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Non-Storm Water Discharges Technical Report

July 1994

Sandra Mathews

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1.0 Introduction

Lawrence Livermore National Laboratory (LLNL) submitted a Notice of Intent to the California State Water Resources Control Board (hereafter State Board) to discharge storm water associated with industrial activities under the California General Industrial Activity Storm Water National Pollutant Elimination System Discharge Permit (hereafter General Permit). As required by the General Permit, LLNL provided initial notification of non-storm water discharges to the Central Valley Regional Water Quality Control Board (hereafter Regional Board) on October 2, 1992. Additional findings and progress towards corrective actions were reported in subsequent annual monitoring reports. LLNL was granted until March 27, 1995, three years from the Notice of Intent submission date, to eliminate or permit the non-storm water discharges.

On May 20, 1994, the Regional Board issued Waste Discharge Requirements (WDR Board Order No. 94-131, NPDES No. CA0081396) to LLNL for discharges of non-contact cooling tower wastewater and storm water related to industrial activities. As a result of the issuance of WDR 94-131, LLNL rescinded its coverage under the General Permit. WDR 94-131 allowed continued non-storm water discharges and requested a technical report describing the discharges LLNL seeks to permit. For the described discharges, LLNL anticipates the Regional Board will either waive Waste Discharge Requirements as allowed for in *The Water Quality Control Plan for the California Regional Water Quality Control Board, Central Valley Region* (hereafter Basin Plan) or amend Board Order 94-131 as appropriate.

1.1 Site Location

LLNL's Experimental Test Site, Site 300 is operated by the University of California for the U.S. Department of Energy. Site 300, established in 1955, is located about 25 kilometers (15 miles) southeast of Livermore and 13 kilometers (8.5 miles) southwest of Tracy in the Altamont Hills. Site 300 is approximately 2,800 hectares (7,000 acres), with the western portion in Alameda County and the remainder of the site and all the buildings in San Joaquin County. Figure 1-1 locates Site 300 relative to local points of reference and Figure 1-2 is a site map.

1.2 Wastewater Disposal System

Site 300's remote location limits the wastewater disposal options available. No local publicly owned treatment works (POTW) is available to accept domestic or industrial wastewaters from Site 300. Domestic wastewater is disposed of on-site in septic systems and a sewage evaporation and percolation pond. Rinse water from explosive processing evaporates in two Class II surface impoundments. Engineered percolation pits for contact cooling wastewater are under design and will be constructed by December 1994.

ERD-S3R-92-0513

Figure 1-1. Location of LLNL's Site 300.

Figure 1-2. Site 300 Building Location Map.

These disposal systems have limited capacity and limits on wastes that can be discharged into them.

In addition to WDR 94-131, several regulatory permits govern activities at Site 300.

1.3 Other Regulatory Permits

Waste Discharge Requirements and National Pollutant Discharge Elimination System Permits	
WDR 91-052 NPDES # CA0082651	Discharges of treated ground water to Corral Hollow Creek (part of the CERCLA remediation project).
WDR 85-188	Discharges of domestic and industrial wastewaters to land treatment units (evaporation ponds and septic systems).
WDR 93-100	Defines the ground water monitoring program for Resource Conservation and Recovery Act closed landfill pits 1 and 7.

Comprehensive Environmental Response, Compensation and Liability Act Substantive Requirements	
Central General Services Area Removal Action	LLNL Site 300, San Joaquin County. California Regional Water Quality Control Board, Central Valley Region. December 17, 1993.
Building 834 Removal Action	LLNL Site 300, San Joaquin County. California Regional Water Quality Control Board, Central Valley Region. December 31, 1993.

Resource Conservation and Recovery Act Permit	
CA2890029002	Treatment Storage and Disposal Facility permit for hazardous waste generated at Site 300 issued by California Environmental Protection Agency, Department of Toxic Substances Control.

A Report of Waste Discharge was submitted by LLNL in June 1994 to amend WDR 85-188 at the Regional Board's request. As required, LLNL obtains coverage under the California General Construction Activity Permit for projects of five acres or larger. Currently there is one project meeting the five-acre threshold at Site 300, the Do-All Road Improvement Project, WDID identification No. 5B39S303589.

1.4 Non-Storm Water Investigations

Under the storm water regulations, an inappropriate connection is any potable, process, or wastewater connection to a storm drainage system. These connections are also referred to as non-storm water discharges.

LLNL recognized the likelihood of inappropriate building drain connections due to the age of the facilities and numerous modifications to meet changing research and development needs. Prior to submitting its General Permit Notice of Intent in 1992, LLNL initiated two comprehensive investigations to identify non-storm water discharges: the Building Drain Investigation and the Storm Water Assessment. These two studies identified existing sources and potential conduits for non-storm water discharges to the environment. The Regional Board was informed of sources and conduits identified in these investigations initially in LLNL's October 2, 1992, letter and updated in subsequent annual monitoring reports required by the General Permit. With the exception of hydrant flushing, occasional flushing of large water pipes after construction or maintenance, and water tank maintenance, none of the discharges flow beyond Site 300 boundaries. The majority of the discharges amount to no more than a continuous drip that quickly evaporates or percolates into the soil within a few feet of the discharge point.

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2.0 Building Sources and Conduits

During 1992 and 1993, LLNL conducted an extensive investigation of building drain connections, testing almost 4,000 drains. The investigation revealed approximately 300 drains inappropriately connected to surface water drainage courses. The investigation methods used included visual observation, dye testing, and other forms of tracing, such as popcorn. Deficiencies are being eliminated through the Building Drain Repair Project, and most repair work should be complete by the autumn of 1994. Several sources and conduits were determined not to pose a threat to the beneficial uses of the receiving waters. These sources and conduits, which LLNL seeks to permit, are described in the remainder of this section.

2.1 Floor Drains and Floor Sinks

LLNL identified and reported the existence of several building conduits (floor drains and floor sinks) designed to discharge to the storm drainage system. A review of the facilities where the conduits existed demonstrated most conduits could be eliminated. However, at 15 buildings it was not possible to eliminate all the conduits for safety reasons or unjustifiable expense to reroute the drain lines.

Conduits designated by the Building Drain Repair Project review are to remain open; the discharges entering the conduits, proposed to continue, are listed in Table 2-1. Most of the conduits are located in mechanical equipment rooms containing electrical or other equipment sensitive to water damage. Frequently, mechanical equipment discharges are routed to the conduits resulting in a discharge to the storm drain system. In addition, the conduits, are needed in the event of a pipe break to evacuate water from the room in a safe manner. Sources, in general, flowing into the conduits are described in Section 2.2 and analytical data are provided in Section 6.0.

The primary concern with internal conduits to the storm drainage system is the potential for spills within buildings to reach the storm drainage system. Recognizing this potential, LLNL is in the process of instituting the following procedures to minimize the potential of significant materials from being released to the storm drainage system.

1. Facility Safety Procedures will identify all rooms having conduits that discharge to the environment and will provide instructions to not dump any materials into the conduit and to clean spills immediately.
2. Conduits discharging to the environment will be so labeled.
3. Storage of chemicals will be discouraged in rooms with conduits that discharge to the environment. Where such storage is necessary, secondary containment and spill response kits will be required. Any spill inside these rooms will be responded to as if it were an outdoor spill.

Table 2-1. Building Conduits to the Storm Drain System.

Bldg.	Conduit	Room	Comments
806 B	Floor drain	129	See note.
	Floor sink	129	
	Floor sink	129	
810 B	Floor drain	100	Inspector test valves.
827 A	Floor sink	B101	See note.
	Floor sink	B101	
	Floor sink	B101	
	Floor sink	B101	
	Floor sink	B101	
	Floor sink	B107	
	Floor sink	B107	
827 C	Floor drain	202A	See note.
	Floor sink	102	
	Floor sink	102	
827 D	Floor sink	102	See note.
	Floor sink	102	
	Floor drain	202A	
827 E	Floor sink	102	See note.
	Floor sink	102	
	Floor drain	202A	
	Floor drain	202A	
830	Floor drain	104	See note.
	Floor drain	104	
833	Floor drain	107	See note.
834 D	Floor drain	Under equipment cover	See note.
836 B	Floor drain	201	Discharge to 20 ft. x 20 ft. gravel pit. See note.
	Floor drain	203	
836 D	Deck drain	Outside Room 102	The deck drain is outside the building and drains a back-flow preventor, hose bib and roof drain as well as rain water away from the building.
851 A	Floor drain	All in area east of Room 215	Floor drains and sump pump receive inspector test valve water. The sump pump also receives air conditioner condensate.
	Floor drain		
	Sump pump	130	
854 H	Floor drain	B100	See note.
854 J	Floor drain	109	See note.
883	Catch basin	1000	Emergency eye wash.
	Catch basin	1000	

Note: All floor sinks and/or floor drains are necessary due to electrical power equipment and are in mechanical equipment/storage room(s). Typical equipment includes: heating ventilation air conditioning system, vacuum pumps, boiler system, compression air system, inspector test valves, hose bibs, backflow preventors.

4. Cleaning of floors in rooms with conduits that discharge to the environment will be limited to sweeping and damp mopping only.

2.2 Equipment Sources

In addition to conduits to the storm drain system, LLNL reported that several types of mechanical equipment discharge either into a conduit, such as a floor drain, or directly to ground, often into a surface water drainage course. For the most part, the equipment is located in the mechanical equipment rooms described in Section 2.1. However, on occasion, equipment is located outdoors with a direct discharge.

The types of mechanical equipment discharging with the possibility of entering a surface drainage course are described in the remainder of this section.

Make up water for all equipment sources is currently supplied by on-site ground water wells treated for use as drinking water. LLNL expects to switch to Hetch-Hetchy water as soon as negotiations conclude between the Department of Energy and the San Francisco Water Department regarding the contract for potable water service. Throughout this section discharge volumes and chemical treatments are those currently used. We anticipate lower discharge volumes and different chemical treatments after the change in water supply.

2.2.1 Compressed Air Systems

Compressed air systems typically include the following components: air compressor, filter drains (on air lines), air tank, air dryer or humidifier, water softener tank (water for use in humidifiers is softened). These systems are used throughout Site 300, providing compressed air for both experiments and mechanical equipment. With the exception of discharges from the humidifier and water softener tank, all routine discharges from an air compression system are condensed water vapor. See Appendix A for a schematic diagram of a typical air compression system.

Air Compressors: Condensate removed in the compression process collects in a reservoir in the compressor and drains as needed. Some air compressors are oil free design, but most are not. In those containing oil, the oil can migrate into the reservoir to mix with condensate water creating a milky white emulsion. As soon as white discharge is noticed, it is contained in carboys and handled by the Hazardous Waste Management Division for disposal.¹ Compressor oil is a 20-weight petroleum product. Regular maintenance prevents discharge of the oil/water mixture to surface drainage courses. LLNL would follow normal spill response and cleanup procedures in the event an air compressor discharged the oil/water emulsion to a surface drainage course.

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¹ It should be noted that, due to the remote location of Site 300, liquid waste deemed inappropriate for disposal into one of the on-site waste disposal systems is handled and transported off-site to appropriate disposal sites by the Hazardous Waste Management Division, whether or not the liquid waste is, in fact, hazardous.

Humidifiers: Depending on the use of the particular air compression system and atmospheric conditions, compressed air is either humidified or dried. Drinking water is treated with a water softener for use in the humidifier. Humidifiers blow down a maximum of ten gallons approximately every seven days.

Air Dryers: Air dryers extract additional water vapor from the condensed air when required. The condensate discharge from these units is discharged as needed, and volumes vary depending on water vapor content of the air.

Water Softeners: Water softeners are used to prevent excessive scale build up in the humidifier and compressed air lines. The softener tank blows down on a timer, approximately every other day, with an approximate maximum discharge of 50 gallons. Currently drinking water supplied to the humidifier is softened with sodium chloride (NaCl). It is likely the softener will be changed or discontinued after the conversion to Hetch-Hetchy water, due to the anticipated lower hardness. A Material Safety Data Sheet (MSDS) for the water softener is in Appendix B.

Filter drains: Filter drains on the air compression system are designed to evacuate any condensate that builds up in the delivery lines. No more than 1/2 cup of condensate would discharge from these drains.

2.2.2 Boiler Systems

Boiler systems typically include: a low or high pressure boiler vessel, water tank, water feed pump, water filter, separation tank(s), condensate tank, and condensate pump. Boilers are used throughout Site 300 to supply heat and steam for building heating ventilation, air conditioning systems, as well as experimental equipment needs. See Appendix A for a schematic diagram of a typical boiler system. In addition to blow-down discharges from boiler systems, most tanks or vessels, for safety reasons, are equipped with a temperature/pressure relief valve, which may result in a discharge if the vessel becomes over pressurized. The relief valve is a safety feature and no routine discharges are expected from this valve.

Vessels: Boiler vessels blow down three times a day with a maximum discharge of approximately 50 gallons. Boiler make-up water is treated with an oxygen scavenger and a corrosion inhibitor and a chelating agent to prevent excessive oxidation of internal system components. MSDSs for the treatment chemicals currently used in boiler systems are provided in Appendix C.

On occasion, boiler vessels are drained to perform maintenance. When drained for maintenance, the liquid contents are collected and handled by the Hazardous Waste Management Division.

Water Tank: The water tank is the holding vessel for water supplied to the boiler system. Tanks can have an external temperature/pressure relief valve and a drain valve.

Water Feed Pump: The water feed pump moves water into the heat source. Pumps can have an external temperature/pressure relief valve and a drain valve. There is no routine discharge from this equipment.

Water Filter: Water filters are typically placed before major mechanical equipment system components to protect the equipment. Water filters have a drain valve. Valves are manual and only opened during maintenance activities.

Separator Tanks: Liquid and steam water phases are separated. Steam is pumped out for use and liquid is returned to the system. Tanks can have an external temperature/pressure relief valve and a drain valve.

Condensate Tank: Condensed water vapor collection point. Tanks can have an external. There is no routine discharge from this equipment.

Condensate Pump: Condensate pumps move water from the condensate tank back into the water tank for reuse in the system. Pumps can have an external temperature/pressure relief valve and drain valve.

2.2.3 Vacuum Pumps

Vacuum pumps are used throughout Site 300 to create negative pressure environments for experiments. Of the three types of vacuum pumps used by LLNL, one type, the liquid ring seal vacuum pump, creates a seal with water and discharges 2 to 16 gallons per minute continuously, depending on the use and load on the pump. See Appendix A for a schematic diagram of a typical liquid ring seal vacuum pump. The other two types, mechanical seal and oil seal vacuum pumps, have no discharge. Liquid ring seal vacuum pumps are being phased out by LLNL due to water conservation requirements. With the liquid ring seal vacuum pumps, there is a slight possibility that process water can get into the seal water if the filters become clogged. Preventative maintenance practices prevent filter clogging. LLNL would follow normal spill response and cleanup procedures in the event a vacuum pump discharged any process water to a surface drainage water course.

2.2.4 Heating Ventilation Air Conditioning System

Heating ventilation air conditioning (HVAC) systems include air conditioning and heating systems. The heating systems have been described in Section 2.2.2. The only discharge from the air conditioning system is condensate extracted from the air in the cooling process. Volumes of condensate discharge varies depending on the system size, heating, load, and atmospheric conditions. In all cases, the condensate discharge is a continuous drip (at most), which quickly evaporates or percolates into the soil. See Appendix A for a schematic diagram of a typical HVAC system.

2.2.5 Domestic Hot Water Heaters

Domestic hot water heaters are used throughout Site 300 to supply hot water to sinks, showers, and kitchen facilities. Domestic hot water heaters are equipped with drain valves for maintenance and a temperature/pressure relief valve. There are no routine discharges from this system. See Appendix A for a schematic diagram of a typical domestic hot water heater.

2.2.6 Cooling Tower Maintenance Discharges

Required preventative maintenance is performed on all the cooling towers annually. The maintenance involves draining all water in the tower to surface water drainage courses. Table 2-1 provides rough estimates of the capacity of the tower in gallons. The capacity of the tower is the maximum volume discharged in the maintenance operation. The treated water typically has a total dissolved solids concentration of approximately 7,500–10,000 mg/L, which is above the normal operational range of the tower and above the permitted blowdown limits of the towers. The permitted daily maximum TDS concentration for the cooling towers 865, 801, and 836D is 2,000 mg/L, the other 14 towers have a maximum of 5,000 mg/L. In addition to the 17 towers under Waste Discharge Requirements, 5 towers that routinely drain into either septic systems or the sewage evaporation ponds are drained to surface water drainage courses during maintenance. After draining, internal walls, diffusers, intake screens and Y strainers in the cooling tower tank are scraped clean. Sludge and all solids are swept from the tower and contained and sampled to determine the proper disposal method. Intake valves are then plugged and the tower is refilled to operating levels, treated and returned to operation. Staff has noted that the TDS range for one to two days after cleaning occasionally exceeds the above noted permitted daily maximum. Staff believes the exceedence of the TDS limit could be avoided by flushing the tower with potable water after scraping. However, this would result in additional water, with high TDS and TSS concentrations being discharged to surface water drainage courses in the maintenance operation. It is expected that the amount of water discharged from this operation would not exceed the capacity of the cooling towers.

Table 2.2. Estimates of the Capacity of the Tower in Gallons.

Tower	Tank Capacity (gals)
850	150
851 #1	175
851 #2	90
854	400
865	20,000
801	600
802	120
812	120
805	45
809	45
810	45
815	75
817	40
825	30
826	45
827 #1	150
827#2	150
828	30
834 A	150
836 A	1,200
836 D	400
875	80

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3.0 Potable Water System

LLNL maintains the pumping, treatment, storage, and distribution system for potable water at Site 300. Currently, Site 300 utilizes two on-site ground water wells (Wells 18 and 20) and treats the water for use as potable water. LLNL expects to switch to Hetch-Hetchy water as soon as negotiations have concluded between the Department of Energy and the San Francisco Water Department regarding the contract for potable water service. After the conversion to Hetch-Hetchy water, Wells 18 and 20 will remain in service as a backup water supply. Discharges from the potable water system are described in the remainder of this section.

3.1 Drinking Water Tanks

Eleven drinking water storage tanks are cleaned every five years on rotation (two or three tanks are cleaned each year.) Water contained in the tanks must be discharged to ground for the maintenance work. After discharging the water in the tank to ground, silt is removed and the tank is flushed with potable water. The floor level of the tank is super-chlorinated and re-filled with potable water. Records of the maintenance activity are kept by the Site 300 Maintenance and Operations Division. Table 3-1 provides the capacity of the drinking water storage tanks at Site 300.

Table 3-1. Estimates of the Capacity of the Tanks in Gallons.

Tank	Capacity (gals)
1	63,000
2	126,000
3	63,000
4	63,000
5	63,000
6	63,000
7	113,000
8	63,000
9	165,000
10	94,500
11	240,000

3.2 Water Piping

Routine discharges from water lines are not required for system maintenance. Occasionally, however, valves and connections may require testing. If this is required, small volumes of potable water may be discharged.

3.3 New Water System Pipes and Broken Line Replacement

New water lines and replacement lines must be flushed and disinfected after installation. Flushing is done with potable water (approximately 0.2 ppm residual chlorine). Disinfection requires the residual chlorine to be elevated to and maintained at 100 ppm. Where possible, the super-chlorinated water is collected and de-chlorinated prior to discharge to surface water drainage courses. When necessary to discharge super-chlorinated water to ground, precautions are taken to ensure the water does not enter any surface water body.

3.4 Backflow Preventors

Backflow preventors must be tested annually to comply with plumbing and California Code of Regulations Title 17 requirements. During annual testing, approximately one quart of potable water is discharged to ground.

3.5 Well 18 Sand Filter Backwash

To prevent excessive sand from entering the drinking water system at Site 300, LLNL plans to install a Lakos AXL Separator (Model # AXL-0300-B) on Well 18. Well 18 is the backup water supply well for Site 300. LLNL, currently procuring the equipment, plans installation by the end of September 1994. The sand filter will purge sand and well water to a container adjacent to the well. Purged sand will be filtered from the water and collected for proper disposal, while the water will percolate into the ground with a slight possibility of entering a storm drainage channel. Purges from the sand filter occur before the chlorination system; therefore, only ground water will be discharged.

Since the system has not been installed, the frequency of backwashing is still unknown. Preliminary design estimates 5-10 gallons of water containing 1-2 cups of sand will be purged from the system daily. The system will be adjusted to optimum operating conditions during the first two months of operation, after which actual discharge volumes will be known. After the adjustment period, the system will be purged on a timer or pressure indicator.

Currently, Well 18 serves as Site 300's backup water system and is used only when the primary source, Well 20, is not operating. When Hetch-Hetchy water service is extended, Wells 18 and 20 will serve as the backup water source in the event of Hetch-Hetchy service outages.

Design drawings and manufacturer's information on the proposed system are included in Appendix D.

4.0 Fire Suppression and Safety Systems

4.1 Building Sprinkler Systems Tests

Building sprinklers, maintained in all buildings for the protection of personnel and property, must be tested to ensure proper operation of both the electronic alarm system and plumbing. LLNL utilizes two types of systems: sprinkler systems and deluge systems. No chemicals are added to the fire suppression system. In all sprinkler testing, the Fire Department's procedures require care to ensure property damage, including erosion, does not result from the water flow. Tests required on these systems are described below.

Inspector Test Valves: Building sprinkler systems are tested monthly through a half-inch inspector test valve to ensure proper operation of the electronic alarm signal and assure there is water in the system. Inspector test valves were referred to as fire auxiliaries in previously submitted reports on non-storm water discharges. Buildings are typically divided into zones, with each zone having a test valve; the largest building at Site 300 has 12 valves. The test valve is run for 45 to 90 seconds at approximately 80 psi (pounds per square inch) resulting in the discharge of approximately 50 gallons of water per test valve. In the unusual circumstance a system fails the test, the valve would be run for a maximum of three minutes.

Main Drain Test: A main drain is located on every sprinkler system; buildings may have more than one sprinkler system. Main drains are tested monthly, with each drain test discharging between 20 and 50 gallons of potable water.

Deluge Valve: Deluge valve sprinkler systems are located in buildings and at equipment particularly vulnerable to fire risk. Deluge systems have no water in the lines and sprinkler heads remain open. The deluge valve supplies water to the system. The system is tested annually during which up to 50 gallons of potable water per sprinkler head is discharged. Each test could entail the discharge of several thousand gallons of potable water.

4.2 Hydrant Testing

Site 300 has 59 fire hydrants. Water supply to fire hydrants is potable water. Hydrants are divided into three areas and tested annually on a pre-determined schedule:

- Area One – tested February through March;
- Area Two – tested March through April; and
- Area Three – tested April through May.

Hydrants are tested on this schedule to avoid excessive water use and because of the public perception of water waste during summer months. The

annual test entails opening a 2.5-inch orifice allowing it to run for 30 seconds to a minute at approximately 80 psi, resulting in a discharge of 750-1,500 gallons of potable water per hydrant.

Measures to prevent erosion are taken during the tests. Erosion controls include the use of a "banana tube" to direct flow away from erosion prone areas; additionally, the fire fighters use hoses if the water spray must be moved more than a few feet from the hydrant to prevent erosion. LLNL's Fire Department plans to purchase a water diffuser that will disperse the water flow, further reducing the chance of erosion.

4.3 Annual In Service Fire Apparatus Pump Testing

Fire apparatus pumps are not tested at Site 300, but are taken to the City of Livermore Fire Department test pit for testing.

4.4 Wet Hose Drills

Wet hose drills are conducted periodically as part of the fire fighters' training regime. The amount of potable water discharged in these drills varies, depending on the drill scenario and equipment used. Fire fighters take appropriate care to prevent excessive erosion in these drills.

4.5 Hose Testing

The LLNL Fire Department maintains 5,000 feet of fire hose for use at Site 300. Fire hose is tested annually by filling and pressurizing the hose to examine for leaks. Once completed, the potable water is bled at low flow rate out of the hose to ground assuring no erosion occurs.

4.6 Fire Apparatus Rinsing

The Fire Station at Site 300 maintains three vehicles: an ambulance, a patrol (pickup), and an engine. These vehicles are rinsed once or twice a week with a minimal amount of potable water and wiped down. No soaps or cleaning chemicals are used. Currently, the Fire Station at Site 300 does not have a floor drain connection to the sanitary sewer system, and this rinsing occurs just outside of the fire house on a paved area. When necessary, fire apparatus is taken to the LLNL Livermore site to be washed at the wash rack, which is plumbed to the sanitary sewer.

4.7 Safety Showers

Safety showers are tested monthly to ensure proper operation. Approximately 30 gallons of potable water is discharged per test. In the event a safety shower is used in an emergency situation, LLNL would follow normal spill response procedures to ensure all contaminated material is properly cleaned up.

LLNL reported a total of eight safety showers in the 1992 Storm Water Annual report. However, this number varies as new activities in remote areas require safety equipment.

4.8 Emergency Eyewashes

Emergency eyewashes are maintained for safety reasons in areas where chemicals or hazardous materials are stored. LLNL employs two types of eyewashes: hard plumbed units where water lines are available and portable eyewashes in areas with no easily accessible water supply. In the event an emergency eyewash is used in an emergency situation, LLNL would follow normal spill response procedures to ensure all contaminated material is properly cleaned up.

Hard plumbed Eyewashes: Hard plumbed eyewashes use potable water and are tested weekly to ensure proper operation. Approximately 30 gallons of potable water is discharged per test. LLNL reported a total of 17 emergency eyewashes in the 1992 Storm Water Annual Report. However, this number varies as new activities in remote areas require safety equipment.

Portable Eyewashes: Portable eyewashes are used at facilities without water service or for temporary projects. Each portable eyewash has a 16-gallon tank filled with potable or distilled water that is treated with a buffered saline solution. According to manufacturer's instructions and LLNL procedures, the eyewash tank is emptied once a month and the water solution is refilled. In areas without other disposal options, the contents of the tank are discharged to ground and allowed to percolate into the soil. Product information on the treatment chemical used in the portable eyewashes is included in Appendix E. Currently, LLNL has five portable eyewashes in use. However, the number of portable eyewashes in use varies depending on programmatic needs and regulatory requirements.

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5.0 Building and Grounds Maintenance

In addition to potable water and wastewater discharges associated with physical buildings at Site 300, there are several other discharges LLNL has found impossible to eliminate and seeks to permit. These discharges are identified in LLNL's Storm Water Pollution Prevention Plan (SWPPP) along with Best Management Practices (BMPs) for these discharges designed to minimize the environmental impact of the non-storm water discharges. The Best Management Practices associated with each type of discharge are described in the SWPPP and are not repeated in this document. Most of the discharges occur in remote locations of Site 300 and are not conducted during rain events, so there is very little chance any of the wastewater would reach a navigable water.

5.1 Building and Pavement Washing

Exterior Building Washing: As needed, LLNL rinses off building facades with potable water. No soaps, detergents, or other cleaning chemicals are used. Water conservation, as well as pollution prevention requirements, minimize water used in this activity.

Pavement Washing: As needed, LLNL rinses off pavement with potable water. No soaps, detergents, or other cleaning chemicals are used. Maintenance staff are encouraged to use dry cleaning methods for pavement cleaning and water is only used if deemed necessary. Care is taken to ensure that water washed areas have had no spills of toxic or hazardous materials or the spills have been properly cleaned prior to any washing activity. Water conservation as well as pollution prevention requirements minimize water used in this activity.

Window Washing: Most exterior windows are washed by hand using commercially available pre-mixed window cleaning solutions. The solution is applied with a spray bottle to the window, hand wiped and squeegeed. However, for some windows, usually those at high elevations, are hosed off with potable water, brushed and squeegeed. No soaps, detergents or other cleaning chemicals are used. Water conservation as well as pollution prevention requirement minimize water used in this activity.

5.2 Excess Landscape Irrigation

Most of Site 300 is maintained as natural grasslands that are not irrigated. A ballfield and landscaping in the General Services Area are the primary areas irrigated. Some remote buildings may have small areas of landscaping that are irrigated. In all areas, water use is minimized as required by water conservation efforts; therefore, run-off from irrigated areas is minimal.

5.3 Culvert Flushing

Storm drain culverts are visually inspected once a year and cleaned if needed. Cleaning includes removing built-up sediment, either with a backhoe or hand digging, and flushing out residual sediment with potable water. Removed sediments are used to reinforce the channel banks or are removed from the immediate area of the drainage channel.

5.4 Hydrant Flushing

There is no routine scheduled flushing of hydrants for maintenance purposes. However, hydrants will at times be utilized for flushing purposes to maintain compliance with applicable standards and the conditions of the water supply permit issued by the State of California Department of Health Services. Water conservation is permitted to minimize the amount of water used in this activity.

5.5 Uncontaminated Ground Water Discharges

LLNL samples ground water at Site 300 in connection with the *Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA)* investigations and remediation activities, drinking water monitoring, compliance with Waste Discharge Requirements, and general ground water surveillance networks required by the Department of Energy. Practices to ensure representative samples are obtained require one or more well bore volumes be purged from the well prior to sample collection. Aware that ground water purged from the wells may be contaminated, the Environmental Restoration Division established a procedure, agreed to by the CERCLA State and EPA Remedial Project Managers, for disposal of clean and contaminated ground water. The procedure is included in Appendix F. Other groups sampling ground water at Site 300 agreed to follow the same procedure.

5.6 Flushing of Sub-Surface Drain Pipes; Landfill Pits 1 and 7

The *Closure and Post Closure Plan for Landfill Pits 1 & 7* requires the annual cleaning of subdrain pipes to ensure they do not become clogged. LLNL cleans the subdrain pipes by flushing with potable water. Water flushed through the pipes is directed into the concrete drainage channels surrounding the landfill caps. Any sediments flushed out of the subdrain pipes would settle out in the stilling basins at the end of the concrete drainage channels before the water flows into natural and roadside drainage channels. The stilling basins and concrete drainage channels per the *Closure and Post Closure Plan for Landfill Pits 1 & 7* are kept clear of accumulated debris. The first flushing of the subdrain system required approximately 6000 gallons of potable water. We anticipate similar volumes to be used in future flushing events.

5.7 Rain Water Collected in Secondary Containment

Water collected in secondary containment berms is evaluated through a detailed series of procedures that can include: analytical testing, pH testing, records review, visual and odor observation. The particular procedure followed depends on the facility in which the water is contained (i.e., Spill Prevention Control and Countermeasures facility, retention system, hazardous waste accumulation area). If the contained rain water is demonstrated to be uncontaminated, it is discharged to surface water drainage courses. If the water is contaminated, it is handled by Hazardous Waste Management, even if the contaminant concentrations are not hazardous.

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6.0 Analytical Data

With the concurrence of the Regional Board staff, LLNL selected representative pieces of mechanical equipment for sampling to characterize the wastewater discharges we seek to permit. Selection of particular sampling locations was based, in part, on convenience. LLNL's sampling plan, included in Appendix G, identifies the location of each sampling point, sample collection procedures, and EPA methods used to analyze collected samples.

6.1 Contract Analytical Laboratories

LLNL contracts with California Laboratory Services and GTEL Environmental Laboratories Inc. for analytical services to support permit applications. Samples collected to support the permitting of discharges described in this report were divided between these two laboratories. Addresses and state certification numbers of these laboratories are provided below.

California Laboratory Services

3249 Fitzgerald Road
Rancho Cordova, CA 95742
CA DOHS ELAP Accreditation/Registration No. 1223

GTEL Environmental Laboratories Inc.

4080 Pike Lane
Concord, CA 94520
CA DOHS Certification No. E1075

6.2 Quality Assurance/Quality Control

All samples collected by Environmental Monitoring Section (EMS) sampling technicians are subject to a rigorous quality assurance and quality control program. The EMS quality assurance and quality control requirements include the preparation of monitoring plans, use of procedures, field tracking forms, chains of custody, and training of sampling technicians to ensure all samples are collected, handled, and transported to contract analytical laboratories as required to guarantee legally valid and representative samples.

Upon receipt of analytical data from contract laboratories, results and quality control data are validated by comparing quality assurance sample results with routine sample results and examining laboratory quality control data of matrix spikes, matrix spike duplicates, and laboratory control samples for values and variances within acceptable ranges. All original contract laboratory certified reports, chains of custody, field tracking and field data forms for samples

discussed in this report have been maintained by LLNL and are available upon request.

6.3 Equipment Sampled

Equipment effluent was tested for the NPDES-required analytes [biochemical oxygen demand (BOD), chemical oxygen demand (COD) total organic carbon (TOC), total suspended solids (TSS), Ammonia as N, temperature, and pH], as well as analytes LLNL expected might be in the effluent. Specific conductivity, pH, temperature, and residual chlorine readings were taken at the time of collection. All analytical data are summarized in Appendix H.

6.3.1 Vacuum Pump

The liquid ring seal vacuum pump in the mechanical equipment room of Building 827 E was sampled on March 10, 1994, and March 11, 1994. Sampling was conducted on two separate days in an attempt to characterize consistent operation. On the days samples were collected, chlorination at the building was increased because the main chlorination unit at Well 20 was under repair.

In addition to the NPDES-required analyses and field analyses, the vacuum pump effluent was tested for general minerals [fluoride, surfactants, total dissolved solids (TDS)]; volatile organic compounds (VOCs); oil and grease; anions; and metals (arsenic, barium, cadmium, chromium, cobalt, copper, lead, mercury, nickel, selenium, silver, vanadium, and zinc).

NPDES-required analytes, general minerals, and anions results were within anticipated concentrations considering ground water is the make-up water for the equipment. Oil and grease were not detected.

None of the VOCs tested for were detected except bromoform, which was detected at 0.90, 1.0 and 0.40 mg/L. Bromoform, a trihalomethane, is a by-product of drinking water chlorination. Testing of the drinking water distribution system at Site 300 in 1993 detected bromoform at similar concentrations. Neither *The Water Quality Control Plan (Basin Plan) for the California Regional Water Quality Control Board Central Valley Region, Second Edition* nor *A Compilation of Water Quality Goals* (hereafter Marshack) establish a water quality objective (WQO) or fresh-water aquatic life criteria for bromoform.

Copper, lead, zinc, and barium were detected in the metals analyses. The Basin Plan and Marshack do not establish a WQO or fresh-water aquatic life criteria for barium. Table 6-1 lists the WQOs and freshwater aquatic life criteria identified in the Basin Plan and Marshack, respectively. Lead detections at 0.0027, 0.005, and 0.12 mg/L are well below the maximum concentration, and only the 0.12 mg/L detection is above the 4-day continuous concentration in Marshack. No lead WQO is listed in the Basin Plan. The Basin Plan states copper and zinc WQOs depend on the hardness (measured as CaCO_3) of the water. Standards listed in the Basin Plan are calculated at a hardness of 40 mg/L CaCO_3 . Hardness of Site 300 ground water is approximately 230 mg/L

as measured in the 1993 drinking water analysis. Table 6-1 also identifies the WQO calculated for a hardness of 230 mg/L. Calculations are included in Appendix I. Copper detections at 0.017, 0.0024, and 0.4 mg/L range above and

Table 6-1. Water Quality Objectives and Freshwater Aquatic Life Criteria.

Analyte	Marshack		Basin Plan Objectives for the Sacramento- San Joaquin Delta Basin	
	Maximum concentration 1-hour Avg. mg/L	Continuous concentration 4-day Avg. mg/L	Water quality objective at 40 mg/L hardness mg/L	Water quality objective at 230 mg/L hardness mg/L
Copper	0.039	0.024	0.01	0.027
Zinc	0.237	0.215	0.1	0.068
Lead	0.236	0.0092	None listed	None listed
Cadmium	0.01	0.0022	None listed	None listed
Barium	None listed	None listed	None listed	None listed
Chromium total	None listed	None listed	None listed	None listed
Chromium III	3.435	0.409	None listed	None listed
Chromium IV	0.016	0.011	None listed	None listed
Mercury	0.0024	0.000012	None listed	None listed

below the identified criteria. Zinc detections at 0.16, 0.083, and 0.39 mg/L also range above and below the identified criteria.

The probable source of metals in this and other discharges described in this section is the metal piping used in the equipment and water distribution system. Although the concentrations of several analytes exceed some of the identified criteria, it is unlikely the discharge will adversely impact the receiving water, Corral Hollow Creek. Due to the remote location of the equipment, discharges are unlikely to reach the creek.

6.3.2 Equipment Room Effluent

Samples of equipment room effluent were collected to characterize the discharge for a typical Site 300 equipment room. The effluent included a liquid ring seal vacuum pump, air compressor, blowdown of two boilers, and makeup water for the boilers. Samples were collected on March 10, 1994, and March 11, 1994. Sampling was conducted on two separate days in an attempt to characterize consistent operation. On the days samples were collected, chlorination at the building was increased because the main chlorination unit at Well 20 was under repair.

In addition to the NPDES-required analyses and field analyses, the vacuum pump effluent was tested for general minerals, VOCs, oil and grease, anions, and metals.

NPDES-required analytes, general minerals, and anions results were within anticipated concentrations considering ground water is the make-up water for the equipment. Oil and grease and all VOCs tested were not detected.

Copper and chromium were detected in the metals analysis. The Basin Plan and Marshack do not establish a WQO or fresh-water aquatic life criteria for total chromium. Total chromium detected at the reporting limit of 0.0010 mg/L does not exceed either the chromium III or chromium IV criteria. Chromium was detected in 1992 at a similar concentration in the ground water supply wells. Copper detected at 0.020 and 0.012 mg/L is below the identified criteria.

6.3.3 Hard Plumbed Emergency Eyewash

A water sample from a hard plumbed eyewash was collected on March 9, 1994, to characterize the representative discharge from this type of unit under normal test operation.

In addition to the NPDES-required analyses and field analyses, water was tested for general minerals, VOCs, oil and grease, anions, and metals.

NPDES-required analytes, general minerals, and anions results were within anticipated concentrations considering ground water is the make-up water for the equipment. Oil and grease and all VOCs tested were not detected.

Copper and zinc were detected in the metals analyses. Copper detections were all below the identified criteria. Zinc detections at 0.076, 0.078, and 0.088 mg/L are slightly above the WQO calculated for water hardness of 230 mg/L and below all other identified criteria.

6.3.4 Inspector Test Valve

Two water samples from an inspector test valve on a building sprinkler system were collected on March 9, 1994, to characterize the representative discharge from a building sprinkler system under normal test operation. A first flush sample was collected immediately upon system initiation and a second sample was collected after allowing the water to flow for five minutes.

In addition to the NPDES-required analyses and field analyses, water was tested for general minerals, VOCs, oil and grease, anions, and metals. Only metals, TSS, and TDS were collected in the second sampling.

NPDES, required analytes, general minerals, and anions results were within anticipated concentrations considering ground water is the make-up water for the equipment. Oil and grease were not detected.

None of the VOCs tested were detected except 1,1-Dichloroethane and 1,1,1-Trichloroethane, which were detected at 5.1 and 4.0 µg/L, respectively.

Water supply for the fire suppression system is potable water and these chemicals have not been detected in the source water. We have not been able to identify a source of these compounds in the fire suppression system. A continued investigation with likely resampling of this source is being pursued.

Barium was detected in the metals analysis at 0.010 and 0.019 mg/L. As previously mentioned, no water-quality objectives of fresh-water aquatic life criteria are established for barium.

6.3.5 Temperature/Pressure Relief Valve

An effluent sample from a temperature/pressure relief valve on a boiler was collected on March 9, 1994, to characterize the representative discharge from this source.

In addition to the NPDES-required analyses and field analyses, water was tested for general minerals, VOCs, oil and grease, anions, and metals.

NPDES-required analytes, general minerals, and anions results were within anticipated concentrations considering ground water is the make-up water for the equipment. Oil and grease and all VOCs tested were not detected.

Chromium, copper, lead, and mercury were detected in the metals analyses. Copper detections at 0.0092 and 0.016 mg/L were below the identified criteria. Total chromium detected at 0.0014 mg/L does not exceed either the chromium III or chromium IV criteria; there is no criteria for total chromium. As previously mentioned, chromium was detected in 1992 at a similar concentration in the ground water supply wells. Lead detections at 0.0041 and 0.006 mg/L are also below the identified criteria. Lead has been detected at similar concentrations in the supply water. Mercury detected at 0.00022 µg/L is above the continuous concentration but well below the maximum concentration identified in Marshack.

Temperature/pressure relief valves are a system safety feature to prevent the over pressurization of a vessel that would lead to an explosion. As such, relief valves have infrequent off-normal discharges. Discharges from this system would be in the form of steam, which would condense once released into the air. This device never discharges a continuous flow of water.

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Appendix A

Schematic Diagrams

LIQUID RING SEAL VACUUM PUMP SCHE

VACUUM PUMP DETAIL

ETER

↑ COOLING
FLUID
OUTLET

NOTES:

1. ALL LOW PIPING POINTS WILL HAVE DRAINS WITH A NORMALLY CLOSED VALVE AND A CAP.
2. ALL HIGH PIPING POINTS WILL HAVE VENTS WITH A NORMALLY CLOSED VALVE AND A CAP.
3. ALL PIECES OF EQUIPMENT ARE USUALLY EQUIPPED WITH CAPPED DRAINS AND NORMALLY CLOSED MANUAL VALVES WHICH ARE TO BE USED FOR MAINTENANCE.

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ATIC

← GAS INLET

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E GAUGE

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DOMESTIC HOT WATER SCHEMATIC

NOTES:

1. ALL LOW PIPING POINTS WILL HAVE DRAINS WITH A NORMALLY CLOSED VALVE AND A CAP.
2. ALL HIGH PIPING POINTS WILL HAVE VENTS WITH A NORMALLY CLOSED VALVE AND A CAP.
3. ALL PIECES OF EQUIPMENT ARE USUALLY EQUIPPED WITH CAPPED DRAINS AND NORMALLY CLOSED MANUAL VALVES WHICH ARE TO BE USED FOR MAINTENANCE.

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TAHL TEMPERATURE ALARM HIGH LOW
BFP BACKFLOW PREVENTER

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BOILER STEAM SYSTEM SCHEMATIC

NOTES:

1. ALL LOW PIPING POINTS WILL HAVE DRAINS WITH A NORMALLY CLOSED VALVE AND A CAP.
2. ALL HIGH PIPING POINTS WILL HAVE VENTS WITH A NORMALLY CLOSED VALVE AND A CAP.
3. ALL PIECES OF EQUIPMENT ARE USUALLY EQUIPPED WITH CAPPED DRAINS AND NORMALLY CLOSED MANUAL VALVES WHICH ARE TO BE USED FOR MAINTENANCE.

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BOILER STEAM SYSTEM SCHEMATIC

Lawrence Livermore National Laboratory Plant Engineering Livermore, CA 94550

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→ LLNL WATER SUPPLY

→ LLNL WATER SUPPLY

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AIR SIDE FOR HEATING, VENTILATIO
AIR CONDITIONING SYSTEM SCHEM

NOTES:

- ALL PIECES OF EQUIPMENT ARE USUALLY EQUIPPED WITH CAPPED DRAINS AND NORMALLY CLOSED MANUAL VALVES WHICH ARE TO BE USED FOR MAINTENANCE.

LEGEND

TE TEMPERATURE ELEMENT
 OA OUTSIDE AIR
 RA RETURN AIR
 / AIR DAMPER
 M MOTOR
 VAV VARIABLE AIR VOLUME

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HVAC HEATING WATER SYSTEM SCH

M. SCHEMATIC

NOTES:

1. PROVIDE GATE VALVES AT ALL BRANCH PIPING TO ALLOW ISOLATION OF PIPING FOR MAINTENANCE.
2. PROVIDE VENT AND DRAIN VALVES AT THE END OF EACH BRANCH.
3. PROVIDE AUTOMATIC VENT VALVES AT HIGH POINTS FOR PIPING LOCATED IN THE BOILER ROOM.
4. PROVIDE MANUAL AIR VENTS FOR PIPING LOCATED OUTSIDE THE BOILER ROOM.
5. PROVIDE DRAIN VALVES AND CAPS AT ALL LOW POINTS.
6. ALL PIECES OF EQUIPMENT ARE USUALLY EQUIPPED WITH CAPPED DRAINS AND NORMALLY CLOSED MANUAL VALVES WHICH ARE TO BE USED FOR MAINTENANCE.

LEGEND

HWR - HOT WATER RETURN
HWS - HOT WATER SUPPLY
CW - COLD WATER
VAV - VARIABLE AIR VOLUME

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NOTES:

1. ALL LOW PIPING POINTS WILL HAVE DRAINS WITH A NORMALLY CLOSED VALVE AND A CAP.
2. ALL HIGH PIPING POINTS WILL HAVE VENTS WITH A NORMALLY CLOSED VALVE AND A CAP.
3. ALL COMPRESSORS ARE BEING FITTED WITH 5 GAL. CARBOYS TO COLLECT WASTE WATER CONTAMINATED WITH OIL. IT WILL BE DISPOSED OF AS HAZARDOUS WASTE.
4. ALL PIECES OF EQUIPMENT ARE USUALLY EQUIPPED WITH CAPPED DRAINS AND NORMALLY CLOSED MANUAL VALVES WHICH ARE TO BE USED FOR MAINTENANCE.

LEGEND

	GLADHAND - EMERGENCY STANDBY AIR HOOK UP. COMPLETE WITH NECESSARY FITTING FOR PORTABLE OR IR RENTAL AIR UNIT FROM LOCAL IR DISTRIBUTOR
	VALVE - WATER OR BALL TYPE VALVE
	UNION - AIDS IN DISCONNECTING COMPRESSOR FROM THE SYSTEM
	PRESSURE GAUGE
	THERMOMETER
	DROP LEG
	DIFFERENTIAL PRESSURE TRANSMITTER
	MANOMETER
	DIFFERENTIAL PRESSURE INDICATOR
	DRAIN VALVE
	FALSE LOADER - BLOWS OFF AIR OUTSIDE OF COMPRESSOR ROOM
	SYSTEM INSTRUMENTATION INCLUDES: NEPHELOMETER; HYGROMETER; PRESSURE; TEMPERATURE
	VENTILATION - MOTORIZED LOUVERS, EXHAUST FANS
	AFTERCOOLER/SEPARATOR, ISOLATION VALVE, UNION, STRAINER AND TRAP

INSIDE
COMPRESSOR
ROOM

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SKM94-BDR-0070

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COMPRESSED AIR SYSTEM						
Lawrence Livermore National Laboratory Plant Engineering Livermore, CA 94550						
PROJECT TITLE						
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Appendix B

Water Softener Chemicals

Material Safety Data Sheet

6810-15000

MATERIAL SAFETY DATA SHEET

GENERAL INFORMATION

RADE NAME (COMMON NAME OR SYNONYM) Salt		C.A.S. NO(S). 7647-14-5	
CHEMICAL NAME(S) Sodium Chloride	FORMULA NaCl	MOLECULAR WEIGHT 58.44	
MANUFACTURER(S) NAME AND ADDRESS Cargill Salt Division P.O. Box 5621 Minneapolis, MN 55440			
CONTACT Director-Quality Admin.	PHONE NO. (612) 475-6581	DATE ISSUED 8/1/85	DATE REVISED 8/6/91

I. HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

Hazardous Components (Specific Chemical Identity; and/or Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	Percent (Optional)

II. PHYSICAL/CHEMICAL CHARACTERISTICS

BOILING POINT (760mm Hg) (°C)	1465	SPECIFIC GRAVITY (H ₂ O=1)	2.16
VAPOR PRESSURE (mm Hg/747°C)	2.4	MELTING POINT (°C)	801
VAPOR DENSITY (Air=1)	NA	EVAPORATION RATE (Butyl Acetate=1)	NA
SOLUBILITY IN WATER (g/cc,t)	26.4		
APPEARANCE AND ODOR White crystalline solid with slight halogen odor.			

IV. FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) Not Applicable.	FLAMMABLE LIMITS			
	LEL	NA	UEL	NA
EXTINGUISHING MEDIA Not Applicable. This product is nonflammable.				
SPECIAL FIRE-FIGHTING PROCEDURES/EQUIPMENT Not Applicable.				
UNUSUAL FIRE AND EXPLOSION HAZARDS None				

V. REACTIVITY DATA

STABILITY		
Stable	X	Conditions To Avoid: Contact with strong acids.
Unstable		
INCOMPATIBILITY (Materials to Avoid): Becomes corrosive to metals when wet.		
HAZARDOUS DECOMPOSITION OR BYPRODUCTS: May evolve chlorine gas when in contact with strong acids.		
HAZARDOUS POLYMERIZATION		
May Occur		Conditions To Avoid: Not Applicable.
Will Not Occur	X	

VI. HEALTH HAZARD DATA

ROUTE(S) OF ENTRY	
Inhalation?	May cause mild irritation of nose and throat.
Skin?	Dust may cause mild irritation.
Ingestion?	Ingestion of large amounts may cause gastrointestinal upset.
HEALTH HAZARDS (Acute And Chronic)	
Ingestion of large amounts (greater than 0.1 pound) can cause gastrointestinal upset and irritation of the stomach.	
No applicable information found for chronic systemic effects.	

HEALTH HAZARD DATA (Continued)

CARCINOGENICITY

Q? Not listed as a carcinogen or mutagen.

RC Monographs? Not listed as a carcinogen or mutagen.

HA Regulated? Not listed as a carcinogen or mutagen.

SIGNS AND SYMPTOMS OF EXPOSURE

Inhalation: Slight irritation of the nose; sneezing.

Skin Contact: Irritation; inflammation.

Ingestion: Nausea; vomiting.

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

In some cases of confirmed hypertension, ingestion may result in elevated blood pressure. (This applies only to salt-sensitive individuals.)

EMERGENCY AND FIRST AID PROCEDURES

Inhalation: If person breathes large quantities, remove to fresh air at once. If breathing stops, apply artificial respiration immediately.

Skin Contact: Remove clothing from affected area. Wash skin thoroughly. Rinse carefully. For eye contact, flush with water immediately, lifting eyelids occasionally.

Ingestion: Less than a few grams would not be harmful. For larger quantities, drink large amounts of water or milk.

EMERGENCY TELEPHONE NUMBERS Daytime (612)475-6581
 Evenings (612)476-1127 (Minnesota) or (510) 791-0775 (California)

II. PRECAUTIONS FOR SAFE HANDLING AND USE

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
 Contain spills to prevent contamination of water supply or sanitary sewer system. Vacuum or sweep into containers for proper disposal.

VII. PRECAUTIONS FOR SAFE HANDLING AND USE (Continued)**WASTE DISPOSAL METHOD**

For disposal of this material as a waste, act in accordance with all applicable Federal, state, and local waste management regulations.

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE

Avoid humid or wet conditions as product will cake and become hard.

OTHER PRECAUTIONS Not Applicable.

VIII. CONTROL MEASURES**RESPIRATORY PROTECTION (Specify Type)**

NIOSH/MSHA approved respirator for particulates.

VENTILATION

Local Exhaust Ventilate as required to maintain airborne particulates below occupational exposure limits.

Mechanical (General) Dust collection equipment may be employed.

Special/Other not applicable.

PERSONAL PROTECTIVE EQUIPMENT

Protective Gloves Normal work gloves are adequate.

Eye Protection Eyeglasses or goggles should be worn in dusty areas.

Other Protective Clothing Or Equipment Protective clothing may be worn in dusty areas, but is generally not required.

Work/Hygiene Practices Warm water showering and handwashing is suggested after working in extremely dusty areas.

All statements, technical information and recommendations contained herein are, the best of our knowledge, reliable and accurate; however, no warranty, either express or implied, is made with respect thereto, nor will any liability be assumed for damages resultant from the use of the material described.

It is the responsibility of the user to comply with all applicable federal, state, and local laws and regulations. It is also the responsibility of the user to maintain a safe workplace. The user should consider the health hazards and safety information provided herein as a guide and should take the necessary steps to instruct employees and to develop work practice procedures to ensure a safe work environment.

This information is not intended as a license to operate under, or a recommendation to practice or infringe upon any patent of this Company or others covering any process, composition of matter or use.

Appendix C

Boiler Treatment Chemicals

Material Safety Data Sheets

MATERIAL SAFETY DATA SHEET

FORMULA BT-505

BOILER CORROSION AND SCALE INHIBITOR

DATE: 6/10/91

PROTECTION ENGINEERING, INC.

I. PRODUCT IDENTIFICATION

PRODUCT NAME: BT-505. CHEMICAL NAME: NA. FORMULA: NA. CHEMICAL FAMILY: NA.

II. INGREDIENTS

Hazardous Component	OSHA PEL	ACGIH TLV	
Sodium Hydroxide	CAS# 1310735	10ppm	(3.0)
Sodium-EDTA	CAS# 64020	NA	(3.0)
Diethylethanolamine	CAS# 100370	10ppm	(3.0)

III. PHYSICAL DATA

STATE: Liquid. APPEARANCE: Clear. ODOR: ammonia odor. SOLUBILITY IN: Water: Completely miscible. OTHER: NO.
BOILING POINT: 212 F. MELTING POINT: 32 F. SPEC. GRAVITY: 1.07. pH: 13.1. VAPOR PRESSURE: NA.
VAPOR DENSITY (AIR=1): NA. STABILITY: Stable. STORAGE PRECAUTIONS: Store in a Cool Dry Place.
KEEP OUT OF REACH OF CHILDREN.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: None. METHOD: NA. FLAMMABILITY LIMITS: None. SUSCEPTIBILITY TO SPONTANEOUS HEATING: None.
SHOCK SENSITIVITY: None. AUTOIGNITION POINT: NO. EXTINGUISHING MEDIA: Water, foam, carbon dioxide, dry chem.
UNUSUAL FIRE/EXPLOSION HAZARDS: None. SPECIAL FIRE FIGHTING PROCEDURES: None.
HAZARDOUS DECOMP. PRODUCTS: Thermal decomposition can produce CO, CO₂, NOx.
NFPA Codes: Health: 2. Flammability: 0. Reactivity: 0.
INCOMPATIBILITY: Acidic material. CONDITIONS TO AVOID: None. OXIDIZER: No.

V. HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: NO. THIS PRODUCT MAY BE: Corrosive to eyes, irritating to skin and respiratory tract.
ACUTE TOXICITY: NO. TARGET ORGANS: NO. CHRONIC TOXICITY: NO. PRIMARY ROUTES OF EXPOSURE: Skin.
CARCINOGENITY: None. EFFECTS OF OVEREXPOSURE: EYES: Severe irritation and destruction of tissue. SKIN: Causes severe burns and destruction of tissue. INGESTION: Severe burns to mucous membranes. Harmful or fatal if swallowed. INHALATION: Severe irritation of respiratory tract, pulmonary edema, laryngeal spasms.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: None reported.

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes and skin. Do not ingest or breath vapors. Wash hands thoroughly after handling.
PROTECTIVE EQUIPMENT: Chemical eye goggles/shield, impervious rubber gloves, apron, long sleeves, eye wash station, emergency shower. RESPIRATORY PROTECTION: None. Use only with adequate ventilation.
VENTILATION: Normal.

VII. FIRST AID

EYE: Flush eyes with eyewash or water for at least fifteen minutes and contact physician. Continue flush until assistance arrives. SKIN: Remove contaminated clothing and launder before re-use. Flush thoroughly with vinegar and water. INGESTION: Do not induce vomiting. If ingested, give large quantities of water followed with citrus fruit juice. Call physician or poison control center immediately. Never give anything by mouth to an unconscious person. INHALATION: Remove to fresh air and call physician immediately.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Contain spill and soak up with absorbent material or flush away well with water.
WASTE DISPOSAL METHOD: Consult local environmental authorities.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: COMPOUND CLEANING, LIQUID, N.O.S. (CONTAINS SODIUM HYDROXIDE SOLUTION) CORROSIVE
MATERIAL, NA 1760, GUIDE 60.
HAZARD CLASS: Not applicable ID: Not applicable

X. MISCELLANEOUS

- 1) This material is not subject to the Proposition 65 warning "Safe Drinking Water and Toxic Enforcement Act of 1986"
- 2) This material is subject to SARA Title III Section 313 reporting.
- 3) PERSONAL PROTECTIVE INDEX: C.

For Assistance Call:
Regulatory Affairs Dept
34 Ardmore Rd. Kensington, CA. 94707
TEL. (415) 527-9394

OR CONTACT YOUR LOCAL
POISON CONTROL CENTER

34 ARDMORE ROAD

KENSINGTON,

CALIFORNIA 94707

(415) 527 - 9394

MATERIAL SAFETY DATA SHEET

FORMULA BT-565

STEAM BOILER WATER TREATMENT ALKALINE SOLUTION

PROTECTION ENGINEERING, INC.

I. PRODUCT IDENTIFICATION

PRODUCT NAME: BT-565. CHEMICAL NAME: NA. FORMULA: NA. CHEMICAL FAMILY: NA.

DATE: 6/15/92

II. INGREDIENTS

Hazardous Component	OSHA PEL	ACGIH TLV	%
Sodium Hydroxide	CASE 1310735	10ppm	(40.0)

III. PHYSICAL DATA

STATE: Liquid. APPEARANCE: Clear. ODOR: Characteristic odor. SOLUBILITY IN: Water: Soluble. OTHER: ND.
BOILING POINT: 212 F. MELTING POINT: 32 F. SPEC. GRAVITY: 1.26. pH: 14.0. VOLATILE(VOLUEx): >50.0.
VAPOR PRESSURE: NA. VAPOR DENSITY (AIR=1): NA. STABILITY: Stable. STORAGE PRECAUTIONS: Store in a Cool Dry Place Away From Acids. KEEP OUT OF REACH OF CHILDREN.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: None. METHOD: NA. FLAMMABILITY LIMITS: None. SUSCEPTIBILITY TO SPONTANEOUS HEATING: None.
SHOCK SENSITIVITY: None. AUTOIGNITION POINT: ND. EXTINGUISHING MEDIA: Water, foam, carbon dioxide, dry chem.
UNUSUAL FIRE/EXPLOSION HAZARDS: None. SPECIAL FIRE FIGHTING PROCEDURES: Cool drums in vicinity of fire with water fog. Firefighters should be equipped with full protective gear including self-contained breathing apparatus. HAZARDOUS DECOMP. PRODUCTS: None. NFPA Codes: Health: 2. Flammability: 0. Reactivity: 1.
INCOMPATIBILITY: Acidic materials. HAZARDOUS POLYMERIZATION: Will not occur. CONDITIONS TO AVOID: None
OXIDIZER: No.

V. HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: ND. THIS PRODUCT MAY BE: Corrosive to eyes, irritating to skin and respiratory tract.
ACUTE TOXICITY: ND. TARGET ORGANS: ND. CHRONIC TOXICITY: ND. PRIMARY ROUTES OF EXPOSURE: Skin contact, eye contact and inhalation.
CARCINOGENICITY: None. EFFECTS OF OVEREXPOSURE: EYES: Severe irritation and destruction of tissue. SKIN: Causes severe burns and destruction of tissue. INGESTION: Danger-POISON. Harmful or fatal if swallowed. Severe burns to mucous membranes. INHALATION: Severe irritation of respiratory tract, pulmonary edema, laryngeal spasms.

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes and skin. Do not ingest or breath vapors. Wash hands thoroughly after handling.
PROTECTIVE EQUIPMENT: Chemical eye goggles/shield, impervious rubber gloves, apron, long sleeves, eye wash station, emergency shower. RESPIRATORY PROTECTION: Use only with adequate ventilation. Use approved respirator to prevent inhalation of vapors or mists.
VENTILATION: Local and mechanical exhaust recommended.

VII. FIRST AID

EYE: Flush eyes with eyewash or water for at least fifteen minutes and contact physician. Continue flush until assistance arrives. SKIN: Remove contaminated clothing and launder before re-use. Flush thoroughly with water. If irritation persists obtain medical attention. INGESTION: Do not induce vomiting. If ingested, give large quantities of water followed with citrus fruit juice. Call physician or poison control center immediately. Never give anything by mouth to an unconscious person. INHALATION: Remove to fresh air and call physician immediately.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Contain spill and soak up with absorbant material or flush away well with water.
WASTE DISPOSAL METHOD: Consult local environmental authorities.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: CORROSIVE, LIQUID, N.O.S. (SODIUM HYDROXIDE SOLUTION) UN1824, GUIDE 60.
HAZARD CLASS: Not applicable 10: Not applicable

X. MISCELLANEOUS

- 1) This material is not subject to the Proposition 65 warning "Safe Drinking Water and Toxic Enforcement Act of 1986"
- 2) This material is not subject to SARA Title III Section 313 reporting.
- 3) PERSONAL PROTECTIVE INDEX: 0.

For Assistance Call:
Regulatory Affairs Dept
268 Arlington Ave. Kensington, CA. 94707
TEL. (510) 527-9394

OR CONTACT YOUR LOCAL
POISON CONTROL CENTER
AT (415) 821-5338

268 ARLINGTON AVENUE, SUITE D • KENSINGTON, CALIFORNIA 94707 • PHONE: (510) 527-9394 • FAX: (510) 527-9395

Appendix D

Sand Filter Manufacturers

Information and Installation Detail

SECTION B

3/4" = 1'-0"

SEPARATOR SUPPORT

1 1/2" = 1'-0"

NOTES

1. MATERIALS
  - A. PIPING : BLACK STEEL, SEAMLESS
ASTM A53, STANDARD WT UNLESS NOTED
  - FITTINGS : BUTT WELD ASTM A234
ANSI B16.9 UNLESS NOTED
  - FLANGES : WELD NECK, RAISED FACE
150 LB ANSI B16.5,
ASTM A105
UNLESS NOTED OTHERWISE
  - BOLTING : ASTM A193 GRADE B7 BOLTS;
ASTM A194 GRADE 1 NUTS
  - GASKET : 1/16" THICK, RING TYPE FOR RAISED
FACE FLANGES & FULL FACE FOR
FLAT FACE FLANGES
GARLOCK 3000
  - COATING : EPOXY COATED PER LLNL FACILITIES
STANDARD 02668
- B. VALVES : GATE VALVE 3" V-1F
200 PSIG, 125 LB FLANGED 18BM
DOUBLE DISC
MUELLER A2380-G OR EQ
BALL VALVE, THREADED ENDS, 2000 LB WOG
CARBON STEEL, APOLLO OR EQ
1/2" SIZE MODEL 73-103
1 1/4" SIZE MODEL 73-106
1 1/2" SIZE MODEL 73-107
BALL VALVE, 150 LB FLANGED ENDS
CARBON STEEL, APOLLO OR EQ
1 1/2" SIZE MODEL 88-107
- C. SPECTACLE BLIND :
1/4" THICK, CARBON STEEL
ASTM A285 C, USED WITH TWO 4"
150 LB RAISED FACE FLANGES
MACK IRON OR EQ
- D. STRAINER : 3" CAST CARBON, Y TYPE
STRAINER, 150 LB ANSI
FLANGED ENDS
1/2" PERFORATED STAINLESS STEEL
SCREEN
MUELLER MODEL 761 OR EQ
- E. SEPARATOR : CENTRIFUGAL TYPE, VERTICAL PROFILE,
CARBON STEEL CONSTRUCTION, RATED
185 PSIG CONTINUOUS W.P.,
285 PSIG MAX, 135 GPM TO 290 GPM,
98% EFFICIENCY IN SAND & WATER
SEPARATION TO 74 MICRONS SIZE,
AUTO PURGE
LAKOS MODEL AXL-0300-B OR EQ.
- F. PRESSURE GAUGES :
4 1/2" DIA. DIAL, 0 TO 160 PSIG
PRESSURE RANGE, POLYPROPYLENE CASE
1/2" NPT BOTTOM CONN., SS BOURDON
TUBE & SOCKET
WEKSLER AA44-2 OR EQ
- G. HEAT TRACING & INSULATION :
CHEMELEX AUTO-TRACE HEATER 112 FT
CATNOS NO 3BTVI W/ THERMOSTAT AMC-1A,
PENER CONN KIT PMKG-JLP & PMKG-LE
WITH 1" THICK RAYCHEM ELECTRIC
TRACED GLASS INSULATION GT66 &
ETL FOR FREEZE PROTECTION
SET TEMP AT 40°F

2. PIPE CLEANING, TESTING AND DISINFECTING SHALL
BE DONE IN ACCORDANCE WITH LLNL FACILITIES
STANDARD 15992

SEPARATOR PIPING PLAN, SECTIONS AND DETAILS

**Lawrence Livermore
National Laboratory**
Livermore, CA 94550
PLANT ENGINEERING

SITE 300 WELL 18

DESIGN	ED WANG	DATE	3-3-77
DRAWN	ED WANG	DATE	3-3-77
CHECK		DATE	
PE/A		DATE	
SL/CL		DATE	
SECURITY		DATE	
WFO		DATE	
W.C.		DATE	

SHEET OF
SET OF

Optional stand raises the separator's purge outlet to a height of approximately 60 inches (1,524mm). Frame area measures 36 in. X 36 in. (914mm X 914mm).

For small systems and low flow rates, the AXL Series offers high performance separation of fine solids with the added feature of internal accessibility, specifically intended for the occasional threat of larger and/or other troublesome solids. Like all Lakos Separators, there are no moving parts to wear out, no screens, cartridges or filter elements to clean or replace, no backflushing requirements or media replacement and the pressure loss is always consistent and low.

Compact in size and boasting trouble-free operation with no required routine maintenance, the AXL Series specifically features:

- Flanged inlet/outlet — Popular for most industrial piping systems, this feature provides for easy installation or retrofit.
- Flanged Access Cap for upper-chamber inspection & servicing — Allows for inspection and/or the removal of unusual and/or troublesome solids.
- Fully accessible collection chamber — Should troublesome solids require access to the separator's lower dome collection chamber, the ability to completely inspect or clean-out is provided for with an easy-to-use grooved-pipe coupling.
- Oversized solids collection chamber — High-capacity solids retention means purging less often and greater solids concentrations when purging.
- Pressure relief line for effective solids collection — This patented feature encourages the quiescent (calm) accumulation of separated solids in the Lakos Separator's lower chamber, thereby maximizing its temporary storage capacity and effective purge characteristics.
- Optional coatings & material construction — For improved resistance to chemicals, caustics and other abrasive liquids/solids, standard carbon steel may be replaced with stainless steel or coated with protectants such as Scotchkote®. Consult your Lakos representative for details.

Flow Range:
 -290 U.S. gpm
 1-66 m³/hr)
Maximum Pressure Rating:
 50 psi
 1055 kPa)

The series consists of eight models, available with or without a support frame. Consult your Lakos representative for special requirements and higher pressure ratings.

Ask your Lakos representative about the many other Lakos separators and equipment available for a wide variety of liquids from liquids applications.

Lakos Industrial Service In-Line Separators. Recognized for performance. Designed for serviceability. Applied with confidence.

Operation

Lakos Industrial Service In-Line separators are designed specifically to remove solids from liquids. Each model is calculated for use within a prescribed flow range for maximum performance of solids removal. Flow rates above or below the recommended range (see

page 3) may affect such performance.

Upon tangential entry, the liquid/solids are drawn through internal tangential slots and accelerated into the separation chamber, where solids heavier than the carrying liquid are centrifugally

separated and allowed to accumulate in the unit's collection chamber for eventual purging (see Section III). The liquid (free of separable solids) is then drawn to the vortex and up through the separator's outlet.

Installation Instructions

Lakos AXL Separators are

- shipped on a wooden skid.

Suitable support or foundation

- must be provided to accommodate the full weight of the separator *including liquid* (see data, page 3). Models may also be ordered with a permanent support frame.

Prior to installation, the inlet, outlet and purge of each unit should be inspected for the presence of any foreign objects which may have entered the unit during shipping or storage.

No preparations are necessary prior to installation. Purge hardware, however, is required before start-up (see Section III).

Pipe connections to the inlet and outlet of Lakos AXL Separators

should be a straight run of at least five pipe diameters to minimize turbulence. A flanged spool of appropriate length (see diagram, page 3) is necessary at the AXL Separator's outlet to allow for removal of the upper dome should inspection/clean-out ever be necessary.

6. All Lakos Separators operate within a prescribed flow range (see data, page 3). *Pipe size is not a factor in model selection.* Use appropriate hardware to match inlet and outlet flange sizes. Flange bolts and gaskets are not included with separator.

7. Minimum inlet pressure should be at least 15 psi (100 kPa) or equal to the pressure loss anticipated through the separator (see graph, page 3) *plus* the system's down-stream pressure requirements.

8. Lakos AXL Separators are typically installed on the discharge of a pumping system. Consult your Lakos representative for suction side installation. No other pressure or power is required to operate Lakos AXL Separators.

9. In a pressurized system (vs. open discharge), pressure gauges are recommended at both inlet and outlet to monitor pressure loss and proper system flow (see flow graph, page 3). If the separator is operated at open discharge, a valve is recommended at the outlet, set to create a backpressure of 5 psi (35 kPa).

10. Winterizing is important if the Lakos Separator is to remain idle in sub-freezing locations. Unless measures are taken to insulate the separator from such temperatures, unit should be drained of all liquid to avoid bursting due to ice expansion. Note: All Lakos automatic purging hardware provide a manual override to allow for easy draining via the purge opening.

I. Maintenance/Purging

Lakos AXL Separators must

- be purged regularly. Otherwise, accumulation of separated solids will overfill the separator's collection chamber, substantially affecting performance.

Several purging options are

- available and all may be performed while the Lakos AXL separator is in full operation.

a. Manual: A full-port, straight-through valve may be installed on the standard purge opening and actuated manually as necessary to purge separated solids.

b. Automatic: The use of Lakos AXL Separators in a given application typically implies the need for heavy or unusual solids removal. A **Lakos Auto-Purge System & Pneumatic Pinch Valve** is therefore recommended. Should compressed air be unavailable, consult your Lakos representative for details on motorized ball valves and other systems.

c. Continuous Bleed: With either a manual pinch valve or Lakos'

Auto-Purge System & Pneumatic Pinch Valve, a controlled rate of purging is also acceptable and effective. Periodic inspection of a manual valve or programmed full purge of the Lakos Auto-Purge system is recommended to avoid plugging of the reduced bleed orifice.

3. Important: All purge hardware should be installed prior to any elbows or turns in the purge piping (see diagram, this page). Avoid "uphill" purging which can clog piping and hinder effective solids evacuation.

4. For best results, actual purging is recommended while the Lakos AXL Separator is in operation. To determine the necessary frequency, purge often at first and calculate the proper rate with regard to the actual volume of separated solids. Ask your Lakos representative for specific recommendations regarding your application.

5. When operating in sub-freezing temperatures, be sure to protect the AXL Separator's collection chamber and all purge line piping from freezing. (See Section II, Item 10 regarding winterizing).

Flow vs. Pressure Loss Chart

Dimensions Inches/Millimeters

MODEL	A	B	C	D	E**	F	G	H*
AXL-0050-B	38 3/4 984	7 1/2 191	4 1/4 108	6 5/8 168	2 1/4 57	8 1/2 216	2 1/4 57	10 254
AXL-0075-B	40 3/4 1035	7 1/2 191	4 1/4 108	6 5/8 168	2 3/4 70	8 1/2 216	2 1/4 57	10 254
AXL-0100-B	49 3/4 1264	9 1/4 235	5 127	6 5/8 168	3 7/8 98	8 1/2 216	2 51	12 305
AXL-0125-B	49 3/4 1264	9 1/4 235	5 127	6 5/8 168	3 7/8 98	8 1/2 216	1 7/8 48	12 305
AXL-0150-B	49 3/4 1264	9 1/4 235	5 127	6 5/8 168	3 7/8 98	8 1/2 216	1 3/4 44	12 305
AXL-0200-B	59 3/4 1518	11 1/4 286	6 1/4 159	8 5/8 219	6 152	10 1/2 267	2 5/8 67	12 305
AXL-0250-B	61 1549	11 1/4 286	6 1/4 159	8 5/8 219	6 152	10 1/2 267	2 5/8 67	14 356
AXL-0300-B	66 1/2 1689	12 305	6 1/4 159	10 3/4 273	7 178	12 305	3 1/4 83	16 406

Millimeters shown in shaded bands.

* This dimension indicates length of recommended flanged spool, required for removing upper flanged dome, should internal access ever be necessary.
 ** This dimension includes width of venturi pressure relief line.

The last letter in each model number indicates the separator's material of construction. "B" = carbon steel. For stainless steel, use "S" (see numbers below).

1. Grooved pipe coupling for access to solids collection chamber.
2. Venturi pressure relief line for improved quiescent (calm) solids collection.
3. Flanged removable upper dome for internal access.
4. Gauge/flowmeter connections, 1/4" N.P.T., female.
5. Flanged spool (recommended-not included with separator) to allow for removal of upper dome.

General Specifications

MODEL	FLOW RANGE		INLET/OUTLET Flanged	COLLECTION CHAMBER CAPACITY		WEIGHT		WEIGHT WITH WATER	
	U.S. gpm	m³/hr		U.S. Gallons	Liters	lbs.	kg	lbs.	kg
AXL-0050-B AXL-0050-S	4-10	1.0-2.5	1/2-inch	1.9	7.2	125 122	57 55	148 145	67 66
AXL-0075-B AXL-0075-S	10-20	2.5-4.5	3/4-inch	1.9	7.2	132 129	60 59	156 153	71 69
AXL-0100-B AXL-0100-S	19-32	4.5-7.5	1-inch	1.9	7.2	144 141	65 64	171 168	78 76
AXL-0125-B AXL-0125-S	28-48	6.5-11.0	1 1/4-inch	1.9	7.2	145 142	66 64	173 170	79 77
AXL-0150-B AXL-0150-S	45-70	10.0-16.0	1 1/2-inch	1.9	7.2	148 145	67 66	177 174	80 79
AXL-0200-B AXL-0200-S	65-108	14.5-24.5	2-inch	4.5	17.0	226 221	103 100	290 285	132 129
AXL-0250-B AXL-0250-S	95-155	21.5-35.0	2 1/2-inch	4.5	17.0	245 240	111 109	312 307	142 139
AXL-0300-B AXL-0300-S	148-290	33.5-66.0	3-inch	7.8	29.5	295 289	134 131	407 401	185 182

Pressure Loss Range: 5-12 psi (35-85 kPa)
 Purge Size (all models): 1 1/2-inch, male, N.P.T. with screw-on flange
 Maximum Particle Size: AXL-0200, AXL-0250 & AXL-0300 ... 3/8-inch (9.52 mm)
 All other models ... 1/4-inch (6.35 mm)

Typical Specifications

Separator Function:

A centrifugal vortex separator shall be furnished for installation in a liquid supply/circulation system to remove separable* solids from the system. Actual solids removal efficiency is predicated on difference in specific gravity (Sp. Gr.) between the liquid and separable* solids. Typical single-pass performance with sand and water is 98% efficiency to 74 microns; for a recirculated system, the level of efficiency is 98% to 40 microns. Performance at this level is predictable when the difference in specific gravity between the liquid and separable* solids exceeds the initial between sand (Sp. Gr. of 2.6) and water (Sp. Gr. of 1.0). *Separable solids: Typical performance efficiency criteria applies to moderate viscosity (minus 100 SSU) liquids in the 1.0 specific gravity range and moderate density solids with a specific gravity of 1.8 or greater.*

Separator Design Features:

The separator shall be designed with tangential entry into the acceptance chamber. Upon tangential entry, the liquid/solids are directed through internal tangential slots and accelerated into the standard diameter separation cylinder. The solids heavier than the liquid are centrifugally spiraled down the perimeter of the separation cylinder past the deflector stool and allowed to accumulate in the separator's collection chamber. The liquid (free of separable solids) will follow the vortex created and centered on the deflector stool up through the interior of the separator cylinder to the vortex finder which becomes the separator outlet.

The separator shall also incorporate a pressure relief line from the acceptance chamber to the venturi located in the tangential inlet to facilitate separation by facilitating quiescent solids sedimentation in the collection chamber. Quiescent solids accumulation shall be facilitated by the baffle spin arrestor below the deflector in the collection chamber. Separation and collection of solids shall not promote excessive wear nor require a continuous "entrained" underflow.

Separator Criteria:

- The separator shall have a _____-inch flanged tangential inlet and a _____-inch flanged outlet.
- The separator shall have a 1 1/2-inch purge outlet.
- The separator shall operate within a flow range of _____ U.S. gpm with a minimum inlet pressure of _____ psi and a corresponding pressure loss range of _____ psi.
- The separator shall be designed for maximum operating pressure of 150 psi.

Separator Construction:

- The separator shall be fabricated of carbon steel with shell material of minimum 3/16-inch thickness. All flanges will be 150 lb., A.N.S.I., Raised Face.
- The separator shall have a flanged removable top to facilitate any potential servicing or inspection of the acceptance chamber or the separation cylinder.
- The separator shall incorporate a grooved pipe coupling to provide for full access to the separator's collection chamber for inspection or servicing.
- Paint coating shall be Mactek M-Line Enamel, F-9056 Laval Blue.

Separator Identification:

The separator(s) shall be Lakos Separator

Model(s) _____

as manufactured and marketed by Claude Laval Corporation of Fresno, California.

Limited Warranty

Products manufactured and marketed by this corporation are warranted to be free of defects in material or workmanship for a period of at least one year from date of delivery. Extended warranty coverage applies as follows:

Lakos Separators — Five-Year Warranty

In the event of a fault develops, notify us, giving a complete description of the alleged malfunction. Include the model number(s), date of delivery and operating conditions of subject product(s). We will subsequently review this information and, at our option, supply you with either servicing data or shipping instructions and returned goods authorization. Upon prepaid receipt of subject product(s) at the instructed designation, we will then either repair or

replace such product(s), at our option, and if determined to be a warranted defect, we will perform such necessary product repairs or replace such product(s) at our expense.

This limited warranty does not cover any products, damages or injuries resulting from misuse, neglect, normal expected wear, chemically-caused corrosion, improper installation or operation contrary to factory recommendations. Nor does it cover equipment which has been modified, tampered with or altered without authorization.

No other extended liabilities are stated or implied and this warranty in no event covers incidental or consequential damages, injuries or costs resulting from any such defective product(s).

Lakos Separators are manufactured and sold under one or more of the following U.S. Patents: 3,289,608; 3,512,651; 3,568,837; 3,701,425; 3,947,364; 3,963,073; 4,072,481; 4,120,795; 4,140,638; 4,147,630; 4,148,735; 4,305,825, and corresponding foreign patents; other U.S. and foreign patents pending.

Claude Laval Corporation

Not connected with The DeLaval Separator Company

1911 N. Helm • P.O. Box 6119 • Fresno, California 93703
(209) 255-1601 • Telex: 355-355 Laval/FSO • FAX (209) 255-8093
Toll-Free: (800) 344-7205; In Calif.: (800) 742-1850

Appendix E

Portable Eyewash

Treatment Product Information

- MIXING INSTRUCTIONS -

EYESALINE

CONCENTRATE

FOR

PORTA-STREAM II OR III

Eyesaline Concentrate must be diluted with tap water prior to use. This bottle contains the concentrate required to prepare a buffered, saline solution with preservative for a sixteen (16) gallon capacity Porta-Stream II or III. For best results, use filtered water. If filtered water is not available, use tap water.

Read Warning Notice on bottle.

TO MIX:

1. The solution can be mixed directly in the Porta-Stream II or III unit or in a separate container with sufficient capacity to mix sixteen (16) gallons of solution. The container should have a cover and a pouring spout or spigot for transferring the mixed solution of Eyesaline Concentrate and water to the Porta-Stream unit.
2. The Porta-Stream II or III must be drained, rinsed and cleaned according to instructions. If a separate mixing container is used, this container must be clean.
3. For best results, mix in an area which is clean and free of airborne particles.
4. Measure fourteen and two-thirds (14.6) gallons (1869 fluid ounces) of filtered water or tap water into a clean container. For best mixing results, use warm water or allow water to reach ambient temperature. Keep container covered.
5. To Mix In A Container Other Than The Porta-Stream II Or III Unit:
  - a) The person mixing the solution should wear protective eyewear and gloves when handling the Eyesaline Concentrate.
  - b) Open the bottle of Eyesaline Concentrate. Slowly pour one-third ($1/3$) of the contents (approx. 60 ounces) into the 14.6 gallons of water. Agitate gently or stir slowly for at least one minute to mix. Then, add an additional $1/3$ of concentrate. Agitate gently or stir slowly for at least one minute. Add the balance of the concentrate. Agitate gently or stir slowly for at least two minutes.

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eyesaline® . . . The Solution for Emergency Eye Care.

- c) Pour the mixture into a Porta-Stream II or III which has been properly cleaned and flushed. Make sure the pull strap is properly seated on the nozzles.
- d) Place refill tag on the Porta-Stream unit. The Eyesaline Concentrate plus water mixture should be replaced at least once every six (6) months.
- e) Dispose of the concentrate bottle.

6. To Mix In The Porta-Stream II or III Unit:

- a) The person mixing the solution should wear protective eyewear and gloves when handling the Eyesaline Concentrate.
- b) The person mixing the solution should have available:
  - 14.6 gallons of water.
  - One (1) 180 ounce package of Eyesaline Concentrate.
- c) Be sure that the Porta-Stream II or III has been properly drained and flushed. The pull strap should be placed on the nozzles.
- d) Pour approximately one-third of the required 14.6 gallons of water into the unit. Add one-third of the concentrate. Agitate the unit to mix water and concentrate.

Then add another one-third of the required 14.6 gallons of water into the unit. Add an additional one-third of the concentrate. Agitate the unit to mix water and concentrate.

Then add the balance of the 14.6 gallons of water. Add the balance of the concentrate. Agitate the unit to mix water and concentrate.

- e) Replace fill cover on Porta-Stream II or III and place unit in the proper location.
- f) Place refill tag on the Porta-Stream unit. The Eyesaline Concentrate plus water mixture should be replaced at least once every six (6) months.
- g) Dispose of the concentrate bottle.

EYESALINE CONCENTRATE

Contents: One Hundred Eighty (180) Fluid Ounces

Contains:

Sodium Chloride.....	Less than 0.05 gms/ml
Sodium Phosphates.....	Less than 0.15 gms/ml
Benzalkonium Chloride.....	Less than 100.0 ml
Purified Water.....	5.01 liters

CAUTION:

- . Eyesaline Concentrate must be diluted in a ratio of 10 parts water to 1 part concentrate before use.
- . DO NOT USE IN CONCENTRATE FORM.
- . DO NOT USE INTERNALLY.
- . DO NOT FREEZE.
- . DO NOT REUSE CONTAINER - DISCARD.
- . Take care when lifting or moving Porta-Stream. A full Porta-Stream II or III weighs 150 pounds.

Appendix F

Ground Water Disposal Procedure

S4.7 TREATMENT AND DISPOSAL OF WELL DEVELOPMENT AND WELL PURGE FLUIDS

by T. M. Carlsen and S. Gregory

S4.7.1 PURPOSE

To ensure that investigation-derived ground water which is purged from monitor wells is properly treated and disposed of in a manner consistent with the protection of human health and the environment.

This SOP was developed using the guidance provided by the U.S. Environmental Protection Agency (EPA) in *Guide to Management of Investigation-Derived Wastes* (EPA, 1991). This guidance states that "the management of investigation-derived wastes (IDW) must ensure protection of human health and the environment and comply with certain regulatory requirements that are applicable or relevant and appropriate (ARAR)." The guidance further states that "as a general rule, it will be necessary to use best professional judgment, in light of the site-specific conditions, to determine whether an option is protective of human health and the environment." The following SOP reflects LLNL Site 300's evaluation of ARARs and its best professional judgment concerning the management of investigation-derived ground water.

S4.7.2 DISCUSSION

S4.7.2.1 BACKGROUND

Purged ground water is produced by well development, aquifer testing, or ground water sampling activities. Well development is typically conducted soon after the monitor well is installed. Depending upon hydraulic characteristics of the monitor well and the aquifer, the monitor well is developed by a combination of surge blocking, air lifting, and pumping with an electric submersible pump. Volumes of purged ground water produced during well development and aquifer testing range from several gallons to several hundreds of gallons. Ground water sampling produces lesser ground water volumes of several gallons to several tens of gallons per monitor well.

Subsurface investigations are conducted at Site 300 to define the spatial distribution of contaminants that may include volatile organic compounds (VOCs), fuel hydrocarbons, tritium, metals, oils, and the high explosive (HE) compounds cyclotetramethylene-tetranitramine (HMX) and cyclotrimethylene trinitramine (RDX). Most subsurface investigations at Site 300 have involved characterizing the vertical and horizontal extent of tritium, VOCs [primarily trichloroethylene (TCE)], and to a lesser extent HMX and RDX. As a result, some monitor wells yield ground water that is contaminated with either tritium, TCE, HE compounds, or a combination of these contaminants. For most monitor wells, contaminant concentrations are typically stable or declining from quarter to quarter.

Parameters such as pH, specific conductance, and a determination of the presence of free product are routinely taken in the field. Laboratory analyses for metals and other constituents are obtained where site history indicates these substances may be present. This data indicates the purge water generally does not meet the definition of a RCRA characteristic waste, i.e. it does not exhibit ignitability, corrosivity, reactivity or toxicity.

In general, the types of chemical analyses, as well as the need to perform them, are dependent on the anticipated concentrations and the location of the monitor well. Chemical analyses are typically performed on purge water in areas with little historical information. In areas with abundant historical chemical information, the most recent analytical data is used to determine the appropriate disposal method for the purge water.

S4.7.2.2 ARARS

According to EPA (EPA, 1991) the "EPA has not established a presumption for the management of aqueous liquid IDW (e.g. ground water). It is left to site managers to determine the most appropriate disposal options on a site specific basis. Managers should consider volume of IDW, contaminants present in the ground water and in the soil, and whether the water is a drinking water supply. In addition, wastes should be managed consistent with the final site remedy.

In determining the procedure for managing purge water, ARARs were evaluated. Table S4.7-1 lists those ARARs which may be applicable to purge water generated from Site 300 investigations. Table S4.7-1 also describes LLNL Site 300 actions taken to comply with the substantive portions of each regulation, as required by EPA, 1991.

In addition, guidance was in part supplied by the State of California Regional Water Quality Control Board—Central Valley Region (RWQCB) and was documented in three LLNL "Records of Communication" (telephone conversations) dated June 28, 1988, November 29, 1989, and February 7, 1990. This guidance stipulates that the volumes of purged ground water at Site 300 are so minor that a Waste Discharge Requirement (WDR) Permit is not required. Also, the EPA considers drinking water MCLs and State environmental standards for drinking water to be the most pertinent applicable requirements for ground water. These levels and goals are summarized in Table S4.7-2. The MCL for TCE is 5.0 ppb (ug/L). No Federal or State water quality standards exist for HE compounds. However, discharge requirements for HE compounds were established in a National Pollutant Discharge Elimination System permit issued at another facility as discussed by Crow and Lamarre (1990). The tritium disposal criterion is set at 5% of the drinking water standard. As tritium occurs in the form of tritiated water, and thus easily moves with water, this very conservative disposal criterion assures that ERD does not increase the areal extent of tritium found at Site 300.

S4.7.3 PROCEDURES

S4.7.3.1 ASSOCIATED PROCEDURES

The following Standard Operating Procedures are relevant to this discussion.

<u>SOP No.</u>	<u>SOP Title</u>
S1.3	Drilling
S1.4	Monitor Well Installation
S1.5	Monitor Well Development
S1.9	Disposal of Investigation-Derived Wastes (Drill Cuttings, Core Samples, and Drilling Mud)
S1.10	Lysimeter Soil Moisture Sampling
S2.1	Presample Purging of Wells
S2.3	Sampling Monitor Wells with Bladder and Electric Submersible Pumps
S2.4	Sampling Monitor Wells with a Bailer
S2.6	Sampling for Volatile Organic Compounds
S3.4	Hydraulic Testing (Pumping)

S4.7.3.2 PREPARATION

S4.7.3.2.1 Office

- A. Prior to the start of any well development, aquifer testing, or ground water sampling activities, the Field Coordinator (FC), study area task leader, Chemistry Group Leader (CGL), Hydrogeologic Group Leader (HGL), Site Safety Officer (SO), and Sampling Team should have exchanged information as to the types and concentrations of contaminants that may be encountered.
- B. The necessary level of personal protection should also be discussed.
- C. The study area task leader, CGL, and HGL will select the laboratory analytical methodology; it will be based upon the ground water chemical distribution in surrounding monitor wells and adjacent program operations. Detection limits should be below the drinking water standards in Table S4.7-1.

S4.7.3.2.2 Field

- A. Place 55-gal drums for the collection of purge water immediately adjacent to all monitor wells.
- B. Attach the drums used to collect ground water to a cemented pole with a cable or chain to prevent accidental spillage.

- C. Label all 55-gal drums "NON-POTABLE WELL DEVELOPMENT PURGE WATER."
- D. Label all portable tanks "NON-POTABLE WATER."
- E. Ensure that no sediment is present in the portable tanks.
- F. Ensure that drums and portable tanks are in good working order.

S4.7.3.3 OPERATION

Purged ground water that is suspected to contain detectable contaminant concentrations should be discharged directly to either dedicated 55-gal drums or portable tanks. The proper analytical data set to use for evaluating purged ground water quality is dependent upon the type of field activity. For routine (quarterly) ground water sampling, the previous quarter's analytical data should be used. The specific analyses from an initial or nonroutine ground water sampling should be used to evaluate that particular purged ground water. Composites should be used to evaluate ground water that is purged during well development and aquifer testing activities.

S4.7.3.3.1 Disposal Criteria and Disposal Procedures for Tritium Investigations in the East and West Firing Areas

The following categories A through D define the criteria that shall be used to select the proper disposal method for purged ground water from the tritium investigation areas.

A. Purged ground water with:

1. Tritium concentrations below 1,000 pCi/L.
2. All VOC concentrations below detection limits.

Disposal Procedure. Discharge purged ground water onto the ground surface in the immediate vicinity of the monitor well. Do not discharge water into any arroyo, culvert, creek, or other surface water drainage system. Discharge of purged ground water in drums to evaporate is optional.

B. Purged ground water with:

1. Tritium concentrations below 1,000 pCi/L, and
2. Detectable VOC concentrations below values listed in Table S4.7-1, [for VOCs not listed in Table S4.7-1, concentrations below any applicable Federal or State Maximum Contaminant Level (MCL) or State Drinking Water Action Level (DWAL)], or

3. Concentrations of VOCs which do not have MCLs or DWALs are above detection limits.

Disposal Procedure. Pump purged ground water into drums (which have been secured to posts or bollards to prevent spillage) and allow to evaporate or treat as necessary. To prevent rainfall from potentially overfilling the drums, do not fill more than three-quarters full between September and April.

C. Purged ground water with:

1. Tritium concentrations above 1,000 pCi/L, regardless of the presence of other contaminants.

Disposal Procedure. Pump purged ground water into drums, and allow to evaporate. To prevent rainfall from potentially overfilling the drums, do not fill more than three-quarters full between September and April.

D. Purged ground water with:

1. Tritium concentrations below 1,000 pCi/L, and
2. VOC concentrations above values listed in Table S4.7-1, or concentrations of VOCs not listed in Table S4.7-1 are above any applicable MCL or DWAL, regardless of concentrations of VOCs which do not have MCLs or DWALs.

Disposal Procedure. Pump purged ground water into drums, and seal drums with lids to prevent evaporation. Pump water from drums into a portable tank, and air strip according to Section S4.7.3.3.6, Air Stripping Procedures for VOC Contaminated Purge Water. To prevent rainfall from potentially overfilling the drums, do not fill drums more than three-quarters full between September and April.

S4.7.3.3.2 Disposal Criteria and Procedures for VOC Investigations and Other Investigations Not Involving HE, Tritium, or Free Product

Categories A through C (below) define the criteria that shall be used to select the proper disposal methods for purged ground water from areas generally involved only in VOC investigations.

A. Purged ground water with:

1. No detectable contaminant concentrations.

Disposal Procedure. Discharge purged ground water onto the ground surface in the immediate vicinity of the monitor well. Do not discharge water into any arroyo, culvert, creek, or other surface water drainage system. Discharge of purge water into drums for evaporation is optional.

B. Purged ground water with:

1. Detectable VOC concentrations below values listed in Table S4.7-1 (for VOCs not listed in Table S4.7-1, concentrations below any applicable MCL or DWAL), or
2. Concentrations of VOCs which do not have MCLs or DWAL are above detection limits.

Disposal Procedure. Discharge purge water into drums or other appropriate containers which have been adequately secured to prevent accidental spillage, and allow to evaporate, or treat as necessary. To prevent rainfall from potentially overfilling the drums, do not fill more than three-quarters full between September and April.

C. Purged ground water with:

1. VOC concentrations above values listed in Table S4.7-1, or concentrations of VOCs not listed in Table S4.7-1 are above any applicable MCL or DWAL, regardless of concentrations of VOCs which do not have MCLs or DWALs.

Disposal Procedure. Pump purged ground water into drums, and seal drums with lids to prevent evaporation. Pump water from drums into a portable tank, and air strip according to Section S4.7.3.3.6, Air Stripping Procedures for VOC Contaminated Purge Water. To prevent rainfall from potentially overfilling the drums, do not fill drums more than three-quarters full between September and April.

S4.7.3.3.3 Disposal Criteria and Disposal Procedures for High Explosive Investigations in the HE-Process Area

The next categories A through D define the criteria that shall be used to select the proper disposal method for purged ground water from HE-Process Area investigations.

A. Purged ground water with:

1. HE concentrations below detection limits, and
2. All VOC concentrations below detection limits.

Disposal Procedure. Discharge purged ground water onto the ground surface in the immediate vicinity of the monitor well. Do not discharge water into any arroyo, culvert, creek, or other surface water drainage system. Discharge of purge water into drums for evaporation is optional.

B. Purged ground water with:

1. HE concentrations below detection limits, and
2. Detectable VOC concentrations below values listed in Table S4.7-1 (for VOCs not listed in Table S4.7-1, concentrations below any applicable MCL or DWAL), or
3. Concentrations of VOCs which do not have MCLs or DWALs are above detection limits.

Disposal Procedure. Discharge purge water into drums or other appropriate containers which have been adequately secured to prevent accidental spillage, and allow to evaporate or treat as necessary. To prevent rainfall from potentially overfilling the drums, do not fill more than three-quarters full between September and April.

C. Purged ground water with:

1. HE concentrations above detection limits regardless of concentrations of other contaminants.

Disposal Procedure. Discharge purge water into drums or other appropriate containers which have been adequately secured to prevent accidental spillage, and allow to evaporate or treat as necessary. To prevent rainfall from potentially overfilling the drums, do not fill more than three-quarters full between September and April.

D. Purged ground water with:

1. HE concentrations below detection limits, and
2. VOC concentrations above values listed in Table S4.7-1, or concentrations of VOCs not listed in Table S4.7-1 are above any applicable MCL or DWAL, regardless of concentrations of VOCs which do not have MCLs or DWALs.

Disposal Procedure. Pump purged ground water into drums, and seal drums with lids to prevent evaporation. Pump water from drums into a portable tank, and air strip according to Section S4.7.3.3.6, Air Stripping Procedures for VOC Contaminated Purge Water. To prevent rainfall from

potentially overfilling the drums, do not fill drums more than three-quarters full between September and April.

S4.7.3.3.4 Disposal Criteria and Disposal Procedures for Investigations with Monitor Wells that Yield Free Product

Disposal Procedure. Free product and emulsions of free product with ground water should be handled as hazardous waste and should be transported to the Livermore Main Site for proper disposal by the Hazardous Waste Management Division.

S4.7.3.3.5 Disposal Criteria and Disposal Procedures for Investigations with Monitor Wells that Yield Compounds Not Discussed in Sections S4.7.3.3.1 to S4.7.3.3.4.

Disposal Procedure. Ground water that contains contaminants that have not been discussed earlier should be discharged into drums. Any additional disposal procedure for this water will be decided by the HGL or CGL.

S4.7.3.3.6 Air Stripping Procedures for VOC Contaminated Purge Water

- A. Transfer all purge water with VOC concentrations above the MCLs or DWALs to the 10,000-gal air-stripping tank, located in the Building 833 parking area (Fig. S4.7-1). This tank is fitted with dedicated bubbling lines and recirculating pumps for optimal air-stripping capability. The air effluent from the tank is routed through activated carbon filters to trap the stripped VOCs.
- B. Once all the collected water has been transferred from the drums to the stripping tank, allow the water to be bubbled and circulated for several days.
- C. Collect an air effluent sample from the carbon canisters at least once every 24 h of operation by attaching a Tedlar bag to the air effluent sampling port (Fig. S4.7-1).
- D. Submit this air sample to the LLNL Chemistry Characterization Laboratory for VOC analysis on a 24-h turnaround. If results show any breakthrough of VOCs, stop operation and replace carbon canisters.
- E. Collect a water sample from the tank every 24 h of operation to be analyzed for VOCs on a 24-h rush. Refer to SOP 2.6, Sampling for Volatile Organic Compounds, for procedures on sample collection.
- F. Once the results from the analyses of the purge water sample show no detected concentrations of VOCs, the water may be discharged.

- G. Open the external valves from the pumping system, and pump the water through the five high-pressure nozzles to vaporize the water into the air.
- H. Record all information in the Document Control Logbook (e.g., date, quantity of water treated, total time of air stripping, air sampling results, results of water analyses during stripping, etc.).

S4.7.3.4 POST OPERATION

S4.7.3.4.1 Field

- A. Clean out any sediment in stripping tank, portable tanks, or drums. Sample and dispose of properly. Inspect all drums for leaks.
- B. Inventory equipment and supplies. Replace or repair all broken or damaged equipment.

S4.7.3.4.2 Office

- A. Review field logbook and forms for completeness.
- B. Deliver original forms and logbook to the Document Control Officer (DCO).

S4.7.4 PROCEDURE EXCEPTIONS

In developing this SOP, every effort was made to ensure compliance with all ARARs, as required in EPA, 1991. But as recognized in EPA, 1991, it is often necessary to use best professional judgment in light of site-specific conditions. Thus, the CGL has the option to grant exceptions to the above purge-water handling protocol. All exceptions will be granted only after consultation with project geologists, appropriate regulatory agencies, and other appropriate professionals. Exceptions shall be granted only after the CGL has determined that such actions are still protective of human health and the environment.

S4.7.5 REFERENCES

Crow, N. B. and A. L. Lamarre (1990), *Remedial Investigation of the High Explosives (HE) Process Area, LLNL Site 300*, Lawrence Livermore National Laboratory, Livermore, Calif. (UCID-21920).

EPA (1991), *Guide to Management of Investigation-Derived Wastes*, U.S. EPA, Office of Solid Waste and Emergency Response, Publication 9345.3-03FS, October 1991.

Title 26, California Code of Regulations, Section 22-66699.

Figure S4.7-1. Disposal of purge water.

S4.7-10

Table S4.7-1. Potential Federal, State and Local ARARs.

ARAR	Comments	LLNL Site 300 actions taken to comply with ARARs
<i>Federal</i>		
1. Safe Drinking Water Act (SDWA) [42 USCA 300] [40 CFR 141.11–141.16; 141.50–141.51]	This law establishes treatment standards for current potential drinking water sources by setting Maximum Contaminant Levels (MCLs) and non-zero Maximum Contaminant Level Goals (MCLGs). Private water supply wells occur near the Site 300 boundary. Site 300 water is also supplied by onsite water supply.	Every effort is made to prevent discharge of ground water with detectable contaminant concentrations onto the ground surface. In no case shall ground water exceeding MCLs be discharged to the ground.
2. Clean Air Act (CAA) [42 USCA 7401–7642] [40 CFR 50–69]	National primary and secondary ambient air quality standards (NAAQS) are defined under Section 109 of the CAA and are listed in 40 CFR 50.	Although VOCs are not regulated, effluent from air-sparging system used to treat purge-water containing VOCs is trapped onto granular activated carbon (GAC).
3. Clean Air Act [42 USCA 7412] [40 CFR 61.92]	National Emission Standards for Hazardous Air Pollutants (NESHAPs) are specific to industrial emissions. 40 CFR 61.92 limits emissions of radionuclides to those amounts that would cause any member of the public to receive, in any one year, a maximum effective dose equivalent of 10 millirems per year (mrem/y).	Evaporation of tritiated purge water will not exceed dose limits.
4. RCRA [40 CFR 264.190–192]	Design and operating standards for tank systems.	Purge-water collection vessels and air-sparging treatment system comply with the substantive portions of these regulations.
RCRA [40 CFR 264.601–602]	Design, monitoring, and performance standards for miscellaneous treatment units.	

S4.7-11

LCRL-MA-109115

S4.7 Treatment and Disposal of Well Development and Well Purge Fluids

Approval: TMC
February 1993, Rev. 1

Table S4.7-1. (Continued)

ARAR	Comments	LLNL Site 300 actions taken to comply with ARARs
5. Land Disposal Restrictions (LDRs) RCRA [40 CFR 268]	Any waste placed in land-disposal units must comply with LDRs by either attaining specific performance or technology-based standards.	Collection of purge-water near well head not considered "placement" under LDR restrictions. Air-sparging system consistent with final site remedy under CERCLA.
6. Clean Water Act [33 USCA 1251-1376] National Pollutant Discharge Elimination System (NPDES) [40 CFR 122-125]	Both onsite and offsite discharges from CERCLA sites to surface waters are required to meet the substantive CWA limitations, monitoring requirements [40 CFR 122.41(i); 40 CFR 136.1; 40 CFR 136.4], and best management practices [40 CFR 125.100].	Discharge of purge-water onto ground limited as much as is practical. In no cases will ground water exceeding State or Federal MCLs be discharged to ground.
<i>State and local requirements</i>		
7. Hazardous Waste Control Act (Health and Safety Code, Section 25100-25395), CCR, Title 22, ch. 30: Minimum Standards for Management of Hazardous and Extremely Hazardous Wastes	HCWA controls hazardous wastes from their point of generation through accumulation, transportation, treatment, storage, and ultimate disposal. All potentially hazardous materials are handled in accordance with standard chain-of-custody procedures.	In no case will purge-water fitting the description of hazardous waste be discharged to the ground. If purge-water is found to contain contaminant concentrations at hazardous waste levels, the purge-water will either be submitted to LLNL's Hazardous Waste Management Division (HWM) for proper disposal (non-VOCs), or air-sparged onsite (VOCs). All used GAC canisters will also be submitted to HWM for proper disposal.
Criteria for Identifying Hazardous Wastes [Title 22, 66693-66776]	Tests for identifying hazardous characteristics are set forth in these regulations.	
Persistent and Bioaccumulative Toxic Substances [Title 22, 66699]	Total Threshold Limit Concentrations (TTLCs) and Soluble Threshold Limit Concentrations (STLCs) have been established for selected toxics to be used in establishing whether waste is hazardous.	

Table S4.7-1. (Continued)

ARAR	Comments	LLNL Site 300 actions taken to comply with ARARs
8. Porter-Cologne Water Quality Control Act [WC13000-13806], as administered by the State Water Resources Control Board (SWRCB) and the Regional Water Quality Control Board (RWQCB) under CCR Title 23, subch. 15, 1050-2836.	Establishes authority for State and Regional Water Boards to determine site-specific discharge requirements and to regulate disposal of waste to land (see Table 3-2).	Discharge of ground water containing detectable contaminant concentrations to the ground surface will be limited to the extent practical.
9. State Water Resources Control Board Resolution 68-16	Establishes State Board policy on maintaining the high quality of California's waters.	Discharge of ground water containing detectable contaminant concentrations to the ground surface will be limited to the extent practical. In no cases will such discharge be allowed offsite or in onsite arroyos or stream beds.
10. California Safe Drinking Water Act, Health and Safety Code, Section 2549.5	Regulations and standards for public water systems; MCLs and secondary MCLs (SMCLs), which are enforceable in California; requirements for water quality analyses and laboratories (see Table 3-2).	Discharge of ground water containing detectable contaminant concentrations to the ground surface will be limited to the extent practical. In no cases shall such discharge be allowed offsite or in onsite arroyos or stream beds.
11. Fish and Game Regulations on Pollution	Prohibits water pollution with any substance or material deleterious to fish, plant, or bird life.	Discharge of ground water containing detectable contaminant concentrations to the ground surface will be limited to the extent practical. In no cases shall such discharge be allowed offsite or in onsite arroyos or stream beds.

S4.7-13

UCRL-MA-109115

S4.7 Treatment and Disposal of Well Development and Well Purge Fluids

Approval: TMC
February 1993, Rev. 1

Table S4.7-1. (Continued)

ARAR	Comments	LLNL Site 300 actions taken to comply with ARARs
12. Air Resources Act (Health and Safety Code, section 3900 <i>et. seq.</i>)	Establishes allowable discharge standards for point sources within each air pollution control district, and establishes ambient air quality standards.	Although VOCs not regulated, effluent from air-sparging system used to treat purge-water containing VOCs is trapped onto granular activated carbon (GAC).
13. Bay Area Air Quality Management District [Regulation 8, Rule 47], San Joaquin County Air Pollution Control District	Requires permitting of VOC air discharges (e.g., from an air-stripping unit).	Air-sparging unit at Site 300 complies with the substantive portions of these regulations.

UCRL-MA-109115

S4.7 Treatment and Disposal of Well Development and Well Purge Fluids

Approval: JMC
February 1993, Rev. 1

Table S4.7-2. Summary of Federal and State drinking water quality standards.

Compound	Federal MCL*	California MCL* and DWAL**	Unit
Tetrachloroethylene (PCE)	5.0	5.0	µg/L (ppb)
Trichloroethylene (TCE)	5.0	5.0	µg/L (ppb)
1,1,1-Trichloroethane (1,1,1-TCA)	200.0	200.0	µg/L (ppb)
1,1-Dichloroethylene (1,1-DCE)	7.0	6.0	µg/L (ppb)
cis-1,2-Dichloroethylene	70.0	6.0	µg/L (ppb)
trans-1,2-Dichloroethylene	100.0	10.0	µg/L (ppb)
1,1-Dichloroethane (1,1-DCA)	—	5.0	µg/L (ppb)
1,2-Dichloroethane (1,2-DCA)	5.0	0.5	µg/L (ppb)
Freon 113	—	1,200.0	µg/L (ppb)
Carbon tetrachloride	5.0	0.5	µg/L (ppb)
Chloroform	—	—	µg/L (ppb)
Benzene	5.0	1.0	µg/L (ppb)
Toluene	1,000.0	100.0	µg/L (ppb)
Total xylenes	10,000.0	1,750.0	µg/L (ppb)
Tritium	20,000.0	20,000.0	pCi/L

* Maximum Contaminant Level

** Drinking Water Action Level

Appendix G

Sampling Plan

Lawrence Livermore National Laboratory

March 10, 1994

Ms. Susan Timm
Ms. Pamela Barksdale
Regional Water Quality Control Board
Central Valley Region
3443 Routier Road, Suite A
Sacramento, CA 95827-3098

Subject: Sampling Plan to Support the Permitting of Non-Storm Water Discharges and WDR 85-188 Amendments

Dear Ms. Timm and Ms. Barksdale:

Attached please find LLNL's proposed Site 300 Sampling Plan to characterize discharges representative of those we seek to permit to comply with the storm water regulations, Water Quality Order No. 91-13-DWQ, NPDES General Permit No. CAS000001, and to support the amendment of WDR 85-188 for discharges "engineered to ground." The storm water regulations require us to permit the Site 300 non-storm water discharges by March 27, 1995. **To meet the regulatory deadline, we must complete our sampling by April 1994, and would, therefore, appreciate verbal comments and concurrence with this plan within one week of your receipt.**

As discussed at our January 10, 1994, meeting, we are transmitting our proposed Sampling Plan for your review and concurrence before we proceed. As you are aware, Site 300 is a remote site with limited options for disposing of wastewater. We identified five general types of discharges that we intend to permit on a site-wide basis: fire auxiliaries, temperature and pressure relief valves, emergency eye washes, washing machines, and equipment room floor sinks (which contain discharges from several types of mechanical equipment). A full suite of samples along with QA replicate samples, will be analyzed for each type of discharge to represent the discharge characteristics.

It is not possible to sample some discharges that we intend to permit during the period in which we must complete our sampling. For example, air conditioners and air compressors, even if run in the winter, will not produce significant condensate because of the low air temperature. We would appreciate any suggestions you may have to sample such low flow discharges. In such instances where sampling is not possible, we will rely on manufacturers' information to assess likely pollutants. We intend to sample air conditioner condensate at the Livermore site during the summer months, and will provide you with the Livermore Site results.

EMS94:63:WI:RV:ch

Sampling Plan to Support the Permitting of Non-Storm Water Discharges and WDR 85-188 Amendment

Please contact Sandy Mathews directly at (510) 423-6679 with your comments or if you have any questions. Thank you in advance for your timely review of this material.

Sincerely,

William F. Isherwood, Division Leader
Environmental Monitoring and Analysis
Environmental Protection Department

Attachment

cc: Wendy Cohen

Sampling Plan to Support the Permitting of Non-Storm Water Discharges and WDR 85-188 Amendment

bcc: R. Failor	L-629
K. Folks	L-629
H. Galles	L-626
W. Hoppes	L-629
W. Isherwood	L-629
E. Raber	L-626
R. Vellinger	L-629
C. Garcia	L-629
B. Ward	L-629
R. Welsh	L-629
S. Mathews	L-629

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EMP-BD-S300

SAMPLING PLAN TO SUPPORT THE PERMITTING OF NON-STORM WATER DISCHARGES AND WDR 85-188 AMENDMENTS

Prepared by:

Rhonda L. Welsh 3-8-94
Rhonda Welsh
Scientific Technologist, WGMG
Date

Reviewed by:

Rebecca Ward 2-23-94
Rebecca Ward
Scientific Technologist, WGMG
Date

See Attached
Robert Vellinger
Environmental Analyst, WGMG
Date

Approved by:

William Hoppes 3/3/94
William Hoppes
Group Leader, WGMG
Date

Lucinda M. Garcia 3/7/94
Lucinda M. Garcia
Quality Assurance Coordinator, EMS
Date

Rebecca A. Faylor 3/9/94
Rebecca A. Faylor
Section Leader, EMS
Date

William Isherwood 3-9-94
William Isherwood
Division Leader, EMAD
Date

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EMP-BD-S300

SAMPLING PLAN TO SUPPORT THE PERMITTING OF NON-STORM WATER DISCHARGES AND WDR 85-188 AMENDMENTS

Prepared by:

Rebecca Ward 2-23-94
Rebecca Ward Date
Scientific Technologist, WGMG

Reviewed by:

Robert Vellinger 2-25-94
Robert Vellinger Date
Environmental Analyst, WGMG

Approved by:

William Hoppes 3/3/94
William Hoppes Date
Group Leader, WGMG

_____
Lucinda M. Garcia Date
Quality Assurance Coordinator, EMS

_____
Rebecca A. Failor Date
Section Leader, EMS

_____
William Isherwood Date
Division Leader, EMAD

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1.0. PURPOSE

This Sampling Plan describes methods to collect aqueous samples from non-storm water discharges to the surface or process waters engineered to ground at the Experimental Test Site (Site 300). These discharges were identified through LLNL's Building Drain Investigation and the Site Wide Building Assessment Projects. This effort will provide analytical results to determine "environmental impact" of identified sources discharges and to support permit applications.

2.0. DISCUSSION

2.1. SURFACE DISCHARGES

In 1987, Congress added Section 402(p) to the 1972 Clean Water Act, establishing a framework for regulating municipal and industrial storm water discharges under the National Pollutant Discharge Elimination System (NPDES) program. The Environmental Protection Agency (EPA) published the final rule implementing Section 402(p) in 1990. This rule required the EPA to establish regulations setting forth NPDES permit application requirements for storm water. The EPA subsequently delegated enforcement and interpretation of this rule to the California State Water Resources Control Board, and the Board then issued the California General Industrial Activity Storm Water Permit (General Permit). The General Permit Section A requires the development and implementation of a Storm Water Pollution Prevention Plan (SWPPP), part of which requires the identification of non-storm water discharge and subsequent permitting or elimination of these discharges. This sampling plan supports the general NPDES permit activity by categorizing the levels of pollutants being discharged to the ground in some of the identified non-storm water discharges, and supports the permitting of these discharges.

2.2. WDR AMENDMENT

The Porter Cologne Water Quality Control Act requires waste discharges to surface waters or ground waters to be permitted. In 1985, the California Regional Water Quality Control Board issued Order 85-188 to LLNL permitting discharges of domestic wastewater to individual building septic systems and a sewage pond, and industrial wastewater to evaporation ponds. The Building Drain Investigation (BDI) identified several process wastewaters discharging to the domestic wastewater treatment units. The identification of these process discharges, in addition to changes in other aspects of the permit, require the submittal of a permit amendment.

3.0. REFERENCES

1. EPA Permit Application-General Information and Form, 3510-1, and 3510-2C (Revised August 1990)
2. LLNL Site Storm Water Pollution Prevention Plan, UCRL-AR-110573-92-DR
3. EMP-QA-SD, *Sampling Documentation*
4. EMP-QA-CS, *Courier Service Protocol*
5. EMP-QA-DM, *Data Management*
6. EMP-QA-S, *Quality Assurance Sampling, Draft*

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7. EMP-GW-CA, *Ground Water Equipment Calibration*
8. EMP-GW-S, *Ground Water Sampling*
9. EMP-RO-S, *Storm Water Run-off Sampling*

4.0. DEFINITIONS

- 4.1. COC: The Chain of Custody Form (COC) documents handling of each sample, including:
  1. Delivery of the sample from the sampler to the courier.
  2. Delivery from the courier to the analytical laboratory.
  3. Data transfer from the analytical lab to the environmental analyst.
  4. Data transfer from the analyst to the data manager.
  5. Data transfer from the data manager to the archivist for archiving.

The COC is a legal document containing vital information about the samples, including: identification/labeling of the sample (the sample identifier), collection date, sampler's identity, and the analyses that are requested to be performed on the samples by the analytical laboratory. Whenever a sample is collected for analysis, a COC must be generated and must accompany the sample at all times until the entire data results/COC packet is archived.

- 4.2. The Field Tracking Form (FTF) is used in the field to document sampling activities.
- 4.3. The Field Data Form (FDF) is used in the field to document information associated with the non-storm water discharge during a sampling event.

5.0. RESPONSIBILITIES

5.1. EMS SECTION LEADER

The Section Leader ensures that sampling methods meet regulatory guidance and that sampling is conducted in accordance with approved procedures.

5.2. WGMG GROUP LEADER

The Group Leader ensures that sampling procedures meet design criteria; that sampling is conducted in accordance with approved procedures; and that all necessary reports are prepared, approved, distributed, and archived.

5.3. EMS ENVIRONMENTAL ANALYST

The analyst is responsible for designing appropriate sampling methods and communicating them to Technologists, evaluating the resulting data in light of regulatory requirements, and designing changes in sampling methods where appropriate.

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5.4. TSG ENVIRONMENTAL TECHNOLOGIST

TSG Technologists are responsible for ensuring that the samples are collected in accordance with the approved procedures.

6.0 PROCEDURE

Equipment required (stored in transportainer (TR) #TY-165 at the end of 6th Street unless otherwise indicated):

Personal protective equipment: rubber boots, safety goggles, rubber gloves
Sample bottles
Tags and labels for sample bottles
Indelible marking pens (LLNL Stores Stock #s 7520-62156, -56629)
Kimwipes or equivalent
Disposable surgical-type gloves (LLNL Stores Stock #s 8415-64994, -64995)
Ice chests
Ice: B175 ice machine (ice bags from LLNL Stores # 8105-27699) (ice must be double-bagged)
Field Tracking Form
Field Data Form
Chain of Custody Form
pH meter with calibration buffer pillows
Deionized water (DI)
Field Blank Water
Tape Measure
Chlorine Residual Test kit
Flashlight
Stainless Steel Bucket

6.1. PREPARATION FOR SAMPLING*

- 6.1.1. All samples will be collected in accordance with EMS sampling protocol defined in EMP-GW-S and EMP-RO-S (References 8 and 9).
- 6.1.2. Calibrate pH meter before taking into field. The pH meter will be used to obtain field pH and temperature.
- 6.1.3. Record calibration information on the FTF.
- 6.1.4. Collect equipment for sampling as listed in the "sampling equipment required section." Proceed to Site 300.

AIM

Association for Information and Image Management

1100 Wayne Avenue, Suite 1100
Silver Spring, Maryland 20910
301/587-8202

Centimeter

Inches

MANUFACTURED TO AIM STANDARDS
BY APPLIED IMAGE, INC.

2 of 2

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6.1.5. In preparation for sampling activities, and in order to achieve and maintain sample integrity following sampling and preservation methods on pages 8-9, samples will be collected in the following order at all locations:

1. Chlorine Residual will be analyzed immediately with a portable test kit.
2. pH and temperature (analyzed in the field along with a 120 ml sample for conductivity and pH to be analyzed by the analytical laboratory).
3. Volatile organics (EPA 502.2)
4. Total Organic Carbon
5. Oil and Grease
6. Chemical Oxygen Demand
7. Biological Oxygen Demand
8. Anions
9. Total Dissolved and Total Suspended Solids
10. Ammonia
11. Surfactants
12. Phosphorous
13. Metals
14. HE Compounds (only at Building 813 washing machine)

*Prior to the actual sampling event, individual facility managers, along with Plant Engineering staff, must be notified to obtain access and coordinate sampling activities within the discharge areas. A current list of the applicable facility managers and Plant Engineering staff can be obtained from the responsible Analyst.

6.2. SAMPLING

6.2.1. BUILDING 827 EQUIPMENT DRAIN

- 6.2.1.1. Proceed to Building 827 to collect samples. Samples will be obtained directly from the discharge flowing from the pipe extending out of the hillside directly east of Building 827.
- 6.2.1.2. Calculate discharge flow rate while obtaining samples. Discharge rate will be estimated by calculating amount of discharge collected into a 1-gallon collector container within a recorded period of time.
- 6.2.1.3. Record discharge rate information on the Field Data Form.

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- 6.2.1.4. Collect 100 ml of discharge and measure for chlorine with the chlorine test field kit.
- 6.2.1.5. Obtain the remaining samples in the order as stated above in Section 6.2., according to EMS sampling protocol.
- 6.2.1.6. Record date and sampler's initials on pre-labeled bottles.
- 6.2.1.7. Record location, samples taken and sampler's initials on FTF.
- 6.2.1.8. Place samples in ice chest.
- 6.2.1.9. Record all information for each discharge area onto the field data sheet. After the bottles have been filled, dry the bottles and place in an ice chest such that they will not break during transit.
- 6.2.1.10. Before leaving the sampling location, rinse all equipment with D.I. water. If equipment will be stored, decontaminate with detergent and D.I. water and with a final D.I. water rinse. Wrap in plastic bags where possible.

6.2.2. BUILDING 870 FIRE AUXILIARY*

*A coordinated effort will be made with the Fire Department to sample fire auxiliary discharge at the pre-approved scheduled maintenance testing of these units.

- 6.2.2.1. Proceed to Building 870.
- 6.2.2.2. Samples will be collected from Building 870 on the southeast side of the building adjacent to the small stairwell.
- 6.2.2.3. Fire Department personnel will discharge the water at the above named point at a 5 gallons per minute rate.
- 6.2.2.4. Samples will be obtained in the same manner and order as stated above in Sections 6.2.1.2. through 6.2.1.10.

6.2.3. BUILDING 870 TEMPERATURE AND PRESSURE VALVE

- 6.2.3.1. Samples will be obtained for temperature and pressure from Equipment Room 125 from the hot water heater located in the southeast corner of the room.
- 6.2.3.2. Locate the release valve directly on top of the unit.
- 6.2.3.3. Don protective glasses and protective rubber gloves as the discharge water may be hot.
- 6.2.3.4. Place a stainless steel bucket under discharge tubing located on the left side of the unit, which drains directly to the ground, and collect the sample volume.
- 6.2.3.5. Remove the sample bucket and decant sample volume into sample containers.
- 6.2.3.6. Take samples in the manner and order as listed above in Sections 6.2.1.2. through 6.2.1.10.

6.2.4. BUILDING 874 EMERGENCY EYEWASH (HARD PLUMBED)

- 6.2.4.1. Samples will be obtained from Room 100. Manually operate the eyewash to provide required sample volume.
- 6.2.4.2. Samples will be obtained in the manner and order as listed above in Sections 6.2.1.2. through 6.2.1.10.

6.2.5. BUILDING 873 WASHING MACHINE

- 6.2.5.1. Samples will be obtained from Building 873, Room 112. There are two washers in the room, either may be sampled.
- 6.2.5.2. Locate the discharge hose running from the washer to the mop sink or pipe drain (depending on washer being sampled) in the same room. During a typical washing operation, take samples from the discharge hose. Samples are to be collected during the first wash cycle.
- 6.2.5.3. Samples will be obtained in the manner and order as listed above in Sections 6.2.1.2. through 6.2.1.10.

6.2.6. BUILDING 813 WASHING MACHINE

- 6.2.6.1. Samples will be obtained from Building 813, Room 124.
- 6.2.6.2. Locate the discharge hose running from the washer to the mop sink in the same room. During a typical washing operation, take samples from the discharge hose. Samples are to be collected during the first wash cycle.
- 6.2.6.3. Samples will be obtained in the manner and order as listed above in Sections 6.2.1.2. through 6.2.1.10.

6.2.7. QA SAMPLES

One field blank for each day of samples will be analyzed for the same suite of parameters as the routine samples. A minimum of 20% of the samples will be replicated (as selected by the environmental analyst).

QA samples are taken to estimate the precision and accuracy of the sampling and analysis methods. They should be taken in an equivalent manner to a routine sample. Special attention should be taken to assure duplication of sampling: location, time, method, and analysis.

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6.3. SAMPLES AND PRESERVATION

Analyte	Method	Sampling requirement	Preservation	Volume/ container	Reporting level (mg/L) best possible
Anions Bromide Chloride Fluoride Nitrate Nitrite Phosphate Sulfate	EPA 300.0	Triple rinse bottle with sample matrix before filling. 48 hours max. hold time.	Store samples in ice chest or refrigerator at 4°C.	500 ml poly	0.005 0.5 0.05 0.5 0.4 0.010 0.5
Chemical Oxygen Demand (COD)	EPA 410.4	Do not rinse preacidified bottles.	Store samples in ice chest or refrigerator at 4°C. preacidified with H2SO4, provided by analytical laboratory.	100 ml poly	1.0
Biological Oxygen Demand (BOD)	EPA 405.1			500 ml	1.0
Metals		Non-Filtered water but preserved.	HNO3 to achieve pH < 2. No refrigeration required.	1 L poly	
Arsenic	EPA 206.2				0.002
Antimony	EPA 204.2				0.005
Barium	EPA 200.7				0.0025
Beryllium	EPA 210.2				0.0005
Cadmium	EPA 213.3				0.0005
Cobalt	EPA 200.7				0.025
Chromium	EPA 218.2				0.0010
Copper	EPA 220.2				0.0010
Lead	EPA 239.2				0.0050
Mercury	EPA 245.2				0.00010
Selenium	EPA 270.2				0.0020
Thallium	EPA 279.2				0.0010
Silver	EPA 272.2				0.0005
Nickel	EPA 249.2				0.0050
Zinc	EPA 200.7				0.020
Vanadium	EPA 200.7				0.025
Iron, Total	EPA 200.7				
Aluminum	EPA 200.7				
Ammonia	EPA 350.3		H2SO4 refrigerate at 4°C.	500 ml poly	

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6.3. (Continued)

Analyte	Method	Sampling requirement	Preservation	Volume/ container	Reporting level (mg/L) best possible R.L.
Total Organic Carbon	EPA 415	No air space or bubbles can be present. Form positive meniscus and cap bottles immediately after filling.	Preacidified bottles are supplied by analytical laboratory. Store samples in ice chest or refrigerator at 4°C.	40 ml clear glass vial, preacidified with H2SO4, provided by analytical laboratory	1.0
Total Dissolved Solids/Total Suspended Solids	EPA 160.1		Store samples in ice chest or refrigerator at 4°C.	250 ml poly	
Oil and Grease	EPA 413.1		H2SO4 to achieve pH < 2.	1 L wide mouth amber glass bottle	5000
*Phosphorous	EPA 365.2	48 Hrs. max. holding time.		100 ml poly	0.05
Surfactants	EPA 425.1	48 Hrs. max. holding time.		100 ml poly	0.5
**RDX			Performed on site at B222.		0.0030
**HMX			Performed on site at B222.		0.0020
**TNT			Performed on site at B222.		0.0030

*Only to be analyzed for in the washing machine samples.

**Only to be sampled for in the Building 813 washing machine.

6.4. ADDITIONAL SAMPLING REQUIREMENTS

6.4.1. Record the following information concerning each discharge on the Field Data Form.

- Type of equipment
- Equipment operational status
- Equipment location (building and room number)
- Humidity control information
- Discharge flow volume
- Color of discharge volume

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7.0. DOCUMENTATION/QA RECORDS

7.1. EVALUATION OF RESULTS

The results of the analyses may be submitted to the Central Valley Regional Water Quality Control Board as part of a NPDES or WDR permit application. The Regional Board will evaluate the analytical data and develop effluent limitations based on numerical and narrative water quality objectives defined in the *Water Quality Control Plan for the California Regional Water Quality Control Board Central Valley Region*. Handle all documentation and records according to References 3, 5, and 6.

7.2. FIELD TRACKING FORM (FTF):

Complete the FTF during sample collection. The sampler must enter the date and time of each sample, their initials, any comments of interest concerning the sample, pH meter calibration information, corresponding COC numbers, and the labs where the samples are sent in the spaces provided. An example of a FTF is included as Attachment A.

7.3. CHAIN-OF-CUSTODY FORM (COC)

The information from the FTFs will be used to complete the COC (Form No. QAP-8-1). FTFs and COCs will be archived in the Document Retention Center (see EMP-QA-DC). An example of a completed COC is included as Attachment B.

7.4. FIELD DATA FORMS

Field Data Forms will be archived in the Document Retention Center (see EMP-QA-DC). An example of a Field Data Form is given in Attachment C.

8.0. ACCEPTANCE CRITERIA

8.1. SAMPLES WILL NOT BE DEEMED ACCEPTABLE IF:

- Proper preservative methods and sample hygiene methods were not followed.
- The chain of custody has been broken or compromised.
- The documentation has not been completed.
- The bottles are not properly labeled, dated, and initialed by the sampler.

8.2. CERTIFICATION AND COMPLIANCE/NON-COMPLIANCE REQUIREMENTS SHALL ALL BE MET IN ACCORDANCE WITH SECTION C OF THE EPA GENERAL STORM WATER PERMIT REQUIREMENTS.

9.0. ATTACHMENTS

Attachment A: Sample FTF

Attachment B: Sample COC

Attachment C: Sample Field Data Form

BDR Field Data Form

Date: _____

Building: _____

Equipment (Type and ID#)	<u>Operational</u> <u>Status</u>	Room #	Notes

COMMENTS:

Chain-of-Custody Record

Release Number:	12J0421	TAR:	R5W

DISPOSITION OF COPIES (after signatures)

Goldendot: Sampler (Return to analyst; other copies to courier w/ samples)
Pink: Laboratory (Return to analyst upon receipt of samples; other copies to Laboratory w/ samples)
Canaap: Laboratory
Green: Analyst (keep for files; white to Data Manager w/ data)
White: Data Manager (archive w/ data; send photocopies of completed white to Analyst)

ALL SIGNATURES MUST BE MADE ON WHITE COPY

Form QAP-8
Rev. 5
October 1993

**Environmental Monitoring Section
Lawrence Livermore National Laboratory
P.O. Box 808, L-621
Livermore, CA 94551**

Relinquished by Sampler:	Date/Time	Received by Courier at LLNL:
Relinquished by Courier to Lab:	Date/Time	Received at Laboratory:
Data relinquished from Lab:	Date/Time	Data received by Analyst:
Data relinquished by Analyst:	Date/Time	Data received by Data Manager:

Appendix H

Analytical Results

**Emergency Eyewash
Conventional and Inorganic
Analytical Results**

Sample collected 3/9/94	Reporting Limit	Units	Hard Plumbed Emergency Eyewash	Quality Assurance Sample	Duplicate Quality Assurance Sample
Field Analyses					
pH (field)		pH units	8.75		
Temperature (field)		° C	18.3		
Specific Conductance (field)		**	1200		
Residual Chlorine	0.1	mg/L	0		
Special Request Analyses					
Total Suspended Solids	1	mg/L	2	ND (5)	
Ammonia Nitrogen as N	0.10	mg/L	0.51		
Oil and Grease	5.0	mg/L	ND		
Chemical Oxygen Demand	5.0	mg/L	ND		
Biochemical Oxygen Demand	2	mg/L	4		
Total Organic Carbon	1	mg/L	2	2	
General Minerals					
Fluoride	0.050	mg/L	0.56		
pH (Lab)		pH units	8.7		
Specific Conductance (Lab)		**	900		
Surfactant	1.0	mg/L	ND		
Total Dissolved Solids	1.0	mg/L	700	ND (10)	
Anions					
Bromide	5.0	mg/L	ND		
Chloride	5.0	mg/L	83		
Nitrate	5.0	mg/L	ND		
Nitrite (as N)	5.0	mg/L	ND		
Total Phosphorus (as PO ₄)	10	mg/L	ND		
Sulfate	10	mg/L	170		
Metals					
Arsenic	0.0020	mg/L	ND	ND	ND (0.005)
Barium	0.050	mg/L	ND	ND	0.006 (0.005)
Cadmium	0.00050	mg/L	ND	ND	ND (0.005)
Chromium	0.0010	mg/L	ND	ND	ND (.010)
Cobalt	0.050	mg/L	ND	ND	ND (.010)
Copper	0.0010	mg/L	0.0063	0.0073	0.010 (0.010)
Lead	0.0020	mg/L	ND	ND	ND (0.005)
Mercury	0.00020	mg/L	ND	ND	ND (0.0004)
Nickel	0.0050	mg/L	ND	ND	ND (.020)
Selenium	0.0020	mg/L	ND	ND	ND (0.005)
Silver	0.00050	mg/L	ND	ND	ND (0.010)
Vanadium	0.050	mg/L	ND	ND	ND (0.010)
Zinc	0.020	mg/L	0.076	0.078	0.088 (0.020)
** μ mho/cm @ 25° C					

Note: Numbers in parentheses indicate a reporting limit for the particular analysis that differs from that listed in the reporting limit column.

ND: Not detected.

**Emergency Eyewash
Volatile Organic Compounds
Analytical Results**

Sample collected 3/9/94	Reporting Limit	Units	Hard Plumbed Emergency Eyewash
Volatile Organic Compounds			
Dichlorodifluoromethane	0.20	µg/L	ND
Chloromethane	0.20	µg/L	ND
Vinyl chloride	0.20	µg/L	ND
Bromomethane	0.20	µg/L	ND
Chloroethane	0.20	µg/L	ND
Trichlorofluoromethane	0.20	µg/L	ND
1,1-Dichloroethene	0.20	µg/L	ND
Methylene chloride	0.20	µg/L	ND
trans-1,2-Dichloroethene	0.20	µg/L	ND
1,1-Dichloroethane	0.20	µg/L	ND
2,2-Dichloropropane	0.20	µg/L	ND
cis-1,2-Dichloroethene	0.20	µg/L	ND
Chloroform	0.20	µg/L	ND
Bromochloromethane	0.20	µg/L	ND
1,1,1-Trichloroethane	0.20	µg/L	ND
1,1-Dichloropropene	0.20	µg/L	ND
Carbon tetrachloride	0.20	µg/L	ND
Benzene	0.20	µg/L	ND
1,2-Dichloroethane	0.20	µg/L	ND
Trichloroethene	0.20	µg/L	ND
1,2-Dichloropropane	0.20	µg/L	ND
Bromodichloromethane	0.20	µg/L	ND
Dibromomethane	0.20	µg/L	ND
trans-1,3-Dichloropropene	0.20	µg/L	ND
Toluene	0.20	µg/L	ND
cis-1,3-Dichloropropene	0.20	µg/L	ND
1,1,2-Trichloroethane	0.20	µg/L	ND
Tetrachloroethene	0.20	µg/L	ND
1,3-Dichloropropane	0.20	µg/L	ND
Dibromochloromethane	0.20	µg/L	ND
Chlorobenzene	0.20	µg/L	ND
1,1,1,2-Tetrachloroethane	0.20	µg/L	ND
Ethylbenzene	0.20	µg/L	ND
m- and p-Xylene isomers	0.20	µg/L	ND
o-Xylene	0.20	µg/L	ND
Styrene	0.20	µg/L	ND
Isopropylbenzene	0.20	µg/L	ND
Bromoform	0.20	µg/L	ND
1,1,2,2-Tetrachloroethane	0.20	µg/L	ND

**Emergency Eyewash
Volatile Organic Compounds
Analytical Results (Continued)**

Sample collected 3/3/94	Reporting Limit	Units	Hard Plumbed Emergency Eyewash
Volatile Organic Compounds			
1,2,3-Trichloropropane	0.20	µg/L	ND
Bromobenzene	0.20	µg/L	ND
n-Propylbenzene	0.20	µg/L	ND
2-Chlorotoluene	0.20	µg/L	ND
1,3,5-Trimethylbenzene	0.20	µg/L	ND
p-Chlorotoluene	0.20	µg/L	ND
tert-Butylbenzene	0.20	µg/L	ND
1,2,4-Trimethylbenzene	0.20	µg/L	ND
sec-Butylbenzene	0.20	µg/L	ND
Isopropyltoluene	0.20	µg/L	ND
1,3-Dichlorobenzene	0.20	µg/L	ND
1,4-Dichlorobenzene	0.20	µg/L	ND
n-Butylbenzene	0.20	µg/L	ND
1,2-Dichlorobenzene	0.20	µg/L	ND
1,2,4-Trichlorobenzene	0.20	µg/L	ND
Hexachlorobutadiene	0.20	µg/L	ND
Naphthalene	0.20	µg/L	ND
1,2,3-Trichlorobenzene	0.20	µg/L	ND

ND: Not detected.

**Inspector Test Valve
Conventional and Inorganic
Analytical Results**

Sample collected 3/9/94	Reporting Limit	Units	Inspector Test Valve First Flush	Inspector Test Valve After 5 Minute Flow	Quality Assurance Sample
Field Analyses					
pH (field)		pH units	8.72		
Temperature (field)		° C	17.1		
Specific Conductance (field)		**	1000		
Residual Chlorine	0.1	mg/L	0		
Special Request Analyses					
Total Suspended Solids	1	mg/L	ND	ND (5)	ND (5)
Ammonia Nitrogen as N	0.10	mg/L	0.76		
Oil and Grease	5.0	mg/L	ND		
Chemical Oxygen Demand	5.0	mg/L	ND		
Biochemical Oxygen Demand	2		ND		
Total Organic Carbon	1	mg/L	4		
General Minerals					
Fluoride	0.050	mg/L	0.39		
pH (Lab)		pH units	9.0		
Specific Conductance (Lab)		**	830		
Surfactant	1.0	mg/L	ND		
Total Dissolved Solids	1.0	mg/L	630	640 (10)	640 (10)
Anions					
Bromide	5.0	mg/L	ND		
Chloride	5.0	mg/L	72		
Nitrate	5.0	mg/L	ND		
Nitrite (as N)	5.0	mg/L	ND		
Total Phosphorus (as PO ₄)	10	mg/L	ND		
Sulfate	10	mg/L	170		
Metals					
Arsenic	0.0020	mg/L	ND (0.005)	ND (0.005)	ND
Barium	0.050	mg/L	0.010 (0.005)	0.019 (0.005)	ND
Cadmium	0.00050	mg/L	ND (0.005)	ND (0.005)	ND
Chromium	0.0010	mg/L	ND (0.010)	ND (0.010)	ND
Cobalt	0.050	mg/L	ND (0.010)	ND (0.010)	ND
Copper	0.0010	mg/L	ND (0.010)	ND (0.010)	0.0011
Lead	0.0020	mg/L	ND (0.005)	ND (0.005)	ND
Mercury	0.00020	mg/L	ND (0.0004)	ND (0.0004)	ND
Nickel	0.0050	mg/L	ND (0.020)	ND (0.020)	ND
Selenium	0.0020	mg/L	ND (0.005)	ND (0.005)	ND
Silver	0.00010	mg/L	ND (0.010)	ND (0.010)	ND
Vanadium	0.050	mg/L	ND (0.010)	ND (0.010)	ND
Zinc	0.020	mg/L	ND (0.020)	ND (0.020)	ND
** µmho/cm @ 25° C					

Note: Numbers in parentheses indicate a reporting limit for the particular analysis that differs from that listed in the reporting limit column.

ND: Not detected.

**Inspector Test Valve
Volatile Organic Compounds
Analytical Results**

Sample Collected 3/9/94	Reporting Limit	Units	Inspector Test Valve First Flush
Volatile Organic Compounds			
Dichlorodifluoromethane	0.20	µg/L	ND
Chloromethane	0.20	µg/L	ND
Vinyl chloride	0.20	µg/L	ND
Bromomethane	0.20	µg/L	ND
Chloroethane	0.20	µg/L	ND
Trichlorofluoromethane	0.20	µg/L	ND
1,1-Dichloroethene	0.20	µg/L	ND
Methylene chloride	0.20	µg/L	ND
trans-1,2-Dichloroethene	0.20	µg/L	ND
1,1-Dichloroethane	0.20	µg/L	5.1
2,2-Dichloropropane	0.20	µg/L	ND
cis-1,2-Dichloroethene	0.20	µg/L	ND
Chloroform	0.20	µg/L	ND
Bromochloromethane	0.20	µg/L	ND
1,1,1-Trichloroethane	0.20	µg/L	4.0
1,1-Dichloropropene	0.20	µg/L	ND
Carbon tetrachloride	0.20	µg/L	ND
Benzene	0.20	µg/L	ND
1,2-Dichloroethane	0.20	µg/L	ND
Trichloroethene	0.20	µg/L	ND
1,2-Dichloropropane	0.20	µg/L	ND
Bromodichloromethane	0.20	µg/L	ND
Dibromomethane	0.20	µg/L	ND
trans-1,3-Dichloropropene	0.20	µg/L	ND
Toluene	0.20	µg/L	ND
cis-1,3-Dichloropropene	0.20	µg/L	ND
1,1,2-Trichloroethane	0.20	µg/L	ND
Tetrachloroethene	0.20	µg/L	ND
1,3-Dichloropropane	0.20	µg/L	ND
Dibromochloromethane	0.20	µg/L	ND
Chlorobenzene	0.20	µg/L	ND
1,1,1,2-Tetrachloroethane	0.20	µg/L	ND
Ethylbenzene	0.20	µg/L	ND
m- and p-Xylene isomers	0.20	µg/L	ND
o-Xylene	0.20	µg/L	ND
Styrene	0.20	µg/L	ND
Isopropylbenzene	0.20	µg/L	ND
Bromoform	0.20	µg/L	ND
1,1,2,2-Tetrachloroethane	0.20	µg/L	ND
1,2,3-Trichloropropane	0.20	µg/L	ND

**Inspector Test Valve
Volatile Organic Compounds
Analytical Results (Continued)**

Sample Collected 3/9/94	Reporting Limit	Units	Inspector Test Valve First Flush
Volatile Organic Compounds			
Bromobenzene	0.20	µg/L	ND
n-Propylbenzene	0.20	µg/L	ND
2-Chlorotoluene	0.20	µg/L	ND
1,3,5-Trimethylbenzene	0.20	µg/L	ND
p-Chlorotoluene	0.20	µg/L	ND
tert-Butylbenzene	0.20	µg/L	ND
1,2,4-Trimethylbenzene	0.20	µg/L	ND
sec-Butylbenzene	0.20	µg/L	ND
Isopropyltoluene	0.20	µg/L	ND
1,3-Dichlorobenzene	0.20	µg/L	ND
1,4-Dichlorobenzene	0.20	µg/L	ND
n-Butylbenzene	0.20	µg/L	ND
1,2-Dichlorobenzene	0.20	µg/L	ND
1,2,4-Trichlorobenzene	0.20	µg/L	ND
Hexachlorobutadiene	0.20	µg/L	ND
Naphthalene	0.20	µg/L	ND
1,2,3-Trichlorobenzene	0.20	µg/L	ND

ND: Not detected.

**Mechanical Equipment
Conventional and Inorganic
Analytical Results**

	Reporting Limit	Units	Sample Collected 3/10/94	Sample Collected 3/11/94	Quality Assurance Sample
Field Analyses					
pH (field)		pH units			
Temperature (field)		° C			
Specific Conductance (field)		**		1200	
Residual Chlorine	0.1	mg/L		0.8	
Special Request Analyses					
Total Suspended Solids	1	mg/L	4	ND	
Ammonia Nitrogen as N	0.10	mg/L	ND	ND	
Oil and Grease	5.0	mg/L	ND	ND	ND
Chemical Oxygen Demand	5.0	mg/L	ND	ND	
Biochemical Oxygen Demand	2		30		27
Total Organic Carbon	1		2		
General Minerals					
Fluoride	0.050	mg/L	0.61	0.61	
pH (Lab)		pH units	8.7	8.6	
Specific Conductance (Lab)		**	860	950	
Surfactant	1.0	mg/L	ND	ND	
Total Dissolved Solids	1.0	mg/L	730	740	
Anions					
Bromide	5.0	mg/L	ND	ND	
Chloride	5.0	mg/L	92	93	
Nitrate	5.0	mg/L	ND	ND	
Nitrite (as N)	5.0	mg/L	ND	ND	
Total Phosphorus (as PO ₄)	10	mg/L	ND	ND	
Sulfate	10	mg/L	180	180	
Metals					
Arsenic	0.0020	mg/L	ND	ND (0.005)	
Barium	0.025	mg/L	ND	ND (0.005)	
Cadmium	0.00050	mg/L	ND	ND (0.005)	
Chromium	0.0010	mg/L	0.0010	ND (.010)	
Cobalt	0.025	mg/L	ND	ND (.010)	
Copper	0.0010	mg/L	0.020	0.012 (0.010)	
Lead	0.0020	mg/L	ND	ND (0.005)	
Mercury	0.00020	mg/L	ND	ND (0.0004)	
Nickel	0.0050	mg/L	ND	ND (.020)	
Selenium	0.0020	mg/L	ND	ND (0.005)	
Silver	0.00050	mg/L	ND	ND (0.010)	
Vanadium	0.020	mg/L	ND	ND (0.010)	
Zinc	0.020	mg/L	ND	ND (0.020)	
** $\mu\text{mho/cm}$ @ 25° C					

ND: Not detected.

**Mechanical Equipment
Volatile Organic Compounds
Analytical Results**

	Reporting Limit	Units	Sample Collected 3/10/94	Sample Collected 3/11/94
Volatile Organic Compounds				
Dichlorodifluoromethane	0.20	µg/L	N D	ND
Chloromethane	0.20	µg/L	ND	ND
Vinyl chloride	0.20	µg/L	ND	ND
Bromomethane	0.20	µg/L	ND	ND
Chloroethane	0.20	µg/L	ND	ND
Trichlorofluoromethane	0.20	µg/L	ND	ND
1,1-Dichloroethene	0.20	µg/L	ND	ND
Methylene chloride	0.20	µg/L	ND	ND
trans-1,2-Dichloroethene	0.20	µg/L	ND	ND
1,1-Dichloroethane	0.20	µg/L	ND	ND
2,2-Dichloropropane	0.20	µg/L	ND	ND
cis-1,2-Dichloroethene	0.20	µg/L	ND	ND
Chloroform	0.20	µg/L	ND	ND
Bromochloromethane	0.20	µg/L	ND	ND
1,1,1-Trichloroethane	0.20	µg/L	ND	ND
1,1-Dichloropropene	0.20	µg/L	ND	ND
Carbon tetrachloride	0.20	µg/L	ND	ND
Benzene	0.20	µg/L	ND	ND
1,2-Dichloroethane	0.20	µg/L	ND	ND
Trichloroethene	0.20	µg/L	ND	ND
1,2-Dichloropropane	0.20	µg/L	ND	ND
Bromodichloromethane	0.20	µg/L	ND	ND
Dibromomethane	0.20	µg/L	ND	ND
trans-1,3-Dichloropropene	0.20	µg/L	ND	ND
Toluene	0.20	µg/L	ND	ND
cis-1,3-Dichloropropene	0.20	µg/L	ND	ND
1,1,2-Trichloroethane	0.20	µg/L	ND	ND
Tetrachloroethene	0.20	µg/L	ND	ND
1,3-Dichloropropane	0.20	µg/L	ND	ND
Dibromochloromethane	0.20	µg/L	ND	ND
Chlorobenzene	0.20	µg/L	ND	ND
1,1,1,2-Tetrachloroethane	0.20	µg/L	ND	ND
Ethylbenzene	0.20	µg/L	ND	ND
m- and p-Xylene isomers	0.20	µg/L	ND	ND
o-Xylene	0.20	µg/L	ND	ND
Styrene	0.20	µg/L	ND	ND
Isopropylbenzene	0.20	µg/L	ND	ND
Bromoform	0.20	µg/L	ND	ND
1,1,2,2-Tetrachloroethane	0.20	µg/L	ND	ND
1,2,3-Trichloropropane	0.20	µg/L	ND	ND

**Mechanical Equipment
Volatile Organic Compounds
Analytical Results (Continued)**

	Reporting Limit	Units	Sample Collected 3/10/94	Sample Collected 3/11/94
Volatile Organic Compounds				
Bromobenzene	0.20	µg/L	ND	ND
n-Propylbenzene	0.20	µg/L	ND	ND
2-Chlorotoluene	0.20	µg/L	ND	ND
1,3,5-Trimethylbenzene	0.20	µg/L	ND	ND
p-Chlorotoluene	0.20	µg/L	ND	ND
tert-Butylbenzene	0.20	µg/L	ND	ND
1,2,4-Trimethylbenzene	0.20	µg/L	ND	ND
sec-Butylbenzene	0.20	µg/L	ND	ND
Isopropyltoluene	0.20	µg/L	ND	ND
1,3-Dichlorobenzene	0.20	µg/L	ND	ND
1,4-Dichlorobenzene	0.20	µg/L	ND	ND
n-Butylbenzene	0.20	µg/L	ND	ND
1,2-Dichlorobenzene	0.20	µg/L	NC	ND
1,2,4-Trichlorobenzene	0.20	µg/L	ND	ND
Hexachlorobutadiene	0.20	µg/L	ND	ND
Naphthalene	0.20	µg/L	ND	ND
1,2,3-Trichlorobenzene	0.20	µg/L	ND	ND
1,1,2-Trichloro-1,2,2-trifluoroethane	0.20	µg/L	ND	ND

ND: Not detected.

**Temperature/Pressure Relief Valve
Conventional and Inorganic
Analytical Results**

Sample collected 3/9/94	Reporting Limit	Units	Temperature/ Pressure Valve	Quality Assurance Sample
Field Analyses				
pH (field)		pH units	8.42	
Temperature (field)		° C	53.4	
Specific Conductance (field)		**	1200	
Residual Chlorine	0.1	mg/L	0	
Special Request Analyses				
Total Suspended Solids	1	mg/L	ND	ND(5)
Ammonia Nitrogen as N	0.10	mg/L	0.45	
Oil and Grease	5.0	mg/L	ND	
Chemical Oxygen Demand	5.0	mg/L	ND	
Biochemical Oxygen Demand	2	mg/L	ND	
Total Organic Carbon	1	mg/L	4	
General Minerals				
Fluoride	0.050	mg/L	0.60	
pH (Lab)		pH units	8.3	
Specific Conductance (Lab)		**	880	
Surfactant	1.0	mg/L	ND	
Total Dissolved Solids	1.0	mg/L	690	680 (10)
Anions				
Bromide	5.0	mg/L	ND	
Chloride	5.0	mg/L	82	
Nitrate	5.0	mg/L	ND	
Nitrite (as N)	5.0	mg/L	ND	
Total Phosphorus (as PO ₄)	10	mg/L	ND	
Sulfate	10	mg/L	160	
Metals				
Arsenic	0.0020	mg/L	ND	ND (0.005)
Barium	0.050	mg/L	ND	0.013 (0.005)
Cadmium	0.00050	mg/L	ND	ND (0.005)
Chromium	0.0010	mg/L	0.0014	ND (.010)
Cobalt	0.050	mg/L	ND	ND (.010)
Copper	0.0010	mg/L	0.0092	0.016 (0.010)
Lead	0.0020	mg/L	0.0041	0.006 (0.005)
Mercury	0.00020	mg/L	0.00022	ND (0.0004)
Nickel	0.0050	mg/L	ND	ND (.020)
Selenium	0.0020	mg/L	ND	ND (0.005)
Silver	0.00050	mg/L	ND	ND (0.010)
Vanadium	0.050	mg/L	ND	ND (0.010)
Zinc	0.020	mg/L	ND	ND (0.020)
** µmho/cm @ 25° C				

ND: Not detected.

**Temperature/Pressure Relief Valve
Volatile Organic Compounds
Analytical Data**

Sample Collected 3/9/94	Reporting Limit	Units	Temperature/ Pressure Valve
Volatile Organic Compounds			
Dichlorodifluoromethane	0.20	µg/L	ND
Chloromethane	0.20	µg/L	ND
Vinyl chloride	0.20	µg/L	ND
Bromomethane	0.20	µg/L	ND
Chloroethane	0.20	µg/L	ND
Trichlorofluoromethane	0.20	µg/L	ND
1,1-Dichloroethene	0.20	µg/L	ND
Methylene chloride	0.20	µg/L	ND
trans-1,2-Dichloroethene	0.20	µg/L	ND
1,1-Dichloroethane	0.20	µg/L	ND
2,2-Dichloropropane	0.20	µg/L	ND
cis-1,2-Dichloroethene	0.20	µg/L	ND
Chloroform	0.20	µg/L	ND
Bromochloromethane	0.20	µg/L	ND
1,1,1-Trichloroethane	0.20	µg/L	ND
1,1-Dichloropropene	0.20	µg/L	ND
Carbon tetrachloride	0.20	µg/L	ND
Benzene	0.20	µg/L	ND
1,2-Dichloroethane	0.20	µg/L	ND
Trichloroethene	0.20	µg/L	ND
1,2-Dichloropropane	0.20	µg/L	ND
Bromodichloromethane	0.20	µg/L	ND
Dibromomethane	0.20	µg/L	ND
trans-1,3-Dichloropropene	0.20	µg/L	ND
Toluene	0.20	µg/L	ND
cis-1,3-Dichloropropene	0.20	µg/L	ND
1,1,2-Trichloroethane	0.20	µg/L	ND
Tetrachloroethene	0.20	µg/L	ND
1,3-Dichloropropane	0.20	µg/L	ND
Dibromochloromethane	0.20	µg/L	ND
Chlorobenzene	0.20	µg/L	ND
1,1,1,2-Tetrachloroethane	0.20	µg/L	ND
Ethylbenzene	0.20	µg/L	ND
m- and p-Xylene isomers	0.20	µg/L	ND
o-Xylene	0.20	µg/L	ND
Styrene	0.20	µg/L	ND
Isopropylbenzene	0.20	µg/L	ND
Bromoform	0.20	µg/L	ND
1,1,2,2-Tetrachloroethane	0.20	µg/L	ND
1,2,3-Trichloropropane	0.20	µg/L	ND

**Temperature/Pressure Relief Valve
Volatile Organic Compounds
Analytical Data (Continued)**

Sample Collected 3/9/94	Reporting Limit	Units	Temperature/ Pressure Valve
Volatile Organic Compounds			
Bromobenzene	0.20	µg/L	ND
n-Propylbenzene	0.20	µg/L	ND
2-Chlorotoluene	0.20	µg/L	ND
1,3,5-Trimethylbenzene	0.20	µg/L	ND
p-Chlorotoluene	0.20	µg/L	ND
tert-Butylbenzene	0.20	µg/L	ND
1,2,4-Trimethylbenzene	0.20	µg/L	ND
sec-Butylbenzene	0.20	µg/L	ND
Isopropyltoluene	0.20	µg/L	ND
1,3-Dichlorobenzene	0.20	µg/L	ND
1,4-Dichlorobenzene	0.20	µg/L	ND
n-Butylbenzene	0.20	µg/L	ND
1,2-Dichlorobenzene	0.20	µg/L	ND
1,2,4-Trichlorobenzene	0.20	µg/L	ND
Hexachlorobutadiene	0.20	µg/L	ND
Naphthalene	0.20	µg/L	ND
1,2,3-Trichlorobenzene	0.20	µg/L	ND

ND: Not detected.

**Vacuum Pump
Conventional and Inorganic
Analytical Results**

	Reporting Limit	Units	Sample Collected 3/10/94	Sample Collected 3/11/94	Duplicate Metals Analysis	Quality Assurance Sample
Field Analyses						
pH (field)		pH units	8.21	8.77		
Temperature (field)		° C	18.9	17.9		
Specific Conductance (field)		**	1200	1200		
Residual Chlorine	0.1	mg/L	0.6	0.8		
Standard Methods Analyses						
Total Suspended Solids	1	mg/L	1	4		
Ammonia Nitrogen as N	0.10	mg/L	0.22	0.21		
Oil and Grease	5.0	mg/L	ND	ND		ND
Chemical Oxygen Demand	5.0	mg/L	ND	ND		11
Biochemical Oxygen Demand	2	mg/L	6			20
Total Organic Carbon	1	mg/L	6			
General Inorganics						
Fluoride	0.050	mg/L	0.61	0.62		
pH (Lab)		pH units	8.6	8.5		
Specific Conductance (Lab)		**	820	900		
Surfactant	1.0	mg/L	ND	ND		
Total Dissolved Solids	1.0	mg/L	740	710		
Anions						
Bromide	5.0	mg/L	ND	ND		
Chloride	5.0	mg/L	88	86		
Nitrate	5.0	mg/L	ND	ND		
Nitrite (as N)	5.0	mg/L	ND	ND		
Total Phosphorus (as PO ₄)	10	mg/L	ND	ND		
Sulfate	10	mg/L	180	170		
Metals						
Arsenic	0.0020	mg/L	ND	ND	ND (0.005)	ND (0.005)
Barium	0.025	mg/L	ND	ND	0.01 (0.005)	0.012 (0.005)
Cadmium	0.00050	mg/L	ND	ND	ND (0.005)	ND (0.005)
Chromium	0.0010	mg/L	ND	ND	ND (0.010)	ND (0.010)
Cobalt	0.025	mg/L	ND	ND	ND (0.010)	ND (0.010)
Copper	0.0010	mg/L	0.017	0.0024	ND (0.010)	0.4 (0.010)
Lead	0.0020	mg/L	0.0027	ND	0.005 (0.005)	0.12 (0.005)
Mercury	0.00020	mg/L	ND	ND	ND (0.0004)	ND (0.0004)
Nickel	0.0050	mg/L	ND	ND	ND (0.020)	ND (0.020)
Selenium	0.0020	mg/L	ND	ND	ND (0.005)	ND (0.005)
Silver	0.00050	mg/L	ND	ND	ND (0.010)	ND (0.010)
Vanadium	0.020	mg/L	ND	ND	ND (0.010)	ND (0.010)
Zinc	0.020	mg/L	0.16	ND	0.083 (0.020)	0.39 (0.020)
** µmho/cm @ 25° C						

Note: Numbers in parentheses indicate a reporting limit for the particular analysis that differs from that listed in the reporting limit column.

ND: Not detected.

**Vacuum Pump
Volatile Organic Compounds
Analytical Results**

	Reporting Limit	Units	Sample Collected 3/10/94	Sample Collected 3/11/94	Quality Assurance Sample
Volatile Organic Compounds					
Dichlorodifluoromethane	0.20	µg/L	ND	ND	ND
Chloromethane	0.20	µg/L	ND	ND	ND
Vinyl chloride	0.20	µg/L	ND	ND	ND
Bromomethane	0.20	µg/L	ND	ND	ND
Chloroethane	0.20	µg/L	ND	ND	ND
Trichlorofluoromethane	0.20	µg/L	ND	ND	ND
1,1-Dichloroethene	0.20	µg/L	ND	ND	ND
Methylene chloride	0.20	µg/L	ND	ND	ND
trans-1,2-Dichloroethene	0.20	µg/L	ND	ND	ND
1,1-Dichloroethane	0.20	µg/L	ND	ND	ND
2,2-Dichloropropane	0.20	µg/L	ND	ND	ND
cis-1,2-Dichloroethene	0.20	µg/L	ND	ND	ND
Chloroform	0.20	µg/L	ND	ND	ND
Bromochloromethane	0.20	µg/L	ND	ND	ND
1,1,1-Trichloroethane	0.20	µg/L	ND	ND	ND
1,1-Dichloropropene	0.20	µg/L	ND	ND	ND
Carbon tetrachloride	0.20	µg/L	ND	ND	ND
Benzene	0.20	µg/L	ND	ND	ND
1,2-Dichloroethane	0.20	µg/L	ND	ND	ND
Trichloroethene	0.20	µg/L	ND	ND	ND
1,2-Dichloropropane	0.20	µg/L	ND	ND	ND
Bromodichloromethane	0.20	µg/L	ND	ND	ND
Dibromomethane	0.20	µg/L	ND	ND	ND
trans-1,3-Dichloropropene	0.20	µg/L	ND	ND	ND
Toluene	0.20	µg/L	ND	ND	ND
cis-1,3-Dichloropropene	0.20	µg/L	ND	ND	ND
1,1,2-Trichloroethane	0.20	µg/L	ND	ND	ND
Tetrachloroethene	0.20	µg/L	ND	ND	ND
1,3-Dichloropropane	0.20	µg/L	ND	ND	ND
Dibromochloromethane	0.20	µg/L	ND	ND	ND
Chlorobenzene	0.20	µg/L	ND	ND	ND
1,1,1,2-Tetrachloroethane	0.20	µg/L	ND	ND	ND
Ethylbenzene	0.20	µg/L	ND	ND	ND
m- and p-Xylene isomers	0.20	µg/L	ND	ND	ND
o-Xylene	0.20	µg/L	ND	ND	ND
Styrene	0.20	µg/L	ND	ND	ND
Isopropylbenzene	0.20	µg/L	ND	ND	ND
Bromoform	0.20	µg/L	0.90	1.0	0.40
1,1,2,2-Tetrachloroethane	0.20	µg/L	ND	ND	ND
1,2,3-Trichloropropane	0.20	µg/L	ND	ND	ND

**Vacuum Pump
Volatile Organic Compounds
Analytical Results (Continued)**

	Reporting Limit	Units	Sample Collected 3/10/94	Sample Collected 3/11/94	Quality Assurance Sample
Volatile Organic Compounds					
Bromobenzene	0.20	µg/L	ND	ND	ND
n-Propylbenzene	0.20	µg/L	ND	ND	ND
2-Chlorotoluene	0.20	µg/L	ND	ND	ND
1,3,5-Trimethylbenzene	0.20	µg/L	ND	ND	ND
p-Chlorotoluene	0.20	µg/L	ND	ND	ND
tert-Butylbenzene	0.20	µg/L	ND	ND	ND
1,2,4-Trimethylbenzene	0.20	µg/L	ND	ND	ND
sec-Butylbenzene	0.20	µg/L	ND	ND	ND
Isopropyltoluene	0.20	µg/L	ND	ND	ND
1,3-Dichlorobenzene	0.20	µg/L	ND	ND	ND
1,4-Dichlorobenzene	0.20	µg/L	ND	ND	ND
n-Butylbenzene	0.20	µg/L	ND	ND	ND
1,2-Dichlorobenzene	0.20	µg/L	ND	ND	ND
1,2,4-Trichlorobenzene	0.20	µg/L	ND	ND	ND
Hexachlorobutadiene	0.20	µg/L	ND	ND	ND
Naphthalene	0.20	µg/L	ND	ND	ND
1,2,3-Trichlorobenzene	0.20	µg/L	ND	ND	ND
1,1,2-Trichloro-1,2,2-trifluoroethane	0.20	µg/L	ND	ND	ND

ND: Not detected.

Appendix I

WQO Calculations

Water Quality Objective Calculations for Copper and Zinc at a Hardness of 230 mg/L

$$\text{WQO of Cu} = e^{(0.905)(\ln \text{ hardness}) - 1.612} \times 10^{-3}$$

$$\ln \text{ hardness (230)} = 5.438$$

$$\text{Cu} = e^{(0.905)(5.438) - 1.612} \times 10^{-3}$$

$$\text{Cu} = e^{(3.309)} \times 10^{-3}$$

$$\text{Cu} = 27.368 \times 10^{-3}$$

$$\text{WQO of Cu} = 0.027$$

$$\text{WQO of Zn} = e^{(0.830)(\ln \text{ hardness}) - 0.289} \times 10^{-3}$$

$$\ln \text{ hardness (230)} = 5.438$$

$$\text{Zn} = e^{(0.830)(5.438) - 0.289} \times 10^{-3}$$

$$\text{Zn} = e^{(4.225)} \times 10^{-3}$$

$$\text{Zn} = 68.343 \times 10^{-3}$$

$$\text{WQO of Zn} = 0.068$$

DATE

FILMED

9/23/94

END

[REDACTED]

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