 803-725-5854
Fax: 803-952-8383	**Fax:**

Email: BX940@cleveland.freenet.e	**Email:**

Title: Material Sciences Lab. Samples **Major Waste Type:** Low Level Waste

PPOA ID Code: SRS-042 SRTC MATÕL SCI LAB **Specific Waste Type:** Aqueous

Date: 25-jul-1995 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Radiological

Description: The Environmental Sampling Group has been receiving approx. 300 of 250 ml ground water samples/quarter. The amount needed for analysis averages 300 lambda. Since the 150 Lab is an RBA, the remaining sample after analysis is disposed of down the low-level-activity drain.Total samples received: 300 samples/qtr X 4 qtrs/yr = 1200 samples/yrTotal volume of samples: 250 ml/sample X 1200 samples/yr = 300 l/yr1 lambda = 0.000001 literTotal volume needed for analysis:300 lambda/analysis X 0.000001 liter/lambda X 1200 analyses/yr = 0.36 liters/yr.Total volume of LLW generated: 300 liter - 0.36 liter = 299.64 liter/yr.

Options: Reduce the amount of ground water sample delivered to the lab to 60 ml the size of a standard small sample container. This will reduce the amount of waste generated by this operation by 76%.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** P. D. Tu
Phone: 803-952-7145	**Phone:** 803-725-5854
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Decontamination by Kelly Machine **Major Waste Type:** Low Level Waste

PPOA ID Code: SRS-043 Rx C-AREA DECON FACIL **Specific Waste Type:** Aqueous

Date: 21-jun-1995 **Major Activity Type:** Environmental Restoration **Specific Activity Type:** Decontamination

Description: The Kelly machine uses superheated steam to remove surface contamination. Its operation is similar to that of a carpet cleaner. The Kelly machine takes process water, superheats it electrically, and ejects the steam against the surface to be cleaned. A vacuum system sucks up the water and contamination removed and separates the liquids and solids from the vapor stream. The dirty water is accumulated for disposal and the vapor stream is filtered through HEPA filters and released to atmosphere.

Options: Use of the Kelly machine for decontamination of floors, walls, ceilings, tools, etc. produces significantly less waste than other methods of decontamination such as sandblasting, needle gun, or strippable coatings. The Kelly machine is easy to set up and use. Total time and cost for decontamination with a Kelly machine is less than the aforesaid other methods. Decontamination with Kelly machine should be the first method attempted when decontamination is needed.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** T. O. Oliver
Phone: 803-952-7145	**Phone:** 803-557-3192
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Flushing 3rd Level Basins **Major Waste Type:** Sanitary Waste

PPOA ID Code: SRS-044 NMSP F Canyon **Specific Waste Type:** Aqueous

Date: 27-jun-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Cleaning

Description: Beneath and around the chemical storage tanks on the third level of F Canyon are pans (basins) to collect drips and spills. The third level has 15 basin sections. Because of the continuous deterioration of the retired-in-place equipment and leaks from valves and piping, each basin section accumulates chemicals (acids and caustic), rust flakes, and other debris. At the supervisorÕs discretion, the basins are scrubbed with floor wax stripper, and flushed with water in accordance with procedure SOP 211-F-39110. The scrubbing and flushing is a housekeeping activity, not a radiation control activity. Radioactive contamination triggers a different clean-up procedure.

Options: Option 1: Water is available inside the contaminated area, but the distribution system has no spigots. Install water spigots so that water is not sprayed into the contaminated area from the non-contaminated area. Equip the water hoses with self-closing spray nozzles to minimize the amount of water used.Option 2: Floor wax stripper is used as a cleaning chemical because no other kind is available. Provide a decontamination cleaner (e.g.iso-clean), which should improve the efficiency of the cleaning process.Option 3: Basins are cleaned at the discretion of the shift supervisor. No guidelines are available to suggest when the basins require cleaning, or a standard for adequately clean basins. Rust and debris in the basin pose no threat to health and safety. Revise the procedure to include standards for cleanliness, or develop a schedule for periodic cleaning, or both.Option 4: Use a Kelly machine for cleaning basins, both for housekeeping and for decontamination. Rejected because operations personnel contend that the basins have too many nooks, crannies, and tight clearances for effective use of a Kelly machine.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** Levi Turner
Phone: 803-952-7145	**Phone:** 803-952-3132
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Free release of CLAB packing matÕls. **Major Waste Type:** Sanitary Waste

PPOA ID Code: SRS-045 CLAB 772F **Specific Waste Type:** Packaging Materials

Date: 18-jul-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Handling

Description: Procedure L4.2-40006, Rev 1, SUPPLIES, RECEIPT & DISTRIBUTION (U), which , provides guidance for the handling of materials and supplies for distribution within the Central Laboratory Facility, 772F, provides a description of the process assessed in this PPOA. These guidelines were needed to minimize RBA waste and to meet required standards.

Options: With the implementation of Procedure 517 of Manual 5Q1.2, Òequipment/material stored or used only in an RBA and the owner/custodian/user believes has no potential for contaminationÓ can be released for disposition as sanitary waste without the requirement to be evaluated or surveyed in accordance with Procedure 517. Based on this, the requirement to unpackage all materials used or distributed from CLAB RBAs, prior to their being placed in the RBAs, as spelled out in L4.2-40006, Rev 1 should be reassessed and rewritten to allow certain packages to be placed in the RBAs thus allowing easier storage and dispensing of supplies and the subsequent free release of said packing materials.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** D. W. Moody
Phone: 803-952-7145	**Phone:** 803-952-4269
Fax: 803-952-8383	**Fax:**

Email: BX940@cleveland.freenet.e	**Email:**

Title: Elimination of 21Ó boxes **Major Waste Type:** Low Level Waste

PPOA ID Code: SRS-046 NMSP FB-LINE **Specific Waste Type:** Cardboard

Date: 06-jul-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Handling

Description: The majority of compactable LLW generated on the FB-Line is placed in poly radioactive waste bags and is subsequently shipped to the 253H compactor after placement in 21Ó cardboard boxes. The boxes are loaded and transported on a radioactive material transportation vehicle. Upon receipt at the 253H compactor the boxes are unloaded and staged for compaction.

Options: Option 1: In place of putting bags of compactible waste into 21Ó cardboard boxes put them into a B-12 for delivery to the compactor. At the compactor transfer the B12s of waste bags to a staging area and subsequently transfer the bags to a compactable (purple) B-25 and do the compaction without using 21Ó boxes. This practice will eliminate the space taken by the compacted 21Ó box (1 ft3/box) and its related disposal volume cost of $39/ft3 ,as well as the $3.03 cost of the 21Ó box itself and the $7.06 cost of RC Labels. Option 2: In place of placing bags of compactible waste into 21Ó cardboard boxes or B12s place them directly into the radioactive material transport vehicle for delivery to the compactor. At the compactor transfer the bags of waste to a staging area and subsequently to a compactable (purple) B-25 and do the compaction without using 21Ó boxes. This practice will eliminate the space taken by the compacted 21Ó box (1 ft3/box) and its related disposal volume cost of $39/ft3, the $3.03 cost of the 21Ó box itself, the $7.06 cost of RC Labels, as well as the cost of the B-12 box and the additional handling.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** K. D. Steeg
Phone: 803-952-7145	**Phone:** 803-952-4960
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Operations requiring plastic suits **Major Waste Type:** Low Level Waste

PPOA ID Code: SRS-047 CLAB 772F **Specific Waste Type:** Personal Protective Equipment

Date: 07-jul-1995 **Major Activity Type:** Laboratory **Specific Activity Type:** Decontamination

Description: Use of plastic suits and other personal protective equipment is required by many routine and non-routine operations in the Central Laboratory, including, but not limited to:- Changing HEPA filters and pre-filters- Routine maintenance of fans, compressors and other equipment- Inspections by building equipment analysts- Clean-up of contamination- D&R of certain areasAll the above operations generate various kinds of waste.

Options: Option 1: Plastic suits are removed by Òcutting outÓ with scissors. Scissors used are the type intended for office service. After 2 or 3 cuttings the scissors are irremediably dull and must be discarded. Purchase of high quality industrial grade scissors would significantly reduce the number of pairs of scissors discarded.Option 2: Air hoses that feed the plastic suits are discarded after each use. Investigate reason for discarding instead of decontaminating and reusing the hoses. If no compelling reason for discarding hoses exists, develop method to decontaminate (e.g. protect with a disposable sleeve) and reuse them.Option 3: Some contamination areas contain equipment that requires routine maintenance. Most of the tools are brought into the area each time the maintenance is performed and discarded after use. Determine the tool requirements for routine and preventative maintenance work in each contaminated area. Provide those tools in a tool box in the area. Post at the entrance to each area what tools are available inside. Insist that the tools be replaced in the tool box after use so that they can be reused.Option 4: Entries into contamination areas are occasionally made with little planning. As a result, workers must sometimes exit the area before the work is complete. Then, they must re-dress and re-enter to complete the work. Investigate

procedures and training and revise to avoid repeated exits and entries in CAÕs. Consult technicians in job planning functions.Option 5: Some repetitious work in contaminated areas requires scaffolding or ladders. This equipment now is discarded after each use. Investigate availability of storage areas inside the contaminated areas to allow for equipment reuse.Option 6: When hoses are discarded they are coiled and placed into a disposal container. Cutting the hoses into pieces would reduce the volume, but not the weight of the material going to disposal. Investigate the possibility of using a chipper/shredder.Option 7: The outer set of cotton coveralls is discarded upon leaving the cell tanks and the fan room contamination areas. Replacing the top cotton coveralls or covering the top set of coveralls with Tyvek coveralls would reduce the volume discarded, and may reduce the cost, because Tyvek coveralls are less expensive than cotton.Option 8: Decontamination operations are often conducted with an unjustifiable sense of urgency. Technicians are instructed to decontaminate as quickly as possible without regard to the employing the most waste-efficient techniques. The volume of waste mop heads, brushes, and wipes used in hurry-up operations significantly exceeds the volume of strippable coating that would effect the same or better level of decontamination, but take more time. Involving the technicians during job planning would improve the efficiency of decontamination operations and minimize the amount of waste generated .Option 9: Permanent reduction in the level of contamination of an area would decrease the type and amount of personal protective equipment needed to enter, hence the volume of waste generated. Investigate the feasibility of rollback of various contamination areas.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** Moody, D
Phone: 803-952-7145	**Phone:** 803-952-4269
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Waste Lub Oil Disposal **Major Waste Type:** Hazardous Waste

PPOA ID Code: SRS-048 NMSP H-Canyon **Specific Waste Type:** Oil

Date: 12-jul-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Vehicle

Description: The process of oil change for the 254-5H diesels is described in Procedure 9-13254-00, Rev 8, of Manual Y 10.6. The 292-H diesels are in an RBA; RAO screen are done and oil is cleared for disposal.

Options: Option 1: Provide 500 gallon used diesel lub oil skid pan to replace 55 gal drums .Option 2: Revise PM procedures to require less frequent diesel lub oil changes. Any potential waste minimization is not considered compelling enough to pursue procedure revision for these Safety Class Items after 30 years of successful continuous operation.Option 3: Provide diesel lub oil requiring less frequent change. Any potential waste minimization is not considered compelling enough to pursue a different lub oil for these Safety Class Items after 30 years of successful continuous operation.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** D. M. Kruzner
Phone: 803-952-7145	**Phone:** 803-557-8319
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Hot Cell Operation **Major Waste Type:** Transuranic Waste

PPOA ID Code: SRS-049 CLAB 772F **Specific Waste Type:** Cardboard

Date: 12-jul-1995 **Major Activity Type:** Environmental **Specific Activity Type:** Sampling &

Restoration Characterization

Description: Samples are collected by Canyon Operations. The samples arrive at a transfer area in carriers or ÒdoorstopsÓ. The sample vials are removed from the shielded carriers and placed in a hot cell for preparation or analysis. The carriers are decontaminated and returned to operations for reuse. Laboratory supplies used in the analysis are accumulated in 5 qt. pails. The pails are removed from the cell, boxed, placed in bags, and put in B-25 boxes for disposal.

Options: Option 1: Pails of used solid laboratory supplies are accumulated in the cell. At present the buckets are removed in minimum lots of five. Determine the maximum number that can be stored in the cell without compromising safety and efficiency. Further research indicates that 5 pails is the maximum that can be stored.Option 2: The lines are already set up for dispensing acids and bases in the hot cell, but are not being used. The dispensing bottles are filled in Labs 144 and 145 outside any containment. The bottles would be disposed as compactable waste rather than TRU on intermediate level waste created in the cells. One line is installed and usable at this time resulting in the avoidance of about 2 ft3 of TRU per year.Option 3: Contamination inside the doorstops is a result of drips from the sample collecting needles, when the vial is removed from the sampler. A disposable covering that protects the inside of the doorstop would reduce the number of wipes and other decontamination supplies needed. Several types of protective cover suggest themselves, e.g. plastic wrap and waxed paper. Lab and operations personnel should work together to develop a disposable liner for the doorstops.Option 4: Pails of waste, removed from the cell, are placed in cardboard boxes (ÒbalkansÓ); the boxes are placed in plastic bags; the bags placed in a transport container, which carries the bags to the B-25 boxes in which the waste is disposed. The cardboard containers do not appear to contribute to the safety of efficiency of the operation and can be eliminated.Option 5: Procedures do not specify maximum quantities of supplies needed for the various analytical procedures. Amounts tend to vary among analysts. CLAB personnel should standardize the amounts of supplies needed. Further investigation indicates that standardizing supply needs is not feasible.Option 6: Sponges used in cells were being used once then thrown away. Now sponges are rinsed in water and reused several times. There are 36 sponges per ft3. Two sponges are used per week rather than 14 per week, which results in a waste reduction of 17 ft3.Option 7: Rinsing vials before putting in cell waste reduces exposure rates and may make the difference between disposing the cell waste as TRU or LLW.Option 8: Minimize the number of samples taken into the cells and the alpha emitting isotopes handled in the cells. If RCO at the canyon could provide a dose rate on each doorstop sample (from the opened top of the doorstop rather from the sides) the samples could be routed to modules capable of handling them. Gene Stewart, the cellsÕ CTF, will investigate. Too early to determine cost, savings and volume reduction.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** Moody, D.
Phone: 803-952-7145	**Phone:** 803-952-4269
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Green is Clean - Procedure. 517 Implementation **Major Waste Type:** Low Level Waste

PPOA ID Code: SRS-050 NMSP FB-LINE **Specific Waste Type:** Paper

Date: 14-jul-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Disposal

Description: The current process related to the release of RBA waste originating from within the FB-Line area is to release it all as LLW.

Options: Option 1: With the implementation of Procedure 517 of Manual 5Q1.2, Òequipment/material stored or used only in an RBA and the owner/custodian/user believes has no potential for contaminationÓ can be released for disposition as sanitary waste without the requirement to be evaluated or surveyed in accordance with Procedure 517. Based on this, waste from the PC Room can be released as sanitary waste.Option 2: With the implementation of Procedure 517 of Manual 5Q1.2, Òequipment/material stored or used only in an RBA and the owner/custodian/user believes has no potential for contaminationÓ can be released for disposition as sanitary waste without the requirement to be evaluated or surveyed in accordance with Procedure 517. Based on this, waste originating in the OCC Room can be released as sanitary waste.Option 3: Paper from a number of RBA areas within the FB-Line could be free released as sanitary waste if the possibility of other types of potentially contaminated waste getting into the containers were eliminated. To accomplish this with a high degree of certainty provide paper shredders at three (3) locations within the FB-Line: the 6-8 Control Room, the 5th Level PC Room, and the 3rd Level

RCO Office.Option 4: iN ORDER TO EASILY SCAN TOOLS AT SOME COMMERCIAL REACTORS VISITED BY SRS PERSONNEL A CONVEYORIZED ÒTOOL FRISKERÓ IS UTILIZED. aN INVESTIGATION SHOULD BE CARRIED OUT TO DETERMINE THE ABILITY OF AN INSTRUMENT SUCH AS THIS TO fRISK FB-lINE WASTE. tHIS FRISKING WOULD ALLOW EASY SEPARATION OF CONTAMINATED WASTE THUS ALLOWING THE ABILITY TO RELEASE LARGER AMOUNTS OF WASTE FROM THE fb-liNE rbaS. FURTHER STUDY REQUIRED.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** K. D. Steeg
Phone: 803-952-7145	**Phone:** 803-952-4960
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: ERD Waste Site Investigations

Major Waste Type: Low Level Waste

PPOA ID Code: SRS-051 ERD SITE INVESTIGATION

Specific Waste Type: Personal Protective Equipment

Date: 17-jul-1995

Major Activity Type: Environmental Restoration

Specific Activity Type: Sampling & Characterization

Description: ERD is the facility custodian for over 420 separate actual or potential waste units which are contaminated with hazardous, radiological and/or mixed constituents in varying concentrations and/or combinations. Investigation of these waste units is conducted to define the nature and extent of contamination. This is accomplished by collecting soil cores, installing ground water monitoring wells, and performing field studies such as ground penetrating radar and soil gas surveys. Investigation of ERD Waste sites during this phase of the RCRA/CERCLA process generates waste streams consisting mainly of plastic sheeting, personal protective equipment, sample residuals, sampling equipment, and other miscellaneous tools and equipment, and drill cuttings. The average volume of job control waste generated per investigation is estimated to be between 90 and 175 cubic feet; an additional 200 cubic feet of contaminated media (e.g., soils, sludges) is estimated per site investigation.

Options: Option 1: Continue to utilize the formal DQO process as described in ER-AP-056 and EPA guidance documents to identify the quality and quantity of data for required end-use and obtain up front concurrence on data uncertainty and error tolerances with regulators and data end users. This up-front planning tool for statistically basing the design of sampling plans for environmental media results in a reduction in total number of samples that are needed due to the optimization of the sampling scheme.Option 2: Explore and utilize less invasive drilling techniques based on the projects DQO. Consider non-invasive techniques such as historical process knowledge, magnetic surveys, ground penetrating radar, and soil gas surveys for obtaining pertinent information while reducing IDW. Evaluate direct push methods of data collection (e.g., cone penetrometer testing, sonic drilling) and determine feasibility of drilling techniques which produce less IDW than techniques currently in use (e.g., reverse air rotary drilling method).Option 3: Replace plastic sheeting which comprises the majority of job control waste with launderable tarps. Also, consider using washable (reusable) cuffs in place of tape.Option 4: Implement a formal tool and equipment control program. Perform an inventory of reusable equipment and tools and store at a central location, such as a Sea-Land Container, and segregate according to waste site type (HW, LLW, MW). Design tools and materials to allow for their reuse. Examples include elimination of porous material, such as wood tables, concrete blocks, and shovels w/wood handles, which are brought into a contaminated area. Fabricate capped augers to allow for decontamination.Option 5: Implement a formal tool and equipment control program. Perform an inventory of reusable equipment and tools and store at a central location, such as a Sea-Land Container, and segregate according to waste site type (HW, LLW, MW). Design tools and materials to allow for their reuse. Examples include elimination of porous material, such as wood tables, concrete blocks, and shovels w/wood handles, which are brought into a contaminated area. Fabricate capped augers to allow for decontamination.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** Mike Griffith
Phone: 803-952-7145	**Phone:** 803-644-6951
Fax: 803-952-8383	**Fax:**

Email: BX940@cleveland.freenet.e	**Email:**

Title: Improvement of the recycling effort. **Major Waste Type:** Sanitary Waste

PPOA ID Code: SRS-052 SW SANITARY WASTE **Specific Waste Type:** Paper

Date: 25-sep-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Recycling

Description: Across the SRS sanitary waste is collected for disposal in a total of 320 dumpsters. In many cases these dumpsters likewise receive recyclables which are then disposed of as sanitary waste and not recycled. Recyclables, i.e., paper, cardboard, and aluminum are each collected using different methods for each such as individual collection containers for each recyclable.

Options: At the location of each of the 320 sanitary waste dumpsters site-wide provide a dumpster to be used for the collection of recyclables, i.e., paper, cardboard, aluminum cans, that would otherwise be disposed of as sanitary waste.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** P. C. Knapp
Phone: 803-952-7145	**Phone:** 803-557-6355
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Chemical Management **Major Waste Type:** Hazardous Waste

PPOA ID Code: SRS-053 CLAB 772F **Specific Waste Type:** Chemicals

Date: 28-jul-1995 **Major Activity Type:** Laboratory **Specific Activity Type:** Recycling

Description: With about 30 labs, reagent prep areas, auxiliary storage areas, etc Chemical Management in CLAB 722F is a complex operation. Identified current Waste Minimization concerns are associated with unused excess reagents and chemical supplies:1) Identification of hazardous chemicals among the spectrum of chemicals utilized in the facility to insure proper handling and disposal2) Lack of control of quantities delivered from stores strains limited storage capacity and materials become dated before they can be consumed3) Chemical supplies ordered independently for auxiliary facilities (trailers etc.) with excess materials stored throughout the area.4) Continued storage of chemicals once ordered for obsolete analytical procedures.5) A means is needed to advise these diverse areas of the importance of continued WMin; inform them of WMin methods and techniques; and promote WMin mind-set.

Options: Option 1: Identify hazardous chemicals - Update Blue Dot program - Materials identified by facility review as hazardous prior to ordering and identified with Blue Dot when received.Option 2: Excess chemicals received. Revise Blue Dot procedure to direct affected personnel to immediately pass on to chemical commodities group any excess beyond CLAB needs received in any chemical supplies shipment. This will alleviate space pressure on limited storage areas and make it more likely the material will be utilized before becoming dated.Option 3: Investigate the possibility of controlling the release of chemical supplies to facility personnel.Option 4: When analytical procedures requiring new chemicals are in the revision process, investigate the possibility of using up all old chemicals first. If this is not possible, transfer obsolete chemicals to the chemical commodities group.Option 5: Promote WMin - Establish Standing Orders for Waste Minimization delineating waste methods and policy applicable to all the areas of concern. Revise waste handling training to include waste minimization items.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** Dawn Moody
Phone: 803-952-7145	**Phone:** 803-952-4269

Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Sampling Resin in Reactor DIÕs **Major Waste Type:** Low Level Waste

PPOA ID Code: SRS-054 Rx DI SAMPLING **Specific Waste Type:** Plastic

Date: 07-aug-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Sampling & Characterization

Description: Eight deionizers will be sampled for analyses to quantify their C-14 concentration. Sampling will be done in the trailer space in P-reactor. The overhead crane will move each DI from its storage cell to the trailer space. The crane will deliver an impact wrench to the mechanic in a plastic suit so that the mechanic can remove the access flange. Then, a fork truck will position the robotic sampling device over the access port. The sampler will remotely take a sample of the resin. The fork lift will remove the sampler and the sample. The mechanic will seal the access port with a plug and the crane will move the DI back to its storage cell. The sample will be placed in a shielded sample carrier (ÒpigÓ). The pig will be surveyed, double bagged, and transported to SRTC, where the sample will be analyzed. Sampling DIÕs is a one-time operation.

Options: Option 1: Whenever personnel operate in a plastic suit, another person must also be suited-up as back-up. In this operation, the mechanic can act as the back-up for the fork lift driver and vice versa. The back-up can wait behind an existing portable lead shield to avoid unnecessary exposure to radiation. Thus, only two plastic suits need to be used for each DI sampled.Option 2: Sample can be placed in the pig either by hand or with tongs to avoid use of a remote operated robot. If the robot were used it could not be decontaminated sufficiently for removal from the contaminated area, and its use elsewhere would be lost.Option 3: Sample for airborne contamination during the first 3-4 sampling evolutions. If no airborne contamination is detected, abandon the use of the plastic suits for subsequent sampling evolutions. Note that implementation of this option reduces the cost saving of option 1 to 4 $2200.Option 4: Maintain sampler for reuse in future operations either at SRS or elsewhere in the DOE complex. Note that the reduction in quantity depends on potential reuse of sampler. If no future uses are found, maintaining the device is a cost without offsetting savings or reduction in waste quantity. Nevertheless, the potential for gain makes this option worth implementing.Option 5: Protect the fork lift and 3 television cameras in the sampling room with tape, strippable paint, bags, etc. so that they can be decontaminated and reused.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** Ken Rumsey
Phone: 803-952-7145	**Phone:** 803-557-3034
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: 234H Packaging Wastes **Major Waste Type:** Low Level Waste

PPOA ID Code: SRS-055 TRITIUM DEFENSE PROGRAM **Specific Waste Type:** Cardboard

Date: 21-sep-1995 **Major Activity Type:** Service **Specific Activity Type:** Packaging

Description: The Tritium packaging room brings in a wide variety of materials to be packaged for on-site/off-site shipment, storage, disposal etc..

Options: Option 1: Reduce RMAÕs in packaging room.Option 2: Send waste to landfill as clean and associated waste with an acceptable statistical sampling method. Historically materials in the packaging room have been between detection limits (150 counts) and acceptable (clean) limits (<1000 counts) tritium. Option 3: Create RBAÕs for material collection.Option 4: Develop new procedures to segregate waste.Option 5: Salvage lead and copper seals, and cadmium nuts and bolts now stored in the packaging room.Option 6: Separate collection/system of area collection containers for clean, associated, and Rad waste (LLW).

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** Craig Johnson
Phone: 803-952-7145	**Phone:** 803-557-1800
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Routine water sampling at the RBOF. **Major Waste Type:** Low Level Waste

PPOA ID Code: SRS-056 RX RBOF **Specific Waste Type:** Aqueous

Date: 14-aug-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Sampling & Characterization

Description: Samples are collected from the Deionized Water Header, Deionizer Discharge, and No. 1 Storage Basin both weekly and quarterly. Samples from seven other sources are collected as needed. The Deionized Water Header, Deionizer Discharge samples come from a spigot in a sink, while the No. 1 Storage Basin sample is dipped from the basin itself. Samples have a 250 ml volume.The operator collecting the samples is dressed in two pairs of coveralls, a hood, three pairs of gloves, and two pairs of shoe covers, as required by RWP/SRWP. The operator is accompanied by an RCO wearing one pair of coveralls and two pairs of gloves.Sampling is always combined with another activity that requires entry into the Basin Area, which is a contamination area, thus sampling does not increase the amount to personal protection equipment used.

Options: Sample bottles are placed in individual rad-bags, then all the bagged sample bottles are placed in one larger bag for transport to the laboratory. The over-bag could be replaced by a reusable sample carrier. Nevertheless, screening and decontaminating the reusable carrier could generate more waste than the over-bag.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** K. L. Rumsey
Phone: 803-952-7145	**Phone:** 803-557-3034
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Computer related hazardous waste. **Major Waste Type:** Hazardous Waste

PPOA ID Code: SRS-057 WSI COMPUTERS **Specific Waste Type:** Circuit Boards

Date: 05-sep-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Disposal

Description: At WSI, computer circuit boards that have reached the end of their useful lives have historically been disposed of as hazardous waste, due to the presence of hazardous materials, at a cost of $1200.00 per drum. The generation rate has been on the order of two (2) drums per year.

Options: Send no longer useful computer circuit boards to excess to be sold for metal extraction rather than dispose of as hazardous waste.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** H. L. Eubanks
Phone: 803-952-7145	**Phone:** 803-952-7980

Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: WSI helicopter hazardous waste. **Major Waste Type:** Hazardous Waste

PPOA ID Code: SRS-058 WSI HELICOPTERS **Specific Waste Type:** Solvents

Date: 05-sep-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Equipment

Description: After each 55 hours of helicopter flight (approx. every two (2) weeks) the helicopter rotors are required to undergo a crack detection inspection per FAA Regulations. The inspection is conducted with Magnaflux Dye Penetrant which is placed on the rotors. Approximately 2-8 ounces of run-off is collected during each inspection. The run-off which cannot be reused is considered hazardous waste due to the presence of 111-TCE in the Magnaflux Dye Penetrant.

Options: Replace the Magnaflux Dye Penetrant with a non-hazardous variety of crack detector.INVESTIGATION DETERMINED THAT FAA REGULATIONS PREVENT THIS OPTION FROM BEING IMPLEMENTED AS THE NON-HAZARDOUS VARIETIES DO NOT MEET FAA SPECIFICATIONS.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** H. L. Eubanks
Phone: 803-952-7145	**Phone:** 803-952-7980
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: ESS Exercise Haz Waste **Major Waste Type:** Hazardous Waste

PPOA ID Code: SRS-059 WSI ESS **Specific Waste Type:** Batteries

Date: 05-sep-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Equipment

Description: During WSI training exercises a variety of ESS equipment used requires power for its operation. This power is supplied by mercury batteries, approximately the size of a quarter. Used batteries (approximately 2 #/yr) which are considered hazardous waste, due to the presence of mercury, are disposed of in Lab-packs at a cost of $1200.00 per drum.

Options: Through contact with the ESS equipment manufacturer it has been determined that changing from a mercury battery to an alkaline battery will not void the equipment warranty; therefore, alkaline batteries are suggested for use in this equipment in the future. This will eliminate the hazardous waste generated.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** H. L. Eubanks
Phone: 803-952-7145	**Phone:** 803-952-7980
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Haz Waste related to portable radios **Major Waste Type:** Hazardous Waste

PPOA ID Code: SRS-060 WSI COMMUNICATIONS **Specific Waste Type:** Batteries

Date: 05-sep-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Equipment

Description: With the high use of portable radios within WSI there are a considerable number of batteries in need of replacement on a regular basis. Historically this has amounted to on the order of 40-45 batteries every three (3) months. The batteries which are the NiCad type have to be disposed of as Hazardous Waste. The disposal cost per drum of Hazardous Waste, which is generated approximately every three (3) months, is $1200.00.

Options: Replace the NiCad batteries (HazWaste) currently in use with Nickel Metal Hydride batteries which are considered non-hazardous. The cost of a Nickel Metal Hydride battery is 1/3 more than that of the NiCad battery; however, the Nickel Metal Hydride battery lasts longer and is not subject to overcharging as are NiCad batteries.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** H. L. Eubanks
Phone: 803-952-7145	**Phone:** 803-952-7980
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Fluorescent Tube Disposal **Major Waste Type:** Hazardous Waste

PPOA ID Code: SRS-061 E&CSD BSRI **Specific Waste Type:** Fluorescent Lamps

Date: 06-sep-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Building

Description: Spent fluorescent tubes (which contain mercury, a hazardous constituent), originating in uncontaminated areas, arrive in cardboard boxes at the crusher facility 719-12N. The tube are stripped of a plastic coating, which cannot be crushed and usually tends to jam the crusher, and processed through the crusher. The crushed glass is placed in 55 gallon drums and shipped to the Hazardous Waste Manager for final disposal. This is usually through a subcontractor that provides this service at substantial cost. The following generation rates have been reported for 1994: Eighty-three (83) 55-gallon drums of hazardous tube waste generated. Of these forty (40) are crushed tubes and contain an average of 375 pounds of crushed glass contaminated with mercury.

Options: Option 1: Test the crushed tubes for the TCLP value related to mercury and if below the acceptable level shrink-wrap the crushed glass and ship it to a recycling facility. Option 2: Buy fluorescent light bulbs without a plastic coating and utilize a removable protective sleeve for safety purposes.Option 3: Currently all the waste has to be sampled and screened for radioactivity, regardless of where it is generated, before shipment per SRS Waste Acceptance Criteria Manual 1S Procedure 3.08 . This procedure should be revised to cut down on this requirement for waste originating in an area known to be clean. Further investigation is recommended.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** Paul Eisenstat
Phone: 803-952-7145	**Phone:** 7-4861
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Waste Chemical Storage Drum Pressure Valves **Major Waste Type:** Hazardous Waste

PPOA ID Code: SRS-062 DWPF OPS **Specific Waste Type:** Air Emissions

Date: 14-sep-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Storage

Description: Fifty five gallon volatile liquid waste drums are located in an outdoor satellite area. Sunlight and ambient temperature raise drum temperature with attendant rise in drum pressure. When waste operators add waste to drums high pressure vapor flashes off exposing operators to vapor as well as allowing excessive vapor release.

Options: Option 1: Add hard sides to the satellite area open sided shed covering the waste drums. Option 2: Provide pressure relief for drums to keep drum pressure low and reduce quantities of volatiles released.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** Clarke Stanford
Phone: 803-952-7145	**Phone:** 803-208-6246
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Mop Head Use and Reuse **Major Waste Type:** Sanitary Waste

PPOA ID Code: SRS-063 DWPF OPS **Specific Waste Type:** Cleaning Supplies

Date: 08-sep-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Building

Description: Cleaning mop heads are stored wet after use and are reused with no additional attention until no longer fit for service. Waxing and stripping mop heads are discarded after one application.

Options: Option 1: Develop and pursue mop head washing in DWPF as pilot program with outside contractor. If successful in mop waste reduction, pursue site-wide adoption of the program.Option 2: Develop and pursue salvaging of waxing and stripping mop heads in DWPF as a pilot program with outside contractor. If successful in mop waste reduction, pursue site-wide adoption of the program.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** Clarke Stanford
Phone: 803-952-7145	**Phone:** 803-208-6246
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Rosemont¨ Transmitter Calibration **Major Waste Type:** Low Level Waste

PPOA ID Code: SRS-064 DWPF OPS **Specific Waste Type:** Glove Bags

Date: 08-sep-1995 **Major Activity Type:** Manufacturing **Specific Activity Type:** Calibration

Description: In order to contain any contamination spread during the calibration of Rosemont¨ transmitters, individual custom glove bags are field-fabricated to contain each transmitter for each calibration. In most cases the bags are not contaminated during the calibration; however since the bags are custom-fabricated they cannot be reused for another transmitter calibration whether contaminated or not.

Options: Option 1: Instead of a once-used custom glove bag for each transmitter calibration, utilize a universal glove bag adapter plate that attaches to the transmitter and only enclose the calibration ports. If the calibration process results in no bag contamination, the adapter and glove bag can be reused on other transmitters until the bag is contaminated.Option 2: Shop prefabricate standard glove bag complete with Rosemont¨ transmitter adapter plate and maintain as stores item.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** Clarke Stanford
Phone: 803-952-7145	**Phone:** 803-208-6246
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Reclamation of Styrofoam from Used Cups **Major Waste Type:** Sanitary Waste

PPOA ID Code: SRS-065 DWPF OPS **Specific Waste Type:** Plastic

Date: 12-sep-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Disposal

Description: Polystyrene foam cups, packing, and other polystyrene materials are used extensively site-wide. The materials go into general site trash and are transported to a sanitary landfill for disposal.

Options: Utilize outside reprocessor who will pay to be allowed to provide receptacles site-wide; pick up; compress; and reprocess polystyrene materials to pellets for manufacture of new products.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** Clarke Stanford
Phone: 803-952-7145	**Phone:** 803-208-6246
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Municipal Solid Waste Screening **Major Waste Type:** Sanitary Waste

PPOA ID Code: SRS-066 SWO SANITARY WASTE **Specific Waste Type:** Solid Waste

Date: 07-sep-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Sampling & Characterization

Description: Municipal solid waste (MSW) is collected from generators throughout the Site and transported to a landfill off-site. Once a week, six MSW containers are randomly selected for examination to look for proscribed items, which include, but are not limited to, hazardous waste, aerosol cans, fluorescent bulbs, rad waste, recyclable items, and, most importantly, ÒassociatedÓ waste. Waste from the selected containers is taken to an inspection area at which the MSW is dumped on a pad. The waste screener examines the waste, estimates the volumes of various categories of waste, and summarizes the findings in a report. Data collected by MSW screening aids in the evaluation of the effectiveness of administrative procedures that control entry of proscribed items into the MSW containers. The additional data on the efficiency of site recycle programs is a coincidental benefit. The inspections have revealed that associated waste appears in the waste with unsatisfactory frequency. Hazardous waste is occasionally discovered, also. The volume of recyclable items in the MSW containers examined indicates that approximately 20% of the paper, 20% of the aluminum cans, and 60% of the cardboard generated on site are not being recycled.

Options: Option 1: Procedures to control entry of proscribed materials into MSW containers and to recycle paper, aluminum, and cardboard are not well known. Training should be included in C.A.T. Moreover, a well-publicized waste disposal help line

to assist generators may reduce incidents of improper disposal resulting from ignorance of procedures. The disposal help line could be added to the recycling help line at little or no additional cost . Option 2: MSW screening has as its primary objective detection of associated and other proscribed wastes. Random selection of containers for screening should be weighted to include more from those from areas likely to generate associated, hazardous, etc. waste. Option 3: Among those areas more likely to generate associated, etc. waste, some areas have a history of more frequent violation than others. Random selection of containers for screening should be weighted to include more from those from areas with a history of violation. Option 4: Recent examination of MSW containers indicate that violation of disposal procedures occurs more frequently by construction contractors and sub-contractors. Pre-work orientation should include training on waste disposal practices. Cost of developing the information to be presented in the training should be minimal. Cost of implementing the training will not increase the cost of construction contractor and sub-contractor orientation. Option 5: The SiteÕs performance in following waste disposal procedures, and recycling is not well publicized either to management or the Site population. Develop performance indicators that reach appropriate levels of management on a regular basis. Announce performance to the Site population by a required (e.g. Spectrum) communication medium. Option 6: Inspection of the MSW could be made more efficient with a specially designed pad on which the waste to be examined is dumped. The design should include provisions for easily reloading the waste into a disposal container after inspection. This option is the subject of a QISS submitted by SWO. The cost of such a facility depends on the complexity of the design. The simplest design, a two tier concrete pad so waste can be pushed from the inspection area into a trailer for transportation, is estimated to cost $15K to $30K.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** J. Maier
Phone: 803-952-7145	**Phone:** 803-952-3707
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Disposal of Drums and Liners **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: SRS-067 SWO TRU WASTE **Specific Waste Type:** Containers

Date: 07-sep-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Storage

Description: 4400 drums of TRU waste suffered rainwater intrusion. Removal of the rainwater generated 6500 gallons of mixed liquid waste, 137 drums with polyethylene liners, 571 rusty drums, some of which contain bags of low level job control waste, and 10 B-25 containers and 1 B-12 container of mixed low level job control waste. The 6500 gallons of liquid waste is waste stream SR-W071 and the waste in the B-25Õs and B-12 is included in waste stream SR-W003, both of which will be treated as specified in the Proposed Site Treatment Plan (WSRC-TR-94-0608 Rev.3). This PPOA examines treatment options for the 137 drums and polyethylene liners. PPOA 068 examines treatment of the 571 drums, which may contain job control waste.

Options: Option 1: Remove liners from drums. Reuse drums for ashcrete. Shred liners for disposal as solid or incinerate in CIF. Contact Mike Griffith to ascertain if liners can be shredded. This option has several conÕs: liners are contaminated with unquantified amounts of alpha waste, so they may not be candidates for shredding or burning; drums will require new lids to be reused as ashcrete containers.Option 2: Remove liners from drums. Reuse drums for ashcrete. Compact liners for disposal as solid. Rejected because the site has no means to compact the liners with sufficient force that they will not spring back. Option 3: Treat drums and liners at a commercial facility. A vendor would have to be identified and a contract let, or this waste would have to be included with an existing or future contract.Option 4: Leave liner in drums; cut or melt a hole in the liner lid, pour ashcrete into liner, replace existing lid This option will require CIF approval, HP approval, and a hut in which to cut the hole in the liner lid. Research needs to be done to ascertain if a vendor has a device to melt an appropriately sized hole in the lid. Rejected because of concerns that the liner would interfere with proper mixing of the ashcrete, which could result in an unacceptable final waste form.Option 5: Develop an empty container management plan. This need has been recognized by solid waste management and included with other non-treatment technology development needs.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** J. Maier
Phone: 803-952-7145	**Phone:** 803-952-3703

Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Disposal of Drums w/ JC Waste **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: SRS-068 SWO TRU WASTE **Specific Waste Type:** Containers

Date: 07-sep-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Disposal

Description: 4400 drums of TRU waste suffered rainwater intrusion. Removal of the rainwater generated 6500 gallons of mixed liquid waste, 137 drums with polyethylene liners, 571 rusty drums, some of which contain bags of low level job control waste, and 10 B-25 containers and 1 B-12 container of mixed low level job control waste. The 6500 gallons of liquid waste is waste stream SR-W071 and the waste in the B-25Õs and B-12 is included in waste stream SR-W003, both of which will be treated as specified in the Proposed Site Treatment Plan (WSRC-TR-94-0608 Rev.3). This PPOA examines treatment options for the 571 drums, which may contain job control waste. PPOA 067 examines treatment of the 137 drums and polyethylene liners.

Options: Option 1: Send drums to compactor at 253-H, include with other waste and compact into B-25 boxes.Option 2: Crush drums with earthmover and dispose in engineered low level trenches. Rejected because disposal in ELLTÕs is no longer permitted.Option 3: Design and construct a mobile drum crushing unit.Option 4: Dispose of drums as they are in LLW vault. Rejected because the drums are rusty and structurally unsound. They do not meet the EAV WAC.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** J. Maier
Phone: 803-952-7145	**Phone:** 803-952-3703
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Plastic suit usage. **Major Waste Type:** Transuranic Waste

PPOA ID Code: SRS-069 NMSP FB-LINE **Specific Waste Type:** Personal Protective Equipment

Date: 08-sep-1995 **Major Activity Type:** Manufacturing **Specific Activity Type:** Abatement

Description: A large portion of work performed on the FB-Line requires the use of respiratory protection equipment in the form of a hood or plastic suit and associated air distribution systems and hoses. During the first eight (8) months of 1995 this has amounted to a total of 18,336 pieces of equipment having a total value of $387,507.96. This is the highest usage of such equipment site wide. Furthermore, all of this equipment ultimately ends up as waste. The purpose of this PPOA is to investigate methods to minimize the amount of equipment used which will result in the generation of less waste.

Options: Option 1: The need for much of the respiratory equipment and its subsequent disposal as LL or TRU waste is the result of the gross contamination of many of the areas associated with the FB-Line. The most significant minimization of waste would come as a result of radiologically cleaning these areas to a level that will not require the use of respiratory equipment at its current level of use. In particular the COR which must be staffed 24 hrs/day. Calculated using only COR.Option 2: Job directions often change after a worker has entered RAD areas associated w/the FB-Line but prior to use of respiratory equipment obtained for the original job. This equipment (~10% of total) is disposed of as waste since it has already been in the area. Begin issuing this equipment in launderable bags which can be ÒswipedÓ by RCO and the equipment removed and returned to inventory if found to be clean. Note: Half of savings comes from using launderable instead of disposable bags.Option 3: Due to airflow problems only two lengths of air hose can be used with hoods at the FB-Line, 25 ft. low pressure and 100 ft. high pressure. This results in two times more waste being generated for a job that is 26 ft. away than what would be generated if a 50 ft. low pressure hose were available. Obtain engineering support to solve the airflow problem that exists w/50 ft. low pressure air hoses.Option 4: While the practice of reusing breathing air hoses and hoods is acceptable per Rev 1 of Procedure

304 of Manual 4Q1.6 and has been done at FB-Line in the past it is not now done. This is due to one or a combination of the following: contamination levels, and/or the lack of sufficient RCO coverage, and/or a lack of FB-Line specific procedures. Develop methods to again reuse this equipment at the FB-Line. Note: Calculated using only COR generation rates.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** K. D. Steeg
Phone: 803-952-7145	**Phone:** 803-952-4960
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Rad Materials Return from OFF-Site Laundry **Major Waste Type:** Low Level Waste

PPOA ID Code: SRS-070 A&ID LAUNDRY **Specific Waste Type:** Laundry

Date: 19-sep-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Handling

Description: The off-site laundry subcontractor returns all items found with Rad count above acceptable limits. Site personnel are required to identify this materialÕs source and dispose of as LLW. Identifying the materialÕs source to allow disposal as LLW is very difficult.

Options: Option 1: Probe returned items to confirm laundered material is above Rad limits . If the Òabove limitsÓ not confirmed return items to service.Option 2: Dispose of returned waste directly into a purple B-25 rather than in a 21 inch cube compactable waste box.Option 3: Clear tags and dispose of as associated waste in landfill rather than LLW.Option 4: Renegotiate contract to require INS to probe items before returning items.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** David M. Butler, Sr.
Phone: 803-952-7145	**Phone:** 803-952-4498
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Washable Job Control Materials **Major Waste Type:** Low Level Waste

PPOA ID Code: SRS-071 A&ID LAUNDRY **Specific Waste Type:** Laundry

Date: 19-sep-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Handling

Description: Damaged washable job control clothes are discarded, creating substantial laundry waste.

Options: Option 1: Provide on-site job control clothes repair as part of laundry group. Option 2: Have off-site subcontractor laundry provide job control clothes repair as part of their contracted services.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** David M. Butler, Sr.
Phone: 803-952-7145	**Phone:** 803-952-4498
Fax: 803-952-8383	**Fax:**

Email: BX940@cleveland.freenet.e	**Email:**

Title: Tritium Facility Waste Volume Reduction **Major Waste Type:** Low Level Waste

PPOA ID Code: SRS-072 TRITIUM DEFENSE PROGRAM **Specific Waste Type:** Air Emissions

Date: 22-sep-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Handling

Description: Tritium Facility offgassing LLW, although compactable, is sent directly to LLW disposal. The LLW cannot be compacted by SRS compactors which do not have provision to handle the contaminated gas.

Options: Install a compactor at the Tritium Facility to compact offgassing LLW thus reducing waste volume.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** Craig Johnson
Phone: 803-952-7145	**Phone:** 803-557-1800
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Magnesium Bed Waste **Major Waste Type:** Low Level Waste

PPOA ID Code: SRS-073 TRITIUM DEFENSE PROGRAM **Specific Waste Type:** Resins

Date: 22-sep-1995 **Major Activity Type:** Manufacturing **Specific Activity Type:** Recovery

Description: Magnesium beds are used in the Tritium Facility Building 232-H Zeolite Bed Recovery System. The magnesium beds are consumable items that have an operational life expectancy of 15. days. When exhausted they occupy 90 cu. ft. (one B-25 box) of Intermediate level disposal vault space.

Options: Install a palladium membrane reactor (PMR) in place of the magnesium bed.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** Craig Johnson
Phone: 803-952-7145	**Phone:** 803-557-1800
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Shoe Covers **Major Waste Type:** Low Level Waste

PPOA ID Code: SRS-074 NMSP H-CANYON **Specific Waste Type:** Personal Protective Equipment

Date: 20-sep-1995 **Major Activity Type:** Environmental Restoration **Specific Activity Type:** Decontamination

Description: PC requirements for H-Canyon tasks vary from lab coat with plastic [polyvinylchloride] shoe covers to the most elaborate Òdressing outÓ that includes multi-shoe covers.

Options: Eliminate the use of PVC shoe covers in H-Canyon and replace with washable, reusable rubber overshoes.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** R. W. Jackson
Phone: 803-952-7145	**Phone:** 803-557-8954
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Sorting Off-Site Laundry Rejects **Major Waste Type:** Low Level Waste

PPOA ID Code: SRS-075 A&ID LAUNDRY **Specific Waste Type:** Personal Protective Equipment

Date: 19-sep-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Handling

Description: The off-site laundry service returns unlaunderable material separately to the site for disposal. Disposable gloves and other job control clothing are worn when sorting this material.

Options: Replace disposable gloves with launderable gloves.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** David Butler, Sr.
Phone: 803-952-7145	**Phone:** 803-952-4498
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Materials Unacceptable at Off-Site Laundry **Major Waste Type:** Low Level Waste

PPOA ID Code: SRS-076 A&ID LAUNDRY **Specific Waste Type:** Personal Protective Equipment

Date: 19-sep-1995 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Handling

Description: Although this is an A&ID assessment the process described includes operations in the individual facilities.In this process the individual facilities personnel include unlaunderable materials in with the washable materials sent to the off-site laundry subcontractor facilities. These items are returned to the site separate from the clean laundry and are eventually distributed to the source facility by A&ID.

Options: Option 1: To eliminate material returns, each facility to examine and certify laundry as free from unlaunderable materials.Option 2: Revise Rad worker training to put HEAVY emphasis on care in not putting non-launderable materials in used job control clothing containers and that the right items go into the right bins.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** David M. Butler, Sr.
Phone: 803-952-7145	**Phone:** 803-952-4498
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Fluorescent light retrofit. **Major Waste Type:** Hazardous Waste

PPOA ID Code: SRS-077 A&ID BLDG RETROFIT **Specific Waste Type:** Fluorescent Lamps

Date: 25-sep-1995 **Major Activity Type:** Maintenance **Specific Activity Type:** Maintenance, Building

Description: 36 buildings and 14 trailers were surveyed to identify fluorescent light fixtures that could be upgraded with more energy-efficient tubes. As a result 40,000 fluorescent tubes and 20,000 ballasts will be replaced over the next 9 months. Generation of the replaced bulbs and ballasts is a one-time event.

Options: Option 1: Dispose of replaced ballasts in a municipal solid waste landfill. Ballasts manufactured after 1979 do not contain PCBÕs and can be put in a dumpster. This material has no recycle value. Buildings have been identified in which ballasts manufactured before 1979 could potentially be found . A PCB control program has been initiated.Option 2: Donate bulbs to other DOE sites, or the State of South Carolina. Rejected because neither DOE sites nor South Carolina will accept used bulbs.Option 3: Crush and dispose of the bulbs per site procedures. Option 4: Send the bulbs to an off-site recycler. Procurement is soliciting proposals for recycling the bulbs at this time. The cost of this option has not yet been determined.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** Tad Dickinson
Phone: 803-952-7145	**Phone:** 803-725-7427
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: 234H Receiving Wastes **Major Waste Type:** Low Level Waste

PPOA ID Code: SRS-078 TRITIUM DEFENSE PROGRAM **Specific Waste Type:** Cardboard

Date: 22-sep-1995 **Major Activity Type:** Manufacturing **Specific Activity Type:** Packaging

Description: A variety of materials are delivered to the Tritium packaging room for unpacking. The room is considered to be an RMA and all waste materials - the unpacked boxes, packing materials, wrappings etc. are disposed of as LLW.

Options: Option 1: Establish clean areas for opening of boxes and accumulation of other waste from receiving of non-radioactive shipments.Option 2: Revise procedures to provide for clean area unpacking and moving materials into and out of RBA.Option 3: Establish waste collection color codes and displayed lists of materials that may be accumulated in clean areasÕs.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** Craig Johnson
Phone: 803-952-7145	**Phone:** 803-557-1800
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: D&D OF M-AREA EQUIPMENT **Major Waste Type:** Low Level Mixed Waste

PPOA ID Code: SRS-079 ERD M-AREA **Specific Waste Type:** Equipment

Date: **Major Activity Type:** Environmental Restoration **Specific Activity Type:** Decontamination

Description: The closure of M-Area Settling Basin was performed by OHM Corp. in 1989. Upon completion of field activities, equipment was decontaminated of hazardous constituents per an approved closure plan. However, certain pieces of equipment could not be cleaned of the uranium and consequently were not released by HP. An evaluation of the equipment was made and determined that the equipment required too much refurbishment to make it operational. A verbal agreement was established between ERD and Reactor HP to store the equipment at 105-R until the facility was turned over to D&D and ERD for decommissioning and remediation. The equipment was visually inspected and it was determined that the pieces of equipment were potentially contaminated with F006 waste from M-Basin. The equipment which had F006 sludge on it was considered to be mixed waste. This sludge had to be removed and the equipment then had to be deconned to make it LLW. There were 17 pieces of equipment at this time and 11 pieces were deconned and disposed of. This leaves 6 pieces which are discussed in this PPOA.. The total volume of this equipment is 13,232 cubic feet. The 6 pieces of equipment, are LLW and some with F006 listed waste attached, that will need to decontaminated, cut up and disposed of, they are: 1) D6 Cat, 2) Mudcat, 3) Filter Press, 4) Mud tank, 5) Mud Tank, 6) Sheepsfoot compactor. Some waste will go to the Burial Ground, MWSF, and LLW Scrap Metal.

Options: Option 1: REFURBISH EQUIPMENT: it was estimated to refurbish the D-6 Cat the cost was $270,000 and to buy a new one was $150,000. The remainder of equipment falls under the same problem.Option 2: Send all MW waste to MWSF. There would be approximately 7632 ft3 if no deconning is done.Option 3: Send all deconned LLW equipment to EAVs. There would be approximately 13,059 ft3 of LLW waste if this is done.Option 4: Macroencapsulate entire bulldozer. This would result in 3024 ft3 of MW if this is done.Option 5: Remove blade from bulldozer. This would result in 128 ft3 of MW.Option 6: Review drawings of blade to see if contamination could be isolated in blade due to design. If so cut out section of blade that has F006 contamination.Option 7: Remove front of blade and decon, (removing the F006 waste leaving the blade as LLW).Option 8: Send sludge and blade to M-Area Melter.Option 9: Send decon water and sludge to M-Area.Option 10: Reuse hepa filter that SWMD has.Option 11: Use strip coat on huts. This will allow the hut to be used and the waste will be reduced to approximately 1ft3 from about 90 ft3.Option 12: Reuse tools. Store in an RMA after project is complete to be used again.Option 13: Use washable tarps and washable PPE. This will reduce the amount of PPE waste to 15 ft3.Option 14: Use glove box on cutting up blade. This will eliminate the use of a hut.Option 15: Send LLW scrap metal to Carolina Metals to be melted down and made into boxes to store the LLW in.

