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Operation and Maintenance Manual

Durez North Tonawanda Site
Niagara Falls, New York

Prepared for: Glenn Springs Holdings, Inc.

Conestoga-Rovers & Associates
651 Colby Drive
Waterloo, Ontario N2V 1C2

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Section 1.0 Introduction

This Operation and Monitoring (O&M) Manual was prepared for the Interceptor Trench (IT) and Carbon Treatment System (CTS) at the former Durez North Tonawanda Site (Site). Site O&M is conducted in accordance with the February 1989 Record of Decision and approved work plans. At the Site, O&M includes maintenance and monitoring of the groundwater collection system, leachate conveyance, treatment system, cover system, groundwater monitoring well, and panhandle area.

Groundwater in the vicinity of the Site is transferred from the IT to the decanters where Non-Aqueous Phase Liquid (NAPL) is separated from the Aqueous Phase Liquid (APL) by decanting. The NAPL is disposed via incineration at a permitted off-Site facility, while the APL is treated on Site prior to being discharged to the storm sewer, under the permissible limits of pollutants in wastewater discharges.

The Site is owned by Occidental Chemical Corporation (OCC), with remedial responsibility assigned to Glenn Springs Holdings, Inc. (GSH). At present, Conestoga-Rovers & Associates (CRA) operates, maintains, and monitors the Site under the direct supervision of GSH. The contact information of the personnel primarily responsible for operation of the Collection and Storage System and the APL Treatment Facility at the Site is provided in Table 1.1.

1.1 Purpose and Scope of O&M Manual

The purpose of this O&M manual is to provide operating personnel with the following information:

- A description of the collection and storage system
- An understanding of the unit operations and control parameters inherent in system operation
- Identify the location of system start-up, normal operating, and shutdown procedures
- Operator actions required in the event of alarm notifications
- Sampling requirements for the groundwater treatment system

The Site and this manual are subject to follow the New York State Department of Environmental Conservation (NYSDEC) State Pollutant Discharge Elimination System (SPDES) Permit Number 9-92912-00041/00022-0. The Site is designated with the SPDES Number NY-0001198. In addition, the Site is required to comply with the substantive provisions of the New York State hazardous waste site requirements.

Equipment operating procedures and manuals provided by the manufacturers or suppliers are stored in the operations file in the Site IT and CTS Treatment Facility control room.

Designated reports which contribute to this O&M Manual consist of the following:

- North Tonawanda Site APL Treatment Facility Manual
- Functional Process Description, Control System Upgrade
- Field Procedures, IT Monitoring Program
- Site-Specific Health and Safety Plan (HASP) for Operation and Maintenance Activities
- Integrated Contingency Plan (ICP) to comply with 6 NYCRR 373-3.3 and 3.4
- Waste Management Plan to comply with applicable New York State waste regulations

The O&M Manual will be updated as significant modifications are made to the system. A formal internal review of the Site IT system and CTS will be performed at a minimum of every 5 years. Revisions of the manual will be distributed to the Site and appropriate operating personnel.

1.2 Definitions

A brief description of terms used in this manual follows:

APL	Aqueous Phase Liquid
ASI	American Safety Institute
ASME	American Society of Mechanical Engineers
°C	Degrees Celsius
COC	Chain of Custody
CRA	Conestoga-Rovers & Associates
CTS	Carbon Treatment System
°F	Degrees Fahrenheit
GAC	Granular Activated Carbon
gpm	Gallons per minute
GSH	Glenn Springs Holdings, Inc.
H_2S	Hydrogen Sulfide
H_2SO_4	Nitric Acid
HASP	Site-Specific Health and Safety Plan
HCl	Hydrochloric Acid
HMI	Human Machine Interface
hp	Horsepower

ICP	Integrated Contingency Plan
IT	Interceptor Trench
MCC	Motor Control Center
NAPL	Non-Aqueous Phase Liquid
NYSDEC	New York State Department of Environmental Conservation
OCC	Occidental Chemical Corporation
O&M	Operation and Maintenance
PCJ	Partial Consent Judgment
PLC	Programmable Logic Controller
ppb	Part per billion
PPE	Personal Protective Equipment
ppm	Part per million
psig	Pounds per square inch gauge, or the pressure relative to ambient atmospheric pressure
P&ID	Process and Instrumentation Diagrams
RC	Reactivated Carbon
rpm	Revolutions per minute
Site	Durez North Tonawanda Site
SC	Site Coordinator
scfm	Standard cubic foot per minute
SOP	Standard Operating Procedure
SPDES	State Pollution Discharge Elimination System
TOC	Total Organic Carbon

1.3 Piping and Instrumentation Diagrams References

The following Piping and Instrumentation Diagrams (P&IDs) display the process/instrument lines, equipment, connections, and other associated elements of the IT and CTS systems at the Site:

- Engineering Flow Sheet Legend (A-7406-03-00)
- Lift Stations Engineering Flow Sheet (A-7406-03-01)
- Decanter Engineering Flow Sheet (A-7406-03-03)
- Retention Engineering Flow Sheet (A-7406-03-04)
- Filtration System Engineering Flow Sheet (A-7406-03-05)
- Sacrificial Carbon Bed Engineering Flow Sheet (A-7406-03-06)
- Main Carbon Beds Engineering Flow Sheet (A-7406-03-07)
- Air, Gas, Water Systems Engineering Flow Sheet (A-7406-03-08)

The P&IDs are presented in Appendix A.

1.4 Site Access

The Site is secured by a 7-foot chain link fence, and access to the Site is controlled through a main automatic gate and a locked manual gate, both on Walck Road. Additional gates are located around the perimeter of the Site; however, these gates are always kept locked and used only when required.

Ingress/egress to the Site is controlled by individuals who possess Site gate keys or a transmitter for the automatic gate. As this Site is typically unmanned, even during normal business hours, individuals wishing to gain entrance to the Site must make prior arrangements with the Site Coordinator (SC).

1.5 O&M Responsibility

The SC's main duties during operation fall primarily into the following categories:

- Monitoring the system's physical performance through flow and pressure monitoring.
- Operating the system, which involves sequencing the adsorbers and transferring carbon to and from the adsorbers.
- Routine minor maintenance to ensure that all moving parts and instrumentation within the system are functioning properly. Such functions include lubrication, replacement of worn parts, housekeeping, and cycling equipment utilized on an intermittent basis to assure operation when needed.
- Sampling of influent and effluent at various locations in the process. This function entails sample collection, sample labeling, preservation, and sample storage and shipment for chemical analysis.

1.6 SPDES Carbon System Operation Requirements

The operating and notification requirements as dictated by the SPDES Permit for the Site are described as follows:

- The CTS will normally be in a shutdown mode when tank water levels are 5 feet or less in Tanks 1501 and 1502.

- When the tank levels are between 5 to 10 feet, the CTS will be started and will operate at a rate greater than the fill rate to Tanks 1501 and 1502. Filter changes will be scheduled to maintain the required feed rate.
- When the tank levels are above 15 feet, the CTS will operate at its maximum feed rate of 150 gallons per minute (gpm) and maximum pressure of 75 pounds per square inch gauge (psig). Filter changes will be scheduled to maintain the required rate.
- With tank levels above 25 feet, the fill rate greater than the carbon bed feed rate, and weather conditions indicating more rain, the groundwater collection system will be shut down. The groundwater system will remain in shut down mode until the feed rate with new filters exceeds the fill rate.
- The groundwater system will be restarted as soon as weather conditions permit and the tank levels are less than 25 feet.

Section 2.0 Site Description

2.1 History

From 1926 to 1977, the Site was used for manufacturing chemicals and plastics for industrial use. In 1977, OCC had entered into negotiations with NYSDEC in regards to conducting remedial investigations at the Site, which OCC carried out between 1977 and 1988. The production facility was demolished in the mid-1990s. OCC implemented a remedial program for two on-Site disposal areas, and installed monitoring wells for ongoing monitoring purposes.

2.2 Site Background And Description

The Site covers approximately 58.7 acres and is located at 700 Walck Road in North Tonawanda, New York. A perimeter fence restricts Site Access; however authorized vehicular traffic access is provided from Walck Road by a locked entrance gate (Figure 1.1).

Pursuant to Appendix B of the Durez Partial Consent Judgment (PCJ), groundwater monitoring at the Site is being conducted as part of the plant-wide groundwater remediation program. The monitoring program was initiated on October 2, 1989, prior to the installation of a groundwater remediation system, the principal component of which is a perimeter groundwater IT.

The purpose and primary design objective of the IT is to collect groundwater that could otherwise migrate off the Site, and to capture groundwater located outside of the Site boundaries, by creating a hydraulic gradient directed toward the trench that is located on Site. The IT consists of the collection of groundwater via a perimeter trench, which surrounds the

Site (Figure 1.1). The groundwater is treated with filtration and granular activated carbon (GAC). Discharge from the CTS is directed to the municipal storm sewer system, which eventually discharges to the Niagara River. Current activities include collection and treatment of overburden groundwater. Buildings on the Site include the treatment plant, four pump houses for the lift pumps, and a storage tank pump/Motor Control Center (MCC) building.

The post-IT groundwater monitoring program is conducted to collect the hydraulic and groundwater chemical data necessary to evaluate the effectiveness of the IT and long-term trends in groundwater chemistry at select monitoring wells.

Section 3.0 IT and CTS System Description

3.1 Objectives of Collection and Treatment

The IT is designed to prevent the migration of groundwater off Site. Collected rain and groundwater is treated by an on-Site treatment system for the removal of suspended solids and organic compounds in order to assure compliance with the SPDES permit prior to discharge to SPDES Outfall 009. The system has been designed to treat groundwater up to a maximum flow rate of 180 gpm.

3.2 Overview

The groundwater water collection system consists of an IT with four lift stations, a NAPL decanter, and two retention tanks.

The treatment process for the Site includes the filtration of sediment through a three bank system of sand filters operated in series, mode followed by the adsorption of dissolved organic contaminants in two sacrificial carbon beds operated in parallel. mode, each process has a holding capacity of 2,200 pounds of GAC, followed by This process is then followed by the adsorption of any remaining dissolved organic contaminants in the three main carbon beds that are operated in series. The main carbon beds contain each have a holding capacity of 20,000 pounds each.

The system is not designed to match the influent flow during a moderate or heavy rainfall event. The design allows for the accumulation of rainwater from high flow events in the large retention tanks, which have a capacity of 1,166,000 gallons. These tanks are normally maintained near or at their minimum capacity level in order to allow a maximum holding capacity for a rain event. It would take 4.5 days of continuous treatment plant operation to go

from completely full to empty if the system was continuously operating at the 180-gpm design flow rate.

3.3 Interceptor Trench

The IT is a groundwater collection trench situated around the perimeter of the Site with an approximate length of 8,350 feet. It is designed to intercept any potentially contaminated groundwater from migrating off-Site. The system consists of a sloped 8-inch perforated pipe surrounded by gravel situated at the bottom of a trench and a cascade pumping system of four lift stations. Lift Station No. 3 pumps to Lift Station No. 2. From Lift Station No. 2, groundwater is pumped to Lift Station No. 1. From Lift Station No. 1, groundwater is pumped into the Main Lift Station. From the Main Lift Station, water is transferred to a NAPL decanter. Water flows from the high point of the system (at the east side of the plant adjacent to the railway tracks) to a lift station where it is pumped to a higher elevation so it can flow by gravity to the next lift station. At the final Main Lift Station, the groundwater is pumped through the NAPL decanter and into the SPDES System Storage Tanks T1501 and T1502 for storage before passing through the SPDES CTS. Any NAPL which may collect in the IT will also be pumped with the groundwater stream. There are 32 access manholes in the IT system.

Although varying groundwater flow rates are experienced at each of the four lift stations, a single pump model is used to provide equipment standardization for plant maintenance. The selected pump capacities are in excess of the varying flow rates in the trench system.

Each lift station is equipped with two identical pump units. Either pump is capable of individually handling the total design flow at a lift station. The second pump provides a backup in the event that the first pump is out of service or there is abnormally high water flow in the trench.

Lift Stations 1, 2, and 3 consist of two pumps each that have a flow capacity of80 GPM. The pumps are manufactured by Goulds, Model 3796MT 1.5x2-10 and are rated for 5 horsepower (hp) and 1,730 revolutions per minute (rpm), with 9-inch impellers. The pumps are constructed of ductile iron. The Main Lift Station consists of two pumps that have a capacity of 150 gpm (P5401 and P5402). The Main Lift Station pumps were also manufactured by Goulds, Model 3796MT 3x3-13, and are rated for 10 hp and 1,735 RPM, with 10-inch impellers.

Lift Station	*Manufacturer Model*	*Pump Number*	*Capacity (gpm)*	*Power (hp)*
Main	Goulds 3796MT 3x3-13 10-inch Impeller	P5401, P5402	150	10
Lift Station #1	Goulds 3796MT 1.5x2-10 9-inch Impeller	P5403, P5404	80	5
Lift Station #2	Goulds 3796MT 1.5x2-10 9-inch Impeller	P5405, P5406	80	5
Lift Station #3	Goulds 3796MT 1.5x2-10 9-inch Impeller	P5407, P5408	80	5

3.4 NAPL decanter

The NAPL decanter is designed to separate APL from NAPL. A stream of liquid is pumped through the decanter at a relatively low velocity. The specific gravity of NAPL is greater than that of APL, and therefore, the NAPL will settle to the bottom. It is temporarily stored in the decanter before being transferred into drums and removed for disposal. The lighter APL floats on top of the NAPL and flows by gravity out of the decanter into the retention tanks (Tanks 1501 and 1502), where it is stored prior to passing through the CTS. The NAPL decanter receives flow from two different sources, the IT Main Lift Station and the NAPL Dike Sump P5409.

The NAPL decanter is manufactured by Dehler. The decanter is cylindrical in shape, with a diameter of approximately 10 feet and a height of approximately 38 feet. The decanter has a volume of approximately 21,740 gallons. The decanter is surrounded by a concrete dike which provides a secondary containment. A sump is located in the northeast corner of the dike, and a sump pump (P5409) redirects water from the sump directly back into the NAPL decanter.

As the NAPL decanter fills, the NAPL level is measured by LIT/LS-5463 (IT system panel located in Building 30 [the treatment building]). This provides an indication of NAPL levels in the IT system. Once the APL level has reached overflow, any reading increase indicated on the IT system panel in Building 30 will be due to the addition of NAPL to the vessel, which will settle to the bottom. The level increase viewed will be proportional to the level of the settling NAPL. As the level increases, it will activate the NAPL high level alarm. The level will drop as the NAPL is drained off. If the level were to continue to drop, the NAPL low-low level alarm would sound to alert the operator of a problem. As the decanter continues to fill without reaching the high-level setting, APL reaches the overflow and drains into Tanks 1501 and 1502. If the NAPL decanter or Tanks 1501 or 1502 were to overfill with APL, then a high-high level would be reached and sound LAHH-5460 to alert the operator.

From the retention tanks, liquid is pumped to filtration by filter feed pumps P1507 and P1508, which are located in the main pump house. Both filter feed pumps are manufactured by Durco,

Model 2K 3x2-10A, with a 9-inch impeller. Both pumps have a capacity of 250 gpm (150 gpm continuous flow) with a feed pressure of 150 psig. Both pumps are rated at 50 hp and 3,555 rpm.

As the level in the filter tanks rise, high level alarm LAH-1507 or LAH-1511 will sound, alerting the operator to start P1507 or P1508. There is also a low level pump cut-off LSL-1507 or LSL-1511. If the level were to drop further than the pump cut-off, then low level alarm LALL-1507 or LALL-1511 will sound to alert the operator of a problem. Also, there are separate high-high level alarms LAHH-1508 and LAHH-1512, which will alert the operator if the tanks are overfilling.

3.5 Filtration

The Site has a sand filtration system for sediment removal prior to the sacrificial carbon adsorbers. Influent flow to the filtration system is regulated by an actuated flow control valve that is modulated by the system Programmable Logic Controller (PLC).

The initial filtration system consists of three sand filters operating in series mode. Each sand filter is a lined, cylindrical vessel with one treatment pump and one effluent pump. The sand filters are rated at 100 psig. The sand filters are manufactured by Diamond, Model No. VSA-330-5.0-American Society of Mechanical Engineers (ASME). Each filter has a diameter of 30 inches and a height of 58 inches, for a volume of 23.7 cubic feet per vessel. The three sand filters are designated as filter beds "A", "B", and "C".

Filter Feed Pumps P1507 and P1508 direct flow from the retention tanks to the sand filters. A filter pump then directs the influent flow through the sand filters in order to remove particulates prior to entering the sacrificial beds. The filter pump is manufactured by Goulds, Model 3656, and is rated at 5 HP.

When the pressure drop across the sand filters becomes excessive, all three filters are backflushed at the same time. The filters can either be backwashed with City water or with the effluent water from the sand filters. For backwash using City water, the water is directed back through the sand filters using a backwash pump. The backwash pump is manufactured by Goulds, Model 3656 and is rated at 5 HP. Backflush discharge water is sent to the NAPL decanter for subsequent treatment. Backflushing is done automatically, approximately two times per day based on differential pressure.

The various water lines that direct influent, effluent, and backwash water are labeled with different colored labels, indicating the purpose of each line. The label colors scheme is as follows:

1. Orange – Influent from Filter Feed Pumps to the top of the sand filters
2. Blue – Effluent from sand filters at the bottom of the filters
3. Green – Backflush line for Municipal City water
4. Red – Backflush effluent from top of sand filters
5. Yellow – Backflush effluent from bottom of sand filters

After a period of time, the sand in the beds becomes filled with sediments that can no longer be removed by backwashing, indicating that the sand needs to be replaced. During a sand filter bed changeout, all three beds are changed at once and the system is taken off-line. Sand is evacuated from the filters by opening a plate at the top of each filter vessel and vacuuming using a vacuum truck. The spent sand is placed into drums using a flexible hose, where it is then drained, and disposed of off Site.

Virgin sand is delivered to the Site in dry 55-pound bags for manual (dry) loading into the top of each filter vessel. Approximately 1,100 pounds of sand are placed in each of the three beds. Approximately four layers of sand are loaded into the beds, with different grain sizes, starting with coarse sand (largest grain size, approximately 25 microns) and ending with fine sand (smallest grain size, approximately 5 microns). During the sand loading process, two layers or the coarsest sand with the largest grain size (approximately 250 pounds) is placed in each vessel first so that the coarse sand is on the bottom. Finer sand (two layers, approximately 850 pounds) is placed inside the vessel on top of the coarse sand, so that the fine sand is at the top of the vessel. Approximately 8 to 12 inches of freeboard space remains from the top of the sand to the top of the vessel. Effluent from the sand filters is pumped directly into the sacrificial adsorption system, which is described in Section 4.6.

3.6 Sacrificial Adsorbers, Carbon Transfers, Single Bag Filter

The sacrificial carbon adsorption system consists of two beds operating in parallel. Each adsorber is a lined, dish-bottomed ASME pressure vessel with a dished head for the top. The adsorbers are rated for 75 psig at 200°F and have an internal underdrain system. Each adsorber has a diameter of 4 feet and a sidewall height of 8 feet. Each adsorber holds approximately 2,000 pounds of carbon and has void space of 34 cubic feet above the bed for freeboard.

The sacrificial adsorber piping directs filtered water down through the adsorbers. Water exits via the adsorber underdrain, a network of lateral well screens at the bottom interior of the

vessel. The 316 stainless steel wire screens are designed to retain the carbon in the tank while allowing water to pass in or out of the vessel.

When the pressure drop across the sacrificial carbon beds becomes excessive, both beds are backflushed, one at a time. The adsorbers are valved to allow single stage flow while one of the adsorbers is being backflushed. During backflush operations, effluent from the single operating sacrificial carbon bed is used to backflush the other adsorber that has been taken off-line. Backflush discharge water is sent to the NAPL decanter for subsequent treatment.

After a period of time, the carbon in the beds becomes spent, indicating a need for fresh carbon. During a sacrificial carbon changeout, both beds are changed at once and the system is taken off-line. Spent carbon is evacuated from the adsorbers pneumatically by pressurizing the adsorbers with compressed air or by using a vacuum truck. The spent carbon is placed into drums using a flexible hose, where it is then drained, and incinerated off Site. Spent carbon from the sacrificial carbon beds is not regenerated.

Virgin carbon is delivered in dry 55-pound bags for manual (dry) loading into the top of each adsorber.

Effluent from the sacrificial adsorbers passes through a single-bag filter housing (FL1505) with a single 50-micron pore size bag filter to remove sediment and carbon fines before the wastewater enters the main carbon adsorbers. The single bag filter is not frequently changed (typically once or twice per year) since most sediment has already been removed in the sand filtration system and sacrificial carbon beds.

The effluent then passes through a temporary filter system consisting of an additional three banks of filters, with four filters in each.

3.7 Main Adsorbers and Carbon Transfers

The main carbon adsorption system consists of three beds in series. Normal operation involves three adsorbers actively online. The influent flow rate should be 115 gpm to 150 gpm for normal system operation in order to achieve the design retention time for organic adsorption.

Each adsorber is a lined, dish-bottomed ASME pressure vessel with a dished head for the top. The adsorbers are rated for 75 psig at 150°F and are outfitted with a specially designed external underdrain system. Each adsorber has a diameter of 10 feet and an overall height of 14 feet 11 inches. Each adsorber holds 20,000 pounds of carbon and has void space of 91 cubic feet above the bed for freeboard.

Influent flows to the adsorption system piping module, which is a separate modular assembly that houses all the valves and instrumentation to permit sequencing of the adsorbers and the transfer of carbon. Appropriate valve sequencing directs influent downward through the granular carbon beds in a series mode. The wastewater exits from the adsorbers through a series of underdrain distributors, which permit water to flow but retains the carbon.

After a period of time, the carbon in the lead column (first to contact wastewater) becomes spent, indicating a need to replace the carbon. The adsorption system is operated in a cyclic series to increase utilization of the carbon in the lead stage. The spent carbon is reactivated off Site and charged to the empty adsorber using pneumatic displacement techniques. To effectively service the system, the reactivated carbon must be transferred from incoming trailers to and from the system. Reactivated carbon is delivered in 20,000-pound bulk trailers. Carbon is loaded into the adsorbers utilizing pneumatic displacement of the carbon slurry. The dry carbon in the trailer is first slurried utilizing clean water after which the trailer is pressurized to 18 psig and the carbon transferred to the adsorber. Ongoing reactivated carbon shipments are transferred to the appropriate empty adsorber in the same manner as the initial fill. Spent carbon from the adsorber is transferred to an empty trailer by pressurizing the adsorber with air to 50 psig and conveying the carbon slurry utilizing pneumatic displacement. Excess water in the trailer system is pressure drained via a septa system in the trailer to the CTS decontamination (decon) pad which ultimately discharges to the CTS's stormwater retention system. The dewatered spent carbon is returned for reactivation. In this process, the adsorber impurities are volatized off the carbon through application of high temperatures. Virgin carbon makeup is added to the dry reactivated product and then loaded into a bulk trailer for delivery back to the CTS and subsequent transfer to the empty adsorber.

The installed system incorporates several design and service features that result in a simple and reliable installation.

3.7.1 Adsorption System

1. The adsorbers are dish bottom pressure vessels with a full cone spray nozzle on the top dish, ultimately permitting complete, efficient, and rapid removal of spent carbon. Complete evacuation of the spent carbon from the adsorbers eliminates effluent problems resulting from organic leakage from a residual well. Residual spent carbon left in the "lag" adsorber can lead to premature column replacement, and can also increase the operating bed depth causing product losses during column charging procedures.
2. The adsorbers have been incorporated with a specially designed underdrain system that virtually eliminates the use of vessel internals. The elimination of complex vessel internals permits the unrestricted and complete removal of carbon, as well as greatly reducing the risk of underdrain failure and the associated problems with such a failure.

3. The adsorbers are also equipped with a "quick opening" 24-inch manway that enables a visual inspection of the vessel internals after the transfer operation. The operator can quickly and positively determine that the vessel has been completely emptied.
4. The adsorbers are provided with a full-cone spray nozzle that permits the washing down of the vessel walls with clean Municipal City water after the transfer process.
5. The entire system is modular, making it easy to maintain and operate. All the required piping to operate the system is housed on a modular skid. The adsorbers and the piping module are interconnected utilizing prefabricated interconnections.
6. The system has a total online adsorption capacity of 60,000 pounds of carbon.
7. The three adsorbers are arranged in a single row. All carbon piping and utilities to enable bulk servicing of the system are neatly piped to one interface to enable all transfer operations to be conducted at one location. Fresh carbon will be loaded into the transfer tank and conveyed by pneumatic displacement of the slurry to the receiving adsorber. Spent carbon will be transferred directly from the adsorber to the trailer. Carbon inlet and outlet piping is manifolded with solidly piped water chase piping.

3.7.2 Carbon Transportation and Transfer

1. Both spent and reactivated carbon is transported in specially designed trailers that are lined, closed bulk hopper type trailers.
2. The dry carbon, after being slurried in the trailer, is transferred to the transfer tank utilizing pneumatic displacement techniques. This method of transferring carbon is simple, rapid, and environmentally sound.
3. Spent carbon in the adsorber is also transferred to the trailer by utilizing pneumatic displacement of the slurry. The spent carbon is dewatered in the trailer by using specially designed screens in the trailer that enable rapid pressure dewatering of the spent carbon. The displaced water is collected and reprocessed through the adsorption system.

3.8 Fugitive Water Emission Control

All fugitive water emissions are contained and treated prior to discharge to the environment.

Fugitive water emissions that are collected and pumped back to the system include:

- Motive water that is drained from the spent carbon trailer during (main) carbon transfer or from the spent carbon drums during sacrificial carbon transfer
- Individual adsorber vents

- Rupture disks and pressure relief valves that are all piped to a common drain header that ties into a floor drain and collection system

This assures that all overflows are captured and reprocessed through the treatment system.

Section 4.0 Control Systems

Operation of the Site IT and CTS is monitored by instruments mounted locally at the process Site and by instruments that transmit information to remote locations. Some of the instruments that transmit information also allow the operator to remotely control operating conditions at the Site.

Operation of the Site IT and CTS involves a variety of manual and automatic controls. As discussed in this section, automatic controls turn on/off pumps, close valves, and act to provide safe, efficient operation of the collection and storage system. In addition, the control system initiates alarms, trends, operational parameters, and notifies personnel in the event of critical situations. Controls are also used to send alarm messages and start/stop pump operation based on tank levels.

4.1 Control Components

The instrumentation manuals and specifications for the instruments discussed in this report are presented in Appendix B.

4.1.1 Programmable Logic Controller (PLC)

A PLC is used as the primary control device. It receives a series of digital inputs and analog inputs, interprets them based on a written program, then sends a series of digital outputs and analog outputs to control pumps, valves, and a variety of other equipment. The PLC program is designed to operate the collection systems, storage area and IT and CTS treatment process in a fail-safe manner. The PLC also serves to trigger alarms for the process.

4.1.2 Human Machine Interface (HMI)

The PLC is tied in to an HMI software package that allows the operator to view the operational processes from a computer screen. This system offers flexibility in process control and allows the operator efficient management of the collection and treatment processes. Alarms that are triggered by the PLC are displayed on the HMI screen.

In addition, the operator can trend process parameters over the history of stored data. The interface allows the operator to change pertinent operational setpoints and treatment system components from the control room.

The operator is provided with all critical process information through the PLC/HMI interface. Some equipment is furnished with standalone logic panels, in which case, status indicators are brought back to PLC/HMI to advise the operator of their operation. The CTS is monitored and controlled by six primary screens.

4.2 IT System

The IT system is a network of perforated pipe bedded in gravel that surrounds the perimeter of the Site. The trench system prevents groundwater from migrating off Site. It also drains off-Site groundwater in the vicinity of the trench back to the Site. There are four lift stations along the trench system. Groundwater from a lift station is transferred to the closest downgradient lift station where it is further transferred until it reaches the Main Lift Station. Lift Station No. 3 pumps to Lift Station No. 2. From Lift Station No. 2, groundwater is pumped to Lift Station No. 1. From Lift Station No. 1, groundwater is pumped to the Main Lift Station. From the Main Lift Station, water is transferred to the NAPL decanter. Each lift station is equipped with two pumps.

All of the lift station pumps have local motor controls at the transfer pumps for hand/off/auto operation. When pump motors are in the "hand" control position, the pumps can only be turned off at the lift station. In the "off" position, the pumps cannot run regardless of any other condition. In the "auto" position, the pumps turn on and off automatically in a lead/lag mode based on the water level in the lift station. The discharge header for each of the lift stations is equipped with an orifice plate type flow meter with a differential pressure transmitter. The flow rate is indicated on the HMI.

4.2.1 Instrumentation and Alarms

Each lift station is equipped with an alternator/lead-lag arrangement. The alternator will vary the "on" pump back and forth between the two pumps at each lift station during each pumping cycle. This provides an equal operating time for each pump. The lead-lag arrangement will allow the second pump to turn on upon experiencing a high-water level in the manhole.

Lift station pump level controls operate as follows:

LOW-LOW LEVEL	Pumps at STOP
LOW LEVEL	Lead Pump ON

HIGH LEVEL	Lag Pump ON
HIGH-HIGH LEVEL	Activate ALARM

When the level reaches the low level setting, the lead pump will start pumping. If this pumping rate is sufficient, it will empty the station to the low-low level setting, stopping the pump. If the lead pump cannot pump out faster than the station is filling up, and the level reaches the high level setting, the lag pump will also start pumping. If the two pumps empty the station, they will reach the low-low level and stop. If the two pumps cannot pump out the station faster than the station is filling, the level will rise to the high-high level setting and sound the Lift Station high level alarm on the IT System Panel in Building 30. If the high level alarm is sounded, the operator will shut down the pumps in the upstream lift station. This will stop the flow of water into the lift station where water is rising.

The flow rate is measured in the pump discharge at each lift station and indicated on the local control panel. This flow rate is then recorded on the IT System Panel in Building 30.

4.2.2 Operation

The following steps should be taken to ready the system for operation:

1. Turn control panel power switch to "on" at:
   - Main Lift Station
   - Lift Station No. 1
   - Lift Station No. 2
   - Lift Station No. 3
2. Provide power to both pumps at each lift station:
   - Place remote disconnect switch to "on"
   - Place local disconnect switch to "on"
   - Place selector switches in level controllers in each lift station control panel to "auto"
3. Place lead pump selector in level controller to the ALT position
4. Check the alarm test for the level controllers in each lift station

The IT System screen on the HMI shows the operating status and treatment system physical parameters. Each transfer pump has an amperage indication. Color coding is shown for the pump on (green) and pump off (red) conditions. All lift stations have high-high and low-low level alarm indicators that flash red when the particular condition exists. The lift stations also have instantaneous flow rate indicators. A flow indicating totalizer displays the cumulative flow

out of the Main Lift Station. The HMI screen only monitors the operating state of the lift station pumps. The pumps cannot be started, stopped, or the operating mode changed from the control screens. All operating state changes must be made from the local control panel.

When a pump is running, an amperage value and instantaneous flow rate value is displayed, and the pump should be green. If it is not, there may be a problem with the status signal transmitting system or computer software. When a main lift station pump is operating, the flow totalizer will display a value that is steadily increasing. If not, this is an indication of a problem with the signal transmitting system, computer software, or flow totalizing instrument.

In the "auto" mode when the water level reaches the low point, the pump stops running and the low-low level warning will come on. The low-low level warning will cease as the water level rises, even before the pump turns on.

If the high-high level alarm for a lift station is on, one or both pumps may not be operating correctly (losing its prime, etc.) The high-high water level warning should only come on during severe precipitation events. In that case, the operator should check retention tank levels and consider shutting off pumps in the trench system.

4.3 NAPL Decanter

The NAPL decanter is used to decant APL from any heavier organic liquid or suspended sediment in the wastewater that is collected and pumped from the IT system. The NAPL decanter receives flow from two different sources, the IT Main Lift Station and the NAPL Dike Sump P5409. The NAPL decanter also periodically receives small volumes of recirculated wastewater from the carbon adsorbers during backwash or carbon transfer. The NAPL decanter consists of a cylindrical vertical tank with a center feed pipe. The feed pipe ends part way down the tank and is designed to minimize turbulence as the process water enters the tank. The lighter APL floats on top of the NAPL and flows out of the decanter into Tank 1501 (Retention Tank #1) and Tank 1502 (Retention Tank #2), where it is stored prior to passing through the CTS. Over a period of time, NAPL and solids accumulate at the bottom of the tank. This is occasionally drawn off and placed into drums for off-Site disposal. This operation is performed manually by the operator.

The NAPL decanter is surrounded by a secondary containment dike. Within the dike area is a sump pump for any process leaks or stormwater collected in the dike. Containment wastewater is pumped back to the NAPL decanter feed.

The sump pump has local motor controls on the outer dike wall for hand/off/auto operation. When pump motor is in the "hand" control position, the pump can only be turned off at the

pump control switch. In the "off" position, the pump cannot run regardless of any other condition. In the "auto" position, the pump turns on and off automatically based on the water level in the sump.

The NAPL decanter screen has various outputs for operating status and treatment system physical parameters. The sump pump amperage is displayed and color coding is shown for the pump on (green) and pump off (red) conditions. The containment dike has high-high, high, and low-low level alarm indicators that flash red when the particular condition exists. The NAPL decanter tank has a water level indicating transmitter and a temperature transmitter. A flow indicating totalizer displays the cumulative flow out of the Main Lift Station and into the NAPL decanter; this readout is identical to the one on the Trench System screen.

When the sump pump is running, an amperage value is displayed, and the pump color turns green. When a pump in the trench system main lift station is on, the flow totalizer display value will steadily increase.

The normal state of the sump pump is off, showing no amps and a low level warning. During precipitation events, the low level warning will cease as the sump water level rises. This will happen before the pump turns on.

The NAPL decanter is equipped with a level indicating transmitter, a temperature indicating transmitter, a high level switch, and a pressure/vacuum relief valve. The level indicated in the NAPL decanter should remain at about 450 inches. An increase in the level is an indication of a restriction in the gravity flow line to Retention Tank #1 or a shut valve. A drop in the level is an indication of a tank leak. The level transmitter signal is used to trip a high, low, and low-low level alarm. A separate level switch is located at the top of the tank to trip a high-high level alarm. The temperature indicator shows the liquid temperature and is used to turn on the decanter heating pad. The pressure/vacuum relief valve prevents the free exchange of air in the air space above the liquid with the outside air, which minimizes the loss of volatile organic vapors.

4.4 Retention Tanks

Wastewater enters the retention tanks from the NAPL decanter. The former stormwater collection sumps also are piped to the retention tanks. Flow from the NAPL decanter flows to Retention Tank #1. Flow from the former stormwater collection sumps flow may be diverted to enter either retention tank by adjusting manual valves. The tanks are piped to a common heater to the suction side of the filter feed pumps. Only one of the two pumps is in operation at any time. The other pump is a backup.

The retention tanks include secondary containment. Each tank is equipped with a level indicating transmitter, a high-high level switch, and a pressure/vacuum relief. The level transmitter is used to trip high level and low-low level alarms and for turning off of the Filter Feed Pump when the tank reaches low level and the pumps are running in "auto" mode. The pressure/vacuum relief minimizes the loss of process water vapors to atmosphere. The retention tanks are connected by a 14-inch diameter pipe. With the manual valves open the levels in both tanks will equalize.

The filter feed pumps are mounted in a building with a below grade floor. The pump suction connections to the retention tanks are located at the bottom sidewall. This gives the pumps the ability to completely drain the tanks if need be. Adjusting manual valves on the pump suction piping allows the operators to select the pump to operate and the retention tank to draw from. The filter feed pump building contains a sump to catch spills and leaks. It has no sump pump but is piped to Lift Station No. 1.

The filter feed pumps have local motor controls (Building 15 Pump House) for hand/off/auto operation. When pump motors are in the "hand" control position, the pumps can only be turned off at the local motor control location in the Building 15 pump house. In the "off" position, the pumps cannot run. In the "auto" position, the pumps turn off automatically based on the water level in the retention tanks.

In normal operation, manual valves at the pump feed and discharge header are adjusted to select the desired filter feed pump and retention tank to draw from. The pump is placed in the auto mode at the local pump mode switch. From the retention tanks screen on the HMI, the pump is selected and placed in "auto on" mode. The pump is then started from the control room by pressing the Retention Pump Auto Start push button on the PLC control panel. The pump will start and continue to run until either the level in the retention tank reaches a level of 4 feet or a shutdown alarm condition occurs.

The Retention Tanks HMI screen has various outputs for operating status and treatment system physical parameters. The pump amperage is displayed for each pump. Color coding is shown for the pump on (green) and pump off (red) conditions. The retention tanks have high-high and low level warning indicators that flash red when the particular condition exists. The water level in feet is displayed for each retention tank.

When a pump is running, an amperage value is displayed and the pump color turns green.

4.5 Filtration System

The influent water is pumped from the retention tank through a series of sand filters prior to flowing to the sacrificial carbon beds. The filtration system consists of three stainless steel pressure vessels (sand filters) operating in series mode. They are used to reduce the suspended solids loading on the carbon beds and in turn lengthen the time period between backwashes.

The sand filter piping directs water from the filter feed pumps (P1507 and P1508) through the sand filters. Water exits the filters via an effluent line that connects to the bottom of each vessel.

Sand filter vessels have ports for influent, effluent, and sand fill. The sand filter piping is equipped with pressure relief valves to protect the adsorbers from exceeding their rated pressure, sample ports, and pressure gauges. The sand filters are also equipped with air operated diaphragm valves that are used to direct influent and effluent flow as well as City water for backflushing.

Effluent from the sand filters is pumped to the sacrificial beds for initial carbon adsorption. Backflush water is directed back to the NAPL decanter in order to be sent through the filtration process again.

The Filtration System HMI screen has various outputs for treatment system physical parameters. The filter feed flow rate, pressure after the sand filters, pressure prior to the filters, and the differential pressure across the bank of sand filters is displayed.

4.5.1 Flow Control Valve

The Flow Control Valve screen is a secondary or pop-up screen that is accessible by double-clicking on the flow control valve symbol on the filtration system screen. The flow control valve screen allows for manual or automated control of the valve.

The normal operation is to place the control valve in "auto" mode. In "auto" mode, a system flow rate is selected and the control system modulates a flow control valve to maintain the flow rate. The flow will remain constant provided there is not an excessive pressure drop across the filters or carbon. In the "manual" mode, the control valve percent open is selected. In this mode, the flow rate is subject to drift due to changes in retention tank level and pressure drop across the treatment system.

4.6 Carbon Adsorption

Effluent from the filtration system proceeds to the carbon adsorption system. The first adsorption step is a set of two sacrificial carbon beds operating in parallel. The main carbon adsorption system consists of three beds in series. Normal operation involves three main adsorbers actively on line. The sacrificial carbon is designed to remove any high molecular weight organics present in the wastewater. The main carbon beds, which are the last treatment step, are designed to remove low molecular weight organics in the wastewater. The final system effluent is discharged to a storm sewer outfall (009) which leads to the Niagara River.

The CTS HMI screen displays the effluent flow rate and totalized effluent flow. During stable flow conditions, the carbon effluent flow rate should be approximately equal to the filtration system influent flow rate. If the flow rates are significantly different for an extended period, one or both of the flow indicating instruments may not be working properly and should be checked for leaks in the system. For short intervals while the system flow rate is fluctuating from pumps turning on/off, the level control valve being manually adjusted, etc., the indicated flow rates will differ as the wastewater moves through the system.

Section 5.0 Process Specifications

5.1 Main Lift Station

Number of pumps:	Two
Pump Model:	Goulds 3796MT 3x3-13
Impeller Size:	10 inches
Power:	10 hp
Capacity:	110 150 gpm

5.2 Lift Stations 1, 2, and 3

Number of pumps	Two per lift station
Pump Model:	Goulds 3796MT 1.5x2-10
Impeller Size:	9 inches
Power:	5 hp
Capacity:	80 gpm

5.3 Filter Feed Pumps

Number of pumps:	Two

Designations:	P1507 and P1508
Pump Model:	Durco 2K 3x2-10A
Impeller Size:	9 inches
Power:	50 hp
Capacity:	250 gpm

5.4 Influent

The influent to the CTS shall be as follows:

Flow Rate (Continuous):	150 gpm
Flow Rate (Maximum):	180 gpm
Temperature:	5 to 20°C
Feed Pressure:	70 psig maximum
Suspended Solids:	Less than 50 mg/L
pH:	6 to 9
Design Influent Organics:	Total organic carbon (TOC) - 50 ppm
	Benzene - 2.7 ppm
	Monochlorobenzene - 7.35 ppm
	Dichlorobenzene - 5.5 ppm
	Trichlorobenzene - 0.13 ppm
	Phenolics - 1.15 ppm
Effluent Standards:	Benzene - less than 5 ppb
	Monochlorobenzene - less than 10 ppb
	Trichlorobenzene - less than 10 ppb
	Phenolics - less than 100 ppb

Notes:

C	Centigrade Celsius.
ppb	Parts per billion.
ppm	Parts per million.

5.5 NAPL Decanter Tank

5.5.1 NAPL Decanter Tank

Drawing Number:	A-7406-03-03
Height:	38 feet
Diameter:	10 feet
Capacity (Volumetric):	1,193 cubic feet
Capacity (gallons):	21,740 gallons

Manufacturer:	Dehler
Decanter Designation:	T-5401

5.5.2 NAPL Decanter Sump

Drawing Number:	A-7406-03-03
Number of pumps:	1-inch sump
Pump Model:	Goulds Model 3171 1x1.5-8
Impeller Size:	7.25 inches
Power:	2
Capacity:	30 gpm
Pump Designation:	P-5409

5.6 Filtration System

5.6.1 Sand Filters

Drawing Number:	A-7406-03-05
Number of Units:	Three
Designation:	Bed "A" Bed "B" Bed "C"
Operation Mode:	Three beds operating in series
Manufacturer:	Diamond
Model:	VSA-330-5.0-ASME
Capacity (Volumetric):	24 23.7 cubic feet
Pressure:	100 psig
Maximum Flow Rate/Unit:	150 gpm
Disposition of Spent Sand:	Manual removal for off-Site disposal

5.6.2 Filter Pump

Number of Units:	One
Pump Model:	Goulds Model 3656
Power:	5 hp

5.6.3 Backwash Pump

Number of Units:	One
Model:	Goulds Model 3656
Power:	5 hp

5.7 Sacrificial Adsorption System

The sacrificial adsorption system consists of two lined carbon steel pressure vessels manufactured per ASME Code Specifications. The sacrificial adsorber piping directs filtered water down through the adsorbers. Water exits via the adsorber underdrain which is comprised of a network of lateral well screens at the bottom interior of the vessel. The 316 stainless steel wire screens are designed to retain the carbon in the tank while allowing water to pass in or out of the vessel.

Adsorber vessels have ports for influent, effluent, carbon fill, carbon discharge, venting, and compressed air (used for carbon transfer). The adsorber piping is equipped with pressure relief valves to protect the adsorbers from exceeding their rated pressure, sample ports, and pressure gauges.

Effluent from the sacrificial adsorbers passes through a single-bag filter housing with a single-bag filter to remove sediment and carbon fines before the wastewater enters the main carbon adsorbers. The single-bag filter unit is a Fulflo model 6SB12-3F with a 316 stainless steel housing and maximum design flow rate of 160 GPM. The single-bag filter unit uses Fulflo C2PE-25identical bag filters (Fulflo C2PE-25) as the quad bag filters described above.

Drawing Number:	A-7406-03-06
Number of Adsorbers:	Two
Designation:	T-1503, T-1504
Code Rating:	75 psig @ 200°F
Operation Mode:	Parallel Downflow
Vessel Weight (empty):	2,200 pounds
Vessel Weight (operating):	11,000 pounds
Capacity (Volumetric):	111 cubic feet
Capacity (Carbon):	2,000 pounds (77 cubic feet)
Surface Loading Rate:	6 gpm/square feet (dual beds)
Pressure Drop (Clean Bed):	5 psig
Pressure Drop (Fouled Bed):	15 psig
Total Contact Time:	11 minutes at 150 gpm (dual beds)
Backflush Freeboard (Void Space):	34 cubic feet
Backflush Rate:	150 gpm
Backflush Water (Source)	Treated water to effluent port, upflow
Backflush Return:	Recycled to floor drain system or NAPL decanter
Type of Carbon:	Virgin coal base 8 x 30 mesh
Disposition of Spent Carbon:	Transferred to drums for off-Site incineration

5.8 Main Adsorption System

5.8.1 Piping and Utility Module

The piping and utility module is a separate modular assembly that serves as a central unit for directing filtered water flow through each of the adsorbers. The adsorbers are sequenced in a cyclic mode utilizing valves and controls to:

1. Enable backflushing of the adsorbers
2. Vent the adsorbers
3. Pressurize the adsorbers with air during carbon transfers
4. Wash down the adsorber with a high pressure spray during carbon unloading procedures

In addition to the above functions, the module houses:

1. Rupture disks that protect the adsorbers from exceeding their rated pressure
2. Sample ports
3. Stations for enabling monitoring of performance of each adsorber
4. Pressure gauges to indicate operating pressures and pressure drop across each adsorber bed

Compressed air that is supplied from a separate source is regulated in terms of pressure by regulators located on the module. Compressed air is utilized to effect carbon transfer operations from incoming trucks to the system and for spent carbon transfer operations from the system.

Butterfly Valves (WV-3):	Grinnel - 2 and 3 (Series 52-AN 14-1) lug type, nickel coated disk, EPDM seats and seals (or equivalent)
Ball Valves (BV-3):	Apollo - 89-100 ¼-inch to 2-inch threaded (or equivalent)
Check Valves (CV-7):	Walworth - 2-inch, 3-inch flanged, Model 8928F (or equivalent)
Line Strainer (LS-1):	Mueller 751-DI
Hose Connectors (HC-1):	OPW Kamlok 633F
Sight Glasses (SG-1):	Plastomatics - 3000-WYPP wafer style
Regulator (Air to Truck PCV-1):	Cashco-1000 hp

Regulator (Air to Adsorbers PCV-2):	Cashco-1000 hp
Rupture Disks (RD-1):	BS&B Safety Systems Saf T Graf 75 psig Impervious Graphite 3-inch disk
Pressure Gauges (PI-1-8):	2½-inch U.S. gauges CP-500 (or equivalent)
Pressure Relief Valves (PSV-1, PSV-2):	3-inch Model 69 Aquatrol 75 psi
Back Pressure Regulator:	Model 108-2 (3-inch) OCV

5.8.2 Main Adsorbers

The main adsorption system consists of three lined carbon steel pressure vessels manufactured as per ASME Code Specifications. Each adsorber is mounted on a square structural steel skid frame. The lining of the adsorber is a 40-mil (0.04 inches) thick abrasion resistant vinyl ester lining that is designed to resist galvanic corrosion and erosion during carbon transfer operations. The adsorbers contain the necessary manhole and nozzle schedule to permit downflow processing of the fluid in a uniform manner across the bed. A spray nozzle located at the apex of the top dish ensures complete removal of the carbon and washing down of the vessel walls during the carbon removal process.

Drawing Number:	A-7406-03-07
Number of Adsorbers:	Three
Designation:	T-1505: "A" T-1506: "B" T-1507: "C"
Code Rating:	75 psig @ 150°F
Operation Mode:	Series Downflow
Staging Sequence:	Three Adsorbers: ABC, BCA, CAB Two Adsorbers: AB, BC, CA
Vessel Weight (Empty):	10,000 pounds
Support Skid (Weight):	1,200 pounds
Vessel Weight (Operating):	100,000 pounds
Carbon Weight/Adsorber:	20,000 pounds
Capacity (Volumetric):	805 cubic feet
Capacity (Carbon):	20,000 pounds (714 cubic feet)
Lining:	Epoxy Lining
Total Carbon Online:	Three Adsorbers: 60,000 pounds Two Adsorbers: 40,000 pounds
Surface Loading Rate:	2 gpm/square feet
Pressure Drop (Clean Bed):	5 psig
Pressure Drop (Fouled Bed):	15 psig
Contact Time Per Adsorber:	36 minutes at 150 gpm

Total Contact Time:	Three Adsorbers - 108 minutes Two Adsorbers - 72 minutes
Backflush Freeboard (Void Space):	91 cubic feet
Backflush Rate:	150 gpm
Backflush Water (Source):	Treated water to module
Backflush Return:	Drain header recycled to floor drain system or NAPL decanter
Type of Carbon:	Reactivated coal base 8 x 30 mesh
Disposition of Spent Carbon:	Transferred to spent carbon trailer for off-Site reactivation
Spray Nozzle (One Per Vessel):	Bete Fog nozzle 2NCS503N

5.8.3 Underdrain

Each adsorber is outfitted with a "proprietary" underdrain design consisting of eight symmetrically located underdrain screens piped to a circular ring header. The screens are designed to withstand the stress of carbon transfer operations as well as to retain carbon and permit liquid flow through the screens in either direction. The liquid flows through the screens and is collected in the ring header from which the water flows via interconnecting piping to the piping module. Valve sequencing in the piping module directs the treated water sequentially through the remaining adsorbers in a similar fashion. The carbon retention screens are fabricated from 304L stainless steel, and the ring header is a heat rolled pipe constructed of Schedule 40 carbon steel.

Number of Underdrain Septas/Adsorber:	Eight
Material of Construction:	304L wedge wire
Manufacturer:	ASI
Ring Headers:	One per adsorber
Material of Construction:	Schedule 40 carbon steel
Manufacturer:	ASI
Flow Rate per Septa (Maximum):	25 gpm downflow
Flow Rate per Septa (Maximum):	30 gpm upflow

5.8.4 Interconnecting Carbon Transfer Piping

The purpose of the carbon transfer piping is to permit the following functions:

- Transfer reactivated carbon (RC) directly from incoming trailers to the adsorbers A, B, and C
- Transfer spent carbon directly from either one of the three adsorbers (A, B, or C) to the spent carbon trailer

Line Designations (Reactivated):	4-inch RC 1, 2, 3
Line Designations (Spent):	4-inch SC 1, 2, 3, 4
Material of Construction (Stainless Steel):	Schedule 10, 304L
Valves (4-inch BV-2):	Avco Full Port 316 stainless steel ball valve
Flush Valves (¾-inch):	Apollo Bronze Ball vale Valve (89-100)
Sight Glasses (4-inch SG-1):	Plastomatics 400GYWVPP
(¾-inch HC-1):	Hose Connects (4-inch HC-1) Kamlok-OPW 633-F

5.8.5 Interconnecting Liquid and Compressed Air Piping

Interconnecting liquid and compressed air piping connects the "adsorber module", filters, adsorbers, and storage tanks to provide a totally functional system. The following specifications apply to the interconnecting liquid and compressed air piping.

Line Designation	***Function***
2-inch CA-5	18 psig air to truck
4-inch BD-1	Truck blow down
By OCC	City water to truck
2-inch SW 1, 2, 3	Spray water to adsorber (A, B, C)
3-inch GW 1, 2, 3	Influent to adsorbers (A, B, C)
3-inch TW-1, 2, 3	Treated water from adsorbers (A, B, C)
2-inch CA-1	Main supply air (100 psig)
2-inch CA-2, 3, 4	Air to adsorbers (A, B, C) - 50 psig
2-inch CA-5	Air to truck (18 psig)
3-inch TW-4	Final effluent
3-inch TW-5	Backwash supply
3-inch TW-6	Water chase to carbon lines
3-inch BWR (1, 2, 3)	Combination vent/backwash return from adsorbers (A, B, C)
3-inch TW-1A	Interstage piping between adsorber (A & B)
3-inch TW-2A	Interstage piping between adsorber (B & C)
3-inch TW-3A	Interstage piping between adsorber (C & A)
3-inch DR-1	System drain line
4-inch SC-1, 2, 3, 4	Spent carbon transfer lines
4-inch RC-1, 2, 3	Fresh carbon transfer line

5.9 Carbon Transfer Operations

5.9.1 Sacrificial Adsorbers

Delivery of Fresh Carbon:	Eighty 55-pound bags (dry)
Amount of Water Required to Slurry 2,200 pounds:	700 gallons
Amount of Air Required (from Trailer to system):	100 standard cubic feet per minute (scfm) at 15 psig
Amount of Air Required (transfer from adsorbers to trailers):	100 scfm at 30 psig

5.9.2 Main Adsorbers

Delivery of Fresh Carbon:	In 20,000- or 40,000-pound quantities (dry)
Amount of Water Required to Slurry 20,000 pounds:	7,000 gallons
Slurry Transfer Rate:	350 pounds per minute
Amount of Air Required (transfer from adsorbers to trailers):	100 scfm at 30 psig
Amount of Air Required (transfer from trailer to system):	100 scfm at 15 psig

Section 6.0 Operating Procedures

6.1 Interceptor Trench

The IT system consists of four lift stations with two pumps each that direct groundwater to a NAPL decanter. The NAPL decanter separates NAPL from the groundwater. Water is then directed to two 583,000-gallon retention tanks before it is pumped to the CTS using two filter feed pumps. The IT system includes the eight lift station pumps and two filter feed pumps with the necessary influent and effluent lines, flow distributors, ancillary piping, valving, and appurtenances needed to operate the system. This system was specifically designed to direct water from the IT to the CTS.

Prior to operating the IT system, verify that all equipment is in a safe condition to operate. Verify that all system pressure, level, and temperature instrumentation is energized, tested, and operating in accordance with the manufacturer's operation specifications and plant design parameters.

6.1.1 System Start-Up Instructions

The following procedures should be followed for system start up.

6.1.1.1 Lift Station Start-Up

1. For the Main Lift Station, open valves LS-1, LS-2, LS-5, LS-6, and LS-9
2. For Lift Station #1, open valves LS-10, LS-11, LS-14, LS-15, and LS-18
3. For Lift Station #2, open valves LS-20, LS-21, LS-24, LS-25, and LS-28
4. For Lift Station #3, open valves LS-30, LS-31, LS-34, LS-35, and LS-38
5. Ensure the PLC sequence controller for the lift stations is operational
6. For the Main Lift Station, place the selector switch for Pumps P5401 and P5402 (located at the pump) to AUTO
7. For Lift Station #1, place the selector switch for Pumps P5403 and P5404 (located at the pump) to AUTO
8. For Lift Station #2, place the selector switch for Pumps P5405 and P5406 (located at the pump) to AUTO
9. For Lift Station #3, place the selector switch for Pumps P5407 and P5408 (located at the pump) to AUTO

6.1.2 Filter Feed Pump Operation

1. For Filter Feed Pump P1507, verify that valves S-27 and S-29 are closed. Verify that valves S-23 and S-25 are open.
2. For Filter Feed Pump P1508, verify that valves S-28 and S-30 are closed. Verify that valves S-24 and S-26 are open.
3. If water is to be taken simultaneously out of Retention Tanks T1501 and T1502, open valves S-23 and S-24.
4. Start Pumps P1507 and P1508 by placing the selector switches located at the pumps to the ON position. Verify that the pumps are on by checking the green indicator light on the pump switches.
5. Slowly open valves S-27 and S-28.
6. When the retention tank low level alarm is energized, secure the filter feed pump. Close valves S-27 and S-28.

6.1.3 Routine Checks

The following routine checks are to be conducted for the normal operation of the IT System.

6.1.3.1 Lift Stations

1. Check the alarm panel. Ensure proper pumps are running if level alarms are activated.
2. Ensure all pump selector switches are in proper position. If they are not, place selector switches in the proper position (AUTO).

6.1.3.2 Tanks and Dikes

1. Valves S-21 (Tank T1501) and S-22 (Tank T1502) should always be open to drain retention tank dikes into the filter feed pump building

6.1.3.3 Filter Feed Pumps

1. Periodically check pump casing for overheating to prevent pump damage. If pump casing is overheated, shut the pump down and use the other filter feed pump (P1507 or P1508) while having the problem pump repaired.
2. Check pressure relief bypass at the pumps which prevents overheating at low flow conditions. This is done by checking and verifying that isolation valves S-41 and S-42 are in working order.

6.2 Initial Carbon Adsorption Beds (SAC Beds)

This system consists of two activated carbon adsorbers with the necessary influent and effluent lines, underdrains, flow distributors, carbon fill lines, ancillary piping, valving and appurtenances needed to operate the adsorbers either individually or in parallel. Specifically, this system was designed to function as a "sacrificial bed" to protect the remaining unit processes from potentially hazardous organic compounds that are readily adsorbed by activated carbon. The carbon within these beds will remain in place and will not be regenerated as a routine operation of this treatment system.

For purposes of identifying the possible operating alternatives, the adsorbers in this system are labeled T1503 and T1504. Section 6.4 outlines a numbering system for the valves associated with the respective adsorbers. They are designated with a "V1" (i.e., V1-5). Also, the valve locations for each adsorber are shown in flow schematic "Sac Carbon Bed Engineering Flow Sheet (Dwg. A-07406-03-06). This valve numbering system will be used to describe the various flow patterns and the associated system operating parameters.

6.2.1 Start-up

Starting up the system encompasses both hydrostatic testing and filling the system with the initial charge of carbon. Hydrostatic testing is of great importance prior to filling carbon since corrective measures for any identified leaks cannot be readily corrected once carbon is already in the system. If leaks are detected after start-up, they should be noted and corrected during the first carbon transfer.

6.2.1.1 Hydrostatic Testing

Hydrostatic testing is a procedure that is used to determine the ability to sustain operating pressure without uncontrolled discharges of untreated or treated water. Hydrostatic testing should be done during start-up and after any major repairs to the adsorber vessels or piping. The following rules should be observed during hydrostatic testing:

- Do not test any portion of the system with compressed air due to the danger of explosive energy being released under a "joint" failure condition.
- Do not perform maintenance or corrective action while system is under pressure.
- Depressurize system to atmospheric pressure before performing maintenance work.
- Wear safety goggles and protective head gear when bleeding static head in liquid and carbon transfer piping.

6.2.1.2 Fill System with City Water

The entire system must be hydraulically filled to capacity with City water prior to being pressurized. Pressurization of the system will be effected at a pressure of 60 psig in 10-psig increments. All leaks will be logged and corrected. Valves should always be opened and closed slowly. Sudden changes in pressure can damage a pipe or cause relief discs to rupture due to water hammer, which can occur if hydraulic pressure is suddenly applied to equipment. When filling the system with water, ensure that air in the piping and tankage can be vented from the highest point in the system. The following procedures should be followed when filling the system with City water.

6.2.1.2.1 Adsorbers and Associated Piping

Note that valves shown below without parentheses are for T1503. Valves in parentheses are for T1504.

1. Connect City water to backwash inlet connection.

2. Close valves V1-5 (V1-6), V1-15 (V1-16), V1-23 (V1-24), V1-9 (V1-10), V1-21 (V1-22), V1-17 (V1-18), and V1-1 (V1-2).
3. Open valves V1-7 (V1-8) and V1-3 (V1-4).
4. Fill the system until water issues out of the backwash outlet line.
5. Close valves V1-3 (V1-4).
6. Observe pressure rise on carbon bed tank installed pressure gauges (downstream of valves V1-13 [V1-14]).
7. Open close valves V1-7 (V1-8) to increase pressure in incremental stages.
8. If leaks are observed, depressurize the system by venting through valves V1-9 (V1-10).
9. Correct any leaks and repressurize. The type of leak correction would be dependent on the nature of the leak. Leaks can be corrected through coating, welding, installation of new gaskets, etc.
10. Hold 60 psig test pressure for 30 minutes prior to terminating the test. Depressurize the system by venting through V1-9 (V1-10).

6.2.1.3 Draining the Adsorbers

Following the completion of the hydrostatic test, the adsorbers may be drained directly to the process floor. This can be done by opening the tank drain valves V1-23 (V1-24).

6.2.1.4 Activated Carbon Initial Fill

After hydrotesting of the beds to 60 psig (the same as the main beds) has been completed, the adsorbers are ready to be filled with activated carbon as follows:

1. Close the spent carbon discharge valve on the adsorber (valves V1-15 and V1-16).
2. Connect a temporary carbon/water transfer line (3-inch diameter flexible hose with quick connect fitting) between the adsorber's carbon fill line and the source of the replacement activated carbon.
3. Position the remaining valves on the adsorber to be filled as follows:
   - Open valves V1-9, V1-10, V1-17, and V1-18
   - Close valves V1-1, V1-2, V1-3, V1-4, V1-5, V1-6, V1-7, V1-8, V1-12, V1- 13, V1-14, V1-15, V1-16, V1-19, V1-20, V1-21, V1-22, V1-23, and V1-24
4. Use compressed air at 75 scfm and 15 psig as the motive force to begin the transfer of the carbon/water slurry.

Table 6.1 also includes the valve sequence for carbon/water slurry transfer.

As an alternative to this procedure, replacement carbon can be transferred into the adsorber from bags (i.e., 55 pounds of dry GAC packaged in bags). This can be done as follows:

1. Close all the valves on the adsorber to be filled as follows:
   - For Adsorber T1503, close valves V1-1, V1-3, V1-5, V1-7, V1-9, V1-13, V1-15, V1-17, V1-19, V1-21, and V1-23
   - For Adsorber T1504, close valves V1-2, V1-4, V1-6, V1-8, V1-10, V1-12, V1-14, V1-16, V1-18, V1-20, and V1-24
2. Remove the manway cover located on top of the adsorber to be filled.
3. Manually pour 2,000 pounds of replacement carbon into the adsorber through the manway opening.
4. Replace the manway cover.

After filling (using either alternative), the adsorber will need to be backwashed to displace any entrained air within the activated carbon bed by using the procedure discussed in Section 6.2.2.2.

6.2.2 Operation of the System

6.2.2.1 System Flow Line-Up

The activated carbon adsorbers were designed to operate only in a downflow mode. However, the flow through the adsorbers can be operated at any time with one of the flow combinations as follows:

1. Parallel Flow (Preferred Mode)

   Operating the adsorbers in parallel is advantageous when large flows of wastewater with readily adsorbed organic contaminants are to be treated. Parallel flow in this system can be achieved by opening specific inlet and outlet valves on the two adsorbers as follows:

   - Open valves V1-1, V1-2, V1-5, V1-6, and V1-11.
   - Close valves V1-3, V1-4, V1-7, V1-8, VI-9, and V1-11.

   The valve sequences for parallel flow in the adsorbers are also shown in Table 6.1.

2. Individual Flow

This system was also designed for either adsorber to be operated individually. This operating parameter will allow a single adsorber to remain online while the other adsorber is being serviced. The valve sequence needed to operate either adsorber individually is as follows:

- T1503 individual flow:
  - Open valves V1-1, V1-5, and V1-11
  - Close valves V1-2, V1-3, V1-4, VI-6, V1-7, V1-8, VI-9, and V1-10
- T1504 individual flow:
  - Open valves V1-2, V1-6, and V1-11
  - Close valves V1-1, V1-3, V1-4, VI-5, V1-7, V1-8, VI-9, and V1-10

Table 7.1 also outlines the valve sequences needed to operate either adsorber individually.

6.2.2.2 Backwashing the Activated Carbon Adsorbers

The adsorbers were designed for backwashing to alleviate a potential pressure drop problem that could occur if suspended solids were filtered by the activated carbon.

Manual backwashing of either adsorber is recommended when the operating pressure reaches 60 psig as indicated on the pressure gauge located on the vent line of each adsorber (see DWG. A-7406-03-06). The backwash flow rate should be set at approximately 150 GPM or 12 GPM/ft^2 for a 15-percent bed expansion. A minimum of two empty bed volumes of water (approximately 150 GPM for 7 minutes) should be used from one of the following sources:

1. Plant water at 60 psig introduced through the backwash inlet. The valve sequence needed to backwash either adsorber individually using plant water is as follows:
   - Backwashing Adsorber T1503 using Plant Water:
     - Open valves V1-3 and V1-7
     - Close valves V1-1, V1-5, and V1-9
   - Backwashing Adsorber T1504 using Plant Water:
     - Open valves V1-4 and V1-8
     - Close valves V1-2, V1-6, and V1-1.

   Note: The adsorber not being backwashed can remain operational. (See Section 6.2.2.1 for flow valve sequences).

2. Adsorber effluent (treated water from the adsorber remaining online) at system operating pressure. The valve sequence needed to backwash either adsorber individually using effluent from the online adsorber is as follows:
   - Backwashing Adsorber T1503 with Effluent from Adsorber T1504:
     - Open valves V1-2, V1-3, V1-5, and V1-6
     - Close valves V1-1, V1-4, V1-7, V1-8, V1-9, V1-10, and V1-11
   - Backwashing Adsorber T1504 with Effluent from Adsorber T1504:
     - Open valves V1-1, V1-4, V1-5, and V1-6
     - Close valves V1-2, V1-3, V1-7, V1-8, V1-9, V1-10, and V1-11

Table 6.1 also outlines the valve sequence needed to backwash either adsorber using plant water or adsorber effluent.

6.2.2.3 Spent Carbon Transfer from SAC Beds to Trailer

The following procedures should be followed when transferring spent carbon.

6.2.2.3.1 Spent Carbon Transfer from Beds to Trailer

T1504 Sac Bed

1. Backflush the bed
2. Close the Retention Tank valve
3. Close V1-11
4. Close V1-2
5. Ensure V1-4 is closed
6. Close V1-6
7. Ensure V1-8 is closed
8. Open Vent valve
9. Ensure V-18 is closed
10. Remove blank from bottom valve of the bed
11. Attach a flange with a 2-inch quick-connect valve in place of the removed blank
12. Attach 2-inch hose to suck truck and remove carbon from the T1504 Sac Bed until the bed is empty
13. Open the top manway and pressure rinse the vessel

14. Allow the carbon to settle overnight in the suck truck
15. Place spent carbon in to disposal drums

T1503 Sac Bed

1. Backflush the bed.
2. Close the Retention Tank valve
3. Close V1-11
4. Close V-1-1
5. Ensure V1-3 is closed
6. Ensure V1-5 is closed
7. Ensure V1-7 is closed
8. Open vent valve
9. Ensure V1-17 is closed
10. Remove blank from bottom valve of the bed
11. Attach a flange with a 2-inch quick-connect valve in place of the removed blank
12. Attach 2-inch hose to suck truck and remove carbon from the T1503 Sac Bed until the bed is empty
13. Open the top manway and pressure rinse the vessel
14. Allow the carbon to settle overnight in the suck truck
15. Place spent carbon in to disposal drums

6.2.2.3.2 Pressure Dewatering of Spent Carbon

Dewatering the trailer will be required to remove the gross water weight prior to the spent carbon being transported for off-Site reactivation. Spent carbon leaving the Site should weigh approximately 46,000 pounds. The following procedure is followed by pressure dewatering.

1. Connect a section of 4-inch flexible hose between compressed air line 2-inchCA-5 and trailer fill line T2.
2. Connect a second section of 4-inch flexible hose between trailer dewatering line T5 and direct the opposite end of the hose to the truck blowdown 4-inch BD-1, which drains to a floor drain system from which the water is pumped for reprocessing.
3. Driver will open the trailer dewatering screen valves T18, T19, and T20 to enable drain water to be conveyed via dewatering line T5.

4. Open the plant side air supply valve V15 to admit 15 psig air to trailer. The air admitted to the trailer will begin to displace the free water in the trailer via the dewatering screens and the dewatering line.
5. The trailer is drained of water when air is emitted through the free end of the dewatering hose.
6. Close the Plant air valve V5 to the trailer.
7. Vent the trailer by opening the trailer vent valve T8 on vent line T3 and ensure that the trailer pressure is zero.
8. Disconnect the 4-inch flexible hose from line 2-inch CA-5 after ensuring that trailer pressure is zero. Bleed any line pressure via bleed valve V15A.
9. Disconnect the other end of 4-inch flexible hose from trailer fill line T2.
10. Disconnect the dewatering hose from dewatering line T5.
11. Driver will close fill line valves T11, T12, T13, T14, and dewatering screen valves T18, T19, and T20.
12. Store all hoses within the treatment building.
13. Trailer leaves Site.

6.2.3 General Information

Pressure Relief Valves

Pressure relief valves were placed on the vent lines in order to release any pressure buildup from the top of each adsorber. The pressure relief valves were preset to open when the operating pressure exceeds 75 psig. At no time should either adsorber be operated at pressures greater than 75 psig. If pressure is excessive and causes the pressure relief valve to open, immediately stop the flow to the adsorber in question and release the built-up pressure through the backwash outlet or vent lines. Once the pressure is reduced to below 75 psig, the pressure relief valve will automatically reset to the closed position. Most pressure build-up problems are due to suspended solids that are filtered by the activated carbon and can be eliminated by backwashing the adsorber in question, using the backwash procedure discussed in Section 6.2.2.2.

Gas Build-Up

During normal operation of the system, the possibility exists that gas (for example, from bacteriological action) will evolve and build up in the top of the adsorber. The gas could have a detrimental effect if the volume increases to a point where it could hinder the activated carbon

adsorption process. The gas can be removed by manually opening vents V1-9 and V1-10 until all the gas is displaced.

6.3 Carbon Adsorption System

6.3.1 Start-Up

Starting up the CTS encompasses hydrostatic testing and filling the system with the initial charge of carbon. Hydrostatic testing of the vessels is important prior to filling with carbon since any corrective measures for vessel leaks cannot be readily affected once carbon is in the system. If minor leaks are detected after start-up, they should be noted and corrected.

6.3.1.1 Hydrostatic Testing

Hydrostatic testing is a procedure that is used to determine the ability to sustain operating pressure without uncontrolled discharges of untreated or treated water. Hydrostatic testing should be done during start-up and after any major repairs to the adsorber vessels or piping. The following rules should always be observed during hydrostatic testing:

1. Do not test any portion of the system with compressed air due to the danger of explosive energy being released under a "joint" failure condition
2. Do not perform maintenance or corrective action while system is under pressure
3. Depressurize system to atmospheric pressure before performing maintenance work

6.3.1.2 Fill System with City Water

The entire system must be hydraulically filled to capacity with City water prior to being pressurized. Pressurization of the system will be effected at a pressure of 60 psig in 10-psig increments. All leaks will be logged and corrected. Valves should be opened and closed slowly. Sudden changes in pressure can damage a pipe or cause relief discs to rupture due to water hammer, which can occur if hydraulic pressure is suddenly applied to equipment. When filling the system with water, ensure that air in the piping and tankage can be vented from the highest point in the system. The following procedures should always be followed when filling the system with City water.

6.3.1.2.1 Main Adsorber and Carbon Transfer Piping

1. Connect City water line 2-inchCW-1 via 4-inch hose to carbon fill line 4-inch RC-1.
2. Open valves V124, V117, and V110 to vent Adsorbers A, B, and C.
3. Open V2, V10, V12, V13, and V11.

4. Open V14 to admit City water into adsorbers.
5. The adsorbers are full of water when water is witnessed in the module sight glasses on 3-inch BWR-1, 2, and 3.
6. Close V124, V117, and V110.
7. Observe pressure rise on pressure gauges PI-6, PI-7, and PI-8.
8. Open and close V14 as required to increase pressure incremental stages.
9. If leaks are observed, depressurize the system by venting through V124, V117, and V110.
10. Correct any leaks and repressurize. The type of leak correction would be dependent on the nature of the leak. Leaks can be corrected through coating, welding, installation of new gaskets, etc.
11. Hold 60 psig test pressure for 30 minutes prior to terminating test. Depressurize system but leave City water supply connected to 4-inch RC-1.

6.3.1.2.2 Piping Module and Associated Piping

1. Leave valves V124, V117, and V110 closed.
2. Influent feed to line 3-inch GW-1 should be "OFF" by closing a line block valve upstream of 3-inch GW-1.
3. Open the ¾-inch bleed valve on 3-inchTW-5 to vent air in module piping.
4. Open V122, V115, V108, V118, V111, and V103.
5. Open V106 and V105.
6. Open V14 to admit water to the adsorbers via the carbon fill lines.
7. After a period of time, all piping circuits in the module will be flooded and water will be observed flowing via 3-inch TW-4 to the final outfall. Check final outfall to ensure this flow.
8. Water will also be flowing out of the bleeder valve on 3-inch TW-5. Close this valve at this time.
9. Close V105 to bring module up to pressure in increments as observed on PI-4.
10. Correct any leaks after depressurizing. Depressurizing is accomplished by closing V14 and opening vent valves V124, V117, and V110.
11. Hold module piping at 60 psig before terminating test.

6.3.1.2.3 Air Piping and Regulator Adjustment

1. Open V128 to admit air to PCV-1 and PCV-2.
2. Regulators are factory set, and downstream pressures on PI-2 and PI-3 should read 50 psig and 18 psig, respectively. Adjust regulators to meet these pressures if readings are different from factory setpoints.
3. Open V15 to ensure a free air flow. Close V15 and check for leaks in compressed air lines 2-inch CA-2, 3, 4, and 5.
4. If leaks are present, close V128 and open V128A and ¼ -inch bleeder valves upstream of V127 and V126, then open V15. Ensure that line pressure is 0 psig on PI-1, PI-2, and PI-3.
5. Correct leaks and retest.

6.3.1.3 Draining THE MAIN Adsorbers

Following completion of the hydrostatic test, the adsorbers may be drained if desired. This is readily accomplished by connecting 4-inch SC-1 to 4-inch BD-1 via 4-inch flexible hose.

1. Open vent valves V124, V117, and V110
2. Open V16 on 4-inch BD-1, and then open V1, V7, V8, and V9 to drain adsorbers via the spent carbon lines
3. Rate of draining can be controlled by throttling V16

6.3.1.4 Reactivated Carbon Initial Fill

The main adsorbers will be initially filled with carbon directly from an ASI trailer(s). Subsequent transfers of fresh carbon to the adsorbers will be made in the same manner. The carbon is transferred as a slurry by means of plant air pressure. The trailer is first filled with water to create the slurry. The carbon slurry hose provided with the system is connected to the adsorber fill line and to the trailer outlet line. The trailer is then pressurized to 15 psig utilizing regulated compressed air and the slurry transferred to the vented adsorber. Prior to disconnecting any hoses, the plant air supply is shut off and the transfer line vented to relieve line pressure.

UNDER NO CIRCUMSTANCES SHOULD THE TRAILER BE CONNECTED TO ANY PRESSURE SOURCE GREATER THAN 18 PSIG UNLESS THE MANHOLES ON THE TRAILER ARE OPEN.

Water to fill the trailer will be provided from the City water to truck line 2-inch CW-1. The following procedures should be followed during the initial fill and subsequent transfers.

6.3.1.4.1 Fill Trailer with Water

1. Connect City water line 2-inch CW-1 with 4-inch hose to trailer fill line 1
2. Open trailer manways (by ASI trailer driver)
3. Open trailer fill line valve 16
4. Open valve V14 to admit water (City) to fill trailer
5. 20,000 pounds of carbon will require about 6,000 to 7,000 gallons of water to produce a well slurried product
6. Fill trailer until water level is about 1 to 1.5 feet above carbon level and water level is not receding
7. Close valve V14
8. Bleed line pressure via valve V14A
9. Disconnect 4-inch water hose from trailer and line 2-inch CW-1
10. Close manway hatches on trailer

6.3.1.4.2 Provide Water Cushion in Adsorbers

Prior to transferring carbon to the empty adsorber, it is important to fill the cone section of the vessel with at least 1,000 gallons of water. The volume of water in the carbon vessels can be metered on the analog signet meter. This will cushion the impact of the carbon and prevent direct impingement of the dense slurry on the adsorber lining. Even though the vessels are lined with a thick abrasion resistant coating, this procedure is a good practice.

1. Open adsorber vent valve V124 (Adsorber A) or V117 (Adsorber B) or V110 (Adsorber C) depending on which adsorber is being filled.
2. Connect 2-inch CW-1 to 4-inch SC-1 via 4-inch flexible hose.
3. Open valve V7 (Adsorber A) or V8 (Adsorber B) or V9 (Adsorber C).
4. Open V1 and then V14.
5. Leave V14 open for approximately 15 minutes and then close V7 or V8 or V9 as the case may be.
6. Close V14 and V1 and bleed hose pressure via V14A and V1A.

6.3.1.4.3 Prepare for Transfer

1. Connect one end of the 4-inch carbon slurry transfer hose to trailer discharge line 2 and connect the other end to carbon fill line 4-inch RC-1.
2. Connect one end of the 4-inch utility hose to trailer fill line 2 and connect the other end to compressed air source.
3. Open adsorber main fill line valve V2 (V10 for Adsorber A, V12 and V11 for Adsorber B, and V12 and V13 for Adsorber C).
4. Open valve 128 on the module to direct 100 psig air through regulator PCV-2 and line 2-inch CA-5. Ensure that the downstream pressure as indicated on PI-3 is no greater than 18 psig. If set pressure is greater than 18 psig, then relief valve PSV1 will relieve. Adjust regulator until PI-3 reads just under 18 psig.

6.3.1.4.4 Transfer Fresh Carbon to Main Adsorber(s)

1. Pressurize the trailer to 18 psig by opening the 18 psig module airline valve V102 and V15.
2. Open the trailer outlet valves T19, T20, and T21 individually to empty respective hoppers (this operation to be performed by ASI drivers).
3. Shut the trailer air valve T12 and plant air valve V15 when trailer pressure drops rapidly and the carbon transfer hose is clear of carbon.

6.3.1.4.5 End Transfer

1. Depressurize the trailer by opening vent valve T17 on trailer.
2. Close the main adsorber fill line valve V2 and then close V10 or V12 and V11 or V13.
3. Depressurize the hose on lines 2-inch CA-5 and 4-inchRC-1 between the point where the hoses on these lines connect to trailer. Depressurization is accomplished by opening valves V15A for the air hose and V2A for the carbon hose.

6.3.1.4.6 Use of Water Chase Line 2-inch TW-6

Water chase is used to aid the movement of slurry in the transfer lines by reducing slurry density. Subsequent transfers of carbon to the adsorbers will be under an operating mode that permits use of the water chase line since this line is activated with treated water. To activate the water chase line during fill operations the following sequence is used:

1. Open V102 on the module and then V3 on 2-inchTW-6.

2. Leave V3 open until transfer is complete.
3. Close V3 and V102.

6.4 Spent Carbon Transfer from Main Adsorber(s) to Trailer

The adsorbers are operated in cyclic series mode via: ABC, BCA, CAB, AB, BC, and CA. Carbon in the "lead" adsorber will become spent after time, indicating that the carbon needs to be removed from the adsorber and transferred to the trailer. When carbon is being removed from the "lead" bed, the CTS will operate with the last bed as the lead bed and the reserve bed as the last bed. The following operations will be conducted to transfer spent carbon to the trailer.

1. Connect the 4-inch spent carbon flexible hose to the 4-inch quick disconnect on line 4-inch SC-1 and other end to trailer fill line T2.
2. Open all the top manways on the trailer and open the trailer fill valves T11, T12, T13, and T14 on the trailer fill line T2.
3. Isolate Adsorber A or B or C depending on which adsorber the spent carbon is being removed from.
4. Open V128 to admit 100 psig via 2-inchCA-2 and via regulator PCV-1 to provide 50 psig air as indicated on PI-2.
5. Open V123 (Adsorber A) or V116 (Adsorber B) or V109 (Adsorber C) to admit 50 psig air to pressurize adsorbers. Adsorber pressure can be noted on PI-6 for Adsorber A, PI-7 for Adsorber B, or PI-8 for Adsorber C.
6. Open water chase supply valve V102 followed by V4 for Adsorber A water chase, V5 for Adsorber B water chase, or V6 for Adsorber C water chase.
7. Commence the flow of carbon into 4-inch SC-1 by opening V-7 for Adsorber A or V-8 for Adsorber B or V9 for Adsorber C.
8. Continue transfer operations until the spent carbon sight glasses at the bottom of the respective adsorbers indicate that no more carbon is flowing and continue the water chase until the line 4-inch SC-1 is emitting clear water. Close water chase valve V4, V5, or V6 as appropriate.
9. At this point, open V106 and then V125 for Adsorber A spray nozzle or V119 for Adsorber B spray nozzle or V112 for Adsorber C spray nozzle.
10. Continue washing down the adsorber with spray water until sight glass is clear. Close V4 and V7 for Adsorber A or V5 and V8 for Adsorber B or V6 and V9 for Adsorber C.
11. Close spray water valves V125 (Adsorber A) or V119 (Adsorber B) or V112 (Adsorber C) as appropriate, and then close V106.

12. Use the water chase ports on the other two adsorbers to clean out remaining traces of carbon from the spent carbon discharge line (4-inch SC-1), and then close V102.
13. Vent free air remaining in the adsorbers by partially opening V125 for Adsorber A, V117 for Adsorber B, or V110 for Adsorber C. Also check that the main floor drain valve is open. Free air will be vented via 3-inch DR-1 to the floor drain. The adsorbers should be vented slowly so as not to cause a high vent flow rate to the floor drain. Partially opening the vent valve will be adequate.
14. Close V1 and disconnect the hose between 4-inch SC-1 and trailer fill line T2 after making sure that line pressure has been reduced to zero by bleeding pressure via valve V1A.
15. Close top manways on the trailer.

6.4.1 Pressure Dewatering of Spent Carbon

Dewatering the trailer will be required to remove the gross water weight prior to the spent carbon being transported for off-Site reactivation. Spent carbon leaving the Site should weigh approximately 46,000 pounds. The following procedure is followed for pressure dewatering.

1. Connect a section of 4-inch flexible hose between compressed air line 2-inch CA-5 and trailer fill line T2.
2. Connect a second section of 4-inch flexible hose between trailer dewatering line T5 and direct the opposite end of the hose to the truck blowdown 4-inch BD-1, which drains to a floor drain system from which the water is pumped for reprocessing.
3. Driver will open the trailer dewatering screen valves T18, T19, and T20 to enable drain water to be conveyed via dewatering line T5.
4. Open the plant side air supply valve V15 to admit 15 psig air to trailer. The air admitted to the trailer will begin to displace the free water in the trailer via the dewatering screens and the dewatering line.
5. The trailer is drained of water when air is emitted through the free end of the dewatering hose.
6. Close the Plant air valve V5 to the trailer.
7. Vent the trailer by opening the trailer vent valve T8 on vent line T3 and ensure that the trailer pressure is zero.
8. Disconnect the 4-inch flexible hose from line 2-inch CA-5 after ensuring that trailer pressure is zero. Bleed any line pressure via bleed valve V15A.
9. Disconnect the other end of 4-inch flexible hose from trailer fill line T2.
10. Disconnect the dewatering hose from dewatering line T5.

11. Driver will close fill line valves T11, T12, T13, T14, and dewatering screen valves T18, T19, and T20.
12. Store all hoses within the treatment building.
13. Trailer leaves Site.

6.5 Backwashing Main Beds

The adsorbers were designed for backwashing to alleviate a potential pressure drop problem that could occur if suspended solids were filtered by the activated carbon. The following procedure should be used.

1. Shutdown the process
2. Close all Outlet and Inlet valves at front distributor panel
3. Open Vent valve (A) V-118
4. Open Backwash Line A Bed valve
5. Observe A Bed sight glass until water runs clear
6. Close Backwash Line A Bed valve
7. Close Vent valve (A) V-118
8. Open Vent valve (B) V-124
9. Open Backwash Line B Bed valve
10. Observe B Bed sight glass until water runs clear
11. Close Backwash Line B Bed valve
12. Close vent valve (B) V-124
13. Open vent valve (C) V-117
14. Open Backwash Line C Bed valve
15. Observe C Bed sight glass until water runs clear
16. Close C Bed vent valve V-117
17. Open Outlet and Inlet valves at distributor panel to proper sequence

6.6 Forward Feed Operations

The following description pertains to valve positions required to process water through the main adsorbers in a series down-flow mode.

6.6.1 Operating Mode - Adsorber Sequence A-B-C

Valve Designation	*Status*	*Operating Sequence*
V122	Open	1
V118	Open	2
V111	Open	3
V104	Open	4
V105	Open	5
All Other Valves	Closed	-

6.6.2 Operating Mode - Adsorber Sequence C-B-A

Valve Designation	*Status*	*Operating Sequence*
V115	Open	1
V111	Open	2
V103	Open	3
V120	Open	4
V105	Open	5
All Other Valves	Closed	-

6.6.3 Operating Mode - Adsorber Sequence C-A-B

Valve Designation	*Status*	*Operating Sequence*
V108	Open	1
V103	Open	2
V118	Open	3
V113	Open	4
V105	Open	5
All Other Valves	Closed	-

6.6.4 Operating Mode - Adsorber A Off Line or Reserve with Adsorber B and C Operating in Series

This operating mode is utilized when it is necessary to isolate Adsorber A for:

1. Reserve bed
2. Removal of spent carbon
3. Backwashing the adsorber

Valve Designation	*Status*	*Operating Sequence*
V122	Close	1
V118	Close	-
V115	Open	-

All other valves are as noted in Sections 6.6.1 through 6.6.8.

6.6.5 Operating Mode - Adsorber C Off Line or Reserve with Adsorber A and B Operating in Series

This operating mode is utilized when it is necessary to isolate Adsorber C for:

1. Reserve bed
2. Removal of spent carbon
3. Backwashing the adsorber

Valve Designation	*Status*	*Operating Sequence*
V108	Close	1
V103	Close	2
V122	Open	3

All other valves are as noted in Section Sections 6.6.1 through 6.6.8.

6.6.6 Operating Mode - Backwashing Adsorber A with Adsorber B and C Operating

Backwashing the adsorbers will normally not be required since the well water is filtered prior to application on the carbon beds. The CTS incorporates this provision in the event the filters need to be bypassed for maintenance and/or in the event that reduced flow conditions are experienced as a result of a higher than normal pressure drop across the adsorber. Such pressure drop can be caused by air pockets entrained within the bed or through biological activity that produces solids within the bed. While the aforementioned problems are rarely encountered, it is good practice to have the ability to cope with such contingencies.

When an adsorber is backwashed, the backwash return water will require retreatment for removal of organics and is hence recycled via the floor drain for processing through the system that is operating with two adsorbers.

Water required for backwashing will be provided as treated water from the online adsorbers. The following sequence of operations will be conducted to backwash Adsorber A.

Valve Designation	*Status*	*Operating Sequence*
Refer to Section 8.8.	Take Adsorber A off line	
V106	Open	1
V105	Close	2
V124	Open	3
V121	Open	4

Backwash Adsorber A for 5 to 10 minutes, and then return A to service as follows:

Valve Designation	*Status*	*Operating Sequence*
V106	Close	1
V105	Open	2
V121	Close	3
V124	Close	4
V122	Open	5
V118	Open	6
V115	Close	7
V104	Open	8

6.6.7 Operating Mode - Backwashing Adsorber B with Adsorber C and A Operating

Valve Designation	*Status*	*Operating Sequence*
Refer to Section 8.8.	Take Adsorber B off line	
V106	Open	1
V105	Close	2
V117	Open	3
V114	Open	4

Backwash Adsorber B for 5 to 10 minutes, and then return B to service as follows:

Valve Designation	*Status*	*Operating Sequence*
V106	Close	1
V105	Open	2
V114	Close	3
V117	Close	4
V115	Open	5
V111	Open	6
V108	Close	7
V103	Open	8

6.6.8 Operating Mode - Backwashing Adsorber C with Adsorber A and B Operating

Valve Designation	*Status*	*Operating Sequence*
Refer to T1 Section 8.8	Take Adsorber C off line	
V106	Open	1
V105	Close	2
V110	Open	3
V107	Open	4

Backwash Adsorber C for 5 to 10 minutes, and then return C to service as follows:

Valve Designation	*Status*	*Operating Sequence*
V106	Close	1
V105	Open	2
V107	Close	3
V110	Close	4
V108	Open	5
V103	Open	6
V118	Open	7
V113	Open	8

Section 7.0 Inspections, Maintenance, & Monitoring

The operator is responsible for day-to-day operations of the facility including system monitoring, record keeping, and ensuring that potential problems are attended to with necessary maintenance. Maintenance requirements and intervals are described subsequently in general.

7.1 Routine Operations Inspections/Monitoring

The operator is responsible for day-to-day operations of the facility including system routine, preventive, and required maintenance. These maintenance and monitoring procedures are designed to maintain compliance with the 6NYCRR 373-3.9 Use and Management of Containers and 373-3.10 Tank Systems, Maintenance of the collection and treatment system components will be performed in accordance with the manufacturer's recommendations and standard industrial practice. Monitoring requirements and intervals are described subsequently in general terms.

7.1.1 Daily Inspection/Monitoring

An inspection of system operation will be made on a 7-day per week basis. This will consist of the following during weekdays:

- Site inspection
- HMI data review

The Site inspection will verify the operation of each component of the Collection and APL Treatment System. Specifically, the inspection will include the following:

- A visual check; walk through the entire treatment building and tank farm area; check for leaks from tanks/piping, overflows, malfunctioning equipment, or signs of vandalism. Document visual check and findings on daily inspection sheet
- Inspection of container storage areas
- Check of communication systems for proper operation
- Visual check for fence integrity from appropriate locations within the Site to ensure that no obvious breaches are present that may allow trespassers into the Site

The weekend inspections will consist of a modified version of the components listed above. All findings and/or issues will be documented on the Daily Inspection Sheet presented in Appendix C. Repairs and/or replacements will be performed as necessary.

7.1.2 Weekly Inspection/Monitoring

The following will be performed on a weekly basis:

- Inspection of first aid kits
- Inspection of safety showers/eye wash stations

All findings and/or issues will be documented on the Weekly Inspection Sheet presented in Appendix C.

7.1.3 Monthly Inspections/Monitoring

The following will be performed on a monthly basis:

- Inspection of fire extinguishers
- Check for breakthrough of carbon vent sorb drums (with photoionization detector)
- Inspection of ladders
- Inspection of portable electrical equipment
- Inspection of autodialer - low battery light
- Inspection of exits - free of obstruction
- Inspection of exit/emergency lights
- Inspection of process vessels and tanks for corrosion or leaks

- Inspection of perimeter fence (cursory visual from a distance)
- Inspection of dielectric matting - free from damage, holes, cuts, or deterioration ,or imbedded objects that may affect its insulating properties

Repairs and/or replacements will be performed as necessary. The monthly inspections will be documented on the Monthly Inspection Sheet presented in Appendix C.

The calibration of the effluent pH probe will be checked on a monthly basis. The results of the check will be indicated by a label placed on the equipment and/or recorded on a sheet filed at the Site.

The pressure release valve on the air compressor will be activated monthly to ensure proper operation. The check will be recorded on a log attached to the compressor.

7.1.4 Quarterly Inspections/Monitoring

7.1.4.1 Manholes and NAPL Collectors

A design objective of the IT is to direct NAPL to 35 collection points. Each manhole, lift station, and the main sump act as a collection point. The 35 collection points are listed as follows:

Main Lift Station	MH-49+48
Lift Station #1	MH-53+51
Lift Station #2	MH-56+60
Lift Station #3	MH-57+97
MH-4+20	MH-58+56
MH-5+54	MH-61+20
MH-8+13	MH-64+84
MH-10+75	MH-66+28
MH-12+58	MH-69+97
MH-13+99	MH-71+54
MH-17+20	MH-72+65
MH-19+78	MH-72+96
MH-23+55	MH-74+68
MH-26+55	MH-74+90
MH-33+35	MH-77+39
MH-37+13	MH-77+72
MH-40+70	MH-80+95
MH-43+54	

Visual inspection and monitoring of manholes is conducted quarterly and completed using an interface probe designed for detecting NAPL. The condition of the manhole, presence of chemistry or sediment, water depth, and flow speed are noted. NAPL wells are also inspected for the presence of chemistry. The accumulation of NAPL, if any, will be removed by a portable pump and the amount of removed NAPL will be recorded.

The results of the quarterly manhole and NAPL collectors are documented in the IT System - Manhole and NAPL Collector Quarterly Inspection Form, located in Appendix C.

Should significant sediment accumulation or blockage be identified, cleaning could be accomplished using high pressure water jetting and vacuum trucks. The high pressure water would reach into the longest length of pipe (400 feet) and wash sediment through. This type of cleaning does not require entry to manholes.

7.1.4.2 Vegetated Remediation Area

A visual inspection of the Vegetated Remediation Area is conducted quarterly to determine the presence or absence of various physical attributes. Four distinct areas are addressed, as are other areas which may influence overall IT function.

Paved areas are inspected for surficial cracks or obstructions, while vegetated areas are checked for growth, stress, drainage features, and ponding. The landfill area is inspected for leachate breakthrough, proper drainage, evidence of runoff and erosion, ponding, and the condition of the vegetative cover. Ditches are checked for scouring, sediment buildup, culvert conditions, and evidence overflow. Other areas addressed include obvious surface contamination, accessibility to wells, and fence line integrity.

The growth of grass on the vegetated area is monitored to ensure that excessive growth does not occur. Mowing of the vegetated area is done periodically, as needed, in order to maintain compliance with the City of North Tonawanda bylaws. There is no set schedule for mowing the grass; however, the vegetated area does need to be maintained.

The quarterly vegetated remediation area inspections are documented in the IT System – Panhandle Remediation Area Quarterly Inspection form, which is located in Appendix C.

7.1.4.3 Effluent Flow Meter Calibration

The calibration of the effluent flow meter will be checked on a quarterly basis. The results of the check will be indicated by a label placed on the equipment and/or recorded on a sheet filed at the Site.

7.1.5 Semi-annual Inspections/Monitoring

7.1.5.1 Lift Stations

An inspection of each lift station will be conducted semiannually (spring and fall). This inspection will include:

- Visual inspection of lift station piping
- Verification of level transducer reading
- Inspection of lift station integrity
- Inspection of lift station security

All lift station and manhole inspections discussed above will be documented on the inspection sheet presented in Appendix C.

7.1.5.2 Perimeter Fence

An inspection of the perimeter fence will be conducted semiannually (spring and fall). This inspection will include the following:

- A detailed inspection of the entire fence via a walk around the perimeter to ensure that no breaches are present that may allow trespassers into the Site
- Detailed inspection of all access gates to ensure they are secure

The inspection will be documented on the Semiannual Fence Inspection Sheet presented in Appendix C.

7.1.6 Annual Inspection/Monitoring

7.1.6.1 Level Switch Operation

An inspection of key level switches will be conducted on an annual basis. The inspection will involve activating each switch to ensure that the desired control action will occur. The key level switches that will be inspected are the high level switches in the pump house and treatment building and the high level switches in the retention tanks NAPL decanter dike, and the lift stations.

These inspections will be documented on the Annual Level Switch Inspection Sheet presented in Appendix C.

7.1.6.2 Back Flow Preventer Inspections

An inspection of the backflow preventers will be conducted annually by a certified third party. The third party will submit the completed inspection forms to the NFWB and the operator. The backflow preventers will be repaired or replaced as needed.

7.1.6.3 Sand Filter Inspections

An inspection of the sand filter system will be conducted by the manufacturer on an annual basis. Any required maintenance or repairs will be identified, and performed by either the manufacturer or by Site maintenance personnel under the direction of the manufacturer. A record of the inspection and repairs will be kept on file at the Site and the project files.

7.1.6.4 Signage

Signs and labels on buildings and tanks will be inspected annually. Any signs or labels that have become illegible due to weathering or deterioration will be replaced.

7.1.7 Pumps

Each lift station is equipped with two identical pump units, and a single pump model is used to provide equipment standardization for plant maintenance. At the Main Lift Station, Goulds 3x3-13/10-inch impeller pump units are used. At lift stations #1, 2, and 3, Goulds 3769MT 1.5x2-10W/9-inch impeller pumps are used. Appendix B includes "Goulds Pumps Installation, Operation, and Maintenance Instructions". All units are oil lubricated and require only that oil be visible in the reservoir or oiler. Other preventative and corrective maintenance practices are located in Section IV of the Goulds Pumps Manual located in Appendix B. Should a problem occur, consult Section VII – Troubleshooting in the Goulds Pumps Manual in Appendix B prior to dismantling.

7.2 Environmental Monitoring

Each day an operator is required to verify operation of the components of the collection system. This is intended to verify that the well systems are providing adequate containment and treatment. This may be accomplished through either a visit to the Site or examination of the HMI data through the WAN or dial-up.

Pursuant to Appendix B of the Durez PCJ, groundwater monitoring at the Site is being conducted as part of the plant-wide groundwater remediation program. This monitoring program began on October 2, 1989, prior to the installation of the groundwater remediation

system; the principal component of which is the perimeter groundwater IT. The groundwater monitoring program will include semiannual groundwater levels and annual sampling. The current groundwater monitoring program is presented in Minor Change Number 10, Rev. 2 (September 30, 1999) to Appendix B of the PCJ – Monitoring, Operations, and Maintenance Plan.

7.3 CTS Monitoring

The monitoring program for the CTS consists of monthly, quarterly, semiannual, and annual sampling events. Treated water is sampled at various stages of the CTS. Effluent sampling is conducted in order to comply with the Site's SPDES permit, which allows for treated groundwater to be discharged at Outfall 009, located inside the treatment building. Process monitoring is conducted to evaluate the performance of the treatment system.

Sample locations and monitoring requirements for the CTS are shown on the process schematic on Figure 7.1. A copy of the SPDES Permit is provided in Appendix D.

Samples can be collected from five locations of the CTS per Figure 7.1 as follows:

1. Outfall 016 - influent prior to the sand filters
2. Effluent from sacrificial beds (sac beds)
3. 1st interstage – sample from effluent of lead bed
4. 2nd interstage – sample from effluent of intermediate bed
5. Outfall 009 – at the effluent of the treatment system

The samples from the sac bed effluent, first interstage, and second interstage are collected from Sample Ports 18, 19, and 20. Each sample port is opened using a ball valve. The sample from the sac bed effluent is collected from the sample port on the connection between the feed from the sac beds and the inlet to the lead bed (Sample Port 18). The sample from the first interstage is collected from the sample port on the connection between the outlet from the lead bead and the inlet to intermediate bed (Sample Port 19). The sample from the second interstage is collected from the sample port on the connection between the outlet from the intermediate bed and the inlet to the last bed (Sample Port 20).

The sample from Outfall 009 is collected from a sample port located in a cabinet next to the location of the outfall. The sample from 016 is be collected from a sample port located next to the sample port for Outfall 009. The sample port for 016 is located in a cabinet similar to the Outfall 009 sample port cabinet. A control panel on top of the cabinet is used to direct flow to

the sample port where the sample is collected. The sample is collected using direct fill methods, as water is directed from the sample port into the appropriate sample bottles.

Section 8.0 Troubleshooting Guide

8.1 High Pressure Drop (Adsorbers)

High pressure drop across adsorbers in excess of 10 psig can result in reduced flow, short circuiting, and reduced contactor efficiency.

8.1.1 Probable Cause

1. Excessive accumulation of solids on surface of bed or within bed
2. Improper operation of upstream pretreatment if provided
3. Air entrapment within bed
4. Gas generation within bed as a result of biological activity
5. Faulty gauge reading
6. Malfunction in process valves after the bed
7. Restriction in piping network

8.1.2 Remedial Action

8.1.2.1 Removal of Solids from Bed

Introduce treated water upflow through the bed for 10 minutes. Rate of upflow should be at the maximum rate available. Valve sequencing should be oriented to isolate bed requiring backwashing and directing influent to second and third adsorbers. Length of backwash cycle will require trial and adjustment. Solids laden backwash water should be directed to the filter system.

See Sections 6.2.2.2 and 6.5 for carbon bed backwash procedures.

8.1.2.2 Removal of Air from Bed

Air or gas bubbles between the granules of carbon obstruct the flow of liquid. This may cause high pressure drops and may prevent contact between the liquid stream and the granules, thus reducing the adsorption action.

Bubbles may from in the bed during the filling process or may also form by gas diffusion out of the pores during the wetting process. Gases may also be evolved from the liquid due to chemical reactions occurring while passing through the bed or due to gases coming out of solution.

Gas bubbles trapped between granules may, in some cases, be removed by chemical reaction with the liquid or by being dissolved into the liquid.

Bubbles may also be flushed out of the bed by upflow of liquid at relatively low liquid flow rates when the bed is free to expand. Water passed upward through the bed at about 100 GPM causes slight bed expansion and causes the air bubbles to gradually accumulate into larger bubbles and rise to the surface. This action will disturb the bed as the bubbles rise and will not cause any fluidization or segregation of fines. After about 30 minutes at this flow rate, all visible bubbles will be worked out of the bed.

8.1.2.3 Faulty Gauge Reading

Replace gauge and note if new gauge reading is at variance with previous pressure gauge reading.

8.1.2.4 Restrictions in Piping

Follow flow path network and open and close valves to see whether valves operate freely and whether valve action produces the desired pressure reaction, as monitored by observing gauge readings.

8.2 Low Pressure (Adsorbers)

Low pressure conditions will cause improper CTS flow output causing feed tank level to rise and the system to ultimately shut down.

8.2.1 Probable Cause

1. Feed pumps not operating properly and developing required head
2. Pumps operating under starved suction condition
3. Rupture disk failure on one or more adsorbers

8.2.2 Remedial Action

1. Replace rupture disk

2. Check for restrictions in pump suction

8.3 Carbon Transfer Lines/Hoses Plugged

8.3.1 Probable Cause

1. Inadequate water to slurry carbon
2. Water chase lines not activated
3. Inadequate air pressure to move slurry
4. Back pressure being created on receiving vessel causing slurry flow to stop
5. Valve not open fully causing slurry to dewater

8.3.2 Remedial Action

1. Ensure that the carbon is very well slurried prior to transfer. Ensure that there are at least 2 to 3 feet of standing free water above the carbon bed in the trailer prior to transfer.
2. Ensure that all product discharge valves on the trailer are fully open during use. A partially open valve will cause more water to discharge than carbon and eventually dewater the trailer causing line plugging.
3. Ensure that the receiving vessel is vented to the atmosphere and that no back pressure is placed on the receiving vessel. Back pressure will slow the slurry transfer rate and could cause dewatering of the slurry in the transfer lines.
4. Ensure that the water chase lines are activated to assist the slurry movement through the pipelines.
5. Compressed air at the right pressure and volume must be utilized for transfers (18 psig - 100 scfm) for the trailer and (50 psig-100 scfm) for the tankage.
6. Plugged lines can be freed by admitting utility water to dilute the carbon slurry until flow is established – ¾-inch flush connections are strategically located on all transfer lines.

Section 9.0 Reports

Discharge monitoring reports are submitted to the NYSDEC per the schedule in the SPDES Permit presented in Appendix D.

A Semiannual report is submitted to the NYSDEC 6 weeks following the March sampling event. The letter report presents the results of the March hydraulic monitoring event

A Site Management Periodic Review Report is submitted to the NYSDEC on an annual basis by March 31 every year, or by the date set by the NYSDEC. The report evaluates the performance of the IT in achieving remedial objectives.

Section 10.0 Personnel

10.1 Staffing Requirements

The Durez North Tonawanda Collection and Treatment Systems are designed to operate with minimal staffing. The Site is designed to operate unattended with the exception of routine inspections, maintenance activities, and response to alarms by the on-call operator.

10.2 Training

10.2.1 Detailed Job Training

The on-the-job training required for a Durez North Tonawanda Operator includes:

a. Review of other environmental and safety regulations applicable to operation of the IT and CTS
b. Detailed study and understanding of the "Durez North Tonawanda APL Treatment System Manual"
c. Satisfactory performance of all required record keeping
d. Demonstration of proficiency with Durez North Tonawanda operating procedures

10.2.2 Training Documentation

Upon completion of training to operate the facility, the Operator will be required to complete a test to document his/her understanding of Site operations. Successful completion of the test is required. Completed tests will be kept on file at the Site.

Section 11.0 Records

11.1 Operating Inspection

Operations inspection sheets are filed in the Durez North Tonawanda Control Room. Examples of the sheets are presented in Appendix C. These inspection sheets will be scanned monthly and saved electronically (e.g., as Adobe® Acrobat® files) at CRA's Niagara Falls office. Operations logbooks are used to record activities performed while on Site. Active logbooks are stored in the Durez North Tonawanda Control Room. Maintenance activities performed while on Site are recorded in a maintenance computer program database.

11.2 Maintenance/Calibration

Maintenance and calibration records for each piece of equipment are filed in the Durez North Tonawanda Control Room. Calibration labels are placed on equipment indicating the last date of calibration if applicable.

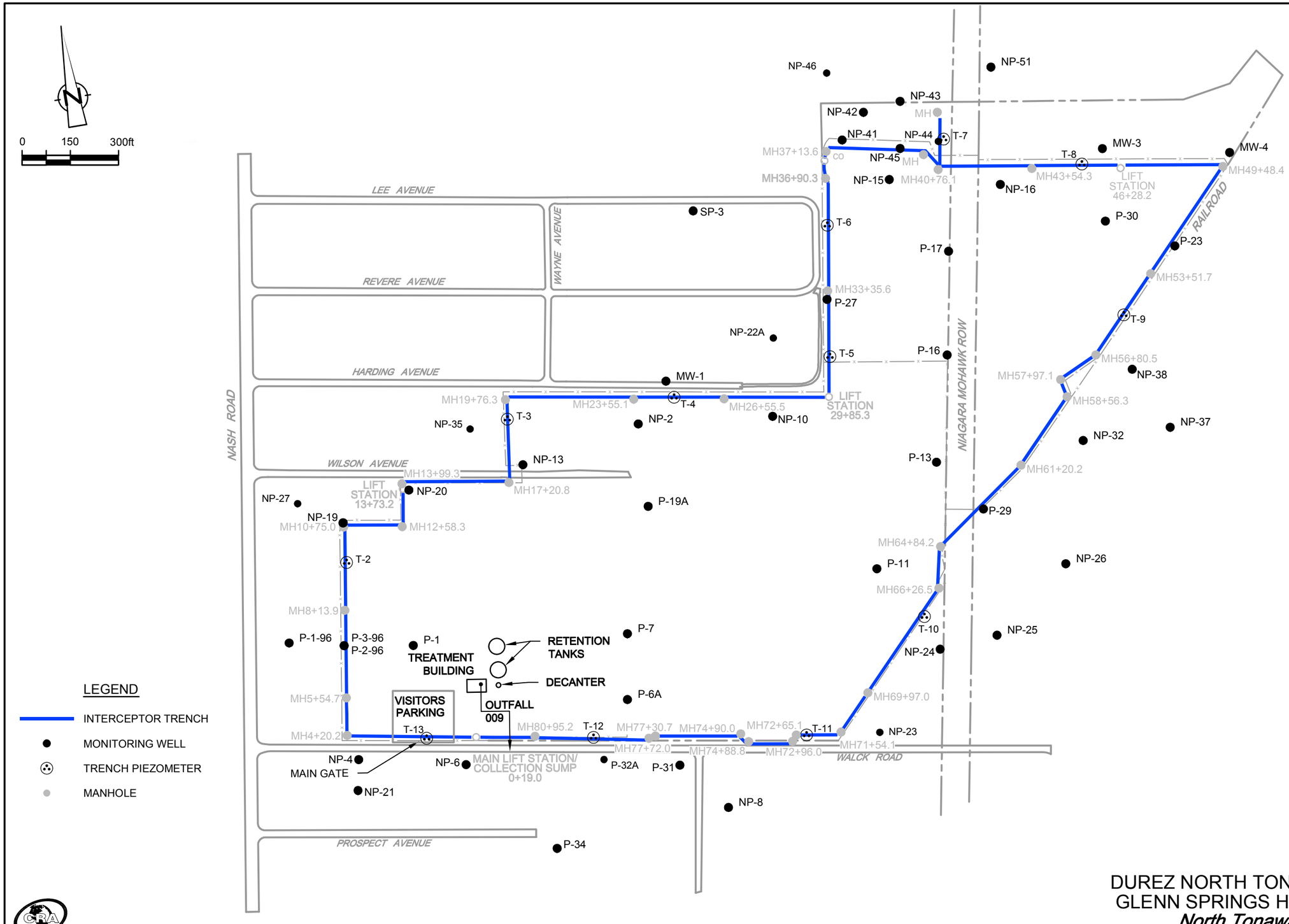
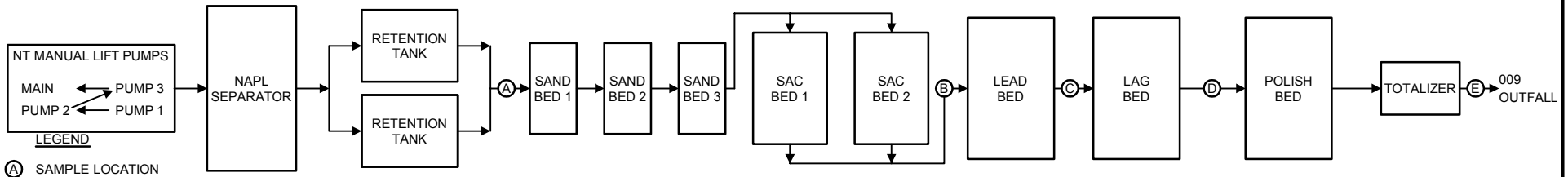


figure 1.1

SITE PLAN
DUREZ NORTH TONAWANDA SITE
GLENN SPRINGS HOLDINGS, INC.
North Tonawanda, New York



Ⓐ SAMPLE LOCATION

Frequency	Sample Location	Sample type	Sampler	Laboratory, T/A	Analyses	Sample Method	Driver	Permit/Action Levels
Continuous	E - 009 Outfall	NA	Operator	NA	NA	1	SPDES Permit	Flow
	E - 009 Outfall	NA	Operator	NA	NA	2	SPDES Permit	pH
Monthly (Third Week)	B - Sac Effluent	Grab	Operator	TA-Pitts (phenols)/Test America 1-week	VOCs, Phenols	2	OM&M	Process Information
	C - 1st interstage	Grab	Operator	TA-Pitts (phenols)/Test America 1-week	VOCs, Phenols	2	OM&M	Process Information
	D - 2nd interstage	Grab	Operator	TA-Pitts (phenols)/Test America 1-week	VOCs, Phenols	2	OM&M	Process Information
	E - 009 Outfall	Grab/Comp	Operator	TA-Pitts (phenols)/Test America STD	Monthly Analytes	3	SPDES Permit	Permit (1)*
Quarterly (2009 and 2014) (coincide with Monthly)	E - 009 Outfall	Grab/Comp	Operator	New England Bioassay, Manchester, CT STD	West Testing	3	SPDES Permit	Permit (2)*
Semi-Annual (coincide with Monthly)	E - 009 Outfall	Grab/Comp	Operator	TA-Pitts (phenols)/Test America STD TA Sacramento (furans) STD	Semi-Annual Analytes	3	SPDES Permit	Permit (3)*
	A - 016 Influent	Grab	Operator	TA-Pitts (phenols)/Test America STD	Semi-Annual Analytes	2	SPDES Permit	Permit (4)*
Annual (coincide with Monthly)	E - 009 Outfall	Grab/Comp	Operator	TA-Pitts (phenols)/Test America STD	Annual Analytes	3	SPDES Permit	Permit (5)*
	A - 016 Influent	Grab	Operator	TA-Pitts (phenols)/Test America STD	Semi-Annual Analytes	2	SPDES Permit	Permit (4)*

Notes:

- 016 Influent (location A) is collected from a sample port located next to sample port for 009.
- Sac Bed Effluent (location B) is collected from Sample Port 18.
- 1st Interstage (location C) is collected from Sample Port 19.
- 2nd Interstage (location D) is collected from Sample Port 20.
- 009 Outfall (location E) is collected from a sample port located in a cabinet next to the location of the outfall.

1. Totalizer
2. Grab sample
3. 24-Hour composite

* Upon receipt by permittee of any monitoring results in excess of the Action Level, a short-term high intensity monitoring program for the parameter will be undertaken. Samples identical to those required for routine monitoring purposes shall be taken on each of at least three consecutive operating and discharging days and analyzed. Results shall be expressed in terms of both concentration and mass, and shall be submitted no later than the end of the third month following the month when the additional monitoring requirement was triggered.

A short-term high intensity monitoring program will also be undertaken if upon receipt by the permittee any monitoring results show the stated Action Level exceeded for four of six consecutive samples, or for two of six consecutive samples by 20% or more, or for any one sample by 50% or more.

Permit (1) - Monthly Analytes and Permit Maxes.
MCTs, Benzene, Chlorobenzene, Trichlorobenzenes, Dichlorobenzenes, Chlorotoluenes, Toluene, Hexachlorobenzene, Mercury, Phenols, TSS

Permit Limits - TSS - 20 mg/L, Benzene - 5 ug/L, Chlorobenzene - 10 ug/L, DCBs - 30 ug/L, HCB - 0.2 ug/L, MCTs - 10 ug/L, Chlorotoluenes - 10 ug/L, Toluene - 5 ug/L, TCBs - 10 ug/L, phenols - 100 ug/L, Mercury - 200 ng/L

Process Information - VOCs and phenols

Permit (2) - Quarterly Analytes and Maxes
Whole Effluent Toxicity Testing

Permit Limits - Chronic Invertebrate - 101 TUc, Chronic Vertebrate - 101 TUc
Acute Invertebrate - 153 TUc, Acute Vertebrate - 153 TUc

Permit (3) - Semi-annual Analytes and Maxes
Monthly plus furans, cyanide, PPL VOCs, PPL SVOCs (plus), PPL pesticides/PCBs, PPL metals

Permit (4) - Semi-annual Analytes and Maxes (016)
PPL VOCs, PPL SVOCs (plus), PPL pesticides/PCBs, PPL metals, phenols, cyanide

Permit (5) - Annual Analytes and Maxes
Monthly plus cyanide, PPL VOCs, PPL SVOCs (plus), PPL pesticides/PCBs, PPL metals

Permit Limits (In addition to monthly)
Benzo(a)pyrene - 0.09 ug/L, 4,4'-DDT - 0.05 ug/L, Chloroform - 0.2 ug/l, BEHP - 20 ug/L, Cyanide - 60 ug/L
0.4 ug/L - Bromodichloromethane, Dibromochloromethane, Pentachlorobenzene, Cadmium
0.8 ug/L - Fluoranthene, Silver
1 ug/L - Pyrene, Styrene, Di-n-butylphthalate, 2,4-DimethylPhenol, Hexachlorobutadiene
2-Chlorophenol, Hexachlorobutadiene
2 ug/L - Pentachlorophenol, 2,4,6-Trichlorophenol
3 ug/L - Anthracene
4 ug/L - Arsenic, Chromium, Copper, Nickel, Lead
5 ug/L - Ethylbenzene
6 ug/L - Naphthalene
10 ug/L - trans-1,2 DCE, MeCl2, PCE, TCE, TCFM, 2,4,5-TCP, Tetrachlorobenzenes, Antimony
Tetra-chlorodibenzofurans $10x10^{-6}$ ug/L
Penta-, hexa-, and hepta- chlorodibenzofurans $50x50^{-6}$ ug/L
Octo-chlorodibenzofuran- $100x10^{-6}$ ug/L

figure 7.1

PROCESS SAMPLING SCHEMATIC
DUREZ NORTH TONAWANDA SITE
GLENN SPRINGS HOLDINGS, INC.
North Tonawanda, New York

TABLE 1.1

SITE CONTACT LIST
OPERATION AND MAINTENANCE MANUAL
GLENN SPRINGS HOLDINGS, INC.
DUREZ NORTH TONAWANDA FACILITY
NORTH TONAWANDA, NEW YORK

Joseph Branch (GSH)
Western New York Project Manager (WNYPM)
Cell: 231-670-6809

Clinton Babcock (GSH)
Western New York Operation Coordinator (WNYOC)
972-687-7506; Cell: 859-421-4233

John Pentilchuk (Conestoga-Rovers & Associates [CRA])
Project Manager, reports to WNYPM
519-884-0510; Cell: 519-572-5644

Dennis Hoyt (CRA)
Project Coordinator, reports to WNYPM
716-297-6150; Cell: 716-345-1978

Darrell Crockett (CRA)
Site Coordinator, reports to PM and Project Coordinator
Cell: 716-998-5804

TABLE 6.1

DUREZ NORTH TONAWANDA TREATMENT FACILITY
SACRIFICIAL CARBON ADSORBER BED VALVE FLOW SEQUENCES
NORTH TONAWANDA, NEW YORK

Activated Carbon Adsorption System: Parallel and Individual Flow Sequences for Sac Beds

A. T-1503, T-1504 in Parallel Flow

1. Open Valves	V1-1, V1-2, V1-5, V1-6, and V1-11
2. Close Valves	V1-3, V1-4, V1-7, V1-8, V1-9, and V1-10

B. T-1503 Individual Flow

1. Open Valves	V1-1, V1-5, and V1-11
2. Close Valves	V1-2, V1-3, V1-4, V1-6, V1-7, V1-8, V1-9, and V1-10

B. T-1503 Individual Flow

1. Open Valves	V1-1, V1-6, and V1-11
2. Close Valves	V1-2, V1-3, V1-4, V1-5, V1-7, V1-8, V1-9, and V1-10

Activated Carbon Adsorption System: Backwashing Valve Sequences Using Plant Water

A. Backwashing Adsorber T-1503

1. Open Valves	V1-3 and V1-7
2. Close Valves	V1-5, V1-5, and V1-9

B. Backwashing Adsorber T-1504

1. Open Valves	V1-4 and V1-8
2. Close Valves	V1-2, V1-6, and V1-10

Note: The adsorber not being backwashed can remain operational.

TABLE 6.1

DUREZ NORTH TONAWANDA TREATMENT FACILITY
SACRIFICIAL CARBON ADSORBER BED VALVE FLOW SEQUENCES
NORTH TONAWANDA, NEW YORK

Activated Carbon Adsorption System: Backwashing Valve Sequences Using Effluent from the On-Line Adsorber

A. Backwashing Adsorber T-1503 with Effluent from Adsorber T-1504

1. Open Valves	V1-2, V1-3, V1-5, and V1-6
2. Close Valves	V1-1, V1-4, V1-7, V1-8, V1-9, V1-10, and V1-11

B. Backwashing Adsorber T-1504 with Effluent from Adsorber T-1503

1. Open Valves	V1-1, V1-4, V1-5, and V1-6
2. Close Valves	V1-2, V1-3, V1-7, V1-8, V1-9, V1-10, and V1-11

Activated Carbon Adsorption System: Initial Carbon Fill Valve Sequences

A. Alternative One: Carbon/Water Slurry Transfer

1. Open Valves	V1-9, V1-10, V1-17, and V1-18
2. Close Valves	V1-1, V1-2, V1-3, V1-4, V1-5, V1-6, V1-7, V1-8, V1-12, V1-13, V1-14, V1-15, V1-16, V1-19, V1-20, V1-21, V1-22, V1-23, V1-24

B. Alternative Two: Manual Fill with Dry Replacement Carbon

1. For Adsorber T-1503

Close Valves	V1-1, V1-3, V1-5, V1-7, V1-9, V1-13, V1-15, V1-17, V1-19, V1-21, and V1-23

1. For Adsorber T-1504

Close Valves	V1-2, V1-4, V1-6, V1-8, V1-10, V1-12, V1-14, V1-16, V1-18, V1-20, V1-22, and V1-24.

Appendix A

Piping and Instrumentation Diagrams

DRAWING INDEX

DWG. Nº	REV. Nº	DATE	TITLE
FLOW SHEETS			
A-07406-03-00	-	3/09	ENGINEERING FLOW SHEET LEGEND
A-07406-03-01	2	3/11	LIFT STATIONS ENGINEERING FLOW SHEET
A-07406-03-03	2	3/11	DECANTER ENGINEERING FLOW SHEET
A-07406-03-04	2	3/11	RETENTION ENGINEERING FLOW SHEET
A-07406-03-05	2	3/11	FILTRATION SYSTEM ENGINEERING FLOW SHEET
A-07406-03-06	2	3/11	SAC CARBON BED ENGINEERING FLOW SHEET
A-07406-03-07	2	3/11	MAIN CARBON BEDS ENGINEERING FLOW SHEET
A-07406-03-08	2	3/11	AIR, GAS, WATER SYSTEMS ENGINEERING FLOW SHEET

OCCIDENTAL CHEMICAL CORP.
NORTH TONAWANDA, NEW YORK

DUREZ REMEDIAL SITE (AS BUILTS)

07406-03(020)

CONESTOGA-ROVERS & ASSOCIATES

PROCESS / INSTRUMENT LINES

- MAIN PROCESS LINE
- SECONDARY PROCESS LINE
- UNDEFINED SIGNAL
- PNEUMATIC SIGNAL
- ELECTRICAL SIGNAL
- CAPILLARY TUBE, FILLED SYSTEM
- ELECTROMAGNETIC OR SONIC SIGNAL (GUIDED)
- ELECTROMAGNETIC OR SONIC SIGNAL (NOT GUIDED)
- INTERNAL SYSTEM LINK
- HYDRAULIC SIGNAL
- MECHANICAL LINK
- ELECTRICAL BINARY SIGNAL
- TO / FROM / SHEET No. — OFF PAGE CONNECTOR
- UTILITY — UTILITY IN/OUT
- I 2 — HARDWIRED INTERLOCK LOGIC (-1,2,3...IS OPTIONAL REFERENCE TO INTERLOCK DETAIL DESCRIPTION)

VALVE SYMBOLS

- BA- " — BALL VALVE
- BU- " — BUTTERFLY VALVE
- CH- " — CHECK VALVE
- GA- " — GATE VALVE
- GL- " — GLOBE VALVE
- A B C — THREE WAY VALVE (FAIL OPEN TO PATH A-C)
- A B C D — FOUR WAY VALVE (FAIL OPEN TO PATH A-C AND D-B)
- DAMPER OR LOUVER

GENERAL INSTRUMENT SYMBOLS

- LOCALLY MOUNTED INSTRUMENTS
- PRIMARY PANEL MOUNTED INSTRUMENTS
- IPx — AUXILARY PANEL MOUNTED INSTRUMENTS WHERE x = PANEL No. WHEN MORE THAN ONE PANEL IS PRESENT
- BEHIND BOARD MOUNTED INSTRUMENTS
- INSTRUMENTS SHARING COMMON HOUSING
- IN LINE INSTRUMENTS AS INDENTIFIED
- XY — SIGNAL CONVERTER (INPUT/OUTPUT)
  E - VOLTAGE P - PNEUMATIC
  I - CURRENT B - BINARY (MODBUS, R5232...)
- COLOR — PILOT LIGHT
  A = AMBERG = GREEN W = WHITE
  B = BLUE R = RED Y = YELLOW
  C = CLEAR

DISTRIBUTED CONTROL / SHARED DISPLAY INSTRUMENTS

- INDICATOR/CONTROLLER/RECORDER OR ALARM POINTS - USUALLY USED TO INDICATE VIDEO DISPLAY (DCS OR HMI CONFIGURATIONS)
  * NORMALLY ACCESSIBLE TO OPERATOR
- NORMALLY BLIND OPERATION
  * NOT NORMALLY ACCESSIBLE TO OPERATOR
- DISTRIBUTED CONTROL INTERCONNECTING LOGIC CONTROLLER OR PLC WITH BINARY OR SEQUENTIAL LOGIC FUNCTIONS.
  * NORMALLY ACCESSIBLE TO OPERATOR
- NORMALLY BLIND OPERATION
  * NOT NORMALLY ACCESSIBLE TO OPERATOR
- I-10 / I X — INTERLOCK LOGIC IN CONTROLLER OR PLC WHERE
  I = 1,2,3,.....IS OPTIONAL REFERENCE TO INTERLOCK DETAIL DESCRIPTION

PRIMARY ELEMENT SYMBOLS

- FI — VARIABLE AREA FLOWMETER
- PI — DIAPHRAM SEAL WITH PRESSURE LEAD LINE
- PI — DIAPHRAM SEAL (LINE-MOUNTED)
- TE RTD — TEMPERATURE ELEMENT WITH THERMOWELL (OPTIONAL ELEMENT DESCRIPTION RTD, TYPE K...)
- FG — FLOW SIGHT GLASS (LG - LEVEL SIGHT GLASS, SG - GENERAL SIGHT GLASS)
- LEVEL DEVICE, FLOAT TYPE

ACTUATOR SYMBOLS

- DIAPHRAM ACTUATOR
- CYLINDER ACTUATOR
- M — ROTARY MOTOR ACTUATOR
- S — SOLENOID ACTUATOR
- HAND ACTUATOR OR HANDWHEEL
- D — AIR ACTUATED VALVE W/POSITIONER OPTIONAL:
  D - DIRECT ACTING POSITIONER
  R - REVERSE ACTING POSITIONER

VALVE FAIL SYMBOLS
FO - FAIL OPEN
FC - FAIL CLOSED
FL - FAIL LOCKED (LAST POSITION)
FI - FAIL INDETERMINATE

- FC
- ZSL — LIMIT SWITCH ACTIVATED WHEN VALVE CLOSED (ZSH ACTIVATED WHEN VALVE OPEN)

SELF-ACTUATED REGULATORS, VALVES, AND OTHER DEVICES

- RUPTURE DISC FOR PRESSURE RELIEF
- RUPTURE DISC FOR VACUUM RELIEF
- PRESSURE RELIEF VALVE
- VACUUM RELIEF VALVE
- PRESSURE REDUCING REGULATOR (SELF CONTAINED)
- BACKPRESSURE REGULATOR (SELF CONTAINED)
- LEVEL REGULATOR WITH MECHANICAL LINKAGE
- V P — CONSERVATION VENT
- XF — FLAME ARRESTOR

ABBREVIATIONS:

POWER SUPPLY OR PURGE FLUID TYPES

AS - AIR SUPPLY	HS - HYDRAULIC SUPPLY
IA - INSTRUMENT AIR	NS - NITROGEN SUPPLY
PA - PLANT AIR	SS - STEAM SUPPLY
ES - ELECTRICAL SUPPLY	WS - WATER SUPPLY
GS - GAS SUPPLY	

THE SUPPLY LEVEL MAY BE ADDED TO THE INSTRUMENT SUPPLY LINE, E.G., AG-100, A 100-PSI AIR SUPPLY; ES-24DC, A 24-VOLT DIRECT CURRENT POWER SUPPLY.

INSTRUMENTS:

HOA - HAND/OFF/AUTO	NC - NORMALLY CLOSED
LOR - LOCAL/OFF/REMOTE	NO - NORMALLY OPEN
OPN - OPEN	ST - START / ENABLE
CLS - CLOSE	SP - STOP / DISABLE
STPT - SETPOINT	

INSTRUMENT / PROCESS LINES DESIGNATIONS

000	UNDERGROUND INSTRUMENTS	CS	CARBON STEEL PIPE
100	PROCESS INSTRUMENTS	CSVD	CARBON STEEL VENT DUCT (12 GAUGE)
200	VENDOR SUPPLIED INSTRUMENTS	DVW	DRAIN VENT WASTE PIPE
300	UTILITY INSTRUMENTS	HDPE	HIGH DENSITY POLYETHYLENE PIPE
		KYA	KYNAR
0000	UNDERGROUND LINES	PDE	CPVC, SOLID
1000	PROCESS LINES	PVC	POLYVINYL CHLORIDE PIPE SCHEDULE 40
2000	VENDOR SUPPLIED LINES	PVE	POLYVINYL CHLORIDE PIPE SCHEDULE 80
3000	UTILITY LINES	PPL	POLYPROPYLENE LINED/LINED DUCTILE PIPE
		SS	STAINLESS STEEL
B	BARE	TFD	TEFLON
I	INSULATED		
J	JACKETED AND INSULATED		
TE	ELECTRICALLY TRACED AND INSULATED		

MISCELLANEOUS SYMBOLS

- REDUCER
- FLEXIBLE PIPE
- EXPANSION JOINT
- BLIND FLANGE
- HOSE CONNECTION
- SCREWED CAP, CLEANOUT
- MALE PIPE PLUG
- Y-LINE STRAINER
- SPECIFICATION CHANGE
- FUNNEL DRAIN
- STATIC MIXER
- FILTER/REGULATOR/LUBRICATOR
- ANNUNCIATOR HORN
- FILTER/REGULATOR
- X" — EQUIPMENT INSULATED WITH X" OF INSULATION
- R — RESET FOR LATCH-TYPE ACTUATOR
- VENT — OPEN VENT TO ATMOSPHERE
- PIPE UNION
- RESTRICTION ORIFICE
- AIR EJECTOR
- T — TRAP
- T — PULSATION DAMPER
- BB — BLOCK & BLEED ASSEMBLY
- TP 1 — TIE POINT TO EXISTING SYSTEM
- DRAIN (FLOOR, SEWER, ETC.)
- FLOW STRAIGHTENING VANE
- SP 4 — SPECIALITY PART
- AV — AIR VENT, AUTOMATIC
- SLUICE GATES

TYPICAL IS A LETTER COMBINATIONS

First-Letters	Initiating or Measured Variable	Controllers: Recording	Controllers: Indicating	Controllers: Blind	Controllers: Self-Actuated Control Valves	Readout Devices: Recording	Readout Devices: Indicating	Switches and Alarm Devices *: High **	Switches and Alarm Devices *: Low	Switches and Alarm Devices *: Comb	Transmitters: Recording	Transmitters: Indicating	Transmitters: Blind	Solenoids, Relays, Computing Devices	Primary Element	Test Point	Well or Probe	Viewing Device, Glass	Safety Device	Final Element
A	Analysis	ARC	AIC	AC		AR	AI	ASH	ASL	ASHL	ART	AIT	AT	AY	AE	AP	AW			AV
B	Burner/Combustion	BRC	BIC	BC		BR	BI	BSH	BSL	BSHL	BRT	BIT	BT	BY	BE		BW	BG		BZ
C	User's Choice																			
D	User's Choice																			
E	Voltage	ERC	EIC	EC		ER	EI	ESH	ESL	ESHL	ERT	EIT	ET	EY	EE					EZ
F	Flow Rate	FRC	FIC	FC	FCV, FICV	FR	FI	FSH	FSL	FSHL	FRT	FIT	FT	FY	FE	FP		FG		FV
FQ	Flow Quantity	FQRC	FQIC			FQR	FQI	FQSH	FQSL			FQIT	FQT	FQY	FQE					FQV
FF	Flow Ratio	FFRC	FFIC	FFC		FFR	FFI	FFSH	FFSL						FE					FFV
G	User's Choice																			
H	Hand		HIC	HC						HS										HV
I	Current	IRC	IIC			IR	II	ISH	ISL	ISHL	IRT	IIT	IT	IY	IE					IZ
J	Power	JRC	JIC			JR	JI	JSH	JSL	JSHL	JRT	JIT	JT	JY	JE					JV
K	Time	KRC	KIC	KC	KCV	KR	KI	KSH	KSL	KSHL	KRT	KIT	KT	KY	KE					KV
L	Level	LRC	LIC	LC	LCV	LR	LI	LSH	LSL	LSHL	LRT	LIT	LT	LY	LE		LW	LG		LV
M	User's Choice																			
N	User's Choice																			
O	User's Choice																			
P	Pressure/Vacuum	PRC	PIC	PC	PCV	PR	PI	PSH	PSL	PSHL	PRT	PIT	PT	PY	PE	PP			PSV, PSE	PV
PD	Pressure, Differential	PDRC	PDIC	PDC	PDCV	PDR	PDI	PDSH	PDSL		PDRT	PDIT	PDT	PDY	PE	PP				PDV
Q	Quantity	QRC	QIC			QR	QI	QSH	QSL	QSHL	QRT	QIT	QT	QY	QE					QZ
R	Radiation	RRC	RIC	RC		RR	RI	RSH	RSL	RSHL	RRT	RIT	RT	RY	RE		RW			RZ
S	Speed/Frequency	SRC	SIC	SC	SCV	SR	SI	SSH	SSL	SSHL	SRT	SIT	ST	SY	SE					SV
T	Temperature	TRC	TIC	TC	TCV	TR	TI	TSH	TSL	TSHL	TRT	TIT	TT	TY	TE	TP	TW		TSE	TV
TD	Temperature, Differential	TDRC	TDIC	TDC	TDCV	TDR	TDI	TDSH	TDSL		TDRT	TDIT	TDT	TDY	TE	TP	TW			TDV
U	Multivariable					UR	UI							UY						UV
V	Vibration/Machinery Analysis					VR	VI	VSH	VSL	VSHL	VRT	VIT	VT	VY	VE					VZ
W	Weight/Force	WRC	WIC	WC	WCV	WR	WI	WSH	WSL	WSHL	WRT	WIT	WT	WY	WE					WZ
WD	Weight/Force, Differential	WDRC	WDIC	WDC	WDCV	WDR	WDI	WDSH	WDSL		WDRT	WDIT	WDT	WDY	WE					WDZ
X	Unclassified																			
Y	Event/State/Presence		YIC	YC		YR	YI	YSH	YSL				YT	YY	YE					YZ
Z	Position/Dimension	ZRC	ZIC	ZC	ZCV	ZR	ZI	ZSH	ZSL	ZSHL	ZRT	ZIT	ZT	ZY	ZE					ZV
ZD	Gauging/Deviation	ZDRC	ZDIC	ZDC	ZDCV	ZDR	ZDI	ZDSH	ZDSL		ZDRT	ZDIT	ZDT	ZDY	ZDE					ZDV

NOTE: THIS TABLE IS NOT ALL-INCLUSIVE.
* A, ALARM, THE ANNUNCIATING DEVICE, MAY BE USED IN THE SAME FASHION AS S, SWITCH, THE ACTUATING DEVICE.
** THE LETTERS H AND L MAY BE OMITTED IN THE UNDEFINED CASE.

OTHER POSSIBLE COMBINATIONS:
FO (RESTRICTION ORIFICE)
FRK, HIK (CONTROL STATIONS)
LLH (LEVEL LIGHT HIGH
LCH (LEVEL CONTROL HIGH)
KQI (RUNNING TIME INDICATOR)
HMS (HAND MOMENTARY SWITCH)
LCL (LEVEL CONTROL LOW)

IDENTIFICATION LETTERS

	FIRST-LETTER: MEASURED OR INITIATING VARIABLE	FIRST-LETTER: MODIFIER	SUCCEEDING-LETTERS: READOUT OR PASSIVE FUNCTION	SUCCEEDING-LETTERS: OUTPUT FUNCTION	SUCCEEDING-LETTERS: MODIFIER
A	Analysis		Alarm		
B	Burner/Combustion		User's Choice	User's Choice	User's Choice
C	User's Choice			Control	
D	User's Choice	Differential			
E	Voltage		Sensor (Primary Element)		
F	Flow Rate	Ratio (Fraction)			
G	User's Choice		Glass, Viewing Device		
H	Hand				High
I	Current (Electrical)		Indicate		
J	Power	Scan			
K	Time, Time Schedule	Time Rate of Change		Control Station	
L	Level		Light		Low
M	User's Choice	Momentary			Middle, Intermediate
N	User's Choice		User's Choice	User's Choice	User's Choice
O	User's Choice		Orifice, Restriction		
P	Pressure, Vacuum		Point (Test) Connection		
Q	Quantity	Integrate, Totalize			
R	Radiation		Record		
S	Speed, Frequency	Safety		Switch	
T	Temperature			Transmit	
U	Multivariable		Multifunction	Multifunction	Multifunction
V	Vibration, Machinery Analysis			Valve, Damper, Louver	
W	Weight, Force		Well		
X	Unclassified	X Axis	Unclassified	Unclassified	Unclassified
Y	Event, State, or Presence	Y Axis		Relay, Compute, Convert	
Z	Position, Dimension	Z Axis		Driver, Actuator, Unclassified Final Control Element	

SCALE VERIFICATION: THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

No	Revision	Date	Initial

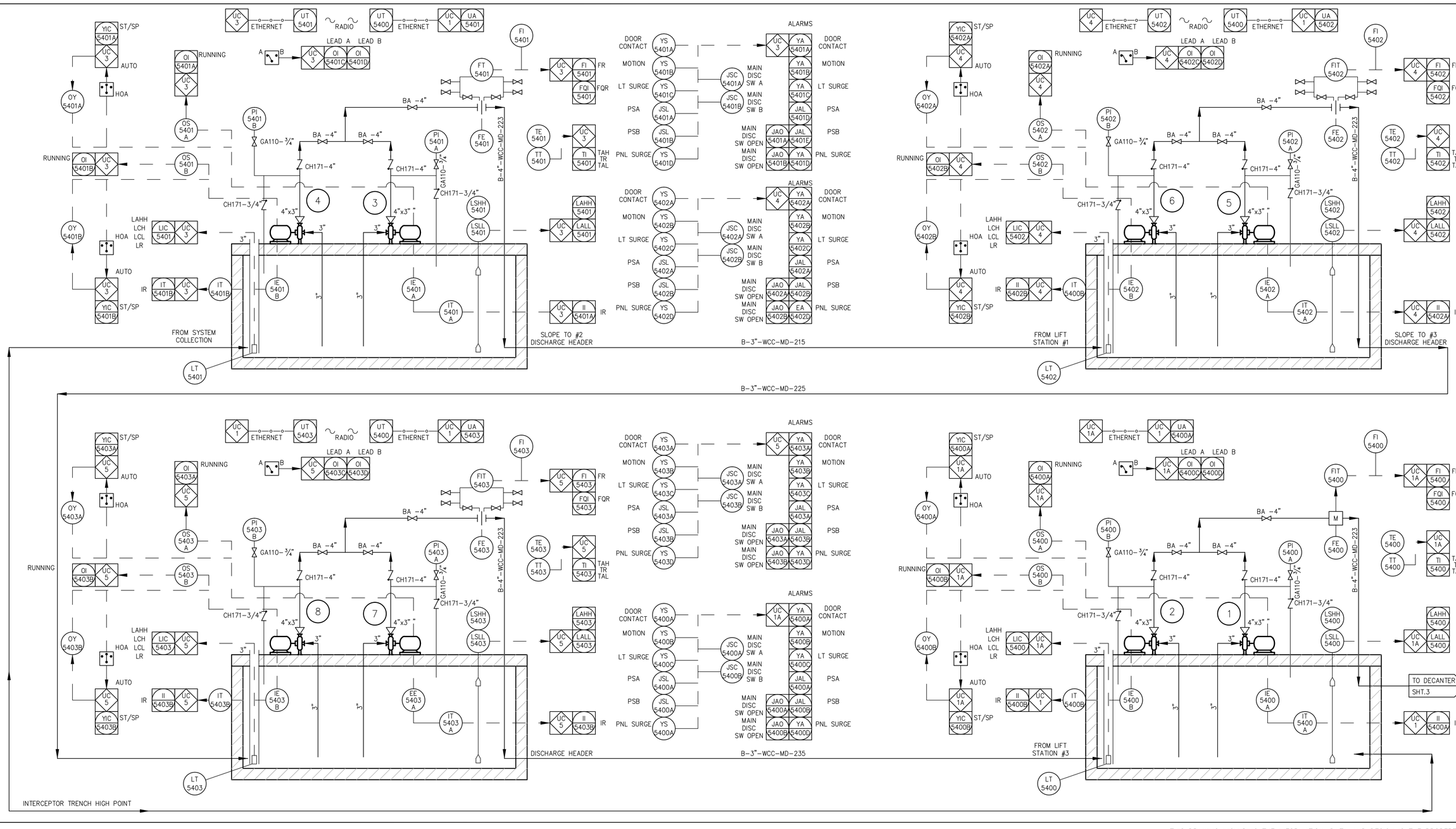
OCCIDENTAL CHEMICAL CORPORATION
NORTH TONAWANDA, NEW YORK

DUREZ REMEDIAL SITE

ENGINEERING FLOW SHEET LEGEND

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:			Date: MARCH 2009
Project Manager: JW	Reviewed By: NS	Designed By:	Drawn By:
Scale: NONE	Project No: 07406-03	Report No: 020	Drawing No: A-07406-03-00



PLANT ID.	P5401 (1)	P5402 (2)	P5403 (3)	P5404 (4)	P5405 (5)	P5406 (6)	P5407 (7)	P5408 (8)	(9)	(10)	(11)	(12)	(13)	(14)
NAME	NO.1 MAIN LIFT STATION 2K2X1.5	NO.2 MAIN LIFT STATION 2K2X1.5	LIFT STATION NO.1 PUMP 2K2X1.5	LIFT STATION NO.1 PUMP 2K2X1.5	LIFT STATION NO.2 PUMP 2K2X1.5	LIFT STATION NO.2 PUMP 2K2X1.5	LIFT STATION NO.3 PUMP 2K2X1.5	LIFT STATION NO.3 PUMP 2K2X1.5						
DESCRIPTION: MATERIAL	DUCTILE IRON	DUCTILE IRON	DUCTILE IRON	DUCTILE IRON	DUCTILE IRON	DUCTILE IRON	DUCTILE IRON	DUCTILE IRON						
SIZE	3X3-13/10"IMP	3X3-13/10"IMP	1.5X2-10W/9"IMP	1.5X2-10W/9"IMP	1.5X2-10W/9"IMP	1.5X2-10W/9"IMP	1.5X2-10W/9"IMP	1.5X2-10W/9"IMP						
CAPACITY	110GPM/20'TH	110GPM/20'TH	80 GPM/18.3'TH	80 GPM/18.3'TH	80 GPM/18.3'TH	80 GPM/18.3'TH	80 GPM/18.3'TH	80 GPM/18.3'TH						
TEMP/PRESS														
HP/V/RPM	10/460/1735	10/460/1735	5/460/1730	5/460/1730	5/460/1730	5/460/1730	5/460/1730	5/460/1730						
WEIGHT														
MANUFACTURE	GOULDS	GOULDS	GOULDS	GOULDS	GOULDS	GOULDS	GOULDS	GOULDS						
MODEL														
VENDOR														

REVISIONS

NO.	DESCRIPTION	MADE BY	APPR. BY	DATE
3	MINOR CORRECTIONS	JFS		8/14
2	CONTROL UPGRADE AS BUILTS	JFS		3/11
1	AS BUILT	JFS		3/09

PROJECT NUMBER: 07406-03(020) | FILE NAME: 07406-03(020)EF-BU002

CRA Services

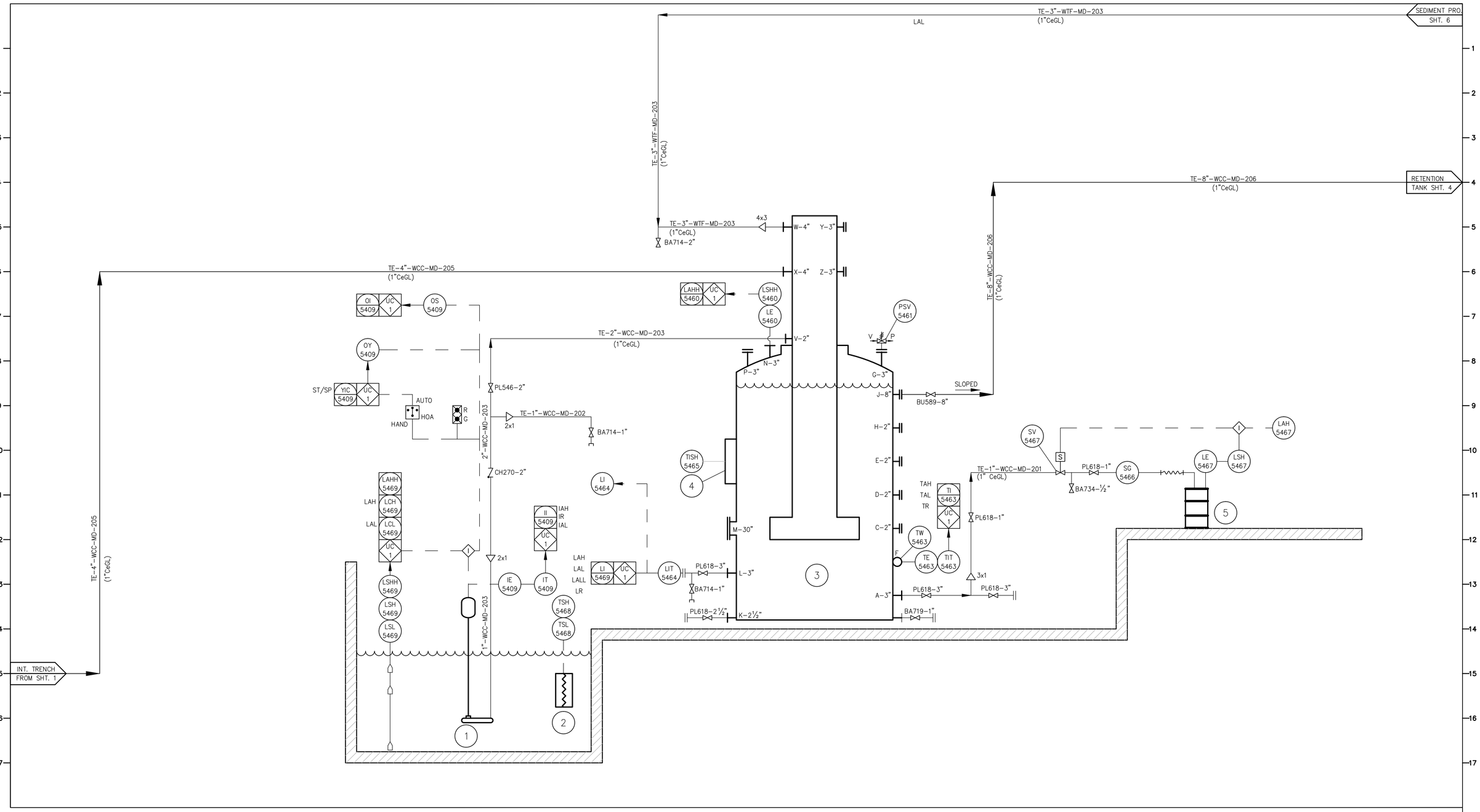
DRAWN BY J.MCDONALD
DATE 11-24-98
DESIGNED BY
DATE
APPROVED BY
DATE

OCCIDENTAL CHEMICAL CORPORATION
NORTH TONAWANDA, NEW YORK

DWG. A-07406-03-01 SHT.

LIFT STATIONS
ENGINEERING FLOWSHEET

07406-03(020)EF-BU002 SEP 03/2014



PLANT ID.	P-5409 (1)	(2)	T-5401 (3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
NAME	NAPL DIKE SUMP PUMP	SUMP IMERSION HEATER	ORGANIC DECANTER	DECANTER HEATER PAD	DRUM									
MATERIAL	IRON		CS											
SIZE	1X1½ -8"(7 ¼"IMP)		10"DIA.X38'SS											
CAPACITY	30 GPM/60' TDH		21,740 GALLONS		55 GALLONS									
TEMP/PRESS														
HP/V/RPM	2/460/1725													
WEIGHT														
MANUFACTURE														
MODEL	3171													
VENDOR	GOULD		DEHLER											

DESCRIPTION

NO.	DESCRIPTION	AS BUILT	AS BUILTS	CONTROL UPGRADE	MADE BY	APPR. BY	DATE
2					JFS		3/11
1		JFS	JFS				3/09

REVISIONS

PROJECT NUMBER: 07406-03(020) | FILE NAME: 07406-03(0020)EF-BU002

CRA Services

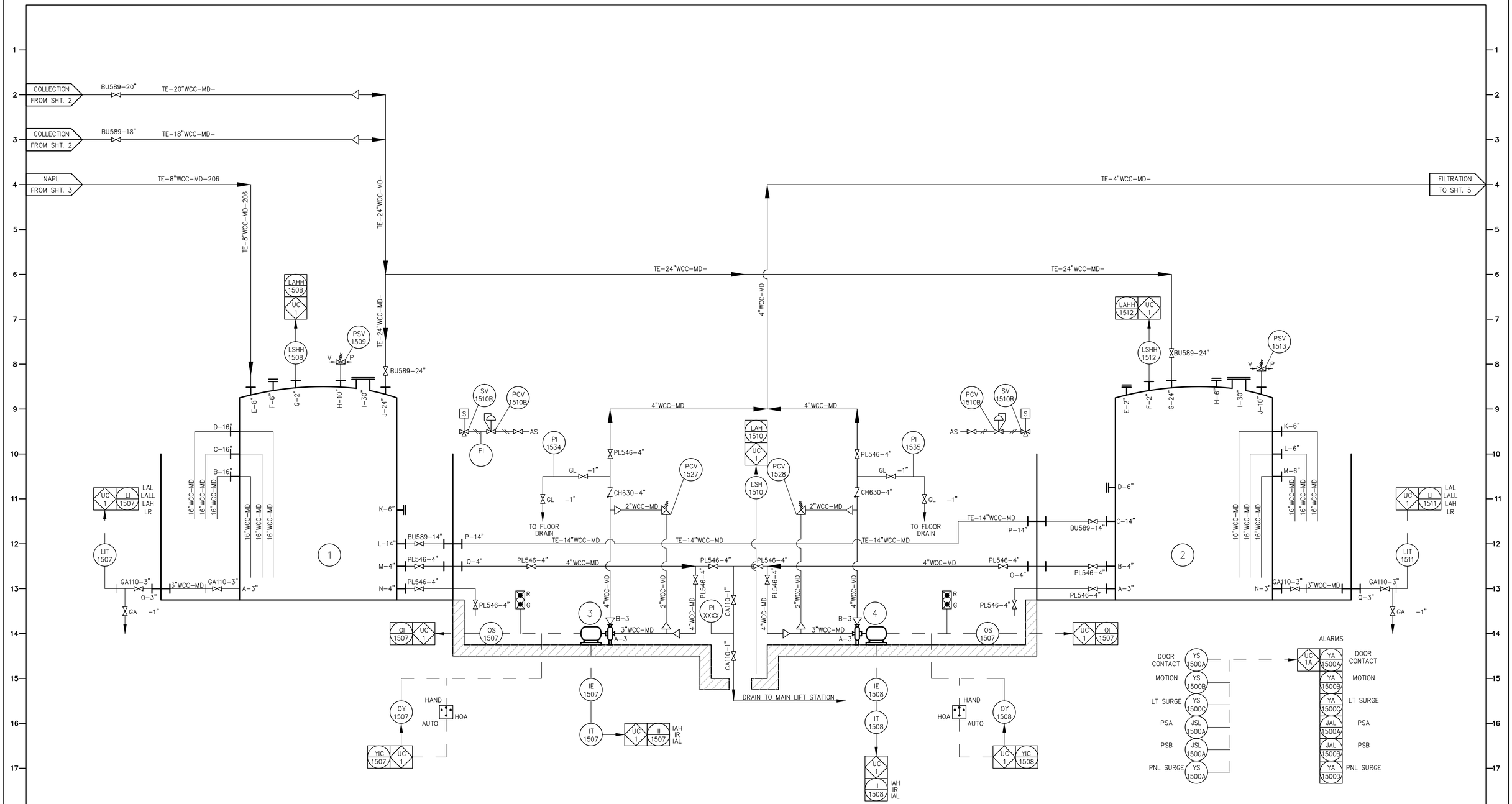
DRAWN BY J.MCDONALD
DATE 12-08-98
DESIGNED BY
DATE
APPROVED BY
DATE

OCCIDENTAL CHEMICAL CORPORATION
NORTH TONAWANDA, NEW YORK

DWG. A-07406-03-03 SHT.

DECANTER
ENGINEERING FLOWSHEET

07406-03(020)EF-BU002 SEP 03/2014



PLANT ID.	T1501 (1)	T1502 (2)	P1507 (3)	P1508 (4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
NAME	RETENTION TANK	RETENTION TANK	FILTER FEED PUMP	FILTER FEED PUMP										
MATERIAL	A36	A36	DCI	DCI										
SIZE	58'DIA.X34'H	58'DIA.X34'H	3X2–10A/9 IMP.	3X2–10A/9 IMP.										
CAPACITY	583,000 GAL.	583,000 GAL.	250 GPM	250 GPM										
TEMP/PRESS	150 PSIG	150 PSIG	150 PSIG	150 PSIG										
HP/V/RPM			50/460/3555	50/460/3555										
WEIGHT														
MANUFACTURE			2K 3X2–10A	2K 3X2–10A										
MODEL			DURCO	DURCO										
VENDOR	CBI	CBI												

DESCRIPTION

NO.	DESCRIPTION	AS BUILTS	CONTROL UPGRADE	MADE BY	APPR. BY	DATE
1	AS BUILT	JFS	JFS	JFS		3/11
2	CONTROL UPGRADE AS BUILTS	JFS	JFS	JFS		3/09

REVISIONS

PROJECT NUMBER: 07406–03(020) | FILE NAME: 07406–03(020)EF–BU003

CRA Services

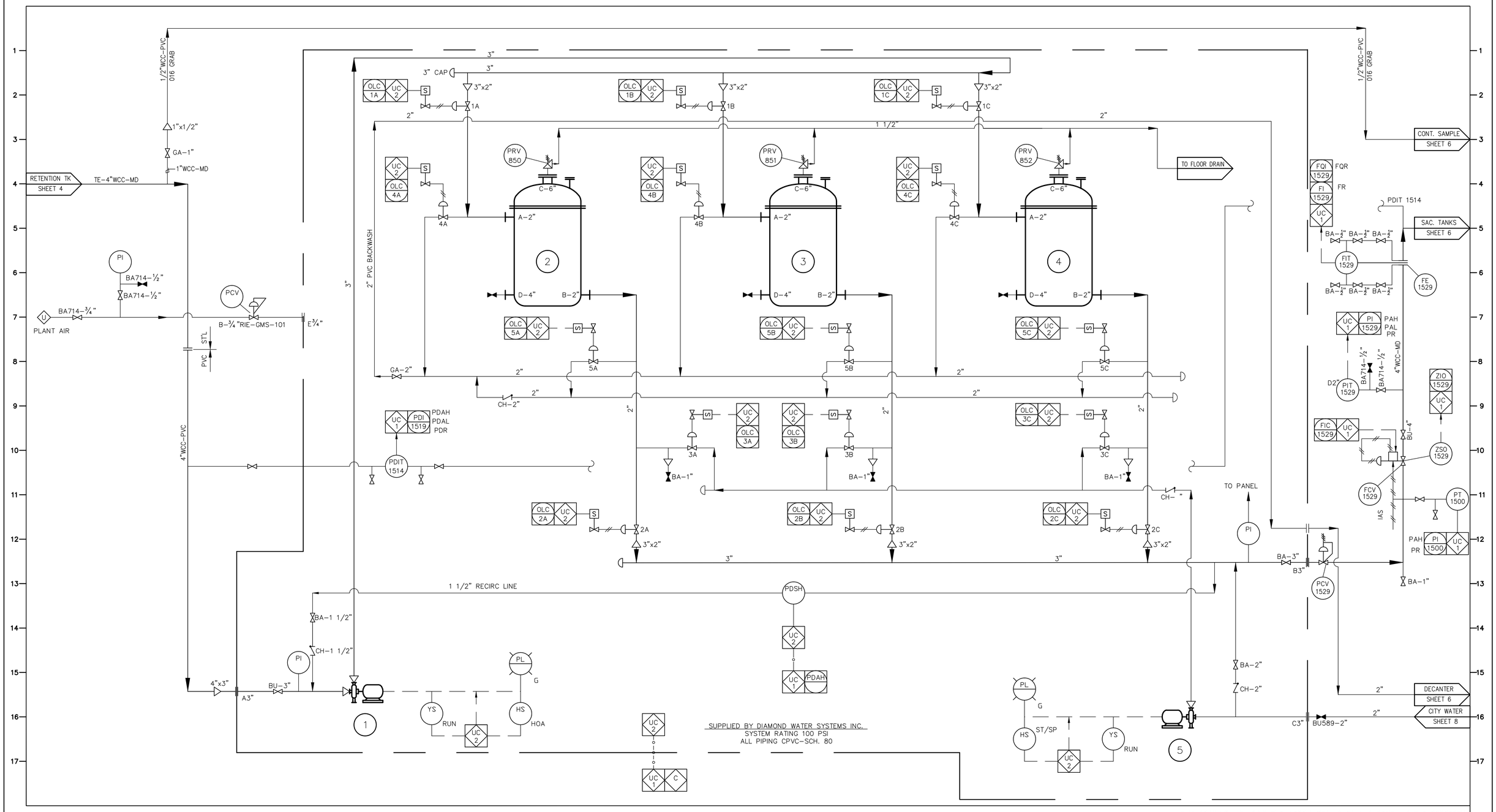
DRAWN BY J.MCDONALD
DATE 12–09–98
DESIGNED BY
DATE
APPROVED BY
DATE

OCCIDENTAL CHEMICAL CORPORATION
NORTH TONAWANDA, NEW YORK

DWG. A–07406–03–04 SHT.

RETENTION TANKS
ENGINEERING FLOWSHEET

07406–03(020)EF–BU003 SEP 03/2014



PLANT ID.	– (1)	– (2)	– (3)	– (4)	– (5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
NAME	DIAMOND FILTER PUMP	SAND FILTER BED "A"	SAND FILTER BED "B"	SAND FILTER BED "C"	DIAMOND BACKWASH PUMP									
DESCRIPTION: MATERIAL	CI	304SS	304SS	304SS	CI									
SIZE	–	30" DIA. x 58" H	30" DIA. x 58" H	30" DIA. x 58" H	–									
CAPACITY	–	–	–	–	–									
TEMP/PRESS	–	100 PSI	100 PSI	100 PSI	–									
HP/V/RPM	5HP	–	–	–	2HP									
WEIGHT	–	–	–	–	–									
MANUFACTURE	GOULDS	DIAMOND	DIAMOND	DIAMOND	GOULDS									
MODEL	3656	VSA-330-5.0-ASME	VSA-330-5.0-ASME	VSA-330-5.0-ASME	3642									
VENDOR	DIAMOND	–	–	–	DIAMOND									

NO.	DESCRIPTION	MADE BY	APPR. BY	DATE
2	CONTROL UPGRADE AS BUILTS	JFS		3/11
1	AS BUILT	JFS		3/09

REVISIONS

PROJECT NUMBER: 07406-03(020) | FILE NAME: 07406-03(020)EF-BU004

CRA Conestoga-Rovers & Ass.

DRAWN BY J.MCDONALD
DATE 12-01-98
DESIGNED BY
DATE
APPROVED BY
DATE

OCCIDENTAL CHEMICAL CORPORATION
NORTH TONAWANDA, NEW YORK

DWG. A-07406-03-05 SHT.

FILTRATION SYSTEM
ENGINEERING FLOWSHEET

07406-03(020)EF-BU004 SEP 03/2014

TO DECANTER SHT. 3

TE–3"WTF–MD–203 (1"CeGL)

3" FLG'D TEE PVC

ST'L

3x2

3"

B–2"WCC–MD

AIR FROM MAIN SHT. 8

RETENTION TANKS SHT. 4

B–1/2"WCC–PVC–016 GRAB

FILTRATION SHT. 5

B–3"WCC–PVC–

PAH PAL PR | PI 1530 | UC 1

PIT 1530

PDAH PDR | UC 1 | PDI 1530

PDIT 1530

BA – ½" BA – ½"

BA – ½" BA – ½" BA – ½" BA – ½" BA – ½" BA – ½"

CH –2"

PVC ST'L

4x3

4x3 TRAP

0–100 PSI PI 1522

BA –1"

PL546–3"

AAH AAL pH AR | AI 1500 | UC 1

0–100 PSI PI

AIT 1500 pH

BA –1"

BA –2"

BU –3" V1–1

BU –3" V1–2

BA –2"

CH –2"

A–3" B–3" C–3" D–3"

D–3" C–3" B–3" A–3"

BU –3" V1–3

BU –3" V1–4

BU –3" V1–15

BU –3" V1–11

PCV

BA –½"

BA –½"

PI

BA –¼"

BA –½"

PI

BA –¼"

BA –½"

BU –3"

BU –3" V1–15

BU –3" V1–16

E–3"

E–3"

F–3"

F–3"

1

2

3

XX 1527

0–100 PSI PI

SET @ 75 PSI PSV

BA –¼"

BA –3" V1–15

BA –1" V1–19

BU –3" V1–7

BU –3" V1–8

3" BF

BU –3" V1–9

BU –3" V1–10

SG

SG

BACKWASH SHT. 5

2" PVC

3" BF

3"

3"

TO SEWER No. 1

BU –3"

BU –3"

BU –3"

BU –3"

BU –4"

BU –4"

BA –1"

BA –1"

BU –1"

PDAH PDR | PDI 1506 | UC 1

PDIT 1506

4

5

TAH TR TAL | TI 1500 | UC 1

TE 1500

TT 1500

LAH 1500 | UC 1

LSH 1500

3" TO MAIN BEDS SHT. 7

TO OUTFALL SHT. 7

XX–1525

FROM MAIN BEDS SHT. 7

1" TO FLOOR DRAIN SHT. 7

PLANT ID.	XX1526 (1)	T1503 (2)	T1504 (3)	FL1505 (4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
NAME	CONTINUOUS PROPORTIONAL SAMPLER	INITIAL CARBON BED No. 1	INITIAL CARBON BED No. 2	BAG FILTER	BAG FILTER									
MATERIAL		EPOXY LINED CS	EPOXY LINED CS	CARBON STEEL										
SIZE		4' DIA x 8' SS	4' DIA x 8' SS	50 MICRON										
CAPACITY		2000 LBS CARBON	2000 LBS CARBON	250 GPM										
TEMP/PRESS		75 PSIG	75 PSIG	75 PSIG										
HP/V/RPM	115VAC 60HZ													
WEIGHT														
MANUFACTURE														
MODEL	ISCO			B12–3F										
VENDOR	ISCO	ENCOTECH	ENCOTECH	FILTRATION UNLIMITED										

DESCRIPTION

NO.	DESCRIPTION	MADE BY	DATE
2	CONTROL UPGRADE AS BUILTS	JFS	3/11
1	AS BUILT	JFS	3/09
0	ISSUED FOR BID	BAB	11/98

REVISIONS

APPR. BY

PROJECT NUMBER: 07406–03(020) | FILE NAME: 07406–03(020)EF–BU006

CRA Services

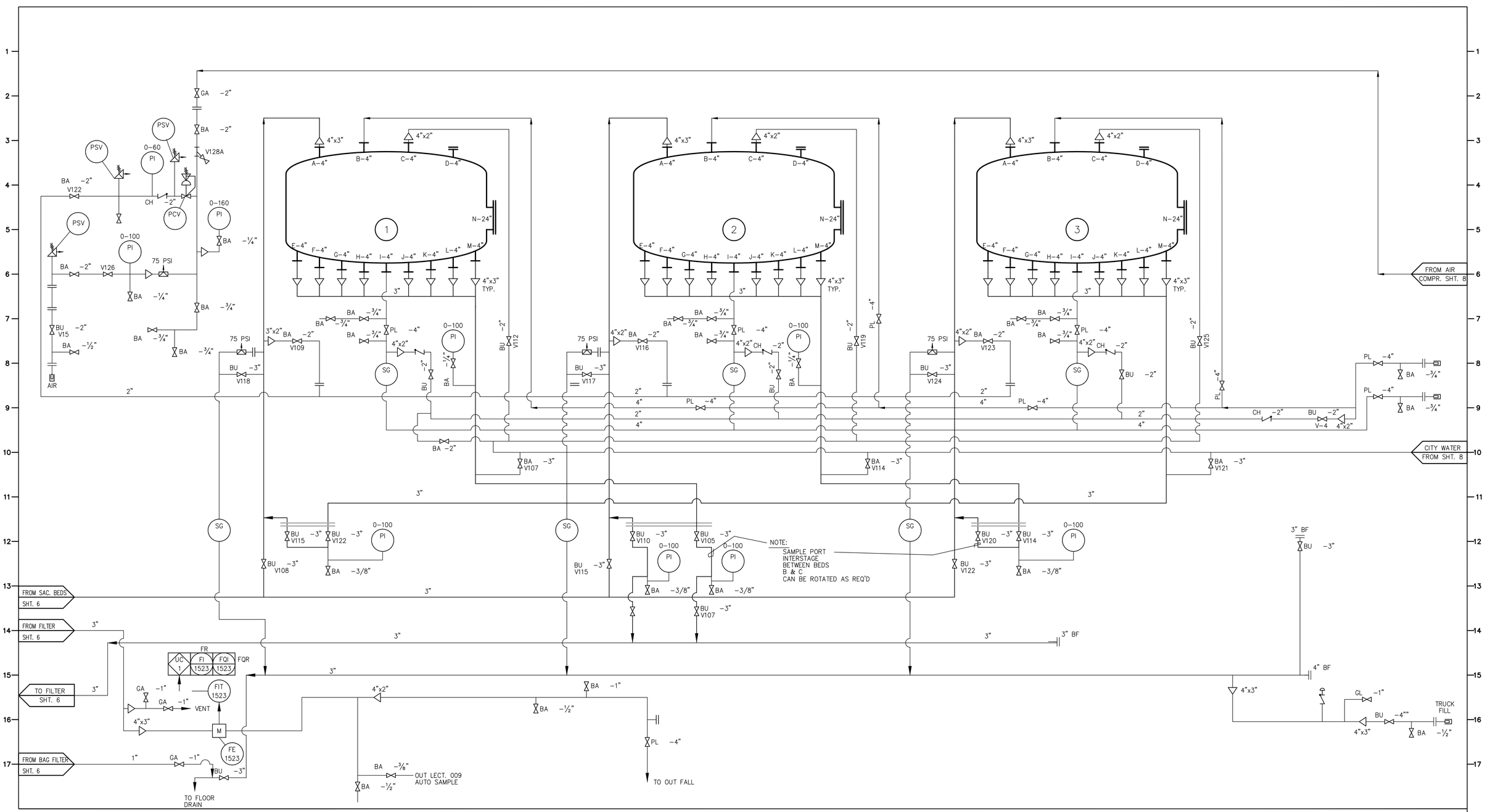
DRAWN BY B.A. BEEBE
DATE 11–23–98
DESIGNED BY
DATE
APPROVED BY
DATE

OCCIDENTAL CHEMICAL CORPORATION
NORTH TONAWANDA, NEW YORK

DWG. A–07406–03–06 SHT.

SAC CARBON BED ENGINEERING FLOWSHEET

07406–03(020)EF–BU006 SEP 03/2014



PLANT ID.	T1505 (1)	T1506 (2)	FL1507 (3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
NAME	MAIN CARBON BED A	MAIN CARBON BED B	MAIN CARBON BED C											
MATERIAL	EPOXY LINED CS	EPOXY LINED CS	EPOXY LINED CS											
SIZE	10'DIA x 11' 1/16"	10'DIA x 11' 1/16"	10'DIA x 11' 1/16"											
CAPACITY	20000 LBS CARBON	20000 LBS CARBON	20000 LBS CARBON											
TEMP/PRESS	75 PSIG	75 PSIG	75 PSIG											
HP/V/RPM														
WEIGHT														
MANUFACTURE														
MODEL														
VENDOR	ASI	ASI	ASI											

DESCRIPTION

NO.	DESCRIPTION	MADE BY	APPR. BY	DATE
2	CONTROL UPGRADE AS BUILTS	JFS		3/11
1	AS BUILT	JFS		3/09
0	ISSUED FOR BID	BAB		11/98

REVISIONS

PROJECT NUMBER: 07406−03(020) | FILE NAME: 07406−03(020)EF−BU005

CRA Services

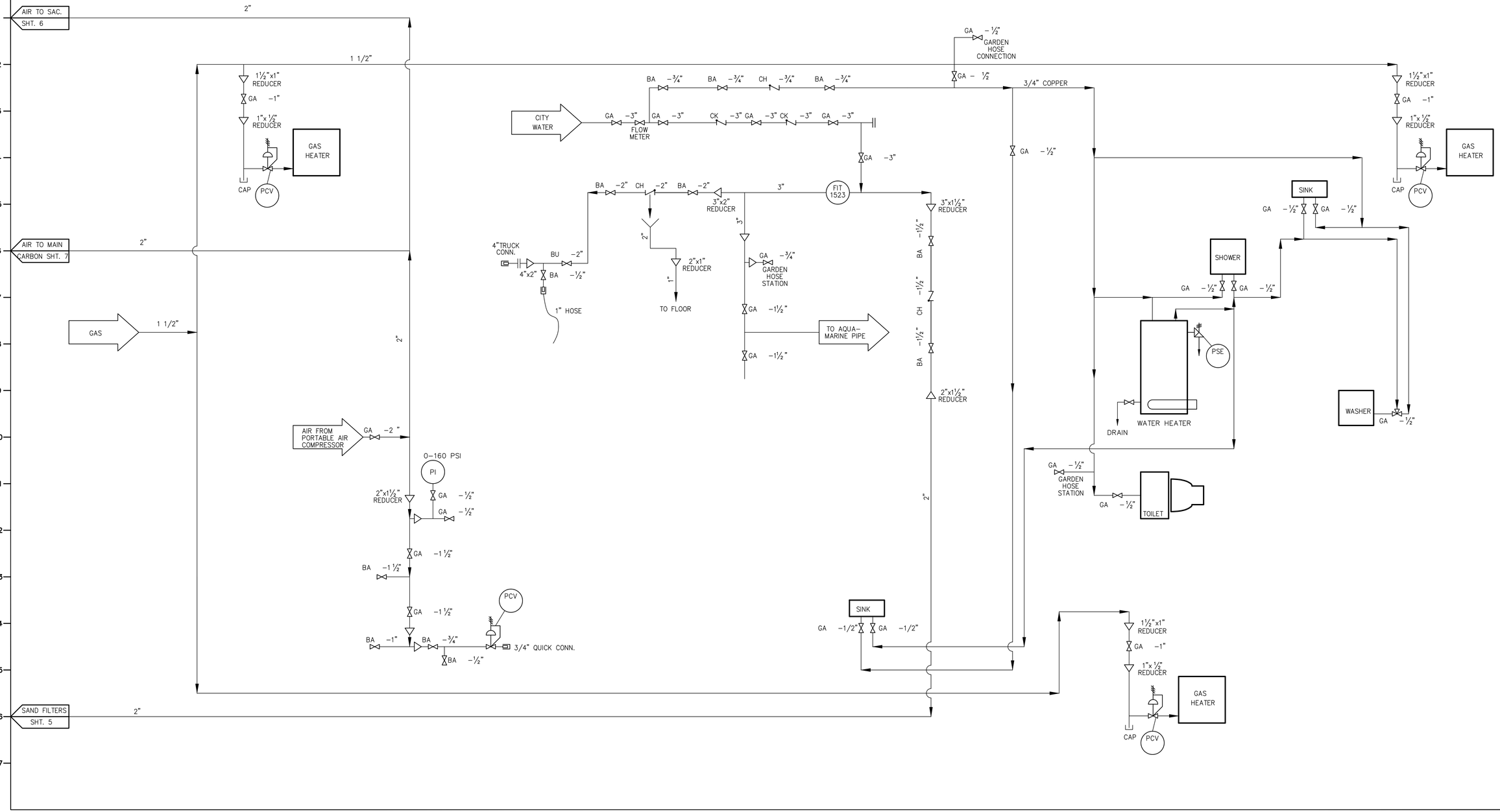
DRAWN BY B.A. BEEBE
DATE 11−23−98
DESIGNED BY
DATE
APPROVED BY
DATE

OCCIDENTAL CHEMICAL CORPORATION
NORTH TONAWANDA, NEW YORK

DWG. A−07406−03−07 SHT.

MAIN CARBON BEDS
ENGINEERING FLOWSHEET

07406−03(020)EF−BU005 SEP 03/2014



PLANT ID.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
NAME														
DESCRIPTION: MATERIAL														
SIZE														
CAPACITY														
TEMP/PRESS														
HP/V/RPM														
WEIGHT														
MANUFACTURE														
MODEL														
VENDOR														

NO.	DESCRIPTION	MADE BY	APPR. BY	DATE
2	CONTROL UPGRADE AS BUILTS	JFS	JFS	3/11
1	AS BUILT	JFS		3/09

REVISIONS

PROJECT NUMBER: 07406-03(020) | FILE NAME: 07406-03(020)EF-BU008

CRA Services

DRAWN BY J.MCDONALD
DATE 11-23-98
DESIGNED BY
DATE
APPROVED BY
DATE

OCCIDENTAL CHEMICAL CORPORATION
NORTH TONAWANDA, NEW YORK

DWG. A-07406-03-08 SHT.

AIR, GAS, WATER SYSTEMS
ENGINEERING FLOWSHEET

07406-03(020)EF-BU008 SEP 03/2014

Appendix B

Instrumentation Manuals and Specifications

GOULDS PUMPS

Installation, Operation, and Maintenance Instructions

MODEL 3796

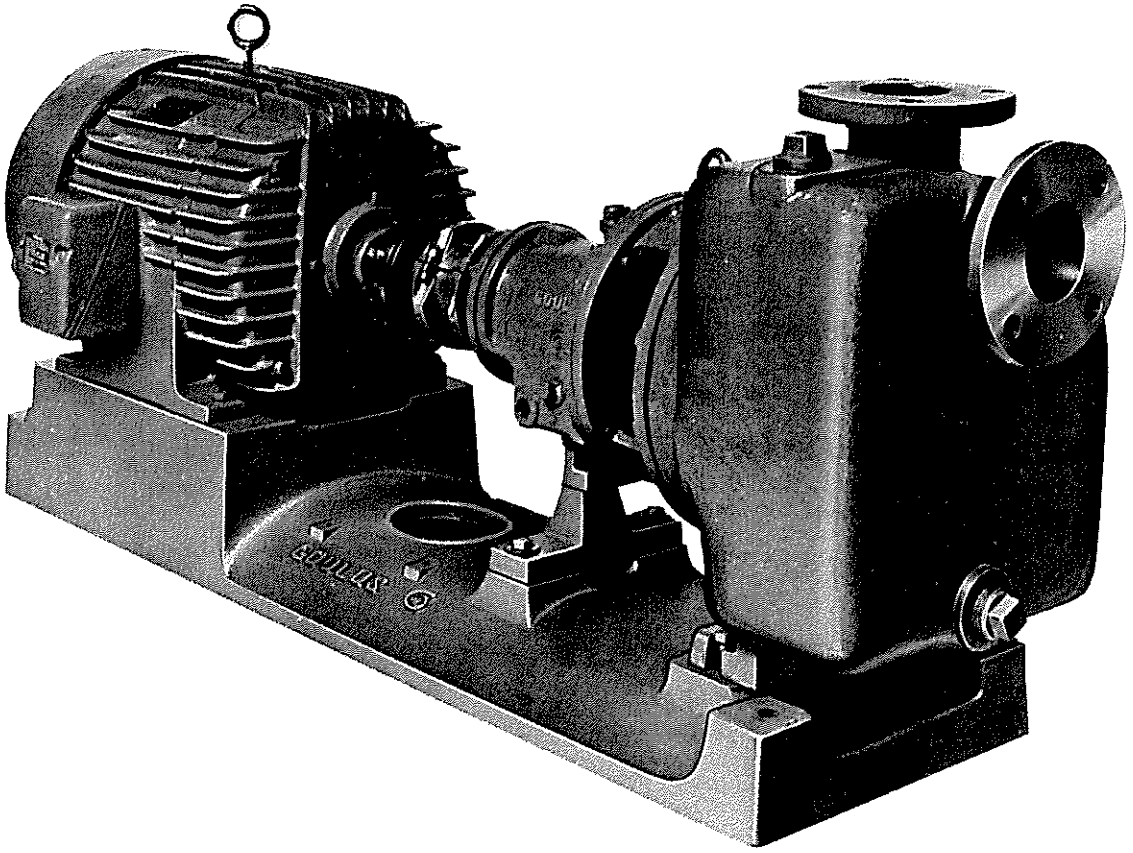


TABLE OF CONTENTS

SECTION I—GENERAL

Introduction

This instruction manual is intended to assist those involved with the installation, operation and maintenance of Goulds' Model 3196 pumps. It is recommended that this manual be thoroughly reviewed prior to installing or performing any work on the pump or motor.

I-A. Importance of Instructions

The design, material and workmanship incorporated in the construction of Goulds' pumps make them capable of giving long, trouble-free service. The life and satisfactory service of any mechanical unit, however, is enhanced and extended by periodic inspection and careful maintenance. This instruction manual was prepared to assist operators in understanding the construction and correct methods of installing, operating, and maintaining these pumps.

Study thoroughly Sections I, II, III, and carefully follow the instructions for installation and operation. Sections IV, V, VI, VII, and VIII are answers to trouble and maintenance questions. Keep this instruction manual handy for reference. Further information can be obtained by contacting the Engineered Products Division, Goulds Pumps, Inc., Seneca Falls, N.Y. 13148 or your local branch office.

I-B. Special Warnings

Goulds Pumps, Inc. will not be liable for any damages or delay caused by failure to comply with the provisions of this instruction manual. This pump is not to be operated at speeds, working pressures, discharge pressures, or temperatures higher than, nor used with liquids other than, stated in the original order acknowledgment without written permission of Goulds Pumps, Inc.

I-C. Receiving Inspection—Shortages

Care should be taken when unloading pumps. If shipment is not delivered in good order and in accordance with the Bill-of-Lading, note the damage or shortage on both receipt and freight bill. MAKE ANY CLAIMS TO THE TRANSPORATION COMPANY PROMPTLY.

Instruction sheets on various components as well as the Instruction Book for the pump are included in the shipment. DO NOT DISCARD!

I-D. Preservation and Storage

Goulds' normal domestic shipping and storage preparation is suitable for protecting the pump during shipment in covered trucks. It also provides protection during covered storage at the jobsite, and for a short period between installation and start-up. If the pump is to be idle and exposed to the elements for an extended period, either before or after installation, special precautions are required. One approach is to provide special preservatives and wrapping before shipment. However, after installation the protective wrappings will have been removed. Therefore, application of preservatives after installation is considered a good practice. Information about various long term perservation and storage options available can be obtained from your local Goulds' representative.

The driver, coupling, and mechanical seal manufacturers should be contacted for their recommendations on preservations and protection procedures.

I-E. Handling Techniques

Care should be used in moving pumps. Pumps should *not* be hoisted by eyebolts. These eyebolts are intended for removing the back pull-out assembly for maintenance and inspection. An assembled pump should be hoisted using a sling under suction flange *and* under rear of bearing frame. Bedplate mounted units should be hoisted using slings under bedplate below both pump and driver.

SECTION II—INSTALLATION

II-A. Location

Pumping unit should be placed as close as practical to the source of supply. Floor space and head room allotted to the unit must be sufficient for inspection and maintenance. Be sure to allow for crane or hoist service.

II-B. Foundations

1. Grouted—Bedplate mounted units are normally grouted-in on a concrete foundation, which has been poured on a solid footing. This allows a permanent, vibration absorbing base for the unit. The location and size of foundation bolts are shown on the outline assembly drawings supplied for the unit. Fig. 1 illustrates a typical foundation bolt installation.

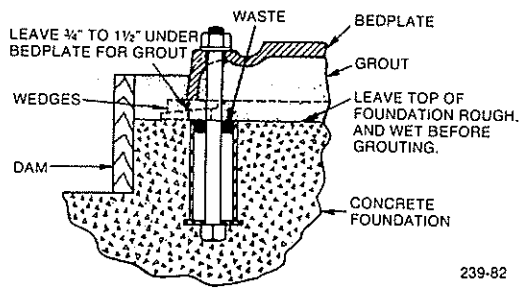


Figure 1

2. Flexibly Mounted—Installation and leveling of the optional flexibly-mounted bedplate should be carried out in accordance with assembly drawings supplied in the data package for the unit.

II-C. Leveling and Grouting of Baseplate—Initial Alignment Check

1. Put the unit in place on wedges located at four points as shown in Fig. 2. Some long installations may require additional wedges near center of bedplate.

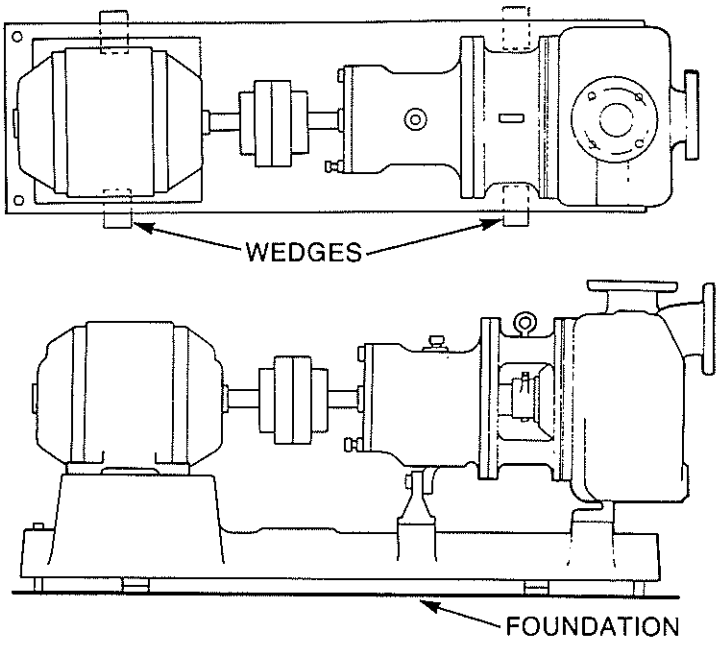


Figure 2

2. Adjust wedges to level unit (approximately), placing unit between ¾" and 1½" above foundation. Level or plumb suction and discharge flanges. Then, bring the coupling halves into reasonable alignment by adjusting the wedges as needed.

3. Make sure that the baseplate is not distorted and that final accurate coupling alignment can be established within the limits of movement of motor and by shimming motor if necessary.

4. Tighten foundation bolts finger tight. Build dam around foundation and pour grout through hole provided in top of bedplate. Fill to level of grout hole making sure that the areas under the pump and motor feet are filled solid. Allow grout to harden at least 48 hours before further tightening foundation bolts. Tighten pump hold down bolts.

II-D. Piping Practices

Guidelines for piping are given in the "Hydraulic Institute Standards" and should be reviewed prior to pump installation. All piping should be supported independently of, and line up naturally with, the pump flanges. NEVER DRAW PIPING INTO PLACE BY USE OF FORCE AT THE FLANGED CONNECTIONS OF THE PUMP.

Both suction and discharge piping should be as short and direct as possible to minimize friction losses.

Foundation, pump and driver hold-down bolts should be tightened prior to connecting suction or discharge piping to the pump.

On units handling corrosives, the piping can be arranged to allow flushing of the pump prior to opening of the unit for servicing. After connecting suction and discharge piping to the pump, rotate pump by hand to be sure that there is no binding.

II-E. Alignment—Preliminary

Alignment of the pump and driver is of extreme importance for trouble-free mechanical operation. Alignment should be obtained by adding or removing shims from under the motor feet. The pump bearing frame foot should never be adjusted to obtain alignment. The proper shimming is installed under the bearing frame foot at the factory on units shipped with bedplates. Changing the pump casing or bearing frame in the field will require a reshimming of the frame foot. The proper number of shims is installed when the pump shaft is level and parallel to the bedplate surface. Proper shimming is achieved by loosening frame foot and tightening casing foot. This should create a gap between the frame foot and and bedplate between 0 and .040 inches (1mm). This must be filled with shims and the frame foot retightened. If this procedure is not followed, mechanical problems can result. The final alignment is done after the unit has been run under actual operating conditions. The following are suggested steps for aligning the unit, prior to initial startup.

1. Parallel Alignment: The unit is in parallel misalignment when the shaft axes are parallel, but not concentric. During initial alignment, vertical parallel alignment may be different, due to thermal expansion of the unit at actual operating conditions. The following is a suggested cold setting for motor driven units:

Pumpage Temperature Above Ambient	Set Motor Shaft
Ambient	.002-.004" low (.05-.10 mm)
100° F.	.000-.002" high (.00-.05 mm)
200° F.	.004-.006" high (.10-.15 mm)
300° F.	.008-.010" high (.20-.25 mm)
400° F.	.012-.014" high (.30-.35 mm)
500° F.	.016-.018" high (.40-.45 mm)

2. To check the parallel alignment of "spider-insert" couplings, place a straight edge across both hubs at four points, 90° apart (see Fig. 3). To check the parallel alignment of flexible spacer couplings, place a dial indicator on one hub and rotate that hub 360° while taking readings on the outside diameter of the other hub. Alignment occurs when indicator deflection does not exceed .002" T.I.R. (see Fig. 4) of the recommended cold setting in elevation and not more than .002" T.I.R. side to side.

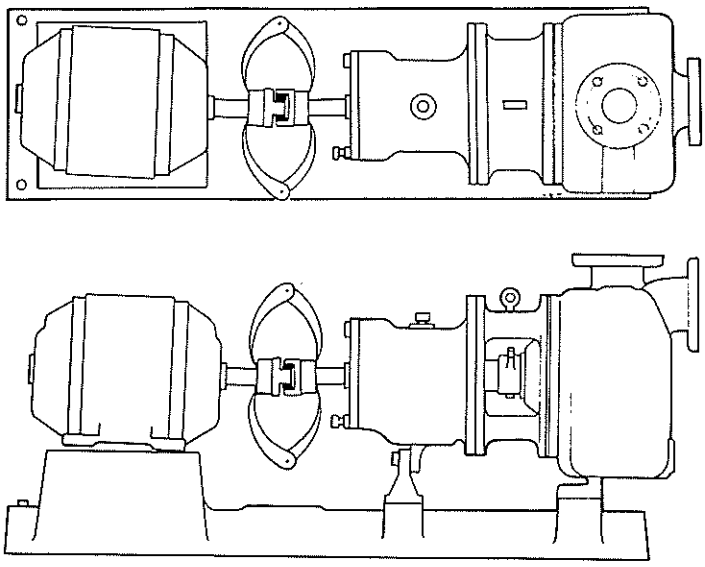


Figure 3

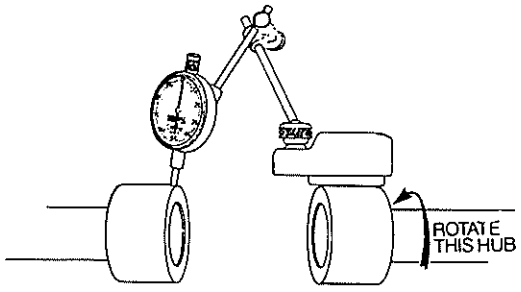


Figure 4

To check angular alignment of a "spider-insert" coupling, use calipers at 90° intervals on the circumference on the outer end of hubs. When caliper measurements are identical, the unit is in angular alignment. The correct gap between the hub and insert will be given in the coupling manufacturer's instructions supplied for the pump.

To check angular alignment of flexible spacer couplings, place a dial indicator on one shaft hub and rotate the hub 360°. Take readings from the face of the other hub. Alignment is achieved when deflection does not exceed .002" (see Fig. 5).

PRIOR TO COUPLING DRIVER TO PUMP, ROTATION OF DRIVER SHOULD BE CHECKED! *Serious damage can result if pump is rotated in wrong direction.* Once motor rotation is checked, connect coupling, following the manufacturer's instructions. If a coupling guard is furnished with the unit, ensure that it is securely fastened in place.

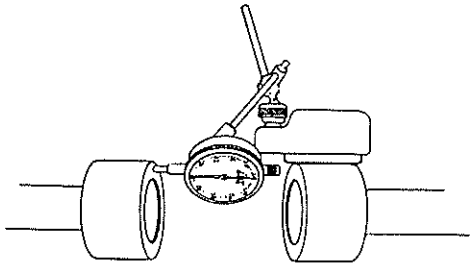


Figure 5

II-F. Stuffing Box

1. Packing: Stuffing box packing, lantern ring and gland are in box of fittings supplied with the pump. Install in proper sequence as shown in drawing in Part VI. Twist rings sideways to place them over shaft—never spread rings straight out. Seat each ring firmly as it is installed, staggering joints 90°. Gland should be installed finger tight only.

Packing cannot run dry, it must be lubricated. If the pumpage is clean, cool fluid, it may be used through a bypass off the discharge to the lantern ring connection to lubricate the packing.

If the pumpage is dirty or hot, it is not suitable to lubricate the packing. An external source must be utilized, unless the bypass is equipped with proper separator, filter, and/or cooling system. This must be piped into the lantern ring connection, also (refer to packing recommendations).

2. Mechanical Seals: When mechanical seals are supplied, they are installed and adjusted at the factory. They must not run dry or in abrasives. Connect recirculation, flush and/or cooling lines as required, following instructions on the seal print supplied for the unit.

SECTION III—OPERATION

III-A. Startup

1. Check List

a. Lubrication—Pump bearings are normally oil lubricated. (THE BEARINGS ARE *NOT* LUBRICATED AT THE FACTORY.) These pumps are supplied with an oiler which maintains a constant oil level in the bearing frame. Locate oiler as shown on the outline drawings supplied for the unit. See Fig. 6 for correct adjustment of oiler.

b. A high quality turbine type oil with rust and oxidation inhibitors should be used. Under normal operating conditions, an oil of 300 SSU viscos-

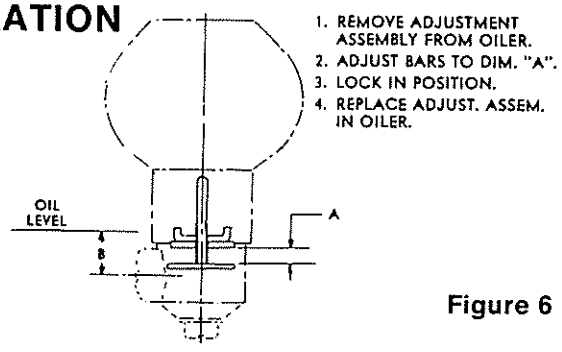


Figure 6

GROUP	OILER SIZE	A	B
ST, MT, LT	#3 (4 oz.)	19/32" (15 mm)	1/2" (13 mm)

ity at 100° F. (approximately SAE 20) should be used. Fill oiler bottle and replace in oiler housing. Repeat until oil remains visible in bottle. Do not add oil through the vent or breather. Optional grease lubricated bearings are lubricated at the factory and need lubrication only after 2,000 hours of operation, or every 3 months, which ever occurs first. On pumps supplied with greased-for-life bearings, no additional lubrication is required for the life of the bearing.

c. Free Rotation—Rotate shaft by hand to make sure it is free. Drag from packing or seal is normal but, if pump cannot be rotated by hand or binding or rubbing is noticed, correct before starting pump.

2. Priming

When the pump is first put in operation, it should be primed with the pumped liquid through the 1½ inch (1" on ST) priming connection. Fill until liquid is level with the inside of the suction pipe. On subsequent starts, enough liquid is retained in the casing to allow repriming.

During the priming cycle, a self priming pump does not develop full pressure. When priming against pressure, such as in a system with a check valve, it may be necessary to vent air with an air vent valve or continuous bleed line connected to the top of the casing.

During the priming cycle, the stuffing box will normally be below atmospheric pressure. On pumps supplied with conventional stuffing box packing, air may be drawn into the casing and interfere with priming. Sealing by use of liquid from an outside source, or by use of a grease lubricator is recommended.

3. Startup

a. Valves—Be sure suction valve is fully open. Normally, discharge valve should be at least partially closed for flow control.

b. Rotation Check—If not already done, uncouple the unit and jog the motor to check for proper rotation (refer to Section II-E-2, page 5).

III-B. Operation Checks

Inspect pump carefully and frequently during the first few hours of operation. If packing runs hot, shut pump down, allow box to cool, loosen gland if necessary. (Do not loosen gland until packing has cooled.) Mechanical seal may weep slightly, but should "run-in" in a few hours. Be sure all auxiliary lines (cooling, flushing, sealing, etc.) are functioning properly. Check pump bearings for excessive heating. Check complete unit for excessive vibration and unusual noises. Do not run pump at greatly reduced flow because damage can result.

III-C. Shutdown Procedure

Backflow through the pump will cause reverse rotation. If backflow is excessive, and there is a possibility of the pump being turned on during this period of reverse rotation, then precautions should be taken to prevent the backflow. This can be done by installing a check valve in the discharge line, or by closing a discharge valve immediately prior to shutting down the pump. NOTE: IT IS NOT RECOMMENDED THAT THE PUMP RUN LONGER THAN ABSOLUTELY NECESSARY AGAINST A CLOSED DISCHARGE VALVE.

SECTION IV—PREVENTIVE AND CORRECTIVE MAINTENANCE

IV-A. Lubrication

Oil lubricated units require only that oil be visible in reservoir or the oiler. Grease lubricated units should be regreased every 2,000 hours or 3 month intervals, whichever occurs first. Use a sodium or lithium grease and fill until grease comes out grease relief fittings. Follow motor and coupling manufacturers' lubrication instructions.

IV-B. Stuffing Box

1. Packing Stuffing Box: Periodically inspect stuffing box to see that there is sufficient leakage to lubricate the packing and maintain a cool box. Never restrict the leakage from the packing as this will cause damage to both packing and shaft sleeve. Draw up gland nuts slowly and evenly and only while pump is running.

After pump has been in operation for some time and the packing has been completely "run-in", a leakage of 40 to 60 drops per minute of the liquid should be allowed to flow from the stuffing box at all times for cooling and lubricating the packing and shaft sleeve.

2. Stuffing Boxes with Mechanical Seal: This type of box requires no attention other than to make sure that the circulating lines do not become clogged.

IV-C. Vibration

It is a good practice to periodically monitor vibration of the pump. Normally, the vibration level will be well within accepted standards. Of equal importance is that the vibration level not increase. If a problem with vibration is encountered, refer to Trouble Shooting, Section VII.

IV-D. Alignment—Final

Alignment should be checked after unit has reached operating temperature, following startup. Repeat alignment procedures outlined in Section II-E. Check alignment again after one week of operation.

IV-E. Performance

If performance or priming capability deteriorates, refer to Trouble Shooting, Section VII.

SECTION V—DISASSEMBLY AND REASSEMBLY

V-A. Disassembly (refer to Sectional Views in Part VI)

1. Prepare pump for disassembly as follow:

a. Lock out power supply to motor.
b. Shut off valves controlling flow to and from pump.
c. Flush pump of all corrosive or toxic liquid, if required.
d. Remove all auxiliary tubing and piping.
e. Disconnect coupling and remove coupling spacer.
f. Drain oil.
g. On units with packed stuffing box, unbolt and remove split gland (107).

2. Disassemble pump as follows:

a. Place sling from hoist through eyebolt (132). On ST units, place sling through frame (228A) above shaft (122).
b. Remove frame foot hold down bolts.
c. Remove bolts (370) holding frame (228A) or frame adapter (108) to casing (100).
d. Slide back pull-out assembly from casing, using jacking bolts (418) provided.
e. Remove casing gasket (351).
f. Unscrew impeller (101) from shaft (122). The threads are right hand. Remove O-ring (412A) which seals between the impeller and shaft or sleeve.
g. (1) On units with inside mechanical seal, remove gland stud nuts (355) and carefully slide gland toward bearing frame (228A).
   (2) On units with outside mechanical seal, loosen set screws holding rotary portion of seal to shaft and slide seal toward bearing frame. Remove gland stud nuts and carefully slide gland off studs.
h. Remove stud nuts (370H) which hold stuffing box cover (184) to frame adapter. Pull stuffing box cover from frame or adapter. Slide sleeve (if any) off shaft.
i. On units with mechanical seal, loosen set screws holding rotary portion of seal to shaft, and carefully slide seal and gland assembly off shaft. On units having a shaft sleeve, it is not necessary to remove rotary portion of seal from sleeve unless replacement of seal is required.
f. Slide deflector (123) off shaft.
k. Scribe shaft at coupling hub for proper positioning of hub during reassembly and remove hub.
l. Remove bearing housing bolts (370C). Using impeller adjustment bolts (370D) for jacking, remove shaft and bearing assembly from frame. This will include the shaft, both bearings (112A) and (168A), and bearing housing (134A). Do not lose or damage O-ring (496).
m. Remove inboard bearing (168A) using a bearing puller. Never use a hammer to drive shaft through bearing! Protect bearing from contamination.
n. Remove bearing housing retaining ring (361A) and slide bearing housing off ball bearing. Do not damage oil seal (332A).
o. Straighten tang in lockwasher and remove bearing locknut (136) and lockwasher. Remove ball bearing (112A) using a bearing puller. Protect bearing from contamination.
p. On units with stuffing boxes, remove lantern ring (105) and packing rings (106) from stuffing box cover (184).

V-B. Inspection and Parts Replacement Guidelines

1. Casing—Check for sediment in priming chamber.

2. Impeller—Replace if it shows excessive erosion, corrosion, extreme wear, or vane breakage. Replace impeller O-ring. O-ring groove and impeller hub must be in good condition. Check impeller balance if possible. Reduction in hydraulic performance and reduced mechanical seal, packing or thrust bearing life may be caused by excessive impeller wear.

If a larger diameter impeller than originally furnished is required, this may be done by remachining the casing to remove the part of the cutwater necessary to accommodate the larger diameter impeller. There should be a 1/16" clearance between impeller vane tips and the cutwater. Note: If a smaller diameter impeller is used than the cutwater is machined for, the self-priming characteristics will be adversely affected.

3. Shaft—Check for runout (.005" max) to see that shaft has not been bent. On pumps without shaft sleeves, shaft surface in stuffing box area must be smooth and free of grooves. Bearing seats and oil seal area must be smooth and free of scratches or grooves. Shaft threads must be in good condition. Metalize or replace shaft if necessary.

4. Shaft Sleeve—Sleeve surface in stuffing box must be smooth. If grooved, replace.

5. Mechanical Seal—Seal faces, gaskets, and shaft sealing members must be in perfect condition or leakage may result. Replace worn or damaged parts.

6. Ball Bearings—Replace if worn, loose or rough and noisy when rotated.

7. Oil Seals—Replace if worn or otherwise damaged.

8. General—All parts should be clean before assembly. All burrs should be removed.

V-C. Reassembly Procedures

This procedure covers reassembly of pump after complete disassembly. Make sure all directions outlined in Section V-B have been followed.

1. Oil shaft at thrust bearing fit on coupling end of shaft (122). Slide thrust (coupling end) bearing (112A) on shaft as far as possible by hand. Place pipe or driving sleeve over shaft, making sure it rests against inner face only. Make sure bearing is "square" on shaft. Tap or press evenly until bearing is seated firmly against shaft shoulder. Do not mar the shaft.

2. Place lockwasher and bearing locknut (136) on shaft and tighten firmly. Bend "tang" of lockwasher into slot in locknut.

3. Slide bearing housing (134A), with O-ring (496) in place, on shaft and over bearing (112A) as far as possible. Do not damage oil seal (332A).

4. Insert retaining ring (361A) into groove in bearing housing (134A). Flat side of retaining ring must be against bearing (112A).

5. Oil inboard bearing seat on shaft. Slide inboard ball bearing (168A) on shaft (122) as far as possible by hand. Continue as in Step 1 above.

6. Place a small amount of O-ring lubricant on inside of bearing frame (228A) at bearing housing (134A), at inboard bearing seats (168A), on O-ring (496), and on inboard oil seal (333A). Carefully slide shaft assembly into bearing frame. Do not damage inboard oil seal (333A). Screw bearing housing bolts (370C) about ½" into bearing frame (228A).

7. Slide deflector (123) on shaft (122).

8. If unit has packed stuffing box, place stuffing box cover (184) against adapter (108), making sure that studs (370H) align with proper holes in adapter. Replace nuts and firmly tighten. Slide sleeve (if any) on shaft. Make sure grooves in end of sleeve engage drive pin on shaft. Continue assembly at Step 10.

9. If unit has mechanical seal:

The following instructions refer to pumps equipped with mechanical seals, either with or without sleeves.

If the unit has a single inside or double seal, a preliminary impeller adjustment must be performed to assure proper positioning of mechanical seal.

(1) Position sleeve (126), if any, on shaft (122) and engage groove in sleeve with drive pin (469) on shaft. Place stuffing box cover (184) against frame (228). Make sure studs (370H) align with proper holes in frame. Firmly tighten nuts or bolts.

(2) Screw impeller (101) with O-ring (412A) in place on shaft. Make sure that shaft assembly extends through stuffing box cover (184) so that the impeller will NOT contact face of stuffing box cover.

(3) Using impeller adjusting bolts (370C and 370D), adjust the impeller clearance until a .020" (0.51mm) feeler gauge can be inserted between the back of the impeller and the face of the stuffing box cover.

The following instructions are for three basic seal types: Single Inside, Single Outside, and Double Seals. Refer to seal manufacturer's drawing seal type and positioning dimension. Follow pertinent procedures.

a. **Single Inside Seal**

(1) Scribe the shaft (122) or shaft sleeve (126) lightly at the face of the stuffing box.

(2) Remove the impeller and stuffing box.

(3) Assemble the gland (250) with gaskets and stationary seat and slide the assembly over the shaft (122) or shaft sleeve (126).

(4) Slide the rotary portion of the seal on the shaft (122) (or shaft sleeve) (126) establishing its location from the scribe line to the dimension as shown on the seal manufacturer's drawing. Tighten set screws.

(5) Reinstall the stuffing box cover and tighten. Do not damage the seal parts.

(6) Reinstall the impeller with O-ring.

(7) Slide the gland assembly against the stuffing box and tighten the nuts evenly. Do not damage the seal parts.

(8) Refer to step 12 for further assembly details.

b. **Double Seals**

(1) Scribe the shaft (122) or shaft sleeve (126) lightly at the face of the stuffing box.

(2) Remove the impeller and stuffing box.

(3) Assemble the gland (250) with gaskets and stationary seat and slide the assembly over the shaft (122) or shaft sleeve (126).

(4) Slide the rotary portion of the seal on the shaft (122) or shaft sleeve (126) establishing its location from the scribe line to the dimension as shown on the seal manufacturer's drawings. Tighten set screws.

(5) Place inboard stationary seat and gaskets into bottom of stuffing box.

(6) Reinstall the stuffing box cover and tighten. Do not damage seal parts.

(7) Reinstall the impeller with O-ring.

(8) Slide the gland assembly against the stuffing box and tighten the nuts evenly. Do not damage seal parts.

(9) Refer to step 12 for further assembly details.

c. **Single Outside Seal**

Preliminary impeller adjustment is not necessary with this type of mechanical seal.

(1) If unit has shaft sleeve (126), slide on shaft (122) and engage groove in sleeve with drive pin (469) on shaft.

(2) Lubricate rotary portion of seal and slide on shaft sleeve. Do not tighten set screws.

(3) Assemble gland (250), gaskets, and stationary seat and slide assembly on shaft or sleeve.

(4) Place stuffing box cover (184) against frame making sure that the studs (370H) align with the proper holes in frame. Firmly tighten nuts.

(5) Screw impeller with O-ring on shaft making sure impeller does not make contact with stuffing box cover. If the impeller does hit, use impeller adjusting cap screws to correct.

(6) Place gland assembly against face of stuffing box and firmly tighten stud nuts.

(7) Slide rotary portion toward gland until it contacts stationary seat. Compress the rotary. Tighten screws.

10. Screw impeller (101) with O-ring (412A) in place, on the shaft (122).

11. On units with stuffing box packing (106), repack stuffing box as outlined in Section II-F. Assemble gland stud nuts finger tight.

12. Install and position coupling hub at scribe mark on shaft.

13. Place casing gasket (351) against shoulder in casing.

14. Slide the pullout assembly into the casing (100). Install frame-to-casing bolts (370) and tighten evenly while rotating shaft (122) by hand. If impeller ceases to turn freely, stop tightening operation and adjust the impeller setting with the adjusting bolts (370C and 370D) before resuming tightening of frame-to-casing bolts (370).

15. Reset impeller clearances.
    a. Loosen bolts (370C and 370D).
    b. Tighten bolts (370C) while turning shaft until impeller starts to rub against casing.
    c. Loosen bolts (370C) until a 0.015" (0.375 mm) feeler can be placed between the bolt head and the bearing housing.
    d. Tighten bolts (370D) evenly. Bearing housing shaft and impeller will be jacked to proper clearance from casing. Tighten bolts (370C) and jam nuts on bolts (370D).

3. If desired, a dial indicator can be used instead of a feeler gauge to check that the bearing housing has been moved the correct 0.015" (0.375 mm) distance.

V-D. Additional Details

An alternate method for setting inside mechanical seals is the "Modified Visegrip Method".

1. Follow assembly up to step 7.

2. Assemble the gland with stationary seat and gaskets.

3. Install the shaft sleeve, if used on the shaft, and engage groove in sleeve with drive pin (469) on shaft.

4. Slide gland assembly over the shaft or shaft sleeve.

5. Install the stuffing box cover and impeller. Establish a preliminary rotor adjustment (refer to Section V-C9).

6. Slide gland assembly against stuffing box. Do not bolt the gland to the stuffing box.

7. Clamp the modified visegrip on the shaft or sleeve directly behind and against the gland.

8. Leave the visegrip in place and remove the impeller and stuffing box cover.

9. Lubricate the rotary portion of seal and slide it on the shaft until it comes in contact with the stationary seat in the gland.

10. Compress rotary portion of seal to correct dimension as shown on seal manufacturer's drawing. Tighten set screws.

11. Remove visegrip and reinstall stuffing box cover and tighten.

12. Reinstall impeller with O-ring.

13. Slide the gland assembly against the stuffing box and tighten nuts evenly.

14. Refer to Step V-C12, etc.

SECTION VI—PRODUCT DESCRIPTION

Size Comparison Chart

Model 3796 Size	Corresponding Model 3196 Size
1½x1½-8 ST	1x1½-8 ST
2x2-10 MT	1x2-10 MT
3x3-10 MT	2x3-10 MT
4x4-10 MT	3x4-10 MT
3x3-13 MT	2x3-13 MT
4x4-13 MT	3x4-13 MT
6x6-13 MT	4x6-13 MT

Parts List and Interchangeability List

Item No.	No. Reqd. Per Pump	Part Name	Material					Interchangeability by Size & Casing Class		
			All Ductile Iron	All 316SS	All CD4M	All GA-20	**All Hast.	Model 3796ST	Model 3796MT[1]	
100	1	Casing	D.I.	316	CD4M	GA-20	Hast.	1½x1½-8	2x2-10 3x3-10 4x4-10	3x3-13 4x4-13 6x6-13
101	1	Impeller	D.I.	316	CD4M	GA-20	Hast.			
105	1	Lantern Ring	Glass Filled Teflon					ST	MT	
106	1 Set	Stuffing Box Packing	Synthetic Fibers with Graphite					ST	MT	
107	1	Gland Packed Box	316			GA-20	Hast.	ST	MT	
108	1	Frame Adapter	Cast Iron					NR	10	13
109A	1	Bearing End Cover—Coupling End	Cast Iron					NR	NR	
112A	1	Ball Bearing—Outboard End	Steel					ST	MT	
113A	1	Bearing Frame Breather	Steel					ST	MT	
119A	1	Bearing End Cover—Inboard	Steel					ST	NR	
122	1	Pump Shaft (Less Sleeve)	SAE4150[2]	316		C-20	Hast.	ST	MT	
122A	1	Pump Shaft (With Sleeve)	SAE4140				316	ST	MT	
123	1	Deflector	Glass Reinforced Nylon					ST	MT	
126*	1	Shaft Sleeve	316[3]	316	CD4M	C-20	Hast.	ST	MT	
132	1	Eye Bolt	Steel					NR	MT	
134A	1	Bearing Housing	Cast Iron					ST	MT	
136	1	Bearing Locknut	Steel					ST	MT	
168A	1	Ball Bearing—Inboard	Steel					ST	MT	
184	1	Stuffing Box Cover—Standard	D.I.	316	CD4M	GA-20	Hast.	ST	10	13
184A	1	Stuffing Box Cover—Water Jacketed	D.I.	316	CD4M	GA-20	Hast.	ST	10	13
210	1	Gland Packing	Synthetic Fiber with EPDM Binder					ST	MT	
228A	1	Bearing Frame	Cast Iron					ST	MT	
241	1	Bearing Frame Foot	Cast Iron					‡	MT	
247	1	Drip Basin	—	316				—	MT	
251	1	Constant Level Oiler	Glass and White Metal					MT	MT	
261	1	Gasket—Adapter to Stuffing Box	Manila Paper					NR	NR	
332A	1	Oil Seal—Coupling End	Buna Rubber					ST	MT	
333A	1	Oil Seal—Inboard End	Buna Rubber					ST	MT	
351	1	Gasket—Casing	Synthetic Fiber with EPDM Binder					ST	10	13
353	2	Gland Stud	316				Monel	ST	MT	
355	2	Gland Stud Nut	304				Monel	ST	MT	
360D	1	Gasket—Bearing Frame to Adapter	Vellumoid					NR	MT	
361A	1	Retaining Ring—Bearing Housing	Steel					ST	MT	
370	4-24	Cap Screw—Frame/Adapt. to Casing	Steel	304				ST	MT	
370B	4	Cap Screw—Adpt./Adpt. Ring to Frame	Steel					ST	MT	
370C	3-4	Tap Bolt-Bearing Housing	Steel					ST	MT	
370D	3-4	Tap Bolt—w-Jam Nut—Impeller Adjust.	Steel					ST	MT	
370F	1-2	Cap Screw—Frame Foot	Steel					NR	MT	
370H	2	Stud & Nut—Cover to Adapter	304					ST	MT	
412A	1	"O" Ring—Impeller	Teflon					ST	MT	
418	2-3	Tap Bolt—Jacking	Steel					ST	MT	
469B	2	Dowel Pin—Frame to Adapter	Steel					NR	MT	
469D	1	Drive Pin—Shaft Sleeve	420					ST	ST	
496	1	"O" Ring—Bearing Housing	Buna Rubber					ST	MT	
503	1	Adapter Ring	D.I.					ST	NR	

†Cast integral with casing.
‡Cast integral with frame.
*Optional

**Available in Hast-B or Hast-C Material.
NR—Not required.

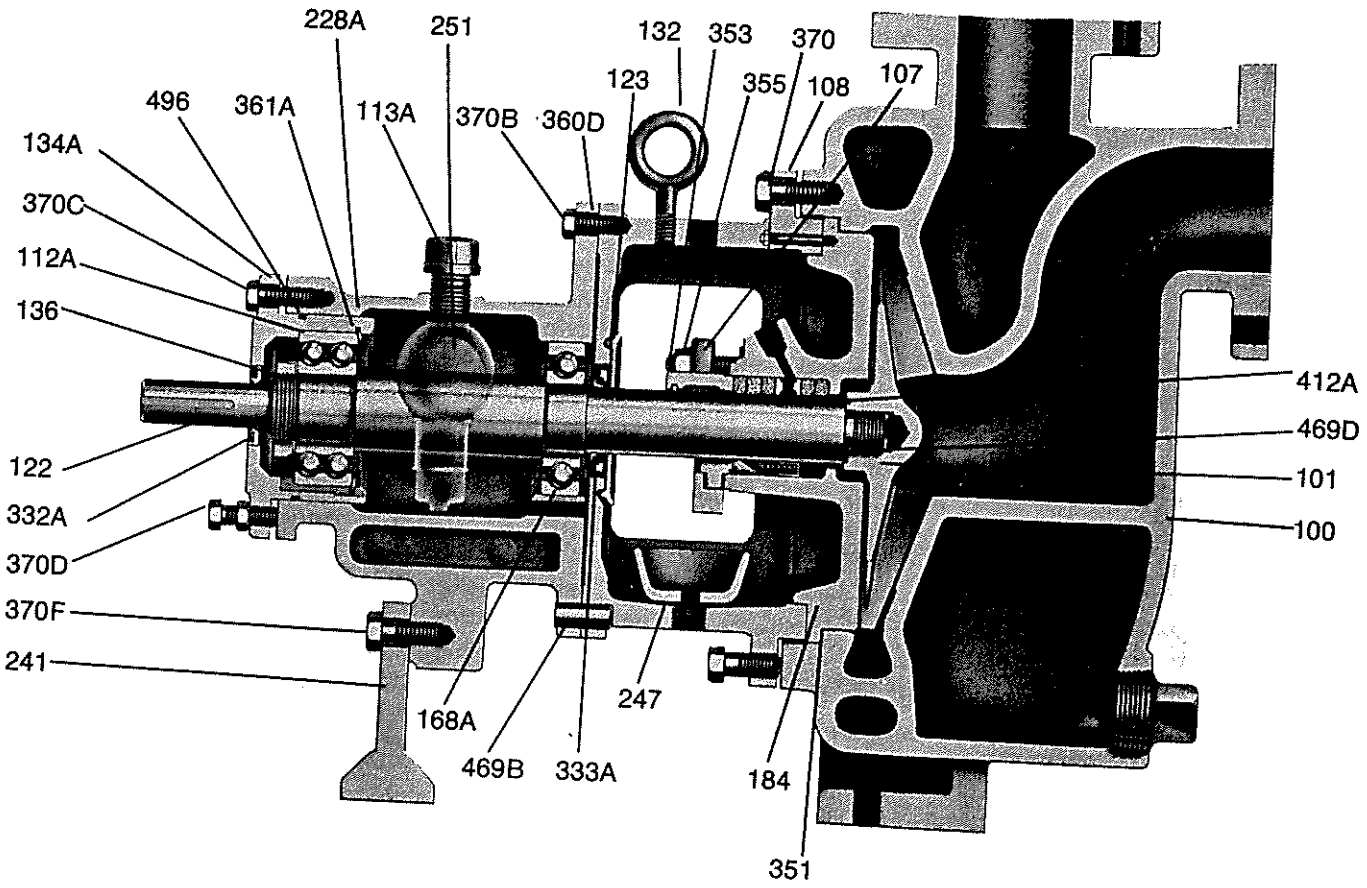
NOTES: [1] Model 3796 LTC with 2⅛ shaft available on 10" and 13" pumps.
[2] Flame hardened to 500 Brinell through stuffing box.
[3] Colmonoy coated to hardness of 60 Rockwell C.

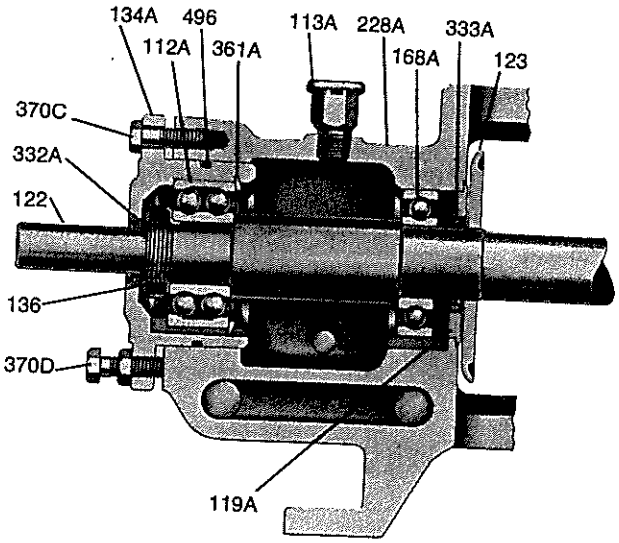
Materials of Construction

Code	Material and Specification
D.I.	Cast Ductile Iron, Heat Treated—ASTM A536
316	Cast Stainless ASTM A296 Gr. CF-8M Wrought Stainless ASTM A276 Type 316
CD4M	Cast Chrome-Nickel Alloy A.C.I. CD4MCu. 250-270 Brinell
GA-20	Cast Gould-A-Loy 20 ASTM A296 Gr. CN-7M
Hast-C	Cast Hast-C ASTM A296 Gr. CW-12M Wrought Hast-C ASTM B336
Hast-B	Cast Hast-B ASTM A296 Gr. N-12M Wrought Hast-B ASTM B335

Code	Material and Specification
Cast Iron (C.I.)	Cast Iron ASTM A48 Class 25
SAE4150	Wrought Steel ASTM A322 Gr. 4150
SAE4140	Wrought Steel ASTM A322 Gr. 4140
420	Wrought Stainless ASTM A276 Type 420
C-20	Wrought Carpenter 20 CB3 ASTM B473
304	Wrought Stainless ASTM A276 Type 304

Sectional Views





SECTION VII—TROUBLE SHOOTING

Problem	Possible Causes & Corrections
A. No liquid delivered, not enough liquid delivered, or not enough pressure	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 18, 19, 20.
B. Pump works a while and then quits	4, 5, 7, 8, 9, 11, 12, 20.
C. Pump takes too much power	6, 13, 14, 15, 16, 21, 22, 23, 24, 31.
D. Pump is noisy or vibrates	15, 16, 17, 28, 31.
E. Pump leaks excessively at stuffing box	8, 24, 25, 26, 27.
F. High bearing temperature	15, 16, 17, 29, 30, 31.
G. Stuffing box overheating	8, 24, 25, 26, 27.
H. Pump does not prime	7, 8, 32, 33, 34.

Causes & Corrective Measures

1. Pump not primed or properly vented—check that casing and suction pipe are completely filled with liquid.
2. Speed too low—check whether motor wiring is correct and receives full voltage or turbine receives full steam pressure.
3. System discharge head too high—check system head (particularly friction losses).
4. Suction lift too high—check NPSH available (suction piping too small or long may cause excessive friction losses). Check with vacuum or compound gauge.
5. Impeller or piping obstructed—check for obstructions.
6. Wrong direction of rotation—check rotation.
7. Air pocket or leak in suction line—check suction piping for air pockets and/or air leaks.
8. Stuffing box packing or seal worn allowing leakage of air into pump casing—check packing or seal and replace as required. Check for proper lubrication.
9. Not enough suction head for hot or volatile liquids—increase suction head, consult factory.
10. Foot valve too small—install correct size foot valve.
11. Foot valve or suction pipe not immersed deep enough—consult factory for proper depth. Use baffle to eliminate vortices.
12. Entrained air or gases in liquid—consult factory.
13. Impeller clearance too great—check for proper clearance.
14. Impeller damaged—inspect and replace as required.
15. Rotating parts bind—check internal wearing parts for proper clearances.
16. Shaft bent—straighten or replace as required.
17. Coupling or pump and driver misaligned—check alignment and realign if required.
18. Impeller diameter too small—consult factory for proper impeller diameter.
19. Improper pressure gauge location—check correct position and discharge nozzle or pipe.
20. Casing gasket damaged—check gaskets and replace as required.
21. Speed too high—check motor winding voltage or steam pressure received by turbine.
22. Head lower than rating; pumps too much liquid—consult factory. Install throttle valve, cut impeller.
23. Liquid heavier than anticipated—check specific gravity and viscosity.
24. Stuffing box not properly packed (insufficient packing, not properly inserted or run in, packing too tight)—check packing and repack stuffing box.
25. Incorrect packing or mechanical seal—consult factory.
26. Damaged mechanical seal—inspect and replace as required. Consult factory.
27. Shaft sleeve scored—remachine or replace as required.
28. Cavitation—increase NPSH available. Consult factory.
29. Pump capacity too low—consult factory for minimum continuous flow.
30. Excessive vibration—See Section D.
31. Improper bearing lubrication or bearings worn out—inspect and replace as required.
32. Check valve in discharge line—install vent line from pump discharge to check valve.
33. Back pressure in discharge line—eliminate any receiver tank "down legs" and "U" shaped loops in discharge piping.
34. No initial casing fill—See Section III-A.2.

SECTION VIII—ORDERING SPARE PARTS

VIII-A. Spare Parts

To insure against possible long and costly down-time periods, especially on critical services, it is advisable to have spare parts on hand.

1. For critical services: It is recommended that a "back pull-out assembly" be kept on hand. This is a group of assembled parts which includes all parts except the casing and the coupling.
   a. If this unit is equipped with stuffing box packing, the following parts should be on hand:
      (1) Stuffing box packing (item 106)—one set.
      (2) Stuffing box gland packing (item 107)—one set.
2. An alternative, though not as desirable as that stated above, can be used on non-critical services. This involves having on hand parts that are most likely to wear and can be used as needed. See Section VI-A, Parts List, for these recommended spares.

VIII-B. Instructions for Ordering Spare Parts

Repair orders will be handled with the minimum of delay if the following directions are followed:

1. Give model number, size of pump, and serial number. These can be obtained from the name-plate on the pump.
2. Write plainly the name, part number, and material of each part required. These names and numbers should agree with those on the sectional drawing in Section VI.
3. Give the number (quantity) of parts required.
4. Give complete shipping instructions.

product news

NO. 170

June 15, 1984
(New)

Subject: Model 3196 Impeller Removal.

Description: Model 3196 impellers are threaded onto the pump shafts. Removal can be difficult unless some means is used to hold the shaft from turning.

Fig. 1 shows a "shaft key wrench" which is an excellent tool for holding the shaft. It provides a positive restraint and does not damage the shaft or coupling hub as a pipe wrench could.

Fig. 2 shows the correct means of removing the impeller. The impeller should be turned clockwise by hand, raising the shaft key wrench off the table or floor. The impeller should then be given a quick turn counterclockwise causing the wrench to impact the table.

NOTE: NEVER USE HEAT TO ASSIST IN IMPELLER REMOVAL!
The application of heat to the hub or nose area of the impeller will not aid in removal and could cause the hub area to fail.

The "shaft key wrench" has Goulds part #A01676, and customers can order them thru their local Goulds sales office.

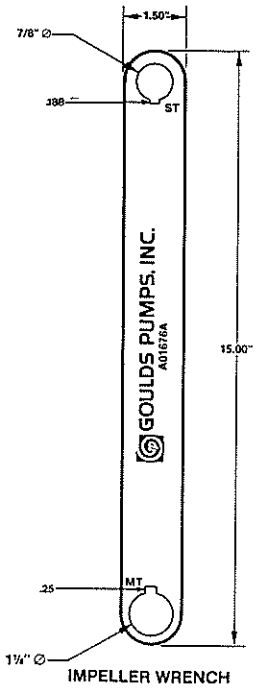


Figure 1

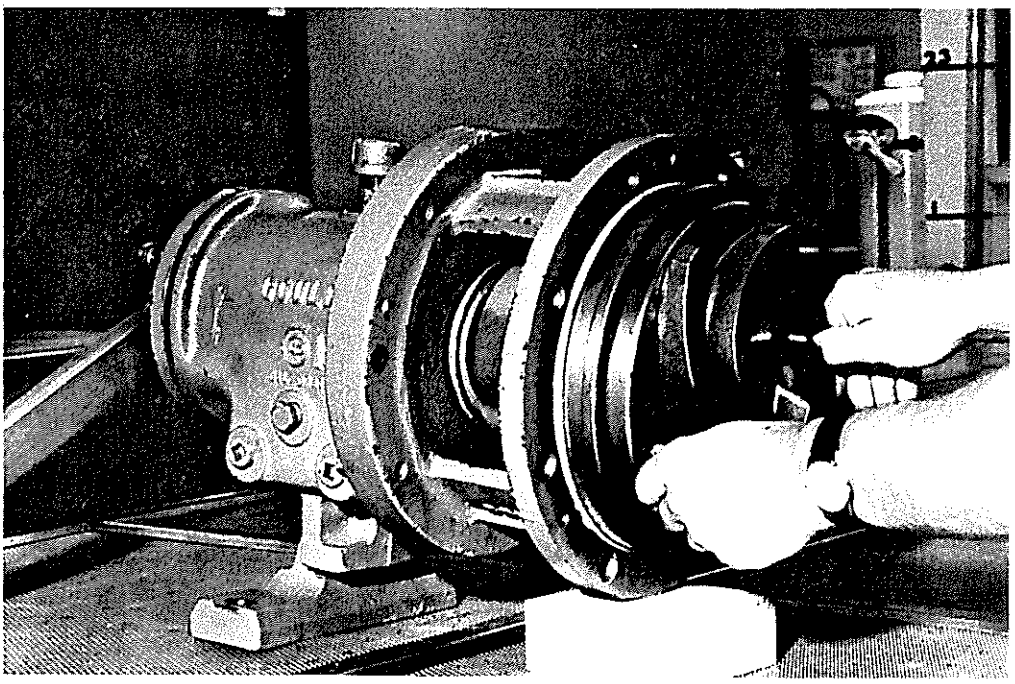
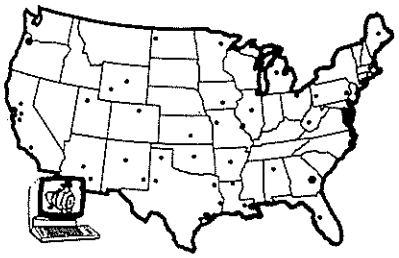


Figure 2

A pump is only as good as its parts.

The Goulds pump featured in this instruction manual is made up of many different parts. All are engineered and precision manufactured to make the pump perform as intended. Therefore it's *most important* to make sure that you use only genuine Goulds replacement parts.

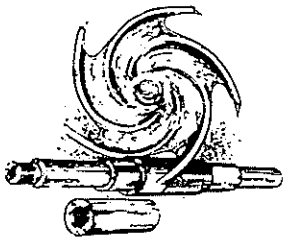
To assure that you can make no better choice than Goulds, we offer the best pump parts program in the industry. We call it "pump parts like never before" and very simply means unsurpassed *availability, service, quality* and *value.*



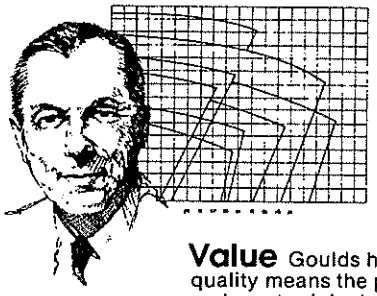
Availability A nationwide, computer-controlled distribution network backed by factory programs designed to get you the part you need — when you need it.

Service Our Certified Original Parts specialists are dedicated to serving your parts needs by:

- Helping minimize parts inventories
- Delivering parts
- Providing maintenance consultation service



Quality Goulds is committed to providing the highest *original* quality and sometimes *better* if design or material improvements have been made.



Value Goulds high standards of quality means the part will fit right and meet original standards of performance.

GOULDS PUMPS
PARTS
THE REAL ONES

GOULDS PUMPS, INC.
SENECA FALLS, NEW YORK 13148

Appendix C

Inspection Forms

Glenn Springs Holdings, Inc.

A subsidiary of Occidental Petroleum

WNY Daily Inspection Sheet

Date: _____

Time: _____

Love Canal: _____ S-Area: _____

Hyde Park: _____ NT: _____

102nd St: _____

Inspected By: _____

Weekend Inspection: Y ☐ N ☐

Satisfactory

Y / N **Security:** Fence Integrity; Postings/Signs; Buildings; and Lighting.

Y / N **Vehicles:** Secure; and Properly Operating.

Y / N **Communications:** Phone Systems; Network(s); Auto-dialers; and HMI's.

Y / N **Utilities:** Gas; Electric; and Water/Sewer.

Y / N **House Keeping:** Garbage; Fence Lines; Walkways/Roadways; Control Room; Locker Room; Offices; Auxiliary Buildings; Maintenance Work Areas; MCC's; and Process.

Y / N **HMI Data:** Reviewed data. Wells Operating at Set Point (Any Discrepancy Noted in Comments).

Y / N **Process:** Tanks and Associated Piping and Transfer Lines; Containment; and Sumps.

Y / N **Storage Dikes:** Tanks; Decanters; Sumps; and Piping.

Y / N **Containment:** Secondary and Leak Detection.

Y / N

Container Storage Area: Container(s) Non-Leaking, Non-Corroded; Closed; Labeled; and Contained (Stored containers meet all applicable regulations).

Earliest Stored Drum Date _____ (<90 Days)

Quantity of Containers _____

COMMENTS: _____

_____

_____

_____

If any Inspections item(s) are NOT Satisfactory comment above and describe what corrective actions were taken.

Signature: _____

Glenn Springs Holdings, Inc.
A subsidiary of Occidental Petroleum

WEEKLY INSPECTION LOG SHEET

Date: _____ Inspected By: _____

____ First aid kits inspected and recorded on kit log

____ Safety Showers/Eye Wash Stations inspected (clean, adequate flow) and recorded on tags

Repairs/Replacements Required: _____

_____

_____

_____.

Glenn Springs Holdings, Inc.
A subsidiary of Occidental Petroleum

MONTHLY INSPECTION LOG SHEET

Date: _____ Inspected By: _____

____ Fire extinguisher inspection conducted and recorded on fire extinguisher tags

____ Check for breakthrough (>20 ppm) of carbon vent sorb drums (with PID)

Indicate drums requiring replacement _____

____ Ladders inspected and recorded on tags

____ Portable electrical equipment, extension cords, hand tools inspected

____ Autodialer - low battery light

____ Exits (free of obstructions, clear path to exit)

____ Exit Lights/Emergency Lights (operational)

____ Visual inspection of all process vessels and tanks (leaks, corrosion)

____ Perimeter Fence (cursory visual from distance - no obvious damage, signage in place)

____ Dielectric matting -free from damage, holes, cuts, or deterioration or imbedded objects that may affect its insulating properties

Repairs/Replacements Required: _____

_____

_____

_____.

DUREZ NORTH TONAWANDA
INTERCEPTOR TRENCH SYSTEM
MANHOLE AND NAPL COLLECTOR
QUARTERLY INSPECTION

Date: _____ Checked By: _____

	Manhole					*NAPL Well*		
Station Number	***Condition***	***Visible Chemistry***	***Sediment***	***Water Depth***	***Flow Speed***	***NAPL***	***Amount Removed***	***Date Removed***
Main Lift Station								
MH-4+20								
MH-5+54								
MH-8+13								
MH-10+75								
MH-12+58								
Lift Station #1								
MH-13+99								
MH-17+20								
MH-19+78								
MH-23+55								
MH-26_55								
Lift Station #2								
MH-33+35								
MH-37+13								
MH-40+70								
MH-43+54								
Lift Station #3								
MH-49+48								
MH-53+51								
MH-56+60								
MH-57+97								
MH-58+56								
MH-61+20								
MH-64+84								
MH-66+28								
MH-69+97								
MH-71+54								
MH-72+65								
MH-72+96								
MH-74+68								
MH-74+90								
MH-77+39								
MH-77+72								
MH-80+95								

DUREZ NORTH TONAWANDA
INTERCEPTOR TRENCH SYSTEM
PANHANDLE REMEDIATION AREA
QUARTERLY INSPECTION

Date: _____ **Checked By: _____**

Area	*Item*	*Remarks*
PAVED AREAS	Surficial Cracks	
	Surficial Obstructions	
	Subsidence	
VEGETATED AREAS	Growth	
	Stress	
	Regrowth	
	Subsidence	
	Drainage Features	
	Ponding	
LANDFILL AREA	Landfill Cover	
	Condition of Vegetation	
	Leachate Breakout	
	Drainage Features	
	Runoff	
	Erosion	
	Subsidence	
	Ponding	
DITCHES	Scouring	
	Sedimentation Buildup	
	Culvert Condition	
	Evidence of Overflow	
FENCE LINE	Breach	
OTHER	Obvious Surface Contamination	
	Accessibility to Wells	

Glenn Springs Holdings, Inc.
A subsidiary of Occidental Petroleum

Durez North Tonawanda Semiannual Lift Station Inspections

Date: _____ ***Weather:*** _____
Inspector: _____ _____

Check the Following as Appropriate:

Visual Inspection of lift station piping
Verification of level probe performance
Inspection of lift station integrity
Inspection of lift station security

Wells	Satisfactory	Needs Maintenance
Lift Station 1		
Lift Stattion 2		
Lift Station 3		
Main Lift Station		

Comments:

Signature: _____

Glenn Springs Holdings, Inc.
A subsidiary of Occidental Petroleum

SEMIANNUAL FENCE INSPECTION

Site: _____

Date: _____ **Weather:** _____

Inspector: _____

Inspection Item	Inspect For	
2. Perimeter Fence	- breaches in fence	Y / N
	- gates secure	Y / N
	- locks in place	Y / N
	- missing or illegible signage	Y / N

Comments/Remarks **(Note: If repair/maintenance is recommended, describe its location/extent below)**

_____

_____

_____

_____

_____

_____

_____

_____

Glenn Springs Holdings, Inc.
A subsidiary of Occidental Petroleum

ANNUAL LEVEL SWITCH INSPECTION

Site: North Tonawanda

Date: _____ **Weather:** _____

Inspector: _____

Inspection Item **Trigger level switch to verify interlock functioning**

				Interlock functioning
1.	**Level Switch Operation**	- Raw Water Tank 1	LSHH1508	Y / N
		- Raw Water Tank 2	LSHH1512	Y / N
		- Main Lift Station	LSHH5400	Y / N
		- Lift Station #1	LSHH5401	Y / N
		- Lift Station #2	LSHH5402	Y / N
		- Lift Station #3	LSHH5403	Y / N
		- Pump House	LSH510	Y / N
		- Decanter Sump	LSHH5469	Y / N
		- Building Trench	LSH1500	Y / N

Comments/Remarks **(Note: If repair/maintenance is recommended, describe its location/extent below)**

Appendix D

SPDES Permit

New York State Department of Environmental Conservation
Division of Environmental Permits, Region 9
270 Michigan Avenue, Buffalo, New York 14203-2915
Phone: (716) 851-7165 **Fax:** (716) 851-7168
Website: www.dec.ny.gov

Joe Martens
Commissioner

March 7, 2013

Mr. Joseph Branch
Glenn Springs Holdings, Inc.
P.O. Box 146
Montague, Michigan 49437

Dear Mr. Branch:

PERMIT TRANSMITTAL LETTER
OCCIDENTAL CHEMICAL CORP./DUREZ DIVISION – WALCK ROAD PLANT
PERMIT NO. 9-2912-00041/00022
SPDES NO. NY – 0001198

Enclosed is your modified permit which was issued in accordance with applicable provisions of the Environmental Conservation Law. The permit is valid for only that project, activity or operation expressly authorized. If modifications are desired after permit issuance, you must submit the proposed revisions and receive written approval from the Permit Administrator prior to initiating any change. If the Department determines that the modification represents a material change in the scope of the authorized project, activity, operation or permit conditions, you will be required to submit a new application for permit.

PLEASE REVIEW ALL PERMIT CONDITIONS CAREFULLY, INCLUDING ANY MONITORING REQUIREMENTS AND/OR COMPLIANCE SCHEDULE THAT MAY BE REQUIRED. IN PARTICULAR, IDENTIFY YOUR INITIAL RESPONSIBILITIES UNDER THIS PERMIT IN ORDER TO ASSURE TIMELY ACTION AND AVOID LATE REPORTING IF REQUIRED. SINCE FAILURE TO COMPLY PRECISELY WITH PERMIT CONDITIONS MAY BE TREATED AS A VIOLATION OF THE ENVIRONMENTAL CONSERVATION LAW, **YOU ARE REQUESTED TO PROVIDE A COPY OF THE PERMIT TO THE PROJECT CONTRACTOR, FACILITY OPERATOR, AND OTHER PERSONS DIRECTLY RESPONSIBLE FOR PERMIT IMPLEMENTATION (IF ANY).**

The Department maintains authority regarding the terms of this permit in accordance with 6 NYCRR Part 750. This regulation may be accessed from the internet at the Department's website, http://www.dec.ny.gov/regs/4584.html. If you do not have website access, you may obtain a paper copy of the regulation at 270 Michigan Avenue, Buffalo, New York 14203, telephone number 716/851-7165.

If you have any questions regarding the administrative processing of this permit or request for modification, please contact this office at the above address. Technical questions relating to the specific conditions should be directed to Mr. Robert Locey of our Division of Water at 716/851-7070.

Respectfully,
David S. Denk
Regional Permit Administrator

LMP:ldg

Enclosure
ecc: Mr. Jeffrey Konsella, NYSDEC Division of Water; attn: Mr. Robert Locey
Ms. Cheri Jamison, Permit Coordinator, Bureau of Water Permits, NYSDEC, Albany
Mr. Jeffrey Gratz, EPA Region 2
Mr. Bruce Kirschner, IJC
Mr. Ronald Gwozdek, Niagara County Health Department

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

State Pollutant Discharge Elimination System (SPDES)
DISCHARGE PERMIT

First3.99

Industrial Code:	**9511**	SPDES Number:	**NY- 0001198**
Discharge Class (CL):	**03**	DEC Number:	**9-2912-00041/00022-0**
Toxic Class (TX):	**T**	Effective Date (EDP):	**12/01/10**
Major Drainage Basin:	**01**	Expiration Date (ExPD):	**11/30/15**
Sub Drainage Basin:	**01**	Modification Dates:	**04/01/13**
Water Index Number:	**O-158**		
Compact Area:			

This SPDES permit is issued in compliance with Title 8 of Article 17 of the Environmental Conservation Law of New York State and in compliance with the Clean Water Act, as amended, (33 U.S.C. §1251 et.seq.)(Hereinafter referred to as "the Act").

PERMITTEE NAME AND ADDRESS

Name: **Occidental Chemical Corporation/Durez Division** Attention: **Mr. Joe Branch, Project Manager**

Street: **805 97th St.**

City: **Niagara Falls** State: **NY** Zip Code: **14304**

is authorized to discharge from the facility described below:

FACILITY NAME AND ADDRESS

Name: **Occidental Chemical Corporation/Durez Division**

Location (C,T,V): **North Tonawanda (C)** County: **Niagara**

Facility Address: **700 Walck Road**

City: **North Tonawanda** State: **NY** Zip Code: **14210-0535**

NYTM -E: 185.4 NYTM - N: 4773.0

From Outfall No.: **009** at Latitude: **43** ☐ **02** ☐ **44** ☐ & Longitude: **78** ☐ **52** ☐ **17** ☐

into receiving waters known as: **Niagara River via storm sewer** Class: **A-special**

and; (list other Outfalls, Receiving Waters & Water Classifications)

in accordance with: effluent limitations; monitoring and reporting requirements; other provisions and conditions set forth this permit; and 6 NYCRR Part 750-1.2(a) and 750-2.

DISCHARGE MONITORING REPORT (DMR) MAILING ADDRESS

Mailing Name: **Occidental Chemical Corporation/Durez Division**

Street: **805 97th Street**

City: **Niagara Falls** State: **NY** Zip Code: **14304**

Responsible Official or Agent: **Mr. Joe Branch, Project Manager** Phone: **716/283-0112**

This permit and the authorization to discharge shall expire on midnight of the expiration date shown above and the permittee shall not discharge after the expiration date unless this permit has been renewed, or extended pursuant to law. To be authorized to discharge beyond the expiration date, the permittee shall apply for permit renewal not less than 180 days prior to the expiration date shown above.

DISTRIBUTION:

Bureau of Water Permits
Permit Coordinator - BWP
Region 9 Water Engineer
Jeff Gratz - EPA Region II
Niagara County Health Department

Permit Administrator: Lisa M. Porter	
Address: 270 Michigan Avenue Buffalo, NY 14203	
Signature: Lisa M. Porter	Date: 3/7/13

PERMIT LIMITS, LEVELS AND MONITORING DEFINITIONS

H:\SPDES Permits\Occidental\0001198p.da.August 4.wpd

OUTFALL	WASTEWATER TYPE	RECEIVING WATER	EFFECTIVE	EXPIRING
	This cell describes the type of wastewater authorized for discharge. Examples include process or sanitary wastewater, storm water, non-contact cooling water.	This cell lists classified waters of the state to which the listed outfall discharges.	The date this page starts in effect. (e.g. EDP or EDPM)	The date this page is no longer in effect. (e.g. ExDP)

PARAMETER	MINIMUM	MAXIMUM	UNITS	SAMPLE FREQ.	SAMPLE TYPE
e.g. pH, TRC, Temperature, D.O.	The minimum level that must be maintained at all instants in time.	The maximum level that may not be exceeded at any instant in time.	SU, °F, mg/l, etc.		

PARA-METER	EFFLUENT LIMIT	PRACTICAL QUANTITATION LIMIT (PQL)	ACTION LEVEL	UNITS	SAMPLE FREQUENCY	SAMPLE TYPE
	Limit types are defined below in Note 1. The effluent limit is developed based on the more stringent of technology-based limits, required under the Clean Water Act, or New York State water quality standards. The limit has been derived based on existing assumptions and rules. These assumptions include receiving water hardness, pH and temperature; rates of this and other discharges to the receiving stream; etc. If assumptions or rules change the limit may, after due process and modification of this permit, change.	For the purposes of compliance assessment, the analytical method specified in the permit shall be used to monitor the amount of the pollutant in the outfall to this level, provided that the laboratory analyst has complied with the specified quality assurance/quality control procedures in the relevant method. Monitoring results that are lower than this level must be reported, but shall not be used to determine compliance with the calculated limit. This PQL can be neither lowered nor raised without a modification of this permit.	Type I or Type II Action Levels are monitoring requirements, as defined below in Note 2, that trigger additional monitoring and permit review when exceeded.	This can include units of flow, pH, mass, Temperature, concentration. Examples include µg/l, lbs/d, etc.	Examples include Daily, 3/week, weekly, 2/month, monthly, quarterly, 2/yr and yearly.	Examples include grab, 24 hour composite and 3 grab samples collected over a 6 hour period.

Note 1: DAILY DISCHARGE: The discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for the purposes of sampling. For pollutants expressed in units of mass, the 'daily discharge' is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the 'daily discharge' is calculated as the average measurement of the pollutant over the day. DAILY MAX: The highest allowable daily discharge. DAILY MIN: The lowest allowable daily discharge. MONTHLY AVG (daily avg): The highest allowable average of daily discharges over a calendar month, calculated as the sum of each of the daily discharges measured during a calendar month divided by the number of daily discharges measured during that month. RANGE: The minimum and maximum instantaneous measurements for the reporting period must remain between the two values shown. 7 DAY ARITHMETIC MEAN (7 day average): The highest allowable average of daily discharges over a calendar week. 12 MRA (twelve month rolling avg): The average of the most recent twelve month's monthly averages. 30 DAY GEOMETRIC MEAN (30 d geo mean): The highest allowable geometric mean of daily discharges over a calendar month, calculated as the antilog of : the sum of the log of each of the daily discharges measured during a calendar month divided by the number of daily discharges measured during that month. 7 DAY GEOMETRIC MEAN (7 d geo mean): The highest allowable geometric mean of daily discharges over a calendar week.

Note 2: ACTION LEVELS: Routine Action Level monitoring results, if not provided for on the Discharge Monitoring Report (DMR) form, shall be appended to the DMR for the period during which the sampling was conducted. If the additional monitoring requirement is triggered as noted below, the permittee shall undertake a short-term, high-intensity monitoring program for the parameter(s). Samples identical to those required for routine monitoring purposes shall be taken on each of at least three consecutive operating and discharging days and analyzed. Results shall be expressed in terms of both concentration and mass, and shall be submitted no later than the end of the third month following the month when the additional monitoring requirement was triggered. Results may be appended to the DMR or transmitted under separate cover to the same address. If levels higher than the Action Levels are confirmed, the permit may be reopened by the Department for consideration of revised Action Levels or effluent limits. The permittee is not authorized to discharge any of the listed parameters at levels which may cause or contribute to a violation of water quality standards. TYPE I: The additional monitoring requirement is triggered upon receipt by the permittee of any monitoring results in excess of the stated Action Level. TYPE II: The additional monitoring requirement is triggered upon receipt by the permittee of any monitoring results that show the stated action level exceeded for four of six consecutive samples or for two of six consecutive samples by 20 % or more or for any one sample by 50 % or more.

PERMIT LIMITS, LEVELS AND MONITORING

OUTFALL NUMBER	WASTEWATER TYPE	RECEIVING WATER	EFFECTIVE	EXPIRING
009*	Sand Filtration followed by Carbon beds	Niagara River	04/01/13	11/30/15

PARAMETER	EFFLUENT LIMIT		UNITS	SAMPLE FREQUENCY	SAMPLE TYPE	FN
	Monthly Avg.	Daily Max.				
Flow	Monitor	0.36	MGD	Continuous	Totalizer	
pH (Range)	Range	6.0 - 9.0	SU	Weekly	Grab	
Total Suspended Solids	Monitor	20	mg/l	Monthly	24 hr. Comp.	
Benzene	Monitor	5	µg/l	Monthly	24-hr. Comp.	
Chlorobenzene	Monitor	10	µg/l	Monthly	24-hr. Comp.	
Dichlorobenzenes	Monitor	30	µg/l	Monthly	24-hr. Comp.	
Hexachlorobenzenes	Monitor	0.2	µg/l	Monthly	24-hr. Comp.	
Chlorotoluenes	Monitor	10	µg/l	Monthly	24-hr. Comp.	
Toluene	Monitor	5	µg/l	Monthly	24 hr. Comp.	
Trichlorobenzenes	Monitor	10	µg/l	Monthly	24 hr. Comp.	
Phenolics, Total	Monitor	100	µg/l	Monthly	24 hr. Comp	
Ethylbenzene	Monitor	5	µg/l	Semi-annual	24 hr. Comp	
Bis(2-ethylhexyl)phthalate	Monitor	20	µg/l	Semi-annual	24 hr. Comp	
Hexachlorobutadiene	Monitor	1.0	µg/l	Semi-annual	24 hr. Comp	
Trichlorofluoromethane	Monitor	10	µg/l	Semi-annual	24 hr. Comp	
4,4'-DDT	Monitor	0.05	µg/l	Semi-annual	24 hr. Comp	
Trichloroethylene	Monitor	10	µg/l	Semi-annual	24 hr. Comp	
Tetrachloroethylene	Monitor	10	µg/l	Semi-annual	24 hr. Comp	
Methylene Chloride	Monitor	10	µg/l	Semi-annual	24 hr. Comp	
1,2-(trans)-Dichloroethylene	Monitor	10	µg/l	Semi-annual	24 hr. Comp	
Benzo(a)pyrene	Monitor	0.09	µg/l	Semi-annual	24 hr. Comp.	
Tetra-chlorodibenzofurans	Monitor	$10x10^{-6}$	µg/l	Semi-annual	24-hr. Comp.	
Penta-,Hexa-,and Hepta-chlorodibenzofurans	Monitor	$50x10^{-6}$	µg/l	Semi-annual	24-hr. Comp.	
Octa-chlorodibenzofuran	Monitor	$100x10^{-6}$	µg/l	Semi-annual	24-hr. Comp.	

* Outfall 009 is treated groundwater from the collection trench around the site.

ACTION LEVEL REQUIREMENTS

OUTFALL NUMBER	WASTEWATER TYPE	RECEIVING WATER	EFFECTIVE	EXPIRING
009*	Sand Filtration followed by Carbon beds	Niagara River	04/01/13	11/30/15

PARAMETER	ACTION LEVEL	PQL	UNITS	SAMPLE FREQUENCY	SAMPLE TYPE	FN
Antimony, Total	10	10	µg/l	Semi-annual	24-hr. Comp	
Arsenic, Total	4	4	µg/l	Semi-annual	24-hr. Comp	
Cadmium, Total	0.4	0.4	µg/l	Semi-annual	24-hr. