RAC V

RESPONSE ACTION CONTRACT FOR

Remedial, Enforcement Oversight, and
Non-Time Critical Removal Activities at Sites of Release
or Threatened Release of Hazardous Substances in Region V

Operations and Maintenance Summary Manual
Onalaska Groundwater Treatment System

ONALASKA MUNICIPAL LANDFILL
Onalaska, Wisconsin

Long-Term Response Action

WA No. 103-RALR-05L5 / Contract No. 68-W6-0025

August 12, 2002

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

PREPARED FOR

U.S. Environmental Protection Agency

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SECTION 1

Introduction

This manual provides the plant operating staff with the information necessary to operate and maintain the Onalaska Groundwater Treatment System. (Information on the landfill cap and its maintenance and the In Situ Bioremediation System is provided in other documents.) The manual gives an overview of the system and the treatment goals and describes how the extraction wells and process equipment function. Startup and shutdown procedures are discussed as well as other information related to the operation and maintenance of the system. The manual includes:

- Section 1—Introduction
- Section 2—Site Background
- Section 3—Process Description
- Section 4—Process Startup and Shutdown
- Section 5—Routine Process Operations and Inspections
- Section 6—Sampling, Monitoring and Reporting
- Section 7—Ancillary Facilities Information
- Section 8—Safety
- Appendix A—P&IDs/Equipment List
- Appendix B—Log Sheets
- Appendix C—WDNR Influent and Effluent Monitoring Requirements

This manual provides an overview of operating the process. It does not present detailed descriptions or step-by-step programming/operation instructions of each piece of equipment. For specific information for a given piece of process equipment, as well as requirements for equipment maintenance, consult the manufacturer's O&M manual. Manufacturers' O&M manuals have been supplied for each piece of equipment and are available and contained in a four-volume set.

SECTION 2
Site Background

The Onalaska Municipal Landfill site is located in Onalaska Township, Wisconsin. It consists of the former municipal landfill, about 8 acres in area and 15 to 20 feet deep, and adjacent property to which the groundwater contamination plume has migrated. A general site plan is provided in Appendix A.

The site was operated as a sand and gravel quarry from the 1960s to 1970s. In the 1970s, municipal wastes and industrial wastes, including naphtha-based solvents, were disposed of at the site. Remedial investigations conducted at the site during 1989 found that the groundwater was contaminated, primarily with volatile organic compounds (VOCs), and the groundwater contamination was migrating toward the Black River. The investigations also concluded that an area of soils outside the limits of the landfill was contaminated with petroleum-based solvents (zone of nonaqueous phase contamination) and that the landfill cap required an upgrade.

The groundwater extraction system is designed to (1) prevent continued offsite migration of contaminants emanating from the landfill and from contaminated soil outside the landfill and (2) reduce contaminant concentrations in the groundwater to the extent practical. The extraction system, five wells located along the downgradient edge of the landfill (Figure 2-1), was designed to capture contaminated groundwater within the target remediation area defined in the feasibility study (FS). The well system was designed to extract groundwater at a design flow rate of 600-800 gallons per minute (gpm).

The treatment system is designed to provide best available technology economically achievable (BATEA) to remove iron and VOCs. The treatment system consists of aeration (to oxidize the iron), clarification (to remove the oxidized iron and miscellaneous suspended solids), and air-stripping (to remove VOCs). The facility was designed to accommodate an effluent filter, if required, in the future. The filter currently is not part of the process. Sludge from the clarifier is dewatered with a filter press and the resulting filter cake is disposed of in a landfill. The treated groundwater is discharged to a diffuser located in the Bullet Chute of the Black River. Figure 2-2 is a process flow diagram showing the treatment system.

Table 2-1 presents the estimated influent and effluent concentrations for the treatment system.

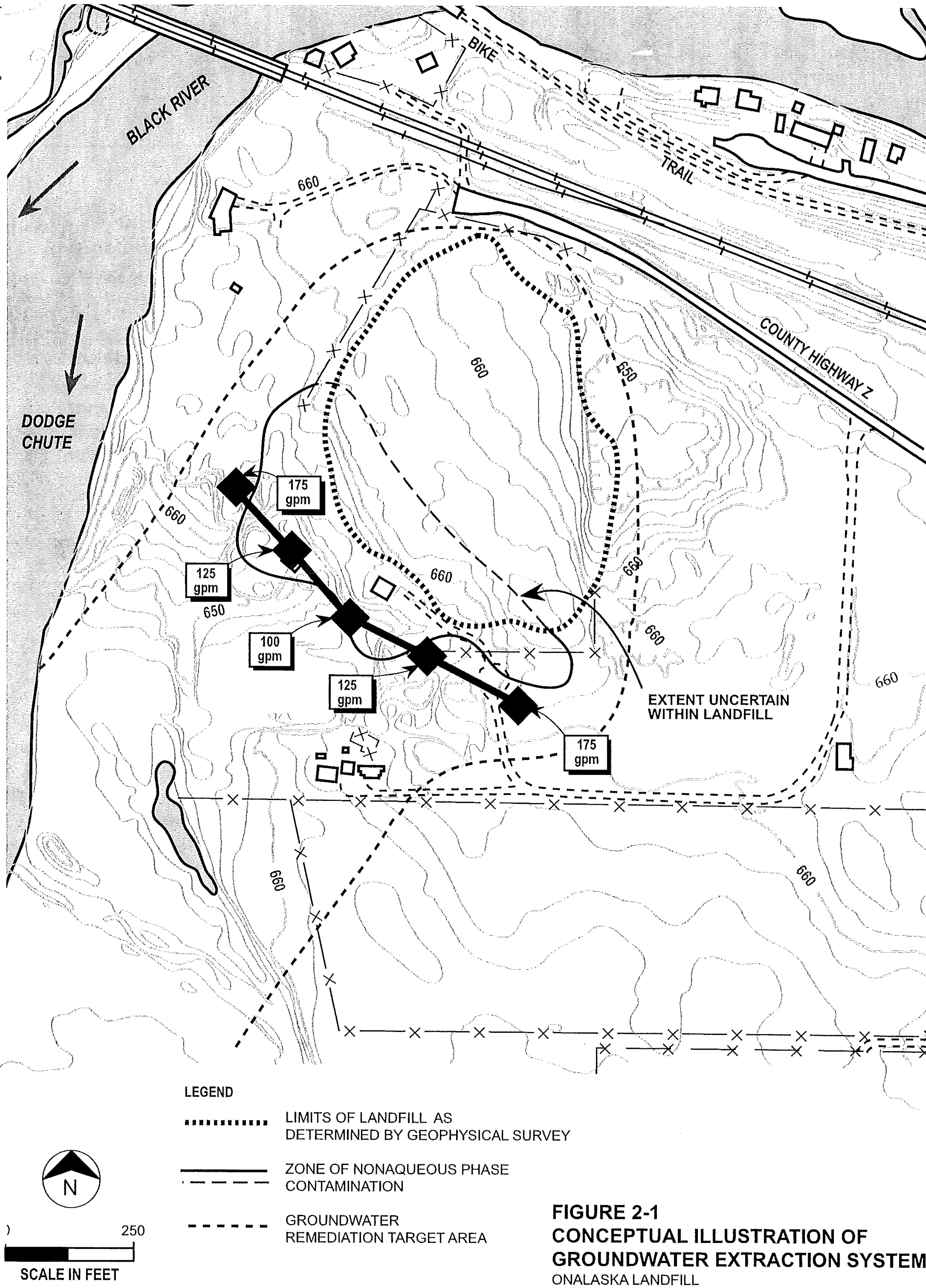
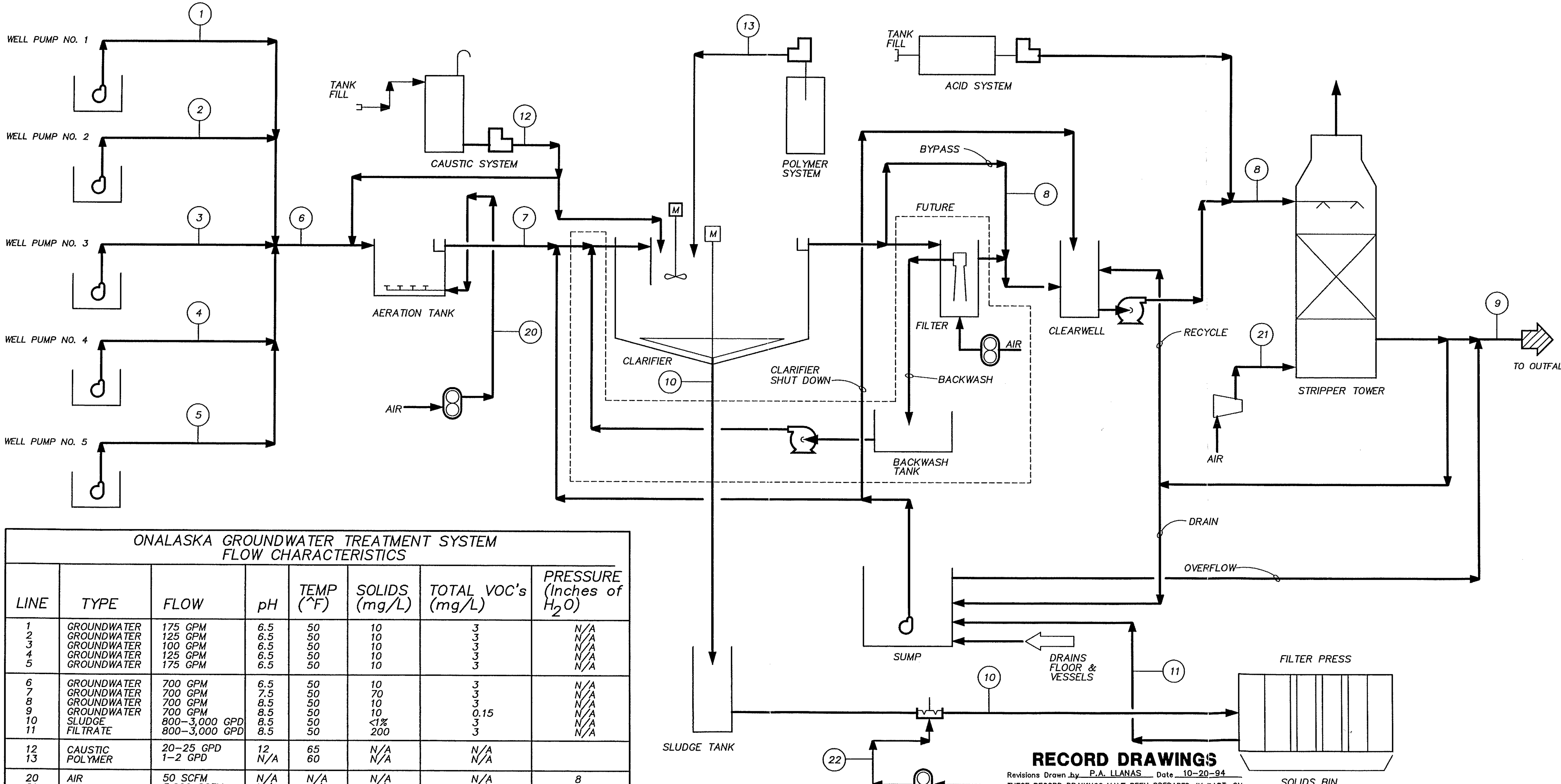


FIGURE 2-1
CONCEPTUAL ILLUSTRATION OF GROUNDWATER EXTRACTION SYSTEM
ONALASKA LANDFILL



ONALASKA GROUNDWATER TREATMENT SYSTEM FLOW CHARACTERISTICS

LINE	TYPE	FLOW	pH	TEMP (^F)	SOLIDS (mg/L)	TOTAL VOC's (mg/L)	PRESSURE (Inches of H_2O)
1	GROUNDWATER	175 GPM	6.5	50	10	3	N/A
2	GROUNDWATER	125 GPM	6.5	50	10	3	N/A
3	GROUNDWATER	100 GPM	6.5	50	10	3	N/A
4	GROUNDWATER	125 GPM	6.5	50	10	3	N/A
5	GROUNDWATER	175 GPM	6.5	50	10	3	N/A
6	GROUNDWATER	700 GPM	6.5	50	10	3	N/A
7	GROUNDWATER	700 GPM	7.5	50	70	3	N/A
8	GROUNDWATER	700 GPM	8.5	50	10	3	N/A
9	GROUNDWATER	700 GPM	8.5	50	10	0.15	N/A
10	SLUDGE	800–3,000 GPD	8.5	50	<1%	3	N/A
11	FILTRATE	800–3,000 GPD	8.5	50	200	3	N/A
12	CAUSTIC	20–25 GPD	12	65	N/A	N/A	
13	POLYMER	1–2 GPD	N/A	60	N/A	N/A	
20	AIR	50 SCFM	N/A	N/A	N/A	N/A	8
21	AIR	5,000 SCFM	N/A	N/A	N/A	N/A	<1
22	AIR	50 SCFM	N/A	N/A	N/A	N/A	100

RECORD DRAWINGS

Revisions Drawn by P.A. LLANAS Date 10-20-94

THESE RECORD DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED BY OTHERS. THEY ARE NOT INTENDED TO REPRESENT IN DETAIL THE EXACT LOCATION, TYPE OF COMPONENT NOR MANNER OF CONSTRUCTION. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THE RECORD DRAWINGS.

FIGURE 2–2

CH2M HILL ®

DSGN P.M.BOERSMA
DR PFD-1 D.OXLEY
CHK S.M.KEITH
APVD S.M.KEITH

NO.	DATE	REVISION	BY	APVD
	10/94	RECORD DRAWING	PAL	SMK

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

GROUNDWATER REMEDIAL ACTION
ONALASKA MUNICIPAL LANDFILL SITE
ONALASKA TOWNSHIP, WISCONSIN

PROCESS FLOW DIAGRAM

SHEET 48
DWG NO. 01-N-02
DATE OCT 1992
PROJ NO. GLO65602.FD

1=1.0

TABLE 2-1
Summary of Influent/Effluent Parameters

Contaminant	Average Influent Concentration			Effluent Concentration		
	Original Estimate[a]	1994 Actual	2001 Actual	Original Estimate[a]	1994 Actual	2001 Actual
Benzene (μg/L)	4	1.3–1.7	<1	< 1	<1 or <5	<1
Ethylbenzene (μg/L)	79	<5–11	<1.2	< 1	<1 or <5	<1
Toluene (μg/L)	2,800	22–230	<1	140	<3 or <5	<1
Xylene (μg/L)	625	19–180	≤14	31	<3 or <5	<8
Iron (mg/L)	25	11–23	2–5	1	0.8–12	1–4
BOD (mg/L)	3	[b]	[b]	2	2–12	<9
TSS (mg/L)	22	[b]	[b]	10	10–40	2–8
NH_3 (mg/L)	10	[b]	[b]	8	1.3–14.2	0.1–1.4
pH	6.6	6.4–7.2	7.1–7.8	8.3	7.7–8.5	8.0–8.3

[a]Concentrations were estimated based on groundwater well-sampling during the Remedial Investigation
[b]Not measured.

SECTION 3

Process Description

This section presents an overview and functional description of the extraction and treatment system. (Detailed operating procedures are presented in Sections 4 and 5.) A process flow diagram (PFD) for the treatment system is shown in Figure 2-2. The PFD provides an overview of the system in schematic form and defines each major process stream. The mechanical equipment and piping plan and the process and instrumentation diagrams (P&IDs) in Appendix A show the locations and controls of all process equipment and valves. Table A-1, in Appendix A, lists and describes the equipment shown in the P&ID including the manufacturer and model numbers.

The groundwater treatment system and the process building were designed so that an effluent filter or oil/water separator can be added in the future, if needed.

Unless otherwise noted, all electric process equipment is controlled from the main control panel (MCP) and power is fed through the motor control center (MCC). Electric motors are fitted with lockout switches. The lockout for the sump pumps is located at the local panel. Other lockouts are located at the MCC. The chemical metering pumps must be unplugged at the receptacles. Annunciators indicate the operating status for each piece of equipment. A more detailed discussion of the motor controls is presented in Section 4.

The tanks (except the chemical tanks) and process equipment are equipped with maintenance drains connected to the sump under the treatment building. The tanks are equipped with overflows that also flow into the sump.

Most of the exterior piping is heat traced to prevent freezing in the winter although some pipes need to be drained if the plant is not operating.

3.1 Groundwater Extraction Wells

The purpose of the extraction wells is to collect and pump the groundwater to the treatment system. The wells are designed and spaced so that their total zone of influence covers the width of the contaminated groundwater plume (Figure 2-1).

The general construction of all five wells is similar. All wells are constructed with an 8-inch stainless steel screen. All wells are about 85 feet deep with submersible pumps (Pumps Nos. 1 through 5). Each well is individually piped to the process building, where it enters through the floor and connects to a manifold.

3.2 Influent Manifold and Chemical Addition

After each extraction line enters the process building, there is a plug valve, a pressure indicator, a flow indicator, and a butterfly valve. The flow rate, total volume of groundwater pumped for that well, and pressure are read locally. The flow rates of all five wells are totalized and the sum is transmitted to the MCP. The combined flow from the five groundwater extraction wells is piped to the Aeration Tank. Fifty percent sodium hydroxide and polymer are fed into the combined flow just downstream of the manifold. The pH of the groundwater is raised to 8.0 to 8.3 to speed the rate of the oxidation and precipitation reaction. The polymer is added to flocculate the iron hydroxide precipitate into larger faster settling solids.

3.3 Aeration Tank

The purpose of the aeration tank (T-2-1) is to aerate the groundwater to oxidize the ferrous (soluble) iron to ferric (insoluble) iron so it will settle as a solid in the clarifier. The capacity of the aeration tank is nominally 12,000 gallons (15-minute retention time at an 800-gpm flow). Groundwater enters the tank through a side inlet pipe and exits over an overflow weir. Coarse bubble diffusers anchored on the bottom of the tank are designed to inject 50 scfm supplied by a positive displacement aeration blower (M-2-2). The blower, equipped with a silencer and a filter, is designed to deliver the air at a pressure of 8 psig. A pressure indicator is mounted on the air supply line next to the blower.

3.4 Clarifier/Caustic and Polymer Storage and Feed/Sludge Tank

The clarifier (T-3-1) is a solids contact clarifier, designed to remove the oxidized iron from the groundwater by facilitating flocculation of iron hydroxide particles into larger, faster-settling particles and settling the iron solids to the bottom of the clarifier. The clarifier has three zones: the mixing zone, the reaction zone, and the settling zone. A marine propeller provides gentle mixing of the influent. Polymer and sodium hydroxide can be added to the clarifier influent pipe and mixing zone, respectively, although the normal addition points were moved upstream of the aeration tank based on testing. Water flows from the mixing zone to the clarifier's reaction zone to allow additional time for the oxidation reaction and flocculation to take place. Finally, the water flows to the settling zone of the clarifier, which provides a long retention time to allow the oxidized iron solids (ferric hydroxide) to settle to the bottom.

The clarifier structure consists of a steel tank and concrete bottom. It is sized for a 30-minute reaction time in the reaction zone and an overflow rate of 0.5 gpm/ft^2. Groundwater flows by gravity into the clarifier from the aeration tank and the settled water from the clarifier flows by gravity to the clear well (T-4-4). Ferric hydroxide sludge settled in the clarifier is scraped with the constantly revolving sludge rake to the center where it is removed through a discharge line at the bottom of the tank. The sludge is then pumped to the Sludge Tank (T-6-1) or directly to the filter press.

Two drive units (M-3-1 and M-3-2) are mounted on the clarifier. M-3-1 turns the sludge rake. M-3-2 turns the marine propeller mixer in the mixing zone or center well. An alarm on the MCP will light if the sludge rake reaches 10 to 20 percent of its design torque. The sludge rake will shut down if it reaches 10 to 20 percent of its design torque. The speed of the propeller can be controlled locally at the clarifier.

Caustic sodium hydroxide is fed with the caustic pump (P-10-2). The pH in the clarifier is continually monitored with a pH probe connected to a transmitter, which sends a signal to the caustic pump to maintain the pH set point. Initially, pH was monitored in the mixing zone but experience showed that measurement in the settling zone provided less pH probe fouling and more reliable control. The caustic pump will automatically adjust its feed rate to maintain the pH set point based on the signal from the pH probe. An indicator on the MCP displays the pH in the clarifier.

The sodium hydroxide is stored in a 750-gallon caustic tank (T-10-1). A secondary containment system with a capacity of more than 110 percent of the tank volume surrounds the tank in case a spill occurs. Fifty percent sodium hydroxide solidifies at temperatures below 60°F. Thus the caustic tank and piping are heat-traced to maintain a minimum temperature well above this. A site glass on the tank provides a local level reading. The caustic tank is filled from an outside fill pipe mounted on the side of the building.

A diked area is provided next to the caustic tank to contain polymer spills. The polymer pump (P-9-1) is a chemical metering pump that supplies polymer to the influent groundwater at a set flow rate. This pump is manually set to provide the required polymer amount.

The clarifier can hold a week's worth or more of sludge in the bottom. However, iron and suspended solids in the clarifier must be checked daily and sludge removed at a frequency that prevents a deterioration in water quality attributable to solids accumulation in the clarifier. A sludge transfer pump (P-3-4) pumps the sludge to the sludge tank. The pumping rate of the sludge transfer pump can be adjusted by locally adjusting the pressure on the air supply to the pump. The sludge tank is sized to hold nominally 11,000 gallons of sludge, and is equipped with a drain valve 13 feet above the floor surface. As sludge thickens in the sludge tank, supernatant can be drained to the sump with a manually operated valve. Supernatant, if free of solids, should be drained off the sludge tank to achieve maximum sludge thickness before starting a filter press run.

The reactor clarifier is intended to form a sludge blanket several feet deep which would trap suspended solids as water rises from below the blanket through the blanket on its way to the effluent launders. However, despite experimenting with not withdrawing sludge for extended periods and varying the clarifier mixer speed, an upflow sludge blanket was never successfully formed. It was not determined whether this was a result of the chemical precipitate characteristics formed at Onalaska or the design of the EIMCO reactor clarifier. Based on experience, a control strategy of operating without any sludge blanket was followed. This was selected to minimize the potential for resuspending settled solids. The sludge tank holds 10,000 gallons of sludge. If the sludge tank were full of sludge and the sludge had a 1 percent solids content, there would be enough sludge to complete a filter press run. However, the sludge may have to be thickened to achieve a 1 percent solids content. The sludge transfer pump should be run at about 2 to 3 gpm continuously. This rate should fill the sludge tank in 3 days. When the sludge tank is full, decant off the upper one third and spend one more day filling it. Then run the filter press. This should be enough solids needed for a filter press run.

3.5 Clear Well

Supernatant from the clarifier flows by gravity into the clear well (T-4-4). The water is then pumped from the clear well to the top of the stripper tower (T-5-1) by the clear well pump

(P-4-5). The level in the clear well is transmitted to a level controller in the control room, which sends a signal to the pneumatically operated flow control valve (LCV 4-4). The valve modulated to maintain the water level set point in the clear well. However, the pneumatic actuator was disconnected because experience showed the valve could be manually set and left alone at a given extraction well pumping rate. This was done to minimize maintenance on the pneumatic actuator, which was problematic.

3.6 Stripper Tower

The stripper tower (T-5-1) is designed to remove 95 percent of the VOCs from the groundwater. VOCs are removed by creating a large air/water interface on the tower packing. The VOCs volatilize from the downward flowing water into the upward flowing air where they are discharged at the top of the tower. The treated water discharges at the bottom of the tower, flows into the building past a sample port and pH probe, and drains to the Black River (Bullet Chute) via the buried gravity discharge pipe.

The stripper tower itself has no moving parts or controls. A manometer mounted on the stripper tower fan (M-5-3) discharge duct indicates the pressure drop of the airflow through the packing. The maximum discharge pressure of the fan is 8.3 inches of water at 5,000 scfm. The combination of airflow and discharge pressure should be measured if the potential for fouled packing is suspected. A primary indication that the packing may be significantly fouled is elevated effluent VOC contaminant concentrations. Airflow can be measured by measuring air velocity with an anemometer at multiple locations within the duct, calculating the average velocity, and multiplying the average velocity by the cross-sectional area of the duct.

Normally, the effluent will discharge to a pipe that runs back inside the building, through a pH meter, and then to the river (Bullet Chute). The effluent piping from the stripper tower is designed so that the valve on the discharge line can be shut and the effluent recirculated to the clear well or to the sump. Directing the groundwater back to the clear well allows recirculating the same water, which was provided to allow cleaning fouled packing in the tower and allow verification of effluent quality before discharge during initial startup, if required. The clear well and stripper tower contents can be directed to the sump after attempting cleaning for treatment and pH adjustment. Addition of sulfuric acid to lower the pH to approximately 2 while recirculating groundwater was conducted the first two times that there was evidence of fouled packing. In both cases, the low pH did not dissolve the deposits that plugged the packing and the packing had to be replaced. Cleaning was not attempted the third time the packing plugged. Each time the packing was removed for replacement, it was discovered that much of the packing was 100 percent filled with a red mud-like material that, based on testing, was primarily iron hydroxide. Therefore, attempts at chemical cleaning are not recommended again at this site.

The stripper tower also has an overflow connection to the effluent line which will protect the tower and fan from water should the effluent valves be closed or plugged.

3.7 Filter Press

The filter press (M-6-3) dewaters the sludge from the clarifier from about 1 percent solids to 30 to 40 percent solids, producing a filter cake that can be disposed of offsite in a landfill. The filter cake must not contain any free liquids in order to be landfilled. Based on operating data, annual landfilled iron solids ranged from 9 to 20 tons per year in recent years. Each 15 cubic yard roll-off dumpster typically contained 5 to 10 tons. Therefore, one to four loads must typically be hauled to a landfill per year. The density of the dewatered solids at the time it was hauled to the landfill (after significant air drying occurred in the dumpster) varied between 30 and 60 lb/ft^3.

The filter press is a plate and frame press in which the sludge is compressed under high pressure to remove the liquids. The sludge is pumped to the press with an air-operated diaphragm sludge feed pump (P-6-2) that will continue to pump until the backpressure reaches 100 psig. An air compressor (M-8-1) supplies the pressurized air to the diaphragm pumps and filter press. Water that is removed from the sludge drains by gravity to the sump. When the filter press cycle is complete, the filter press plates must be separated by the operator to allow the filter cake to drop into the dumpster below the press. Air valves and a scraper may be used to remove filter cake sticking to the press.

The press is equipped with a sludge pump control panel to regulate the pressure and flow of the sludge pump. The control will shut down the pump after all programmed (operator-adjustable) pumping cycles are complete. A signal light on the control panel indicates when the cycle is complete. The filter press is also equipped with a plate shifter that will pull the filter press plates back individually to drop off the filter cake from the plates.

A filter precoat system, installed with the filter press, includes a precoat tank (T-6-5), recirculation pump (P-6-6), and a precoat tank mixer (M-6-5). The precoat system is designed to coat the filter press plates with a coating of diatomaceous earth slurry. This improves the dewatering characteristics of the sludge. A batch of slurry can be mixed in the precoat tank and then circulated through the filter press by the recirculation pump. When precoating is complete, the sludge pump will be activated to pump sludge from the sludge tank to the filter press to start sludge dewatering. Experience showed that precoating the filter press was not necessary for the iron solids.

3.8 Plant Air Compressor and Dryer

All compressed air supplied to the filter press and the pneumatic valves are supplied by the plant air compressor (M-8-1). The compressor, a rotary screw compressor, can supply 80 scfm at 100 psig. A tube in shell heat exchanger and water trap are provided downstream of the compressor to condense out as much moisture as possible before the desiccant air dryer. The flow of plant service water through the heat exchanger can be controlled by adjusting a manual valve. A desiccant air dryer is located downstream of the air compressor, heat exchanger, and water trap to provide dry air to controls and other plant air utilization locations. The dryer also has an oil filter and a dew point indicator.

3.9 Sulfuric Acid System

The acid storage tank (T-14-1), located outside, has a nominal capacity of 5,600 gallons of 93 percent sulfuric acid. The tank is located in a containment sump, which has the capacity to hold the tank volume. The acid feed pump (P-14-2) is located inside on the wall. Acid was pumped into the pipe between the clear well pump and the stripper tower. The pH of the effluent is monitored by pH probe (AE 5-4). The acid feed pump (P-14-2) flow rate is controlled by a flow-paced signal from the MCP.

The purpose of the addition of sulfuric acid was to lower the pH of the effluent before discharging to the river. The sulfuric acid system was added to meet the discharge pH limit of 9.0 and the pH-dependent ammonia limit. Although the system was used for the first year when ammonia concentrations were significantly higher, experience showed that it was possible to meet both limits by operating at a lower clarifier pH setpoint (i.e., adding less sodium hydroxide) instead of adding acid. Although operating at a lower clarifier pH may have slightly reduced iron removal efficiency, this strategy is preferable for the following reasons: sulfuric acid is a safety risk, not using acid reduces operation and maintenance cost, not storing acid eliminates annual reporting requirements to the state emergency management agency for the acid (although reporting is still required for the sodium hydroxide).

3.10 Sump

The floor drains in the building, the tank drains and overflows, and the filtrate drain from the Filter Press are connected to the sump (T-7-1) below the floor of the process building. The sump consists of two sump pumps (P-7-2-1 and P-7-2-2) that pump the contents of the sump back to the clarifier (normal valving) or clear well. Pump P-7-2-1, sized to pump 100 gpm, is used to return wash water and filtrate to the clarifier. Pump P-7-2-2, sized to pump 800 gpm, is used during startup, testing, shutdown of the process, or other abnormal situations. The sump is equipped with an emergency overflow, which will direct flow by gravity to the effluent line if the sump is filled while the sump pumps are not operating.

3.11 Discharge

After flowing through the air stripper, the treated water is discharged through a submerged diffuser in the Black River (Bullet Chute).

SECTION 4

Plant Startup and Shutdown

4.1 Introduction

This section describes the interaction of the control panel and the process equipment, provides instructions on plant startup and shutdown, and provides trouble shooting information

4.2 Process Control

Almost all of the process equipment is controlled from the control panel. (The filter press, sludge feed pump, and sump pumps are controlled locally.) The control panel is the first area to check in the event of a shutdown. The control panel includes:

- Annunciators that indicate an upset in the system
- Level indicators for the clear well and sludge tank
- On/off switches and on/off/auto switches for the process equipment
- pH control for the caustic and pH monitoring for the treated groundwater discharge

Figure 4-1 is a diagram of the MCP, an annunciator schedule, and an MCP schedule. The MCP is equipped with an audible alarm that will sound if there is trouble in any of the control systems.

4.2.1 Annunciators

The top lights on the control panel are annunciators that will flash if one of the following happens:

- Extraction well pump failure
- A malfunction in the clarifier mixer
- A malfunction in the clarifier (sludge rake) drive
- High torque on the clarifier drive
- High water level in the clear well
- High levels in the bottom of the stripping tower sump
- A malfunction of the plant air compressor
- High (first level above overflow level), high-high (second level above overflow level), or low water levels in the building sump
- Low header pressure and low tank level in the potable water tanks for the safety showers, sinks, and toilet

- Low pressure in the service water tank
- High water level in the septage tank serving the toilet and sink drains
- Aeration tank blower failure
- Stripper tower fan failure
- Bioventing blower failure
- High/low clarifier pH
- High/low stripping tower discharge (effluent) pH
- Clear well pump failure
- Low caustic tank temperature, and
- High/low flow rate from extraction well pumps

4.2.2 Indicators and Controllers

There are process indicators and controllers on the MCP for total flow rate (with strip chart recorder), clarifier pH, stripper tower discharge pH, clear well level control, and sludge tank level. Use of the strip chart recorder was discontinued except for occasional troubleshooting because the instantaneous and totalized flow readings on each of the flow meters provided adequate flow information.

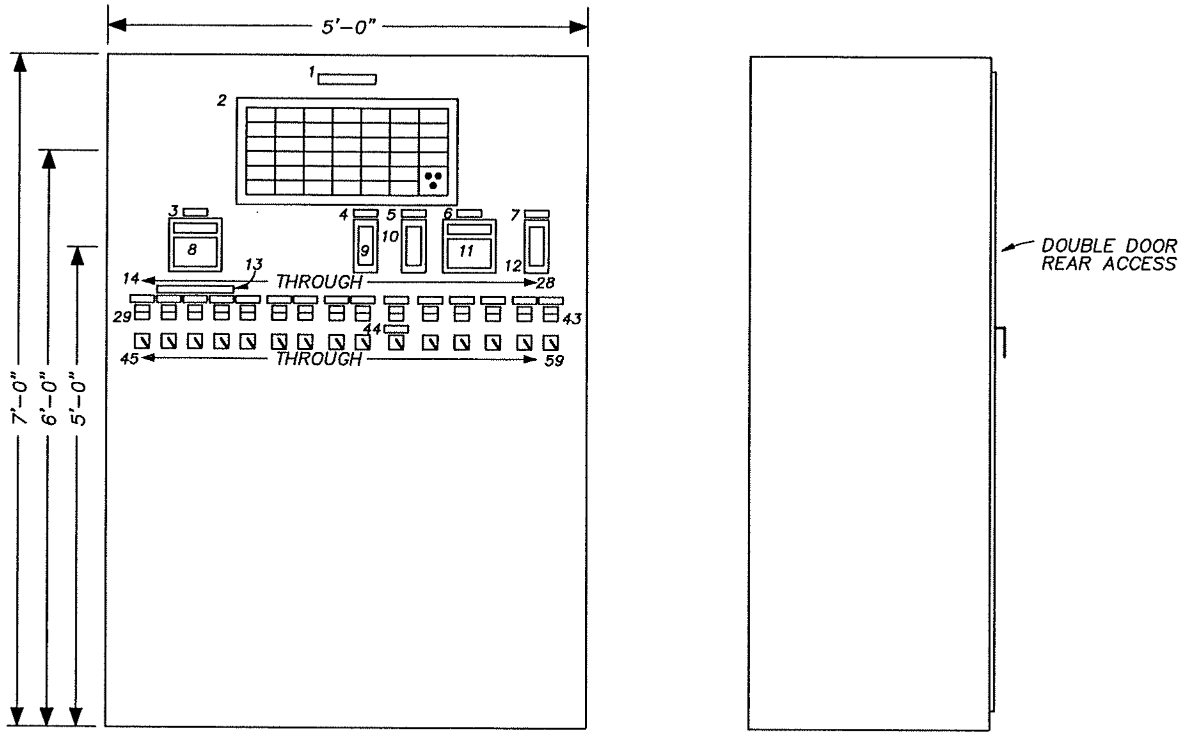
The pH indicators for the clarifier and air stripper discharge include pH controllers to control the caustic feed pump and to calibrate both pH probes. The clear well level controller can be programmed to adjust the level set point in the clear well, although as noted above, the pneumatic actuator on the valve used to control the level was disconnected because it was not needed. Therefore, the clear well level indicator and controller is only used for indication.

4.2.3 Switches

There are on/off and on/off/auto switches and indicator lights for the well pumps, aeration tank blower, bioventing blower, caustic feed pump, acid feed pump, stripper tower fan, clear well pump, service water pump, clarifier mixer, and clarifier rake on the MCP.

4.3 Startup

The following instructions are provided for starting and operating the groundwater extraction and treatment system. The instructions assume that all process tanks and equipment are full of water.



MAIN CONTROL PANEL (MCP) PANEL ELEVATION
NTS

MCP ANNUNCIATOR SCHEDULE		
ROW-COLUMN	TAG NUMBER	WINDOW INSCRIPTION
1-1	QA-1-1-1 (FAIL)	WELL PUMP NO. 1 FAILED
1-2	QA 2-2-1 (FAIL)	AERATION TANK BLOWER FAILED
1-3	(FUTURE)	(FUTURE FILTER-LEAVE BLANK)
1-4	LAH-5-2	STRIPPING TOWER SUMP LEVEL HIGH
1-5	LALL-7-1	PLANT DRAIN SUMP LEVEL LOW-LOW
1-6	PAL-8-1	COMPRESSED AIR PRESSURE LOW
2-1	QA-1-1-2 (FAIL)	WELL PUMP NO. 2 FAILED
2-2	QA-2-2-2 (FAIL)	AERATION WELL BLOWER FAILED
2-3	(FUTURE)	(FUTURE FILTER-LEAVE BLANK)
2-4	QA-5-3 (FAIL	STRIPPING TOWER FAN FAILED
2-5	LAHH-7-1	PLANT DRAIN SUMP OVERFLOW
2-6	LAH-13-1	WASTEWATER HOLDING TANK LEVEL HIGH
3-1	QA-1-1-3 (FAIL)	WELL PUMP NO. 3 FAILED
3-2	NAH-3-1 (TORQUE)	CLARIFIER DRIVE TORQUE HIGH
3-3	(FUTURE)	(FUTURE FILTER-LEAVE BLANK)
3-4	AAHL-5-4 (pH)	STRIPPING TOWER DISCHARGE pH HIGH/LOW
3-5	LAHHH-7-1	PLANT DRAIN SUMP OVERFLOW
3-6	SPARE	SPARE-UNINSCRIBED
4-1	QA-1-1-4 (FAIL)	WELL PUMP NO. 4 FAILED
4-2	QA-3-1 (FAIL)	CLARIFIER DRIVE FAILED
4-3	LAH-4-4	CLEARWELL LEVEL HIGH
4-4	LAL-12-2-1	POTABLE WATER SUPPLY TANK LEVEL LOW
4-5	LAL-12-2-2	SAFETY SHOWER SUPPLY TANK LEVEL LOW
4-6	SPARE	SPARE-UNINSCRIBED
5-1	QA-1-1-5 (FAIL)	WELL PUMP NO. 5 FAILED
5-2	QA-3-2 (FAIL)	CLARIFIER MIXER FAILED
5-3	LAH-4-4	CLEARWELL LEVEL HIGH
5-4	PAL-12-3-1	POTABLE WATER HEADER PRESSURE LOW
5-5	PAL-12-3-2	SAFETY SHOWER HEADER PRESSURE LOW
5-6	---	TEST-RESET-ACKNOWLEDGE
6-1	FAHL-1-4	WELL FIELD FLOWRATE HIGH/LOW
6-2	AAHL-3-3 (pH)	CLARIFIER pH HIGH/LOW
6-3	QA-4-5 (FAIL)	CLEARWELL PUMP FAILED
6-4	PAL-11-2	SERVICE WATER PRESSURE LOW
6-5	TAL-10-1	CAUSTIC TANK TEMPERATURE LOW

MCP PANEL SCHEDULE		
ITEM NO.	INSTRUMENT ITEM/ TAG NUMBER	NAMEPLATE INSCRIPTION (SERVICE LEGEND)
1	NAMEPLATE	MAIN CONTROL PANEL (MCP)
2	ANNUNCIATOR	(SEE ANNUNCIATOR SCHEDULE)
3	NAMEPLATE	TOTAL WELL FIELD FLOWRATE
4	NAMEPLATE	CLARIFIER FEED pH
5	NAMEPLATE	CLEARWELL LEVEL CONTROL
6	NAMEPLATE	STRIPPING TOWER DISCHARGE pH
7	NAMEPLATE	SLUDGE TANK LEVEL
8	FIR/SHL-1-4	(NONE REQUIRED)
9	AI-3-3 (pH)	(NONE REQUIRED)
10	LIC-4-4 (AM)	(NONE REQUIRED)
11	AIR/SHL-5-4 (pH)	(NONE REQUIRED)
12	LI-6-1	(NONE REQUIRED)
13	NAMEPLATE	WELL FIELD PUMP STATUS/CONTROL
14	NAMEPLATE	WELL PUMP NO. 1
15	NAMEPLATE	WELL PUMP NO. 2
16	NAMEPLATE	WELL PUMP NO. 3
17	NAMEPLATE	WELL PUMP NO. 4
18	NAMEPLATE	WELL PUMP NO. 5
19	NAMEPLATE	AERATION TANK BLOWER STATUS/CONTROL
20	NAMEPLATE	AERATION WELL BLOWER STATUS/CONTROL
21	NAMEPLATE	CLARIFIER MECHANISM STATUS/CONTROL
22	NAMEPLATE	CLARIFIER MIXER STATUS/CONTROL
23	NAMEPLATE	SLUDGE TRANSFER PUMP STATUS
24	NAMEPLATE	CLEARWELL PUMP STATUS/CONTROL
25	NAMEPLATE	STRIPPING TOWER FAN STATUS/CONTROL
26	NAMEPLATE	SERVICE WATER PUMP STATUS/CONTROL
27	NAMEPLATE	PRECOAT TANK MIXER STATUS/CONTROL
28	NAMEPLATE	RECIRCULATION PUMP STATUS/CONTROL
29	QL-1-1-1 (OO)	(ON/OFF)
30	QL-1-1-2 (OO)	(ON/OFF)
31	QL-1-1-3 (OO)	(ON/OFF)
32	QL-1-1-4 (OO)	(ON/OFF)
33	QL-1-1-5 (OO)	(ON/OFF)
34	QL-2-2-1 (OO)	(ON/OFF)
35	QL-2-2-2 (OO)	(ON/OFF)
36	QL-3-1 (OO)	(ON/OFF)
37	QL-3-2 (OO)	(ON/OFF)
38	QL-3-4 (OO)	(ON/OFF)
39	QL-4-5 (OO)	(ON/OFF)
40	QL-5-3 (OO)	(ON/OFF)
41	QL-11-1 (OO)	(ON/OFF)
42	QL-6-5 (OO)	(ON/OFF)
43	QL-6-6 (OO)	(ON/OFF)
44	NAMEPLATE	POLYMER PUMP CONTROL
45	HS-1-1-1 (O/O-R)	(ON/OFF-RESET)
46	HS-1-1-2 (O/O-R)	(ON/OFF-RESET)
47	HS-1-1-3 (O/O-R)	(ON/OFF-RESET)
48	HS-1-1-4 (O/O-R)	(ON/OFF-RESET)
49	HS-1-1-5 (O/O-R)	(ON/OFF-RESET)
50	HS-2-2-1 (O/O-R)	(ON/OFF-RESET)
51	HS-2-2-2 (O/O-R)	(ON/OFF-RESET)
52	HS-3-1 (O/O-R)	(ON/OFF-RESET)
53	HS-3-2 (O/O-R)	(ON/OFF-RESET)
54	HS-9-1 (OO)	(ON/OFF)
55	HS-4-5 (O/O-R/A)	(ON/OFF-RESET/AUTO)
56	HS-5-3 (O/O-R)	(ON/OFF-RESET)
57	HS-11-1 (OOA)	(ON/OFF/AUTO)
58	HS-6-5 (OO)	(ON/OFF)
59	HS-6-6 (OO)	(ON/OFF)

NOTE: PROVIDE HOUSEKEEPING PAD UNDER MCP SAME AS PROVIDED FOR MCC.

RECORD DRAWINGS

Revisions Drawn by P.A. LLANAS Date 10-24-94

THESE RECORD DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED BY OTHERS. THEY ARE NOT INTENDED TO REPRESENT IN DETAIL THE EXACT LOCATION, TYPE OF COMPONENT NOR MANNER OF CONSTRUCTION. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THE RECORD DRAWINGS.

FIGURE 4-1

CH2M HILL

DSGN OHLSSON
DR MCP OHLSSON
CHK R.NAGEL
APVD S.M.KEITH

NO.	DATE	REVISION	BY	APVD
	10/94	RECORD DRAWING	PAL	SMK

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

GROUNDWATER REMEDIAL ACTION
ONALASKA MUNICIPAL LANDFILL SITE
ONALASKA TOWNSHIP, WISCONSIN

PROCESS INSTRUMENTATION AND CONTROL SYSTEM
MAIN CONTROL PANEL ELEVATION/DETAILS

SHEET 55
DWG NO. 01-N-09
DATE OCT 1992
PROJ NO. GLO65602.FD

4.3.1 General

1. Check that all breakers are energized at the motor control center (MCC).
2. Check that all switches at the control panel are off.
3. Check that all local motor switches are on.
4. Check that all drain valves for the tanks and process equipment are closed (V-163, V-232, V-262, V-332, V-333, V-432, V-441).
5. Walk the entire main process pipe line, pipes connected to main process pipe line (e.g., caustic feed, polymer feed, sump pump discharge), and auxiliary system pipe lines (e.g., compressed air, service water, potable water) from start to finish and open the valves necessary to direct flow through the process and close drain valves and alternative flow routing valves. The following table provides guidance for some of the valves:

Valve	Function	Position
V-111, V-121, V-131, V-141, V-151	Extraction well valves	Open
V-112, V-122, V-132, V-142, V-152	Extraction well valves	Open
V-261	Clarifier sludge	Open
V-321	Clear Well discharge	Open
V-323	Clear Well pump discharge	Open
V-432	Stripper to sump	Closed
V-332	Stripper to Clear Well	Closed
V-433	Effluent	Open
V-233, V-236	Caustic feed line	Open
V-703	Acid feed line	Closed
V-271	Polymer feed line	Open
V-272	Polymer feed line drain	Closed
V-440, V-441, V-442, V-443, V-444	General service water	Closed
V-513	After sludge tank	Closed
V-641	Compressed air	Open
V-615	Sump valve	Closed
V-612, V-614, V-616	Sump valves	Open

4.3.2 Process Equipment

The following equipment has to be activated before startup of extraction wells:

1. Turn on the aeration tank blower from the MCP and verify that the pressure indicated at the aeration blower pressure gauge (PI 2-3) is close to 8 psig.

2. Turn on the motors to the mixer drive and sludge rake drive on the clarifier at the MCP. Visually inspect the clarifier to verify that the mixer and sludge rake drive are working.

3. Start the plant air compressor from its local panel. Allow the compressor to warm up for 2 minutes in the unload mode. Push load twice for the modulate/ACS mode. This compressor supplies air to the pneumatically controlled devices and so it must be on at all times when the building is occupied or the plant is running. Verify that the compressor is on by checking the pressure indicator on the compressor panel. The pressure should be at least 90 psig and not exceed 100 psig.

4. Turn on the stripper tower fan from the MCP. Verify that the fan is working by checking the pressure on the fan discharge manometer.

5. Turn on the caustic pump from the MCP. The pump will operate until the set point (pH 8.3) is reached in the mixing zone. Verify that the pump is set for automatic control.

6. Turn both sump pumps to the automatic position at their local panel. These pumps will not start until the water level in the sump switches the pumps on.

4.3.3 Groundwater Extraction Wells and Polymer Pump

The well pumps are turned on and adjusted to the desired flow one at a time to avoid putting more flow through the system than it is designed for. To start well pump No. 1:

1. Turn on well pump No. 1 (HS 1-5) at the control panel.

2. Turn on the clear well pump.

3. Check the water flow rate at the local flow indicator and adjust the butterfly valve until the flow is at the desired rate. The target flow rates from each well are as follows:

Well	Flow Rate
1	175 gpm
2	125 gpm
3	100 gpm
4	125gpm
5	175 gpm
Total	**700 gpm**

   The suggested flow rates may be varied based on evaluation of the hydraulic gradient and groundwater monitoring results.

4. Turn on the polymer pump after all the wells are turned on.

4.4 Plant Shutdown

4.4.1 Short-Term Routine Shutdown

A short-term routine shutdown is for minor repairs or replacement of nonsubmerged equipment, power outages, or other events that will cause short-term interruption of the process.

For short-term routine shutdown:

1. Turn off the well pumps Nos. 1 to 5.
2. Turn off the caustic pump and the polymer pump.
3. If the plant will be left in a shutdown mode with the aeration tank full, then close valves V-111, V-121, V-131, V-141, and V-151 from the extraction wells. This is necessary to prevent the back flow of water from the aeration tank into the wells, which would result in some cross-contamination between wells. Experience has shown that the check valves at the extraction pumps do not preclude back flow when the pumps are off as evidenced by a drop in the aeration tank water level.
4. Shut down other operating equipment if the plant will remain shut down beyond the operator's shift.

4.4.2 Long-Term Shutdown

Refer to the Groundwater Treatment Facility Shutdown/Restart Plan dated December 7, 2001.

4.4.3 Automatic Shutdown

The annunciators indicate potential problems in the treatment system. Some problems will trigger automatic shutdown of the entire system. When a problem is suspected or the alarm on the control panel is on, the operator should first assess the problem by determining what annunciator lights are on. The treatment system (including the groundwater extraction wells) will shut down automatically for the following reasons:

- Shutdown of the Aeration Blower
- High water level in the clear well
- High water level in the sump
- Malfunction or shutdown of the stripper tower fan

4.5 Troubleshooting

4.5.1 General

As a general approach, first investigate potential causes of problems using the approaches below and the troubleshooting guides in the manufacturer's operation and maintenance manuals. Do not attempt to investigate or fix issues that require the expertise of an electrician, maintenance specialist, or manufacturer's service representative. Most equipment can be reset at the MCC by moving the circuit breaker from off and back to on and, if necessary, by pressing the reset button. Some equipment items have a local disconnect switch, which must be on in order for the equipment to be operated from the MCP or MCC. If the problem cannot be resolved then solicit the services of an electrician, maintenance specialist, or manufacturer's service representative, as appropriate.

4.5.2 Aeration Tank Blower

Loss of airflow to the aeration tank will result in the failure of the system to oxidize and remove the iron. Loss of airflow to the aeration tank may be noticed by lack of noise from the blower, or by the pressure indicated on the pressure gauge on the blower. If the blower shuts down, the extraction wells will automatically be turned off and all other process equipment will shut down (e.g., clear well pump, polymer pump, and caustic pump).

Operator Response:

- Check the blower for broken belts or other damage. Also check the blower circuit breaker for power overload. Check the blower inlet for obstructions. Consult the blower manual for troubleshooting.
- Restart the blower from the control panel if a problem has been identified and solved.
- If the blower will not restart, further investigate potential mechanical and electrical explanations to identify and resolve the problem.
- When the blower is back on-line, restart the process following the instructions presented under "Startup."

4.5.3 Clear Well

If the level in the clear well reaches a high set point, the groundwater extraction wells will shut down, which will be followed by shutdown of the rest of the process equipment. If the level in the clear well reaches a low set point, the clear well pump will trip off. As water refills the clear well, the clear well pump will turn on automatically. A high water shutdown most likely would be caused by too much flow to the clear well. This can occur if treated groundwater flows into the building sump via the standpipe at a rate that results in a high enough sump level to turn on the large sump pump. The combination of the extraction well pumps and the large sump pump running results in approximately double the design capacity flow through the plant. A low water shutdown most likely would be caused by flow being interrupted from the clarifier. As noted above, the pneumatic flow control valve was disconnected because it was problematic and not needed. The manual valve on the clear well pump discharge can be manually adjusted to achieve a desired level (e.g., half full) in the clear well tank with the extraction well pumps running at the desired flow rates and the clear well pump running continuously.

Operator Response:

- Verify that the extraction wells are on and flow is continuous from the aeration tank to the clarifier and then to the clear well.

- If treated effluent groundwater is flowing into the building sump from the standpipe, decrease flow from the extraction well pumps by throttling the butterfly valves at the manifold.
- Adjust the clear well pump discharge valve to achieve a desired steady state level or slowly falling level in the clear well tank. The clear well pump may automatically turn off and back on occasionally but a high clear well tank alarm should be avoided because the latter turns off the extraction well pumps. The discharge valve should be throttled if the clear well tank is drawn down too rapidly because the clear well pump should not cycle on and off too frequently. Frequent cycling will decrease the motor life expectancy.

4.5.4 Building Sump

If the water level in the sump reaches the level at which the water is flowing into the overflow pipe and discharging to the effluent pipe, the groundwater extraction wells will automatically shut down and then the entire system will shut down. The cause for this overflow most likely would be the failure of both of the sump pumps (e.g., the pumps do not turn on or the pump intakes are plugged). A high sump level can also occur when there is reverse flow from the sump standpipe into the sump. Reverse flow from the treated groundwater discharge pipe into the building sump via the sump standpipe can occur from a blocked effluent line (most likely by air pockets which restrict flow), too high a plant flow, a high river level, or a combination of the above.

Operator Response:

- Check to see if reverse flow is occurring into the sump and if so, decrease the extraction well flow set points by throttling the butterfly valves at the manifold.
- Check to see if the sumps are pumping properly and if not:
  - Check the sump pumps' power circuits for signs of overload. Attempt to restart the sump pumps individually from the local control panel.
  - Check the sump pump suction strainer to see if debris is restricting flow into the pumps.

4.5.5 Stripper Tower Fan

If there is no fan noise or no pressure reading on the manometer at the fan discharge, there might be an airflow loss to the stripper tower. Without counter-current airflow, the stripper tower will not remove VOCs. Thus, if the fan shuts down, the groundwater extraction wells will shut down also.

Operator Response:

- Inspect the fan area for evidence of broken belts.
- Try to restart the fan by turning the fan on from the MCP if a problem has been identified and solved.

In the first year of operation, the fan began vibrating and was noisy. Water in the fan was the cause. Holes were drilled in the fan impeller to allow water to drain and this solved the problem.

Operator Response:

- If unusual fan vibration and noise recurs, make sure that the drain holes are not plugged with dirt or debris and clean as necessary.
- After verifying the fan is not unbalanced due to water or debris, make sure that moving parts are properly lubricated, check alignments, and check for worn bearings or other worn components.

4.5.6 Well Pump Failure

Having one well pump shut off will NOT shut down the entire process. However, if the overall flow rate is less than 500 gpm, a low flow rate alarm light will flash on the control panel.

Operator Response:

- If the pump runs but flow rates have dropped over time (e.g., the quickest check of this is to turn off the other pumps, open the manual butterfly valve at the manifold, note the flow rate, and compare this to when the pump was first installed), then schedule well maintenance to have the well screen cleaned (see section on well cleaning).

4.5.7 Plant Air Compressor Shutdown

If the compressor shuts down, pneumatically controlled items, including water supply to the safety showers, sinks, and the toilet, and building ventilation and air supply unit heating, will not function properly.

Operator Response:

- Connect the portable backup air compressor to the air piping upstream of the desiccant dryer. Plug in the portable backup air compressor and it will cycle on and off based on pressure in the airline.
- Follow the manufacturer's operation and maintenance manual to troubleshoot the main air compressor.

4.5.8 Filter Press

When the sludge transfer pump is shut down, it tends to clog. Try to keep it operating as much as possible.

If operations suggest that there are not sufficient solids in the sludge tank to complete a filter press run, then the follower liner plate of the filter press (the last plate in the stack) and the blank plate (the 1 inch steel plate) should be inserted further up in the stack to reduce the amount of sludge needed for a filter press run. The blank plate weighs about 600 pounds. Always maintain an even number of plates in use.

The controller that controls the sludge feed pump is set to run for 13 stages at 14 minutes per stage. At each stage, the pressure feeding to the sludge transfer pump will increase by about 7 to 8 psi. When the pressure reaches 100 psi, the controller will run one final stage for 1 hour at the maximum 100-psi pressure. After this final stage, the cake is ready for discharge. Blow some air into the upper left discharge port to chase out residual water in the press.

Note: The press should NEVER be fed more than 100 psi of pressure. Therefore, never increase the air compressor to a pressure greater than 100 psi. If this cycle does not produce good cake, then call Eimco about modifications to the cycle.

If ever needed to prevent plugging the filter cloth or to improve dewatering, precoat with about 75 to 100 pounds of precoat media. The precoat systems should keep running until the sludge feed pump reaches 25 psi of pressure.

SECTION 5

Routine Process Operations and Inspections

Under normal operating conditions, inspections/monitoring must be performed daily, Monday through Friday, or weekly to assess system operation. These operations are discussed below. Appendix B provides operational log sheets for the groundwater extraction wells and process monitoring as well as maintenance plan log sheets. Items on the log sheets and additional routine monitoring are discussed below.

5.1 Groundwater Extraction Wells

Daily

- Record the flows, totalized flow, and pressures from individual wells where the extraction lines enter the building.

After Adjustments

- Record the flows, pressures, and the position of the butterfly valves used to adjust the flow (e.g., notch 3 or between notch 3 and 4).

5.2 Aeration Tank

Daily

Check the pressure being supplied to the aeration tank from the blower.

5.3 Clarifier

Daily

- Verify that the mixer and sludge rake are working.
- Measure the depth of sludge in the bottom of the clarifier using a sludge gauge and record the depth of sludge. Record sludge depth at edge, middle, and center of clarifier.
- Record the level of caustic sodium hydroxide in the caustic storage tank. Order the next shipment so that the caustic will not run out before the next shipment arrives.
- Measure and record the amount of polymer being fed to the clarifier. A dose of 1 to 2 parts per million (i.e., 1 to 2 gallons of polymer per million gallons of groundwater), depending on visual observation and iron analysis, was determined appropriate for the polymer selected prior to the shutdown for the natural attenuation study based on jar testing and full scale observations. Jar testing and full-scale observation is required to determine dose if alternative polymers are used. Do not change polymer feed rates until consultation with the site manager.

- Record volume of sludge in the sludge tank and the operating pressure of the sludge transfer pump.

5.4 Stripper Tower

Daily

- Visually inspect the air intake of the air stripper to check that it is not clogged.
- Record the pressure to the air stripper from the manometer mounted on the stripper tower fan discharge.

5.5 Sludge Dewatering/Disposal

Daily

- Draw off as much supernatant as possible from the sludge tank and drain to the sump by opening the supernatant drain valve. If the supernatant contains significant solids, close the drain valve.

As Necessary

- When the sludge tank is full, turn on the filter press and sludge pump to dewater the sludge. Turn off the filter press and release the filter cake to the roll off container.
- Arrange for the roll-off container to be emptied as needed.
- Calibrate the sludge transfer pump so that solids are removed from the clarifier at the same rate they are produced, as evidenced by a constant sludge blanket level or no sludge blanket in the clarifier.

5.6 Air Monitoring

Based on HNu, LEL, and oxygen monitoring during operation from 1994 through 2001, readings in the plant have not triggered action levels. Therefore, routine air monitoring of the building is not necessary. Air monitoring is required for confined space entry, monitoring well sampling, and other tasks where there is a greater than normal potential for exposure. A 120-volt outlet plug in type carbon monoxide detector is suggested for the building because of the propane heating.

5.7 Routine Inspection/Maintenance

For each piece of equipment, follow the maintenance schedule summary. Refer to manufacturers' O&M manuals for guidance.

5.7.1 Well and Pump Maintenance and Rehabilitation

Note any changes in the operating characteristics of the wells and pumps because both can deteriorate to the point where rehabilitation is difficult, if not impossible. Generally, experience indicates that if the specific capacity of a well declines by 10 to 20 percent, it is time to initiate rehabilitation procedures. (Specific capacity is the flow rate of the well divided by the drawdown in the well. Drawdown in the well is the static water level minus the water level in the well.)

A bubble tube was provided with each extraction well pump for estimating water level based on the pressure required to establish airflow into the well. Although an attempt was made to estimate initial specific capacity, this approach was likely too inaccurate to serve as a basis for determining when well maintenance is required. Alternative baseline measurements were made with the manual butterfly valve in the manifold used to control flow completely open. The following measurements were recorded:

Extraction Well Pump

1. 217 gpm
2. 170 gpm (after replacement in 1999)
3. 114 gpm
4. 185 gpm (after replacement in 1999)
5. 247 gpm (after replacement in 1998)

Chemical precipitation fouling and biofouling of the pump and the well screen can be controlled. Typical maintenance for the extraction wells may be adding sulfuric acid pellets to lower the pH and dissolve chemical precipitates and shock chlorination treatments using sodium hypochlorite to kill biological growth. Adding sulfuric acid pellets when an extraction well pump needs replacement due to failure is sufficient. The extraction well pumps that were replaced had a thin black coating that the well replacement subcontractor concluded was a chemical precipitate.

Frequent shock chlorination or acid treatments may have a detrimental (corrosive) effect on the stainless steel well screen and/or casing over a period of several years. The well pump and cable should be removed before acid treatment or shock chlorination. Pump removal requires a well driller and the cost are too significant to justify until the pump needs replacement. In addition, incrustation can cause sand pumping over time. Because of the potential, the extraction wells have been designed to facilitate replacement of the well screen should it become necessary. Evidence of well screen deterioration would be the onset of sand pumping after several years of service.

The pump impellers, housing, and shaft are particularly susceptible to sand pumping. Corrosion or biofouling of pump parts can also be serious problems. Any of these conditions can drastically reduce the efficient life of a pump.

5.7.2 Aeration Tank and Diffusers

Every year, the aeration tank should be drained (following the procedures discussed above) and the coarse bubble diffusers cleaned with brushes and a dilute acid solution, as needed. Precipitation and microbial growth may tend to clog the diffuser ports over time. This would increase the pressure needed to blow air through the aeration tank and reduce the effectiveness of the aeration.

5.7.3 Stripper Tower

The plastic media in the air stripper tower will become fouled over time by iron, calcium carbonate, and other chemical precipitates or biological growth. Based on experience at the site between 1994 and 2001, elevated VOC contaminant concentrations in the treated groundwater may be an indication that the media is becoming plugged and is in need of replacement. A high fan discharge pressure to the tower would also indicate media fouling. As noted above, if fouling is suspected, the operating point of the stripper tower fan should be determined based on the discharge pressure reading and airflow as estimated from air velocity readings. If the media becomes nearly completely plugged then water will overflow the top of the tower, which is a definitive sign that the plant needs to be shut down immediately, and the media replaced.

Media replacement frequency will depend on site and operating conditions. The media plugged three times between initial plant startup in 1994 and 2001. The key parameter affecting media fouling is the iron concentration to the stripper tower.

To replace the media, the media is removed through the manhole at the bottom of the packing (i.e., the second to the lowest manhole). A roll off dumpster should be placed under this manhole to collect the media. Based on experience, the plugged media is very difficult to remove. When allowed to dry, the media was essentially cemented together. When wet, the media was essentially bound together in a heavy, damp mud-like precipitate. The removal process is analogous to mining using hand tools and is a slow and labor-intensive process. All work must be done with tools extended through the manhole. Extreme caution must be exercised at all times because the hollow formed as media is removed collapses occasionally with the full weight of all the plugged media above. The difficulty and time required for media replacement was the impetus for close monitoring and attempted optimization of the iron removal system to maximize the time between required media replacement.

New or cleaned media can be inserted through the manhole second to the top in the stripper tank.

Other parts of the stripper tower should be inspected as well. The stripper tower air plenum/sump should be visually inspected every 6 months by removing the bottom manhole cover. Check the condition of the packing support plate. Look for and remove biological growths, chemical deposition, broken media fragments. Clean out deposits and verify that the discharge pipe is not obstructed.

Tower upper internals should be visually inspected according to the manufacturers' O&M manual when replacing the packing. A boom lift will be necessary to access the upper stripper tower manways. Remove the manhole cover near the top of the tower. Inspect the mist eliminator above the distribution pipe and remove for cleaning, clean, and reinstall as needed. Clean the distribution pipe nozzles and the distribution plate orifices if fouled.

5.7.4 Filter Press

The cloths on the filter press will gradually wear out and will have to be replaced. Consult the filter press maintenance manual for further instructions on filter cloth replacement.

SECTION 6

Sampling, Monitoring, and Reporting

6.1 Sampling/Analysis

Sampling untreated and treated groundwater (influent and effluent) is performed to assess the ongoing performance of the process equipment and to verify compliance with effluent limits. Samples will be analyzed for the parameters required to be monitored by WDNR by a WDNR-certified laboratory. Some onsite testing of process water will be required as well. The onsite laboratory equipment shall include a pH meter, thermometer, and a 0-10 mg/L Hach kit for testing iron in the clarifier effluent. pH, iron, and a visual assessment of the clarifier effluent suspended solids, turbidity, and color are to be used to make operational adjustments to the polymer feed, caustic feed, and other parameters affecting iron removal.

6.1.1 Influent Monitoring

WDNR requires influent monitoring for the BTEX contaminants and iron. A copy of the influent monitoring requirements issued by WDNR are included in Appendix C.

6.1.2 Effluent Monitoring

The objective of the treatment facility is to provide best available equipment economically achievable (BATEA). This includes removing 95 percent of the VOCs and most of the iron in the groundwater. The WDNR will also regulate the effluent pH, BOD, TSS, and ammonia. Because the groundwater cleanup is part of a CERCLA action, a NPDES permit will not be required. However, the effluent monitoring must conform to the general requirements for surface water discharges in the State of Wisconsin and the WDNR administers the site in the same manner as if the monitoring requirements and discharge limits were in the form of an official NPDES permit. Monitoring will consist of recording and measuring some parameters on-site (e.g., temperature and pH) and collecting samples for offsite analysis of parameters required to be monitored by WDNR. Composite samples must be collected using a refrigerated composite sampler. Whole effluent toxicity test samples will be collected and analyzed on an annual basis. River water upstream of the plant discharge must also be collected as part of the whole effluent toxicity testing. A copy of the effluent monitoring requirements issued by WDNR are included in Appendix C.

6.1.3 Air Stripper Tower Off Gas

Toluene and xylene, the primary VOCs being removed from the air stripper tower, are regulated under the NR 445 regulations that govern the discharge of toxic compounds to the air. However, the mass emissions from the air stripper are an order of magnitude less than the mass emissions requiring control. Consequently, no sampling is required of the air stripper off gas.

6.1.4 Sludge

The Toxicity Characteristic Leaching Procedure (TCLP) analyses performed on the filter cake showed the filter cake to be nontoxic. The filter cake has always passed the paint filter test as well which demonstrates there is no free water. Further tests of the filter cake will depend on the requirements of the disposal company.

6.2 Reporting

Monitoring results are to be recorded on the appropriate process-monitoring log and required information must also be entered on the WDNR discharge monitoring report (DMR) and submitted to the WDNR.

SECTION 7

Ancillary Facilities Information

This section describes the ancillary facilities. Information on facility maintenance should be obtained from the supplied maintenance manuals.

7.1 Heating, Ventilation, and Air Conditioning

The process building is heated with propane. The 1,000-gallon propane tank is located south of the building. Four gas-fired, ceiling-mounted unit heaters controlled by individual electric thermostats heat the building. A make-up air inlet on the south wall of the building is used to provide fresh outside air. A wall-mounted air conditioner located in the office cools the office and laboratory. Ceiling fans are mounted around the process building to reduce thermal stratification. Small exhaust fans in the laboratory and bathroom are designed to go on automatically when the lights are turned on.

The operator must coordinate delivery of propane to the propane storage tank on an as-needed basis. The operator will also need to seasonally adjust the ratio of make-up air to recirculate air inside the building. Thermostats may be set to the desired temperature. For a more detailed description of the HVAC system, the operator should consult the equipment manuals.

Note: The heating and ventilation control panel, air supply unit, and wall dampers require plant air to operate.

7.2 Electrical Supply

The building is supplied with 3-phase, 480-volt power from Riverland Energy Cooperative. The electricity is supplied to the site by overhead lines. At the last pole north of the building, the electric lines descend to the ground and are buried. The electricity enters through the floor in the control room. A transformer steps down the voltage to 110 or 220 volts, depending on what voltage is needed.

7.3 Potable Water

Potable water will be supplied from two 450-gallon, pressurized water tanks. Potable water must to be trucked to the site by a water supplier. The plant operator will have to monitor the water level and coordinate delivery of the water on an as-needed basis. An anti-microbial growth powder may have to be added to water supply tanks as needed to prevent bacterial growth.

The safety showers should be operated every 3 months to drain stagnant water so they can be replenished with fresh water.

Annunciators in the control panel will indicate when the water levels in the potable water tanks are low. An annunciator will also indicate if a safety shower is in use.

7.4 Sewage

All sewage from the toilet and sinks drains to a 2,000-gallon-holding tank south of the building. The tank is equipped with a high level alarm at the control panel to signal when it is full.

The operator will have to monitor the sewage level in the tank and coordinate disposal of the sewage with a septic tank cleaning company on an as-needed basis.

7.5 Service Water

General service water, consisting of treated effluent, which is nonpotable water, is used for cleaning the floors and process equipment and to supply dilution water to the polymer activation and feed equipment . The water is pumped from the bottom of the air stripper with the service water pump (P-11-1). The pump is turned on from the control panel and it will cycle on and off to maintain pressure set points. A bladder tank near the service water pump provides some pressurized service water storage, which prevents the service water pump from running continuously when only a small amount of water is being used. Numerous hose connections located around the process building can be used for flexible hose connections. Floor drains in the process building drain to the sump.

7.6 Plant Air

Several air line outlets are located around the facility for operator use.

7.7 General Maintenance

General maintenance such as snow removal, grass cutting, cleaning, and site security will be the responsibility of the plant operator to perform or coordinate.

8.2 Chemical Hazards

There are two types of chemical hazards associated with operating the treatment facility. The first is associated with handling chemicals and other substances used as part of the treatment process. These include sodium hydroxide, polymer, and diatomaceous earth and sulfuric acid, if used. Other chemicals may also be used for analysis and calibrating monitoring equipment. Material Safety and Data Sheets (MSDSs) must be maintained at the site in an organized file. The MSDSs should be consulted for proper handling and safety precautions.

It will be the duty of the plant operator to establish a Hazard Communications Program, which identifies chemicals in use at the facility.

The second type of chemical hazard is associated with fugitive emissions of VOCs or exposure to other contaminants from the groundwater. Table 8-1 provides a list of the main VOCs detected in the groundwater together with the OSHA exposure limit and the concentration that is immediately dangerous to health and life (IDLH) for each VOC. Table 8-1 also lists symptoms of exposure.

TABLE 8-1
Known Contaminants

Known Contaminant	OSHA ppm	IDLH ppm	Symptoms of Exposure
Benzene	1	500	Irritant to skin, eyes nose, respiratory system; giddiness; headache, nausea, staggered gait; fatigue, anorexia, lassitude; dermatitis; bone marrow depressant; carcinogenic.
Toluene	100	800	Irritant to eyes, nose; fatigue, weakness, confusion, euphoria, dizziness, headache, dilated pupils, tears, nervousness, muscle fatigue, insomnia, paresthesia, dermatitis; liver and kidney damage.
Ethyl Benzene	100	500	Irritant to skin, eyes, mucous membrane; headache; dermatitis; narcosis; coma.
Total Xylenes	100	900	Irritant to skin, eyes, nose, throat; dizziness, excitement, drowsiness, incoordination, staggered gait, corneal vacuolization; anorexia, nausea, vomiting, abdominal pain, dermatitis.

The potential for exposure will be highest during equipment maintenance and cleaning (e.g., cleaning the insides of the tanks). Project-specific health and safety plans must be developed for each task for which chemical exposure is likely. The health and safety plan would include provisions for monitoring breathing space air for VOCs and selecting personnel protective equipment.

8.3 Spills and Releases

A failure of a tank or piping could result in the loss of contaminated groundwater to the environment. After any uncontrolled release of chemicals to the groundwater, the WDNR

SECTION 8

Plant Safety

Plant personnel are responsible for knowing safety hazards and taking steps to eliminate them. The plant O&M contractor must develop and abide by an approved health and safety plan. This section is not to be considered a comprehensive safety manual for the plant operation. Instead, it is intended to highlight some of the significant plant safety issues and note resources that supply more detailed information.

An effective safety program is the responsibility of everyone involved in the plant operation. The plant operator is responsible for:

- Reading the reference material on safety
- Observing safety precautions
- Knowing and understanding safety precautions
- Knowing how to use safety equipment

There are general plant safety concerns associated with the plant and safety concerns associated with the contaminants in the groundwater.

8.1 General Plant Safety Concerns

Numerous regulations and reference materials have been produced, which set minimum safety standards for industrial facilities, and specifically for wastewater treatment plants. These include:

- *The Manual of Practice No. 1, Safety in Wastewater Works,* by the Water Pollution Control Federation

- Federal regulations for industrial safety (40 CFR 29.1910)

- *Safety in Operation of Wastewater Treatment Plants,* by OSHA

These manuals provide appropriate guidelines for eye, ear, head, foot, and skin protection, as well as guidelines for working near industrial equipment.

Plant personal are also instructed to consult the process equipment operation manuals for information pertaining to proper safety procedures.

Plant personnel are also referred to the Wisconsin Administrative Code:

- Chapter 11 for liquified petroleum gases
- Chapter 31 for confined space entry

should be notified. The WDNR will establish appropriate response actions. Notify appropriate agencies in the event of spills or releases in excess of reportable quantities. Contact the local emergency response team for spills or releases of significant proportion. Spills contained within the spill containment basins surrounding the sulfuric acid tank and sodium hydroxide tank are not reportable but the site manager must be consulted to determine an appropriate course of action that is protective of the environment and human health and safety.

8.4 Medical Emergencies

A first-aid kit should be kept in the process building office at all times. A record of all injuries should be kept together with the facility files. Table 8-2 is a list of emergency contacts. Appropriate names and numbers should be filled in. This table should remain posted by the telephone at all times.

TABLE 8-2
Emergency Contacts

Emergency Contacts	Name	Phone
Plant Manager		
EPA Contact		
Sate Environmental Agency		
Fire Department		
Police Department		
State Police		
Health Department		
Poison Control Center		
Medical Emergency		
Hospital Name:		
Hospital Address:		
Name of 24-Hour Ambulance:		
Route to Hospital: Attach map with route to hospital		
Distance to Hospital:		

The site safety manager shall post the above information in a conspicuous location.

8.5 Access Control

Access to the site is authorized only to the WDNR, the U.S. EPA, and their authorized subcontractors. All unauthorized entries should be reported to the police.

All persons entering the treatment building while the treatment process is operating (contaminated groundwater flowing into the building) must be 24-hour or 40-hour trained per 40 CFR 29.1910. Persons not meeting these qualifications can be granted access if accompanied at all times by properly trained personnel, if working in an area without risk f exposure, or only after the operator has stopped normal operations, ventilated the building, and verified that ambient organic vapor concentrations are at background levels.

Appendix A
P&IDs/Equipment List

TABLE A-1
Equipment List—Onalaska

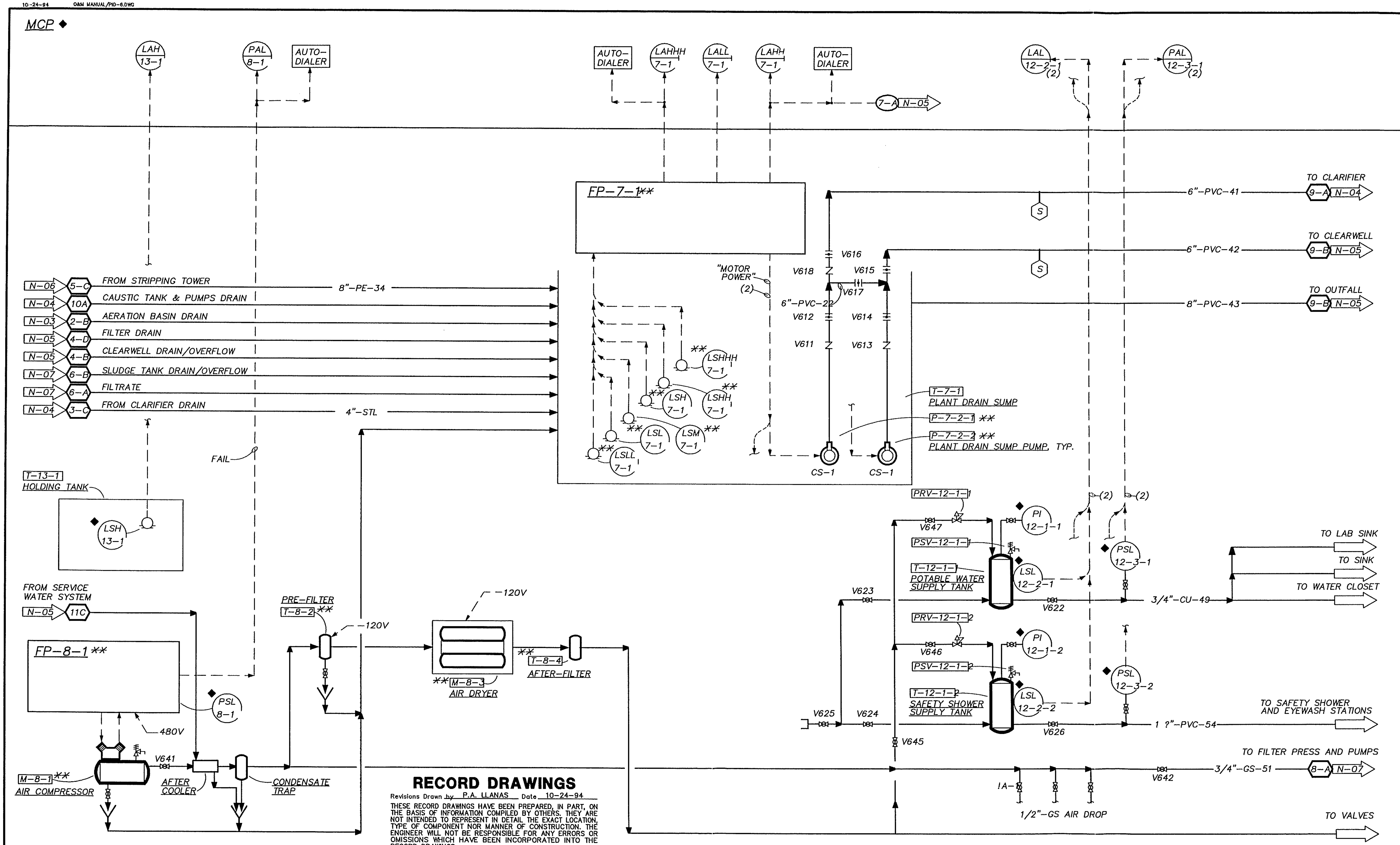
Title	Equipment Number	Description	Electrical	Manufacturer, Model, Phone
Aeration Tank	T-2-1	FRP, cylindrical tank 11′ diameter/21′ high 18′ water depth/overflow weir Coarse bubble diffusers on bottom	—	Airplastics, Inc.
Aeration Tank Blower	M-2-2-1	Positive displacement blower 50 scfm at 8 psig Single stage Provide spare blower	7½ hp	Roots Grub Equipment Corp. (612) 777-4041
Aeration Tank Blower Filter	T-2-2-1-1	Furnish with M-2-2-1	—	Roots
Aeration Tank Blower Silencer	T-2-2-1-2	Furnish with M-2-2-1	—	Roots
Aeration Well Blower	M-2-2-2	Positive displacement blower 300 scfm at 4 psig Single stage	—	Roots Grub Equipment Corp. (612) 777-4041
Aeration Well Blower Filter	T-2-2-2-2	Furnish with M-2-2-2	—	Roots
Aeration Well Blower Silencer	M-2-2-2	Furnish with M-2-2-2	—	Roots
After-Filter	T-8-4	3 micron	—	Ingersoll-Rand/IR30P
Air Compressor	M-8-1	Rotary screw 80 scfm at 100 psig operating Automatic float drain valve	20 hp feeder	Ingersoll-Rand/SSR-20 Airpower Equipment Corp. (612) 522-7000
Air Dryer	M-8-3	Regenerative 20 scfm, 100 psig operating	120 V 5 A	Ingersoll-Rand/HB52 Airpower Equipment Corp. (612) 522-7000
Air Stripping Tower	T-5-1	Packed tower Remove 95% of toluene, xylene 6′ diameter 25′ of packing	—	ERS (Environmental Restoration Systems) (800) 944-5515
Backwash Pump (Future)	P-4-3	—	—	—
Backwash Tank (Future)	T-4-1	—	—	—
Calibration Column	T-10-2	Furnish with P-10-2	—	—
Caustic Pump	P-10-2	Chemical metering/diaphragm 1 gph capacity	120 V 190 W	Pulsatron Remedial Systems, Inc.

TABLE A-1
Equipment List—Onalaska

Title	Equipment Number	Description	Electrical	Manufacturer, Model, Phone
		With calibration column		
Caustic Storage Tank	T-10-1	Horizontal/steel 750 gallon capacity Insulated Approximately 5′ diameter Blanket tank heater	2 heaters 110 V 500 W each	Highland Tank and Mfg. Co.
Clarifier	T-3-1	Solids contact clarifier 50′ diameter/0.5 gpm/ft^2 rise rate 30 min retention in reactor zone	1 hp	Eimco (801) 526-2000
Clear Well	T-4-4	Vertical FRP tank 6′ diameter/8′ tall tank	—	Air Plastics, Inc.
Clear Well Pump	P-4-5	Centrifugal Q = 800 gpm, H = 50′	15 hp	Griswold Model 811 Remedial Systems, Inc.
Coarse Bubble Diffuser	M-2-3	Air diffusers for bottom of aeration tank	—	Sanitaire Industrial Piping Co. (906) 228-8890
Filter (Future)	T-4-1	Continuously backwashing 200 ft^2 of filter bed Sand media	—	Dynasand/DSF-200 Stratasand/SSF-200
Filter Compressor (Future)	M-4-2	Piston compressor 40 scfm at 60 psig	(10 hp)	Ingersoll-Rand
Filter Press	M-6-3	Plate and frame filter press 40 ft^3 volume	—	Eimco Schriver/1200 FB (801) 526-2000
Mixer Drive	M-3-2	Furnished with T-3-1	5 hp	Burhans-Sharpe Co. (206) 932-1030
Plant Drain Sump	T-7-1	6′ dia. × 7′ FRP 1,000 gallons Furnished with P-7-2-1 and P-7-2-2	—	—
Plant Drain Sump Pump	P-7-2-2	Vertical Sump 800 gpm/35′ head	10 hp	Carver Pump Remedial Systems, Inc.
Plant Drain Sump Pump	P-7-2-1	Vertical Sump 100 gpm/30′ head	2 hp	Carver Pump Remedial Systems, Inc.
Polymer Pump	P-9-1	Chemical metering 1–2 gpd	120 V	Pulsatron Remedial Systems, Inc.
Potable Water Supply Tank	T-12-1-1	42″ diameter 450 gallons	—	Wessels Industrial Piping Co.
Pre-Filter	T-8-2	99.99% of 0.01 microns Coalescing filter	120 V 5 A	Ingersoll-Rand/IR20C

TABLE A-1
Equipment List—Onalaska

Title	Equipment Number	Description	Electrical	Manufacturer, Model, Phone
		Automatic drain valve		
Precoat Mixer	M-6-5	Furnished with M-6-3	¼ hp	—
Precoat Tank	T-6-5	600 gallons, FRP Furnished with M-6-3	—	Air Plastics, Inc.
Recirculation Pump	P-6-6	450 gpm 30 psi Furnished with M-6-3	10 hp	Worthington D-1012 Mountainside, NJ (Worthington-Dresser)
Safety Shower Supply Tank	T-12-1-2	42″ diameter 450 gallons	—	Wessels/Industrial Piping Co. (906) 228-8890
Calibration Column	T-10-2	Furnish with P-10-2	—	—
Service Water Pressure Tank	T-11-2	Vertical 80-gallon expansion tank	—	Wessels/Industrial Piping Co. (906) 228-8890
Service Water Pump	P-11-1	Centrifugal Q = 75 gpm, H = 125′	5 hp	Goulds Model 3196/ Remedial Systems, Inc.
Sludge Feed Pump	P-6-2	Air Diaphragm 0 to 50 gpm Furnished with M-6-3	—	Warren-Pupp/Sandpiper (419) 524-8388
Sludge Tank	T-6-1	Vertical FRP tank 10′ diameter/18′ tall	—	Air Plastics, Inc. (513) 398-8081
Sludge Transfer Pump	P-3-4	Air Diaphragm Q = 2—10 gpm, H = 20′	—	Lutz Remedial Systems, Inc.
Stripper Tower Fan	M-5-3	Vanaxial 5,000 scfm @ 3″ H2O pressure RPM 500	3 hp	New York Blower (215) 372-1104
Well Pump	P-1-1-1 & P-1-1-5	Submersible 200 gpm/78′ head Built-in check valve	2 @ 5 hp each	Grundfos
Well Pump	P-1-1-2 & P-1-1-4	Submersible 150 gpm/65′ head Built-in check valve	2 @ 5 hp each	Grundfos
Well Pump	P-1-1-3	Submersible 100 gpm/60′ head Built-in check valve	2 hp	Grundfos
Acid Feed Pump	P-14-1			Pulsatron Remedial Systems, Inc. (508) 543-1512



RECORD DRAWINGS

Revisions Drawn by P.A. LLANAS Date 10-24-94

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DR OXLEY/OHLSSON					
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APVD S.M.KEITH	NO.	DATE	REVISION	BY	APVD

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GROUNDWATER REMEDIAL ACTION

ONALASKA MUNICIPAL LANDFILL SITE
ONALASKA TOWNSHIP, WISCONSIN

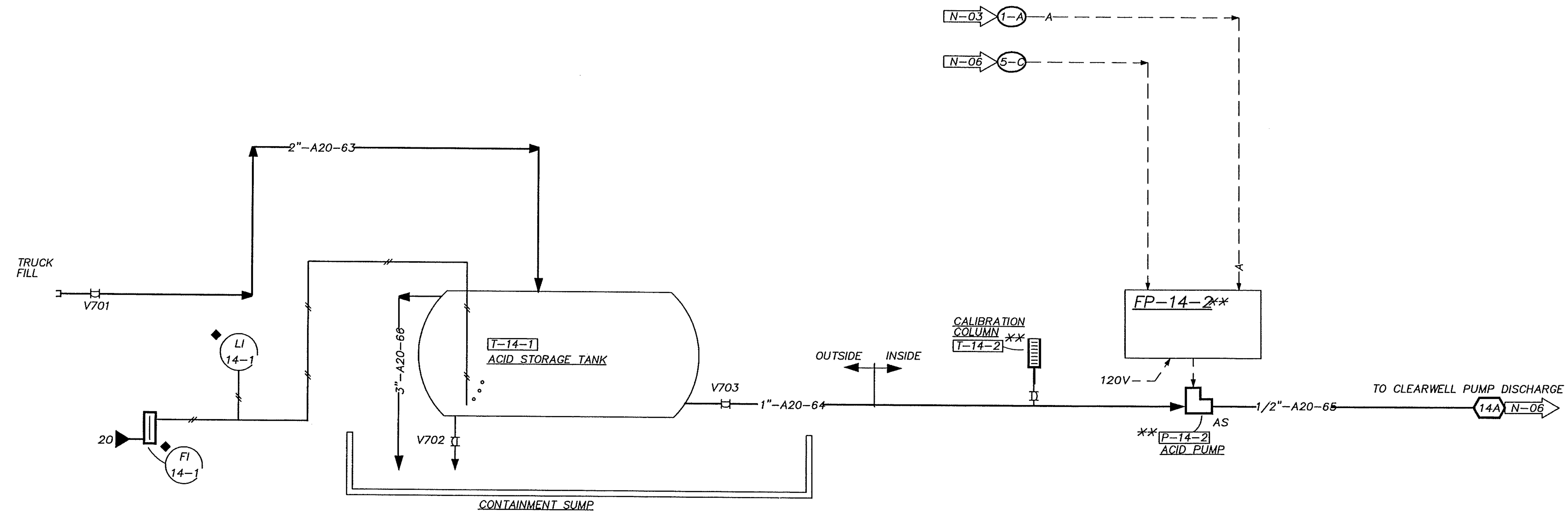
PROCESS & INSTRUMENTATION DIAGRAM
PLANT SUMP/COMPRESSED AIR SYSTEM

SHEET 54

DWG NO. 01-N-08

DATE 8-8-02

PROJ NO. GL065602.FD



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DR PID-11 B.OHLSSON					
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APVD S.M.KEITH		1-93	NEW SHEET	BO	SMK
	NO.	DATE	REVISION	BY	APVD

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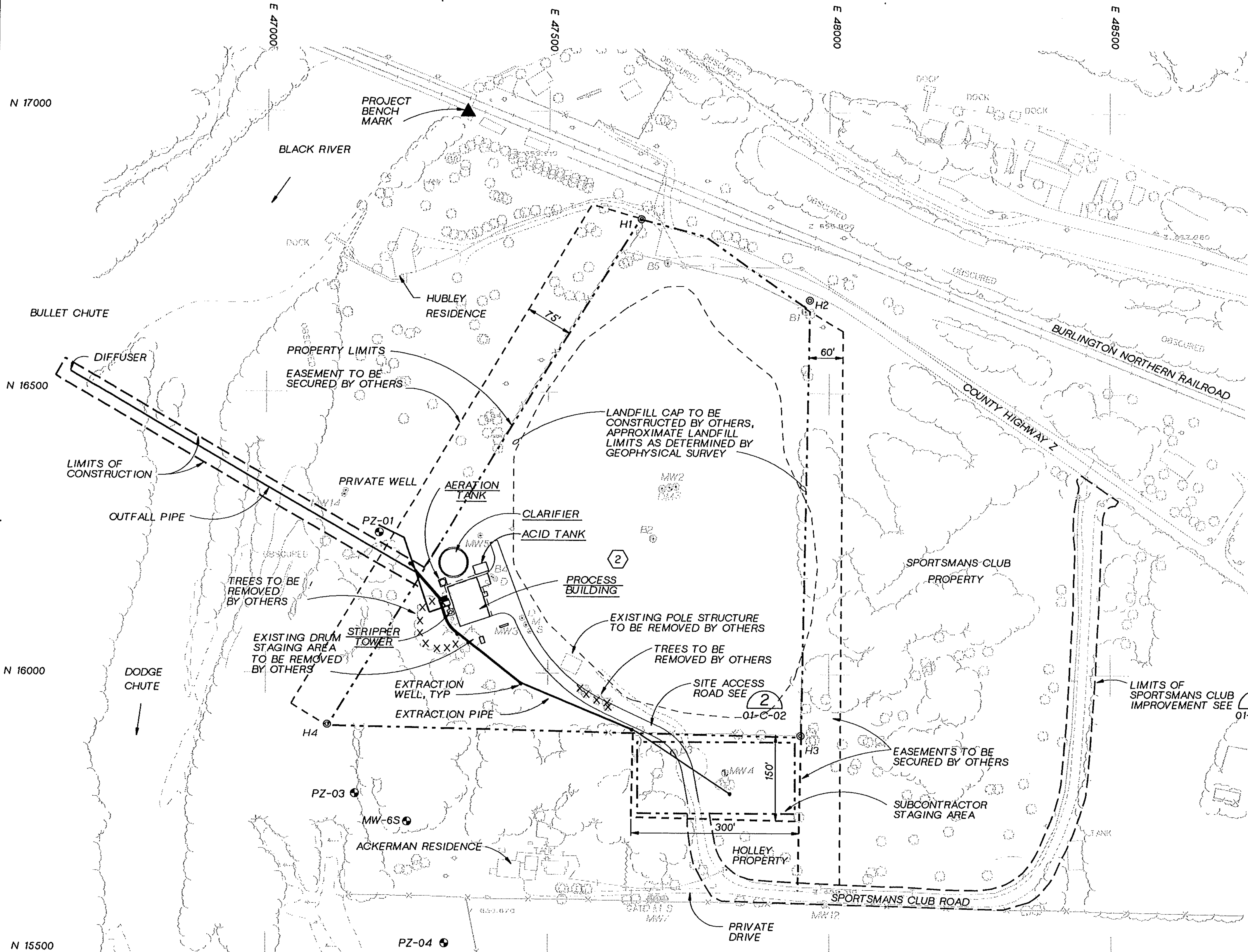
GROUNDWATER REMEDIAL ACTION
ONALASKA MUNICIPAL LANDFILL SITE
ONALASKA TOWNSHIP, WISCONSIN

PROCESS & INSTRUMENTATION DIAGRAM
ACID SYSTEMM

SHEET 57
DWG NO. 01-N-11
DATE 8-8-02
PROJ NO. GL065602.FD



VERTICAL CONTROL

PROJECT BENCHMARK:

CHISELED "X" IN THE SOUTHEAST WINGWALL ON THE RAILROAD TRESTLE, ELEVATION = 657.09

VERTICAL DATUM BASIS IS USGS 1929. ELEVATION ESTABLISHED BY OTHERS FROM THE FOLLOWING LA CROSSE COUNTY BENCHMARKS:

1. PK NAIL IN FRONT OF MARY JANE FRITZ COTTAGE W8602 LYTLE ROAD, ELEVATION 660.02.
2. CHISELED SQUARE IN SE CORNER OF CURBING AROUND ONALASKA TOWNSHIP HONOR ROLL MEMORIAL AT INTERSECTION OF COUNTY ROAD ZN AND COUNTY ROAD OT, ELEVATION 653.03.

HORIZONTAL CONTROL

POINT	NORTHING	EASTING	DESCRIPTION
H1	16809.40	47660.98	1" IRON PIPE
H2	16665.53	47965.52	1" IRON PIPE
H3	15887.77	47950.28	1" IRON PIPE
H4	15906.08	47109.21	1" IRON PIPE

HORIZONTAL DATUM BASIS IS ASSUMED PROJECT COORDINATE GRID SYSTEM. TRANSFORMATION TO WISCONSIN STATE PLANE 2 ZONE COORDINATES CAN BE ACCOMPLISHED BY ADDING 700,000 TO THE NORTHING AND 1,600,000 TO THE EASTING.

NOTES:

1. CONSTRUCTION LIMITS COINCIDE WITH PROPERTY LINE AND/OR EASEMENTS UNLESS OTHERWISE NOTED.
2. SUBCONTRACTOR SHALL SHARE THE SITE, INCLUDING THE STAGING AREA WITH OTHER SUBCONTRACTORS. SCHEDULING OF WORK IS CRITICAL. SEE SPECIFICATIONS.
3. BASE MAPPING BY MARTINEZ CORPORATION. SITE WAS FLOWN ON 11-11-88. ORIGINAL MAPPING WAS PREPARED AT A SCALE OF 1"=100'.
4. (2) PZ-01, PZ-03, PZ-04, AND MW-6S ARE ALL TO BE INSTALLED UNDER THIS CONTRACT. SEE DETAILS, DWG 01-C-09.
5. (2) FOR ACID TANK DETAILS SEE DRAWING 01-S-07 AND 1 / 01-M-03.

N

0 100 200 300
SCALE 1"=100'

RECORD DRAWINGS

Revisions Drawn By D.J.SCHAUER Date 10-19-94

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CH2M HILL

DSGN MW PADDOCK		10-94	RECORD DRAWING		DJS	SMK
DR PT KUTZ PA LLANAS	(2)	1-93	ACID TANK ADDITION AND REVISED NOTE.		TP	SMK
CHK MS SCHMIEGE	NO.	DATE	REVISION		BY	APVD
APVD S KEITH						

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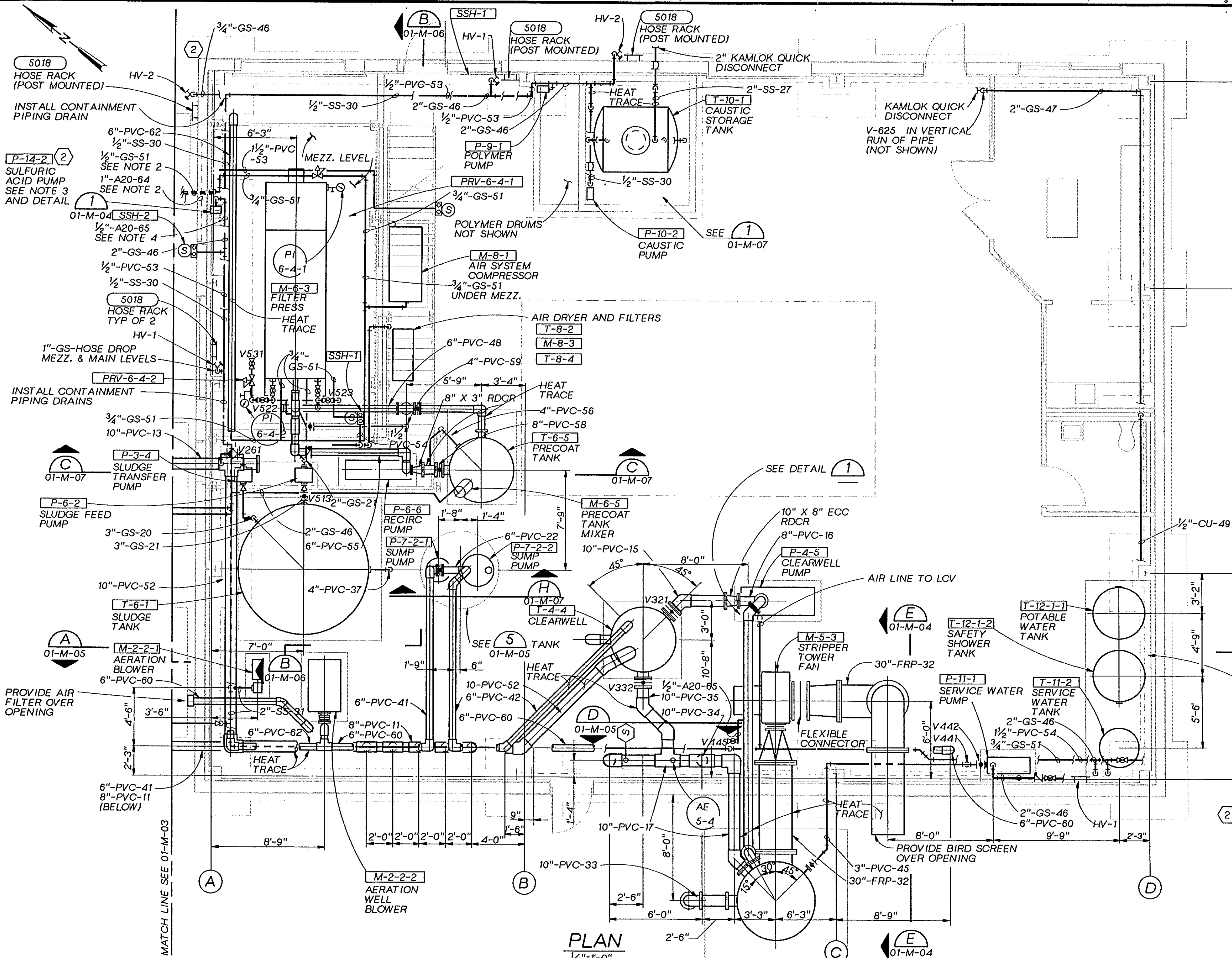
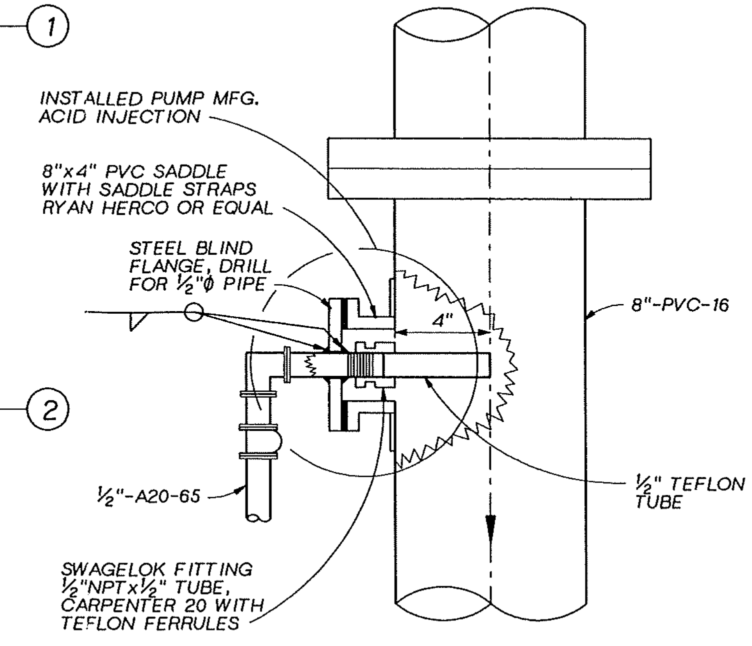
GROUNDWATER REMEDIAL ACTION
ONALASKA MUNICIPAL LANDFILL SITE
ONALASKA TOWNSHIP, WISCONSIN

GENERAL SITE PLAN

SHEET	8
DWG NO.	01-C-01
DATE	OCT 1992
PROJ NO.	GLO65602.FD





ACID INJECTION DETAIL 1

NTS

NOTES:

1. SEE SPECIFICATIONS (DATA SHEETS) FOR EQUIPMENT SIZE AND LOCATIONS OF CONNECTIONS AND ACCESSORIES.
2. FIELD ROUTE TO SULFURIC ACID TANK.
3. CALIBRATION COLUMN NOT SHOWN.
4. FIELD ROUTE SULFURIC ACID PIPING ALONG BUILDING PERIMETER. ROUTE PIPING AT AN ELEVATION LESS THAN 4'-0" ABOVE FLOOR WHEREVER FEASIBLE. WHERE NOT FEASIBLE, PIPING MUST BE ROUTED IN CONTAINMENT PIPING. SIMILAR TO DETAIL 4 01-M-07

RECORD DRAWINGS

Revisions Drawn By D.J.SCHAUER Date 10-20-94

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DSGN P. BOERSMA					
DR D. OXLEY		10-94	RECORD DRAWING	DJS	SMK
CHK R. YOLO	2	1-93	ADDED ACID FEED SYSTEM AND DETAIL.	LAA	SMK
APVD S. KEITH	NO.	DATE	REVISION	BY	APVD

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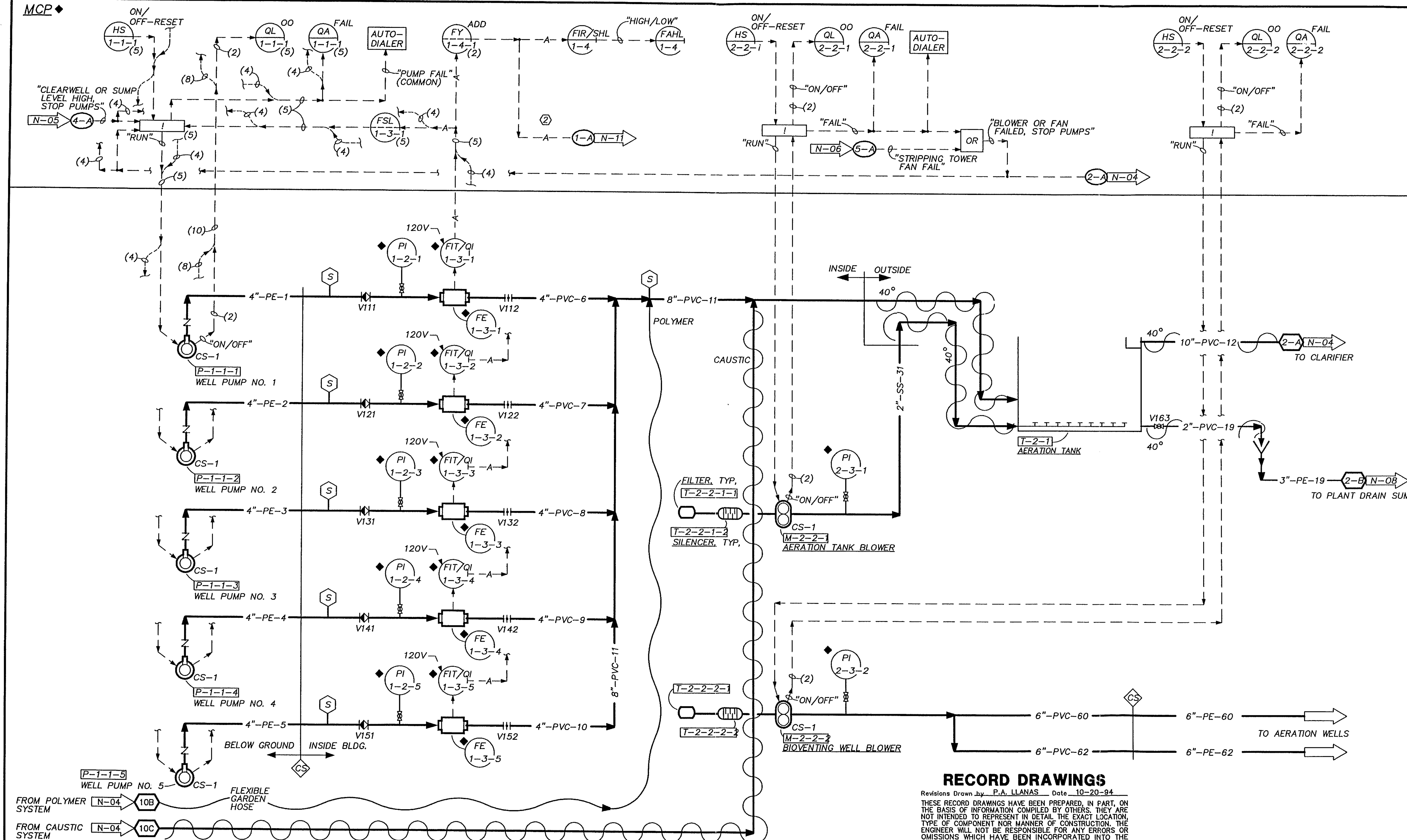
GROUNDWATER REMEDIAL ACTION
ONALASKA MUNICIPAL LANDFILL SITE
ONALASKA TOWNSHIP, WISCONSIN

PROCESS BUILDING MECHANICAL EQUIPMENT AND PIPING PLAN & DETAIL

SHEET 32
DWG NO. 01-M-02
DATE OCT 1992
PROJ NO. GLO65602.FD

8-8-02 O&M MANUAL/PID-1.DWG



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DR OXLEY/OHLSSON	2	1/93	ADDED PACING SIGNAL TO ACID FEED SYSTEM	BO	SMK
CHK R.NAGEL	NO.	DATE	REVISION	BY	APVD
APVD S.M.KEITH					

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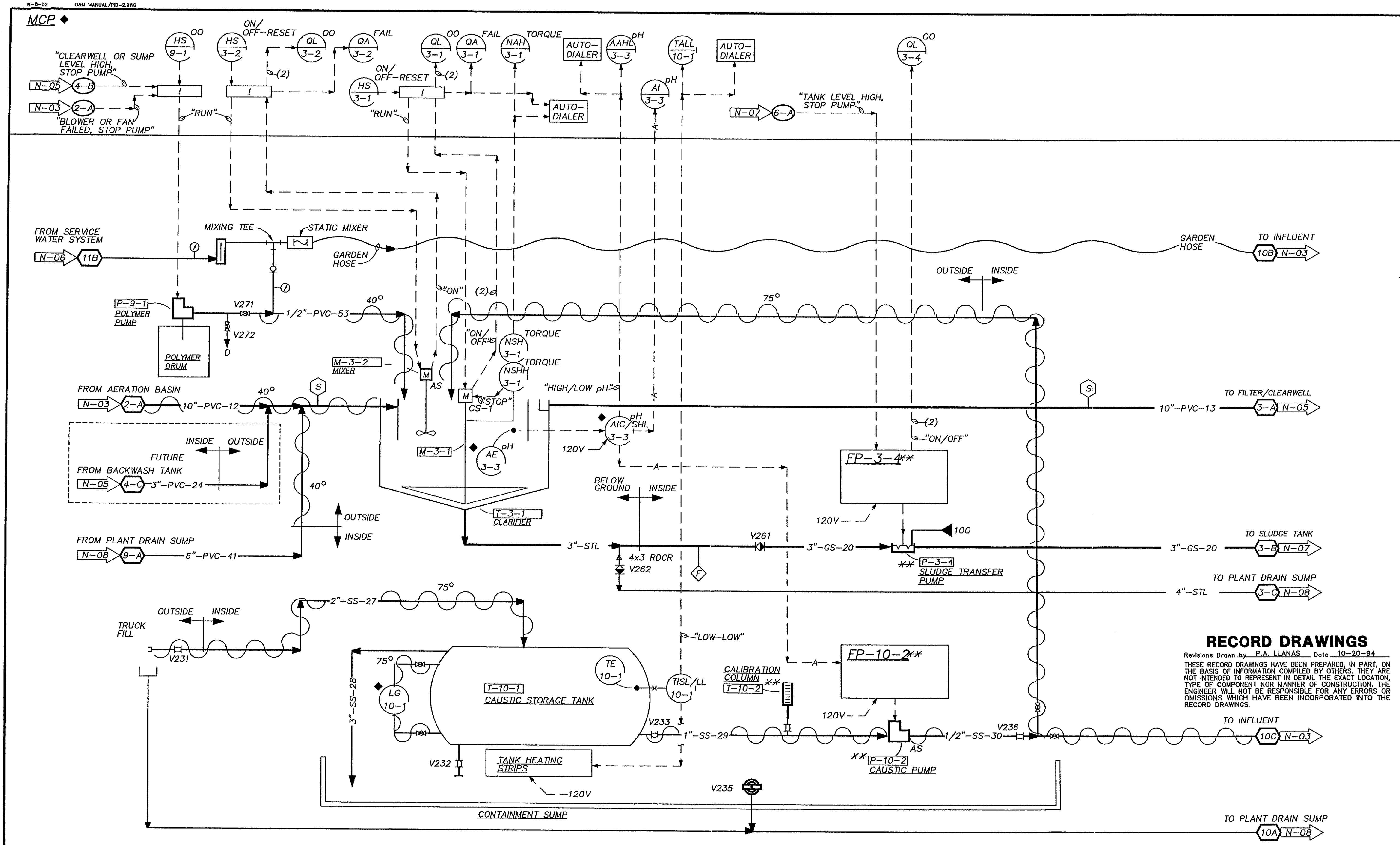
GROUNDWATER REMEDIAL ACTION
ONALASKA MUNICIPAL LANDFILL SITE
ONALASKA TOWNSHIP, WISCONSIN

PROCESS & INSTRUMENTATION DIAGRAM
WELL FIELD PUMPS & AERATION

SHEET 49
DWG NO. 01-N-03
DATE OCT 1992
PROJ NO. GLO65602.FD



CH2M HILL

DSGN KEITH/OHLSSON				
DR OXLEY/OHLSSON				
CHK R.NAGEL		10/94 RECORD DRAWING	PAL	SMK
APVD S.M.KEITH	NO.	DATE / REVISION	BY	APVD

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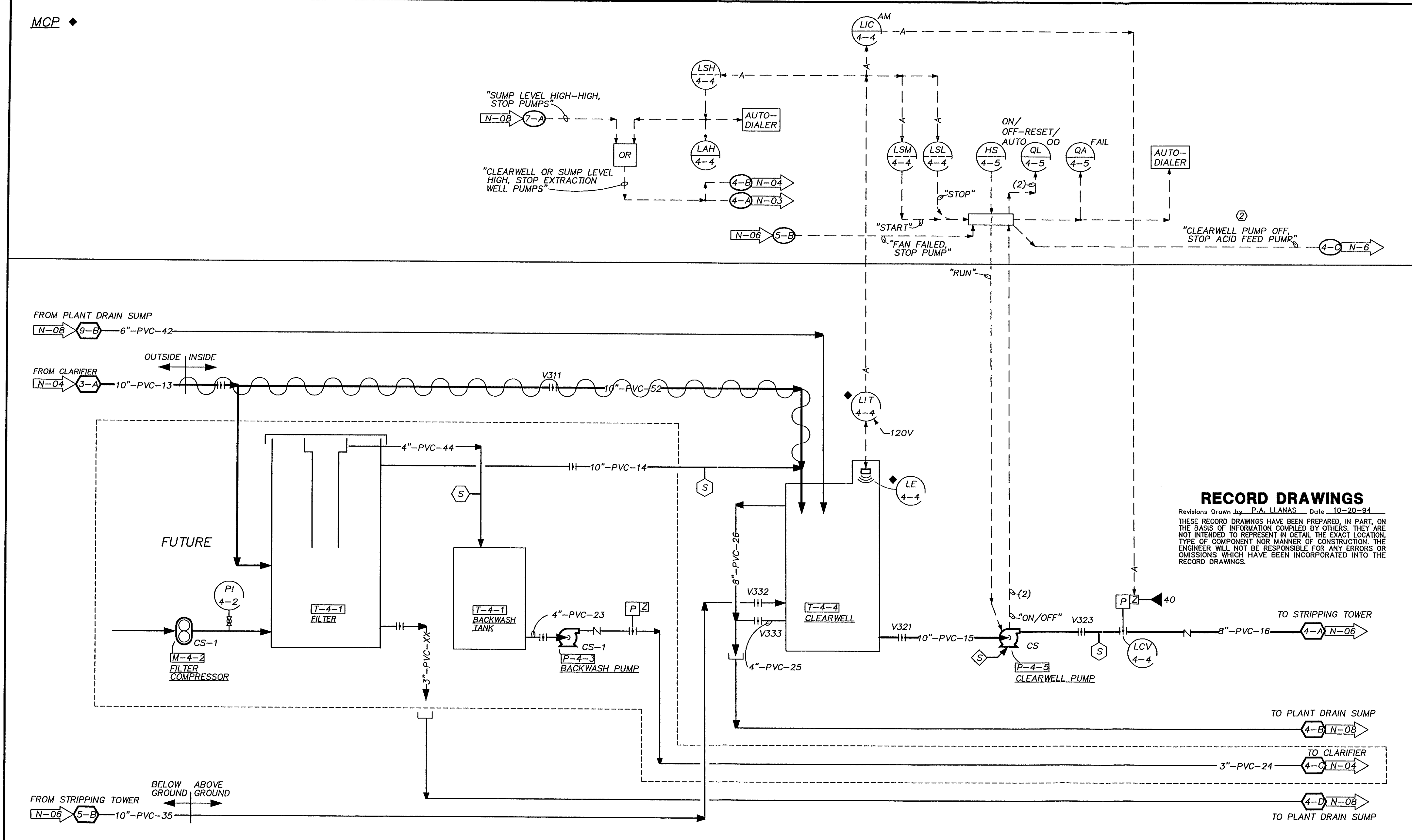
GROUNDWATER REMEDIAL ACTION
ONALASKA MUNICIPAL LANDFILL SITE
ONALASKA TOWNSHIP, WISCONSIN

PROCESS & INSTRUMENTATION DIAGRAM
CLARIFICATION & CAUSTIC SYSTEM

SHEET 50
DWG NO. 01–N–04
DATE 8–8–02
PROJ NO. GLO65602.FD



CH2M HILL

DSGN KEITH/OHLSSON		10/94	RECORD DRAWING	PAL	SMK
DR OXLEY/OHLSSON	2	1/93	ADDED CONTROL INTERLOCK TO ACID FEED PUMP FROM CLEARWELL PUMP.	BO	SMK
CHK R.NAGEL					
APVD S.M.KEITH	NO.	DATE	REVISION	BY	APVD

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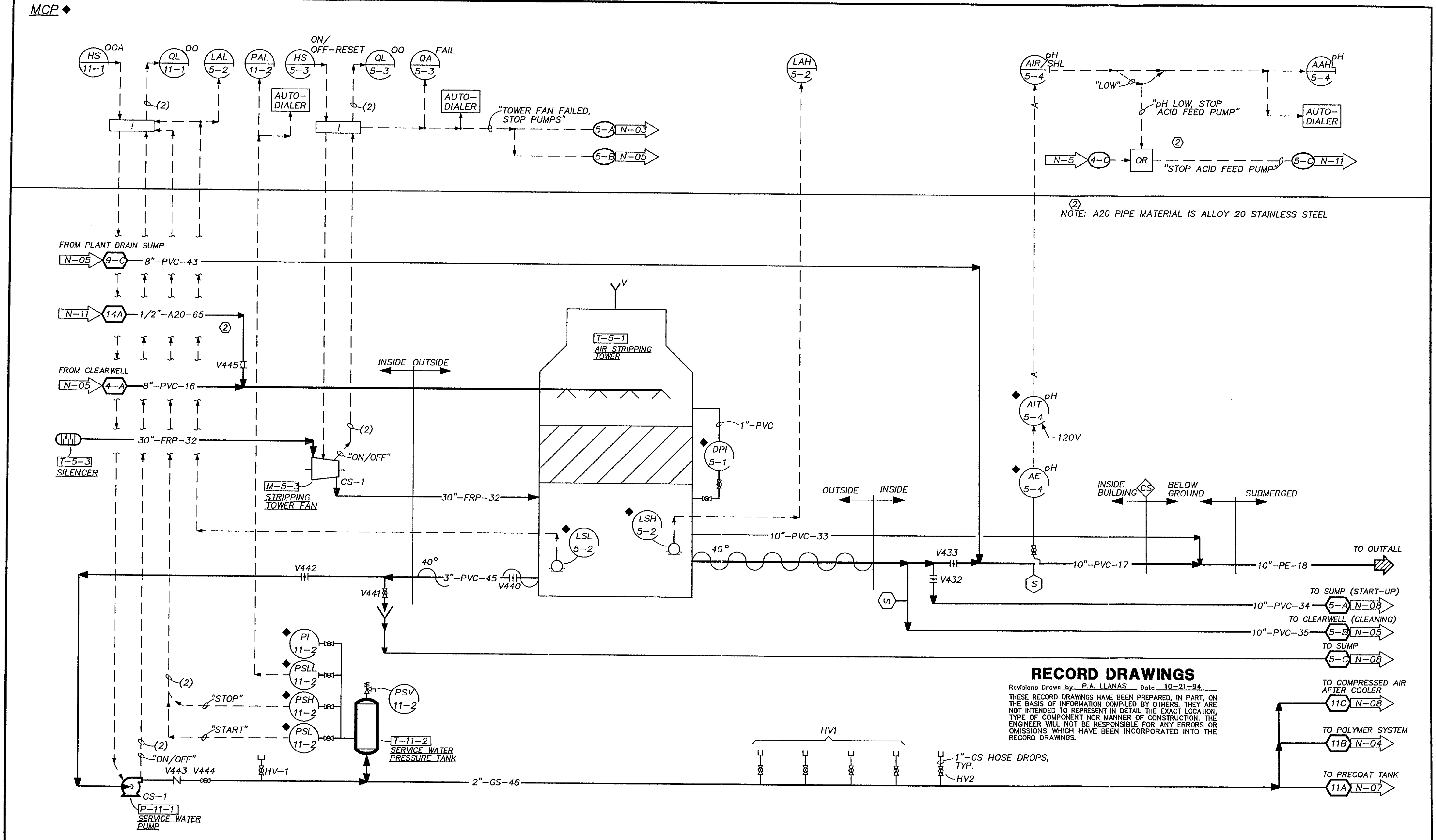
GROUNDWATER REMEDIAL ACTION
ONALASKA MUNICIPAL LANDFILL SITE
ONALASKA TOWNSHIP, WISCONSIN

PROCESS & INSTRUMENTATION DIAGRAM
FILTRATION AND CLEARWELL

SHEET 51
DWG NO. 01-N-05
DATE OCT 1992
PROJ NO. GL065602.FD

6-8-02 O&M MANUAL/PID-4.DWG



CH2M HILL

DSGN KEITH/OHLSSON					
DR OXLEY/OHLSSON		10/94	RECORD DRAWING	PAL	SMK
CHK R.NAGEL	②	1/93	ADDED ACID FEED PIPING AND CONTROL INTERLOCK FROM LOW pH ALARM.	BO	SMK
APVD S.M.KEITH	NO.	DATE	REVISION	BY	APVD

REUSE OF DOCUMENTS

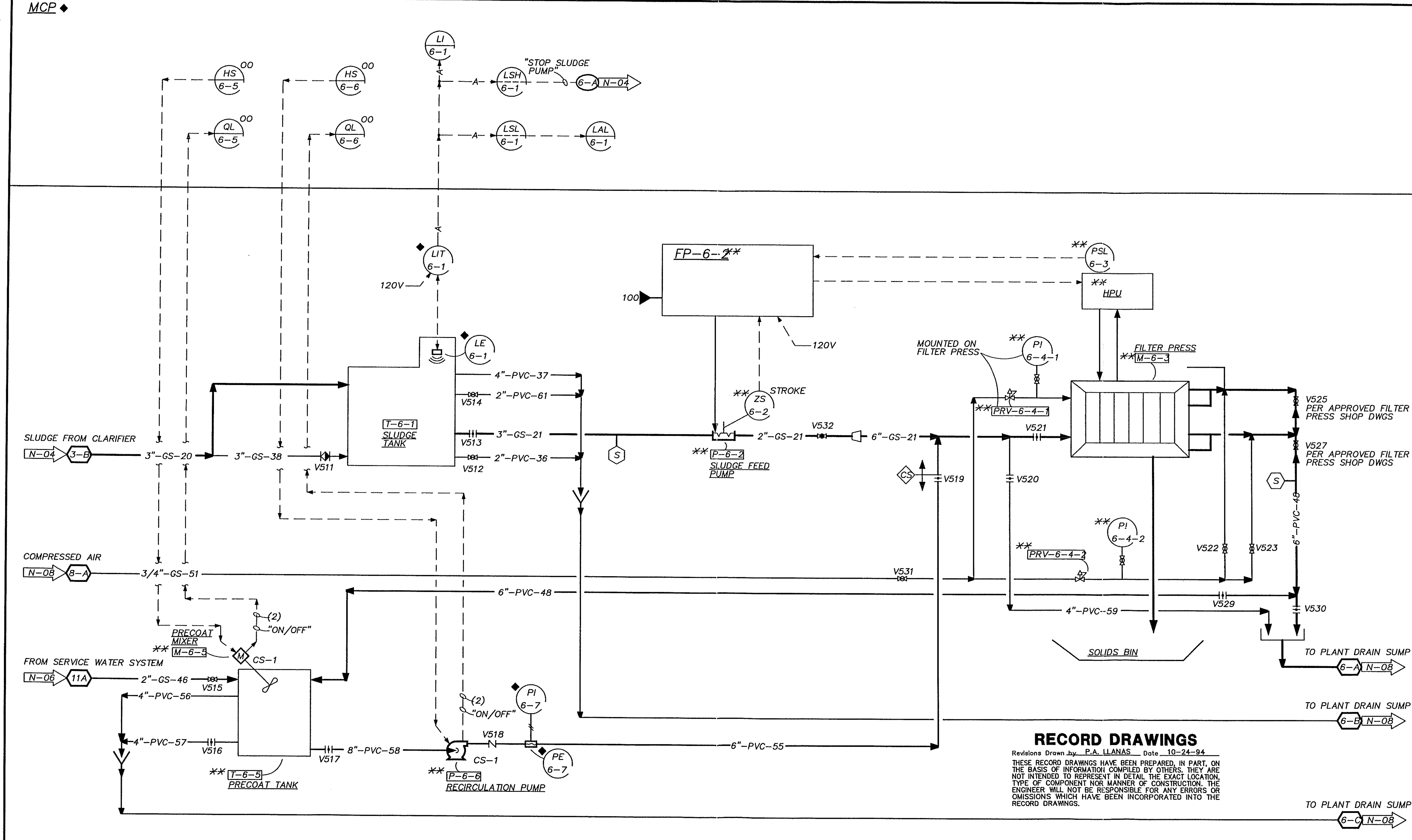
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 — 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

GROUNDWATER REMEDIAL ACTION
ONALASKA MUNICIPAL LANDFILL SITE
ONALASKA TOWNSHIP, WISCONSIN

PROCESS & INSTRUMENTATION DIAGRAM
AIR STRIPPING/SERVICE WATER SYSTEM

SHEET 52
DWG NO. 01-N-06
DATE OCT 1992
PROJ NO. GL065602.FD

8-8-02 O&M MANUAL/PIO-5.DWG



RECORD DRAWINGS

Revisions Drawn by P.A. LLANAS Date 10-24-94

THESE RECORD DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED BY OTHERS. THEY ARE NOT INTENDED TO REPRESENT IN DETAIL THE EXACT LOCATION, TYPE OF COMPONENT NOR MANNER OF CONSTRUCTION. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THE RECORD DRAWINGS.

CH2M HILL	DSGN KEITH/OHLSSON					
	DR OXLEY/OHLSSON					
	CHK R.NAGEL		10/94	RECORD DRAWING	PAL	SMK
	APVD S.M.KEITH	NO.	DATE	REVISION	BY	APVD

REUSE OF DOCUMENTS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

GROUNDWATER REMEDIAL ACTION
ONALASKA MUNICIPAL LANDFILL SITE
ONALASKA TOWNSHIP, WISCONSIN

PROCESS & INSTRUMENTATION DIAGRAM
SLUDGE DEWATERING

SHEET 53
DWG NO. 01-N-07
DATE OCT 1992
PROJ NO. GL065602.FD

Operator: ____________________

Month, Year: ____________________

EXTRACTION WELL FLOW

DATE / TIME	Run Time	WELL #1		WELL #2		WELL #3		WELL #4		WELL #5		Totals			
	(minutes)	Reading[1]	gpm[2]	Reading[1]	gpm[2]	Reading[1]	gpm[2]	Reading[1]	gpm[2]	Reading[1]	gpm[2]	Reading[1]	gpm[2]	gpm[3]	MGD[3]

Notes:

1 Flow Meter Totalized Reading x 10 = Gallons

2 Instantaneous reading (gpm)

3 Calculated value Using Totalized Reading Divided By Elapsed Time

Operator: ____________
Date Ending: ____________

PROCESS MONITORING

DAY: **DATE:** TIME:	WEDNESDAY	THURSDAY	FRIDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	MONDAY
CHECK ALARM PANEL[1]									
AERATION BLOWER PRESSURE (psi)									
CLARIFIER MIXER / RAKE (on and ok)									
SLUDGE DEPTH (feet)									
AIR STRIPPER INTAKE (visual)									
STRIPPER FAN PRESSURE (in. w.c.)									
CLAIRIFIER pH (panel reading)									
CLARIFIER pH (portable wkly check)									
OUTFALL pH (panel reading)									
OUTFALL pH (portable wkly check)									
EXTRACTION WELL pH									
HACH TEST IRON INFLUENT (mg/l)									
HACH TEST IRON EFFLUENT (mg/l)									
EFFLUENT TEMPERATURE (°C)									
CAUSTIC VOLUME (gal)									
CAUSTIC USAGE (gph)									
POLYMER USEAGE (gpd)									

[1]Note any alarms or other operational information here:

OK = Item has been checked and found to comply with all operational specifications
NA = Not applicable as item is either monitored weekly or was not operational during the identified period.

ONALASKA MUNICIPAL LANDFILL SUPERFUND SITE MAINTENANCE PLAN							
Description	**Jan**	**1**	**2**	**3**	**4**	**5**	**Comments**
Daily Activities							
Check Alarm Panel and Investiagte Alarms.							
Verify That Each System Component Is Operating Properly.							
Aeration Tank Blower Pressure. If pressure is not 7 to 8.5 psi, clean blower							
Check Caustic and Polymer Pump for leaks, noise & temperature. Record volume pumped and discharge pressure reading.							
Inspect Clarifier. Check page 34 and 77 of the O&M Manual for troubleshooting							
Check Stripper Tower Fan and record discharge pressure reading. Notify CH2M Hill when monthly pressure average exceeds 7.75" or when any individual reading exceeds 8.3" of water column.							
Inspect Clarifier Effluent: Clean as directed by CH2M Hill.							
Weekly Activities							
Inspect Polymer System Makeup Water and Clean Filter. Inspect paper filter and replace if plugged.							
Clear Well Pump: Keep oil glass half full, tighten or loosen packing until a slight stream of water seals and lubricates the packing. See pages 4, 5, 77-84 of the O&M Manual for troubleshooting.							
Check Air Stripper Tower air intake for fouling. See page 12 of O&M Manual for troubleshooting.							
Check Air Compressor coolant level and condensate trap.							
Verify that sufficient water is flowing through the After Cooler between the Service Air Compressor and the Air Dryer. Look for water flow to the drain and feel water to ensure that it is cold.							
Check Green Dry Air indicator on Air Dryers. See pages 16 & 52-55 in O&M Manual for troubleshooting.							

ONALASKA MUNICIPAL LANDFILL SUPERFUND SITE
MAINTENANCE PLAN

Description	Year 2001	J	F	M	A	M	J	J	A	S	O	N	D	Comments
Monthly														
Check Well Pumps. Chlorinate or Acid Wash to Clean Biofouling. See pages 7-8 of O&M Manual for troubleshooting.														
Aeration Tank Blower: Check oil level.														
Inspect Stripper Tower Fan and Replace Belts. Check V-Belt alignment. Clean Impellers. Lube Bearings with #2 Grease. See pages 7, 9 & 12 of O&M Manual for Troublreshooting.														
Polymer System: Inspect rotometer, static mixers, tubing and discharge check valve. Clean and replace tubing, if necessary.														
Clarifier Drive Mechanism: Check drive chain tension and lube.														
Air Dryers: Check timing of recharge cycle and filters. Exercise petcocks and check for desiccant dusting. See page 9 and the last 4 pages of the O&M Manual for troubleshooting.														
Pump out Acid Containment Sump whenever it is full.														
Sludge Pump to Press: Oil air inlet with SAE 10 wt. Maximum.														
6 Weeks														
Aeration Tank Blower: Change Oil using Mobile DTE.BB or Amoco 220.														
Air Well Blower: Change Oil using Mobile DTE.BB or Amoco 220														
Service Air Compressor: Inspect coolant filter, coolant level and air filter. Replace filters if necessary.														
Inspect Stripper Duct and Tower for leaks.														

ONALASKA MUNICIPAL LANDFILL SUPERFUND SITE MAINTENANCE PLAN													
Description	**Year**	**2**	**0**	**0**	**1**	**2**	**0**	**0**	**2**	**2**	**0**	**0**	**3**	**Comments**
Quarterly	**Quarter**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	
Aeration Tank Blower: Grease Bearings using Darina #2 or Mobilith SHC 220. Replace oil filter. See pages 7 & 9 in the O&M Manual for troubleshooting.														
Air Well Blower: Grease Bearings using Darina #2 or Mobilith SHC 220. Replace oil filter.														
Service Water and Clearwell Pumps: Check oil level and inspect packing and seals for leaks.														
Filter Press: Lube sidebars, rollers, etc. Inspect filter and oil for debris and change if necessary.														
Plant Drain Sumps: Lubricate with #2 grease every 1000 hours. See pages 3 & 4 of the O&M Manual for troubleshooting.														
1/2 Year														
Service Air Compressor: Lube bearings and change filters, inspect seals for leaks.														
Plant Drain Sumps: Inspect. Grease and lube bearings and fittings, if necessary.														

ONALASKA MUNICIPAL LANDFILL SUPERFUND SITE
MAINTENANCE PLAN

Description	Year	2001	2002	2003	Comments
Annual					
Clarifier Rake Mechanism: Drain and replace main oil bath with Mobilegear 632.					
Clarifier Mixer: Drain and replace oil.					
Gear Reducer: Drain and replace oil. See page 5 of the O&M Manual.					
Service Air Compressor: Change Coolant and coolant filter. Inspect V-Belt and change, if necessary.					
Air Stripper Tower Fan: Check current draw. See page 10 of the O&M Manual for troubleshooting.					
Stripper Tower: Remove lower manholes and inspect for fouling. Remove iron sludge and broken packing.					
Aeration Tank Cleanout: Turn off wells, drain aeration tank to sump and route to clarifier. Clean diffuser and air piping and fully open all orifices.					
Clarifier Cleanout: Remove sludge to storage tank or filter press. Drain clarifier to clearwell and stripper and discharge. Close sump valve and inspect Clarifier. Clean and pump washwater to sludge storage tank.					
Service Water Pump: Drain and replace oil. Inspect packing and replace as necessary. See pages 5, 17, 22, 33 and 69 of O&M Manual for troubleshooting.					
Clearwell Pump: Drain and replace oil. Inspect packing and replace as necessary.					
Filter Press: Change oil and replace filter. Use Mobile DTE 25 hydraulic oil. Grease railings as needed. See pages 60, 61 and 77-84 of O&M Manual for troubleshooting.					
Recirculation Pump: Lubricate mototr with #2 grease. See pages 15, 28 and 29 of the O&M Manual for troubleshooting.					
Electric Motors: Grease according to applicable O&M Manual(s).					
Verimot/Euro Drive Gear Units: Service after 2 years or 10,000 hours. See pages 9, 23, 28 and 34 of O&M Manual for instructions.					

ONALASKA MUNICIPAL LANDFILL SUPERFUND SITE MAINTENANCE PLAN														
Description	**Year**	2	0	0	1	2	0	0	2	2	0	0	3	**Comments**
As Needed	**Quarter**	1	2	3	4	1	2	3	4	1	2	3	4	
Sludge Transfer Pump: Tear down to unplug or to investigate unusual sounds. See pages 2, 3, 4 & 6 of O&M Manual for troubleshooting.														
Sludge Feed Pump: See Sludge Transfer Pump information.														
Water Tank: Chlorinate and drain if needed to prevent bacterial growth. Thoroughly rinse out (do not use plant service water) and replace with potable water since tanks supply eye wash.														
Acid Feed Pump: Check for leaks, noise, vibration, temperature and cleanliness. See pages 7, 8, 12 & 15 of O&M Manual for troubleshooting.														
3 Year														
Air Dryer: Replace desiccant and desiccant filters.														

Appendix C
WDNR Influent and Effluent Monitoring Requirements

A. EFFLUENT LIMITS AND MONITORING REQUIREMENTS

(Testing Frequencies and Total BTEX Limit modified 4/30/97)
(Testing Frequencies modified 7/24/00)

The discharge of treated groundwater to Bullet Chute of the Black River through outfall 001 is subject to the limits and monitoring requirements below and in conditions B, C and D.

Sampling Point: After the groundwater treatment system prior to discharge.

EFFLUENT CHARACTERISTIC	TABLE 1 - EFFLUENT LIMITATIONS: Daily Maximum (mg\L)	Weekly Average (lb\d)	Monthly Average (lb\d)	MONITORING REQUIREMENTS: Sample Frequency	Sample Type
Flow (MGD)				Contin.	Contin.
pH	(6 s.u. minimum and 9 s.u. maximum)			Contin.	Contin.
Tss	40			Monthly	24hr comp
BOD_5				Annual	24hr comp
Temperature (°F)				Weekly	Grab
Hardness, total				Annual	24hr comp
Influent Monitoring					
Iron				Monthly	Grab
BTEX				Monthly	Grab
WATER QUALITY LIMITS					
Ammonia	Table 2			Monthly	24hr comp
Iron, total		59.5		Monthly	24hr comp
Chloride	1700			Annual	24hr comp
Arsenic, total	0.73			Annual	24hr comp
Cadmium, total recoverable	0.17	0.0168		Annual	24hr comp
Chromium(+3 or tot)	8.1	2.8		Annual	24hr comp
Copper, total recoverable	0.06	0.173		Monthly	24hr comp
Lead, total recoverable	1.1	0.186		Annual	24hr comp
Nickel, total recoverable	4.8	3.39		Annual	24hr comp
Zinc, total recoverable	0.46	1.35		Monthly	24hr comp
*Benzene	22			Annual	Grab
Chloroform	29			Annual	Grab
1,1-Dichloroethylene			144.6	Annual	Grab
1,2-Dichloroethylene	30			Annual	Grab
*Ethylbenzene	45			Annual	Grab
*Toluene	17			Annual	Grab
1,1,1-Trichloroethane	63			Annual	Grab
Trichloroethylene	41			Annual	Grab
Tetrachloroethylene	13			Annual	Grab
Vinyl Chloride			30.1	Annual	Grab
Pentachlorophenol	0.034			Annual	24hr comp
Phenol	7.0			Annual	24hr comp
Di-n-butyl Pthalate	0.94			Annual	24hr comp
1,4-Dichlorobenzene	1.4			Annual	24hr comp
2,4-Dinitrotoluene			783.2	Annual	24hr comp
Napthalene	6.6			Annual	24hr comp
Pyrene			0.3	Annual	24hr comp
Aldrin	0.0043		0.0017	Annual	24hr comp
Gamma-BHC	0.0076			Annual	24hr comp
4,4'-DDD			0.000065	Annual	24hr comp
TECHNOLOGY BASED LIMITS(* More Restrictive Than Water Quality Limits For BTEX Above - Cond. A(1))					
BTEX, total	0.05			Monthly	Grab
% Removal BTEX				Monthly	
VOCs				Annual	Grab
Base/Neutrals				Annual	24hr comp
Acid Extractables				Annual	24hr comp
Pesticides(except PCBs)				Annual	24hr comp
Priority Pollutants	Table A, Additional Procedures A Part III			Annual	Cond. A(6)
Whole Effluent Toxicity	Acute & Chronic, Additional Procedures B Part III			Annual	Bioassay

PRIORITY POLLUTANT ANALYSES (Test Method References modified 4/30/97)

(1) Sampling of the effluent for the parameters described shall be done during days when groundwater treatment system discharges are occurring at normal to maximum levels.

(2) Sample collection, storage and analysis shall conform to the procedures recommended or approved by the Department. Special sampling and/or preservation procedures will be required for those compounds which deteriorate rapidly. The Department has chosen the Recommended Analytical Methods based on the lowest expected levels of concern for the pollutants. Other approved methods may be used as long as the levels of detection are adequately low to evaluate compliance with permit conditions or the need for effluent limits for individual situations. For example, where there is sufficient dilution, GC/MS may provide an adequate limit of detection for parameters where we have recommended a GC method. See NR 219, Wis. Adm. Code or 40 CFR Part 136, Code of Federal Regulations for additional information.

(3) Reporting of the monitoring results shall include information on sample collection, analytical methods used, levels of detection, sample preservation procedures used, and interpretation of GC/MS results (if applicable).

(4) Sample analysis shall be performed by a laboratory registered or certified by the Department for these specific parameters, except as otherwise approved by the Department.

TABLE A - Priority Pollutants-Recommended Analytical Test Methods and Sample Types

Parameter	Sample Type	Analytical Test Methods	Estimated MDL[1] (ug/L)
VOLATILE COMPOUNDS (PREVIOUSLY METHOD 624 ANALYTES)			
Acrolein	Grab	SW-846 8260A	Not Available
Acrylonitrile	Grab	SW-846 8260A	Not Available
Benzene	Grab	SW-846 8260A	0.04
Bromoform	Grab	SW-846 8260A	0.12
Carbon tetrachloride	Grab	SW-846 8260A	0.21
Chlorobenzene	Grab	SW-846 8260A	0.04
Chlorodibromomethane	Grab	SW-846 8260A	0.05
Chloroethane	Grab	SW-846 8260A	0.10
2-Chloroethylvinyl ether	Grab	SW-846 8260A	Not Available
Chloroform	Grab	SW-846 8260A	0.03
Dichlorobromomethane	Grab	SW-846 8260A	0.08
1,1-Dichloroethane	Grab	SW-846 8260A	0.04
1,2-Dichloroethane	Grab	SW-846 8260A	0.06
1,1-Dichloroethylene	Grab	SW-846 8260A	0.12
trans-1,2-Dichloroethylene	Grab	SW-846 8260A	0.06
1,2-Dichloropropane	Grab	SW-846 8260A	0.04
cis- and trans-1,3-Dichloropropylene	Grab	SW-846 8260A	Not Available
Ethylbenzene	Grab	SW-846 8260A	0.06
Methyl bromide (bromomethane)	Grab	SW-846 8260A	0.11
Methyl chloride (chloromethane)	Grab	SW-846 8260A	0.10
Methylene chloride (dichloromethane)	Grab	SW-846 8260A	0.03
1,1,2,2-Tetrachloroethane	Grab	SW-846 8260A	0.04
Tetrachloroethylene	Grab	SW-846 8260A	0.05
Toluene	Grab	SW-846 8260A	0.11
1,1,1-Trichloroethane	Grab	SW-846 8260A	0.08
1,1,2-Trichloroethane	Grab	SW-846 8260A	0.10
Trichloroethylene	Grab	SW-846 8260A	0.19
Vinyl Chloride	Grab	SW-846 8260A	0.17
ACID EXTRACTABLE COMPOUNDS (PREVIOUSLY METHOD 604 ANALYTES)			
para-Chloro-meta-cresol (4-chloro-3-methyl phenol)	24-hr. comp.	SW-846 8270B	1.0
2-Chlorophenol	24-hr. comp.	SW-846 8270B	1.0
2,4-Dichlorophenol	24-hr. comp.	SW-846 8270B	1.0
2,4-Dimethylphenol	24-hr. comp.	SW-846 8270B	1.0
4,6-Dinitro-ortho-cresol	24-hr. comp.	SW-846 8270B	1.0
2,4-Dinitrophenol	24-hr. comp.	SW-846 8270B	1.0
2-Nitrophenol	24-hr. comp.	SW-846 8270B	1.0
4-Nitrophenol	24-hr. comp.	SW-846 8270B	1.0
Pentachlorophenol	24-hr. comp.	SW-846 8270B	1.0
Phenol	24-hr. comp.	SW-846 8270B	1.0
2,4,6-Trichlorophenol	24-hr. comp.	SW-846 8270B	1.0

PRIORITY POLLUTANT ANALYSIS

Parameter	Sample Type	Analytical Test Methods	Estimated MDL[1] (ug/L)
BASE/NEUTRAL COMPOUNDS (PREVIOUSLY METHOD 625, 612, 611 & 607 ANALYTES)			
Acenaphthene	24-hr. comp.	SW-846 8270B	1.9
Acenaphthylene	24-hr. comp.	SW-846 8270B	3.5
Anthracene	24-hr. comp.	SW-846 8310 (HPLC)	0.66
Benzidine	24-hr. comp.	SW-846 8270B	44
Benzo(a)anthracene	24-hr. comp.	SW-846 8310 (HPLC)	0.013
Benzo(a)pyrene	24-hr. comp.	SW-846 8310 (HPLC)	0.023
3,4-Benzofluoranthene	24-hr. comp.	SW-846 8310 (HPLC)	0.018
Benzo(ghi)perylene	24-hr. comp.	SW-846 8310 (HPLC)	0.076
Benzo(k)fluoranthene	24-hr. comp.	SW-846 8310 (HPLC)	0.017
Bis(2-chloroethoxy) methane	24-hr. comp.	SW-846 8270B	5.3
Bis(2-chloroethyl) ether	24-hr. comp.	SW-846 8270B	5.7
Bis(2-chloroisopropyl) ether	24-hr. comp.	SW-846 8270B	5.7
Bis(2-ethylhexyl) phthalate	24-hr. comp.	SW-846 8270B	2.5
4-Bromophenyl phenyl ether	24-hr. comp.	SW-846 8270B	1.9
Butyl benzyl phthalate	24-hr. comp.	SW-846 8270B	2.5
2-Chloronaphthalene	24-hr. comp.	SW-846 8270B	1.9
4-Chlorophenyl phenyl ether	24-hr. comp.	SW-846 8270B	4.2
Chrysene	24-hr. comp.	SW-846 8310 (HPLC)	0.15
Dibenzo(a,h)anthracene	24-hr. comp.	SW-846 8310 (HPLC)	0.03
1,2-Dichlorobenzene	24-hr. comp.	SW-846 8270B	1.9
1,3-Dichlorobenzene	24-hr. comp.	SW-846 8270B	1.9
1,4-Dichlorobenzene	24-hr. comp.	SW-846 8270B	4.4
3,3'-Dichlorobenzidine	24-hr. comp.	SW-846 8270B	16.5
Diethyl phthalate	24-hr. comp.	SW-846 8270B	1.9
Dimethyl phthalate	24-hr. comp.	SW-846 8270B	1.6
Di-n-butyl phthalate	24-hr. comp.	SW-846 8270B	2.5
2,4-Dinitrotoluene	24-hr. comp.	SW-846 8270B	5.7
2,6-Dinitrotoluene	24-hr. comp.	SW-846 8270B	1.9
Di-n-octyl phthalate	24-hr. comp.	SW-846 8270B	2.5
1,2-Diphenylhydrazine	24-hr. comp.	SW-846 8270B	Not Available
Fluoranthene	24-hr. comp.	SW-846 8310 (HPLC)	0.21
Fluorene	24-hr. comp.	SW-846 8310 (HPLC)	0.21
Hexachlorobenzene	24-hr. comp.	SW-846 8121 (GC)	0.006
Hexachlorobutadiene	24-hr. comp.	SW-846 8121 (GC)	0.001
Hexachlorocyclopentadiene	24-hr. comp.	SW-846 8121 (GC)	0.240
Hexachloroethane	24-hr. comp.	SW-846 8270B	1.6
Indeno(1,2,3-cd)pyrene	24-hr. comp.	SW-846 8310 (HPLC)	0.043
Isophorone	24-hr. comp.	SW-846 8270B	2.2
Naphthalene	24-hr. comp.	SW-846 8270B	1.6
Nitrobenzene	24-hr. comp.	SW-846 8270B	1.9
N-Nitrosodimethylamine	24-hr. comp.	SW-846 8270B	1.9
N-Nitrosodi-n-propylamine	24-hr. comp.	SW-846 8270B	Not Available
N-Nitrosodiphenylamine	24-hr. comp.	SW-846 8270B	1.9
Phenanthrene	24-hr. comp.	SW-846 8310 (HPLC)	0.64
Pyrene	24-hr. comp.	SW-846 8310 (HPLC)	0.27
1,2,4-Trichlorobenzene	24-hr. comp.	SW-846 8270B	1.9

PRIORITY POLLUTANT ANALYSIS

Parameter	Sample Type	Analytical Test Methods	Estimated MDL[1] (ug/L)
PESTICIDES (PREVIOUSLY METHOD 608 ANALYTES)			
Aldrin	24-hr. comp.	SW-846 8081	0.034
alpha-BHC (α-hexachlorocyclohexane)	24-hr. comp.	SW-846 8081	0.035
beta-BHC (β-hexachlorocyclohexane)	24-hr. comp.	SW-846 8081	0.023
delta-BHC (δ-hexachlorocyclohexane)	24-hr. comp.	SW-846 8081	0.024
gamma-BHC (γ-hexachlorocyclohexane)	24-hr. comp.	SW-846 8081	0.025
Chlordane	24-hr. comp.	SW-846 8081	0.008
4,4'-DDT	24-hr. comp.	SW-846 8081	0.081
4,4'-DDE	24-hr. comp.	SW-846 8081	0.058
4,4'-DDD	24-hr. comp.	SW-846 8081	0.050
Dieldrin	24-hr. comp.	SW-846 8081	0.044
alpha-Endosulfan	24-hr. comp.	SW-846 8081	0.030
beta-Endosulfan	24-hr. comp.	SW-846 8081	0.040
Endosulfan sulfate	24-hr. comp.	SW-846 8081	0.035
Endrin	24-hr. comp.	SW-846 8081	0.039
Endrin aldehyde	24-hr. comp.	SW-846 8081	0.050
Heptachlor	24-hr. comp.	SW-846 8081	0.040
Heptachlor epoxide	24-hr. comp.	SW-846 8081	0.032
PCB-1016	24-hr. comp.	SW-846 8081	0.054
PCB-1221	24-hr. comp.	SW-846 8081	0.054
PCB-1232	24-hr. comp.	SW-846 8081	Not Available
PCB-1242	24-hr. comp.	SW-846 8081	0.065
PCB-1248	24-hr. comp.	SW-846 8081	Not Available
PCB-1254	24-hr. comp.	SW-846 8081	Not Available
PCB-1260	24-hr. comp.	SW-846 8081	0.90
Toxaphene	24-hr. comp.	SW-846 8081	0.086
DIOXIN			
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	24-hr. comp.	EPA 1613 [a]	10 pg/L
METALS AND CYANIDE (TOTAL OR TOTAL RECOVERABLE)			
Antimony	24-hr. comp.	EPA 200.9 [b,c]	0.8
Arsenic	24-hr. comp.	EPA 206.2 or 200.9 [b,c]	1.0/0.5
Beryllium	24-hr. comp.	EPA 210.2 or 200.9 [b,c]	0.05/0.02
Cadmium	24-hr. comp.	EPA 213.2 or 200.9 [b,c]	0.05/0.05
Chromium	24-hr. comp.	EPA 218.2 or 200.9 [b,c]	1.0/0.1
Copper	24-hr. comp.	EPA 220.2 or 200.9 [b,c]	1.0/0.7
Cyanide, Total	Grab	EPA 335.4	5.0
Cyanide, Amenable to Chlorination	Grab	EPA 335.1	5.0
Lead	24-hr. comp.	EPA 239.2 or 200.9 [b,c]	1.0/0.7
Mercury	Grab	A minimum sensitivity of 20 to 50 ng/L is required	
Nickel	24-hr. comp.	EPA 249.2 or 200.9 [b,c]	1.0/0.6
Selenium	24-hr. comp.	EPA 270.2 or 200.9 [b,c]	2.0/0.6
Silver	24-hr. comp.	EPA 200.9 [b,c]	0.5
Thallium	24-hr. comp.	EPA 279.2 or 200.9 [b,c]	1.0/0.5
Zinc	24-hr. comp.	SM 3111B, C or EPA 289.1 [b]	2.0/2.0

[1] Listed MDLs are taken from the analytical methods or are excerpted from WI DNR interlaboratory data and may represent ideal MDLs determined in reagent water under ideal laboratory conditions.

[a] EPA Method 1613 or Appendix C in the 5 Mill Study (EPA 440/1-88-025), March 1988. The expected MDL is 10 pg/L.

[b] A more sensitive analytical method, if approved in Chapter NR 219, Wis. Adm. Code, may be substituted for the method(s) specified.

[c] Standard Methods 3113B may be substituted for EPA's AA furnace method.

Non-Priority Pollutants

Parameter	Sample Type	Analytical Test Methods[1]	Estimated MDL[2] (ug/L)
VOLATILE COMPOUNDS			
cis-1,2 Dichloroethylene	Grab	SW-846 8260A	0.12
1,1-Dichloropropylene	Grab	SW-846 8260A	0.10
2,3-Dichloropropylene	Grab	SW-846 8260A	Not Available
ACID EXTRACTABLE COMPOUNDS			
3-Chlorophenol[3]	24-hr. comp.	SW-846 8270B	1.0
4-Chlorophenol[3]	24-hr. comp.	SW-846 8270B	1.0
2,3-Dichlorophenol[3]	24-hr. comp.	SW-846 8270B	1.0
2,5-Dichlorophenol[3]	24-hr. comp.	SW-846 8270B	1.0
2,6-Dichlorophenol[3]	24-hr. comp.	SW-846 8270B	1.0
3,4-Dichlorophenol[3]	24-hr. comp.	SW-846 8270B	1.0
2,5-Dinitrophenol	24-hr. comp.	SW-846 8270B	1.0
2-Methyl-4-chlorophenol[3]	24-hr. comp.	SW-846 8270B	1.0
3-Methyl-4-chlorophenol[3]	24-hr. comp.	SW-846 8270B	1.0
3-Methyl-6-chlorophenol[3]	24-hr. comp.	SW-846 8270B	1.0
2,3,4,6-Tetrachlorophenol[3]	24-hr. comp.	SW-846 8270B	1.0
2,4,5-Trichlorophenol[3]	24-hr. comp.	SW-846 8270B	0.5
BASE/NEUTRAL COMPOUNDS			
N-Nitrosodiethylamine	24-hr. comp.	SW-846 8270B	Not Available
N-Nitrosodi-n-butylamine	24-hr. comp.	SW-846 8270B	Not Available
N-Nitrosopyrrolidine	24-hr. comp.	SW-846 8270B	Not Available
Pentachlorobenzene	24-hr. comp.	SW-846 8270B	Not Available
1,2,4,5-Tetrachlorobenzene	24-hr. comp.	SW-846 8270B	Not Available
PESTICIDES			
BHC-Technical Grade	24-hr. comp.	SW-846 8081	Not Available
Chlorpyrifos	24-hr. comp.	SW-846 8141A	0.07
Parathion (ethyl plus methyl)	24-hr. comp.	SW-846 8141A	0.06
METALS AND OTHERS			
Aluminum (Total or Total Recoverable)	24-hr. comp.	EPA 200.7 or 200.9	3
Chromium, Hexavalent	Grab	EPA 218.6	0.5
Hardness (Total as $CaCO_3$)	24-hr. comp.	Any NR 219 Method	NA
Chloride	24-hr. comp.	Any NR 219 Method	NA
Chlorine, Total Residual	Grab	EPA 330.1 or 330.5	<0.10 mg/L
2,3,7,8-TCDF	24-hr. comp.	EPA 1613[4]	10 pg/L

[1] The methods listed here may not have been approved or verified for all compounds, however, analytical standards are available and these methods may be appropriate.

[2] Listed MDLs are taken from the analytical methods or are excerpted from WI DNR interlaboratory data and may represent ideal MDLs determined in reagent water under ideal laboratory conditions.

[3] Taste and Odor substances from ch. NR 102, Wis. Adm. Code.

[4] EPA Method 1613 or Appendix C in the 5 Mill Study (EPA 440/1-88-025), March 1988. The expected MDL is 10 pg/L.