Site: Savannah River Site	
Site Coordinator: Peter L. Nowacki	**Team Leader:** Doug Weaver
Phone: 803-952-7145	**Phone:** 803-644-6764
Fax: 803-952-8383	**Fax:**
Email: BX940@cleveland.freenet.e	**Email:**

Title: Low Level Waste Treatment Facility **Major Waste Type:** Low Level Waste

PPOA ID Code: WV-1 **Specific Waste Type:** Sludge

Date: 15-feb-1994 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Treatment

Description: An evaluation was performed to characterize the waste streams associated with the Low Level Waste Treatment Facility (LLWTF) and to develop technically and economically feasible opportunities to minimize the volume of treated effluent, wet resin, and sludge generated at the LLWTF. The LLWTF process uses clarification, filtration, and ion exchange to remove contaminants from wastewater before it is discharged to the environment. The waste stream is essentially water with small amounts of dissolved solids and trace quantities of radiological impurities.

Options: Option 1: Reduce Non-radioactive Water Additions to Plant Drain System: Modifypumps to use mechanical seals to reduce controlled leakage (leakoff). Recycle water by redirecting the output. Option 2: Reduction of Rainwater Additions to the Lagoon System: Possible modifications include building shelters over the lagoons and/or regrading the groundsurrounding the lagoons to redirect clean water away from the lagoon system. Option 3: Regenerable Ion Exchange Media. Replacing the current type of ion exchange media with one that can be regenerated. Option 4: Modify Chemical Additions to Reduce Sludge. Potassium ferrate, potassium hydroxide, sodium carbonate, and polyelectrolytes can be used to enhance the system's performance. Option 5: Reduce Radioactive Sources from Plant Drain Systems. Sourcereduction/recycling opportunities will be evaluated. Also, an employee awareness and incentive program for waste minimization/pollution prevention is being developed.

Option 6: Modify Treatment System to Include Evaporation Step. Option 7: Reduce the Amount of Ion Exchange Media Used Per Run. Re-engineer the ion exchange columns. Option 8: Waste Tank Farm and NRC Licensed Disposal Area PPOAs. PPOAs suggested to determine possible source reduction opportunities.

Site: West Valley Demonstration Project	
Site Coordinator: Sally Kalamanka	**Team Leader:** Sally Kalamanka
Phone: 716-942-4009	**Phone:** 716-942-4009
Fax: 716-942-4473	**Fax:** 716-942-4473
Email:	**Email:**

Title: Vitrification Cold Chemical System **Major Waste Type:** Hazardous Waste

PPOA ID Code: WV-2 **Specific Waste Type:** Acid

Date: 25-apr-1994 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Treatment

Description: Evaluate and develop technical and economically feasible opportunities to minimize the volume of waste generated at the Vitrification Cold Chemical System. The Cold Chemical System is a batching plant for the preparation and transfer of non-radioactive slurries, decontamination solutions, and water to the vitrification hot cell during the integrated testing and hot operations phases of the vitrification campaign. The following is an input/output summary for the system: Principal Input Materials: Nitric Acid; Sodium Hydroxide; Demineralized Water; Potential Waste Streams: Off spec batches; Washdown Water; Miscellaneous Process Water; and Primary Products: Glass Formers; Waste Simulant; and Decontamination Solution.

Options: Option 1: Reuse chemical shipping drum onsite. Option 2: Prevention of outdated chemicals. Chemicals will be properly rotated per expiration date and also partial containers will be used. Option 3: Return chemical shipping drums to vendor for reuse. Drums can be reused approximately two more times before structural integrity is questioned. Option 4: Recycle off-specification Slurry for possible reuse. Option 5: Reuse water for tank calibrations. If each tank was calibrated, 85,000gallons of water would be used. By reusing the water to calibrate each of the nine tanks, only 20,000 gallons of water is required. Option 6: Change oil based on total run time vs. elapsed time. Currently, the preventive maintenance program specifies that the oil be changed on scheduled calendar intervals. Because the system is a batch operation, it was suggested that the preventive maintenance program be revised to schedule oil changes based on actual runtime to prevent unnecessary oil changes. To monitor the run times, hour meters could be installed on the equipment or operator logs may be utilized. Option 7: Volume reduce fiberboard box from chemical deliveries. Option 8: Reduce the number of tyvex suitups used. Replace with washable, reusable rainsuits. Option 9: Replace disposable Scale Room exhaust filters with washable, stainless steel filters.

Site: West Valley Demonstration Project	
Site Coordinator: Sally Kalamanka	**Team Leader:** Sally Kalamanka
Phone: 716-942-4009	**Phone:** 716-942-4009
Fax: 716-942-4473	**Fax:** 716-942-4473
Email:	**Email:**

Title: NRC Licensed Disposal Area **Major Waste Type:** Low Level Waste

PPOA ID Code: WV-3 **Specific Waste Type:** Personal Protective Equipment

Date: 09-sep-1994 **Major Activity Type:** Waste Management **Specific Activity Type:** Waste Management, Storage

Description: Evaluate the activities performed at the NRC Licensed Disposal Area (NDA) and ifpracticable, develop technically and economically feasible opportunities to minimize the volume of waste generated. The NDA was used for disposal

of radioactive wastes other than high level radioactive wastes from fuel reprocessing. The following is an input/output summary for the disposal area: Principal Input Materials: Suitup Materials, Sample Bottles, Rain/Ground Water;Waste Streams: LLW Suitup Material (solid), LLW Effluent (liquid); and Primary Products: Samples.

Options: Option 1: Reroll the trench cap. Leachate is produced from rain and groundwater. The amount has increased by 74% from 1991 to 1994. Trench was initially capped and needs rerolling to recompact the surface.

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Site Coordinator: Sally Kalamanka	**Team Leader:** Sally Kalamanka
Phone: 716-942-4009	**Phone:** 716-942-4009
Fax: 716-942-4473	**Fax:** 716-942-4473
Email:	**Email:**

Title: Vitrification Cold Laboratory Support of the Scaled Vitrification System

Major Waste Type: Hazardous Waste

PPOA ID Code: WV-4

Specific Waste Type: Personal Protective Equipment

Date: 16-aug-1995 **Major Activity Type:** Laboratory **Specific Activity Type:** Laboratory, Chemical

Description: Contains a process description of the Scaled Vitrification System (SVS) and the Analytical and Process Chemistry (A&PC's) support of SVS, a description of the data collection process, a material balance, a process flow diagram, waste characterization, and the waste minimization opportunities identified for support of SVS. A&PC will provide SVS support that will include analyzing the waste simulant at the various stages. It is this support that is the focus of this PPOA.

Options: The following minimization opportunities do not address changing the procedures in the analytical methods, but rather changing how the current procedures are conducted: 1) keep the idle time for the inductively coupled plasma (ICP) to a minimum; 2) turning off the argon when the ICP is not in use; 3) use of dedicated plasticware, which will reduce the need for precleaning; 4) use an acid presoak vat for cleaning glassware; 5) replacing Wypalls, used as equivalent to paper towels, with a smaller towel that is just as absorbent; and 6) skindex gloves are sometimes disposed of as radioactive waste. No radioactive materials are handled, so extra paperwork and manpower could be avoided, if gloves are color coded.

Site: West Valley Demonstration Project	
Site Coordinator: Sally Kalamanka	**Team Leader:** Frank Barber
Phone: 716-942-4009	**Phone:** 716-942-4761
Fax: 716-942-4473	**Fax:** 716-942-4946
Email:	**Email:**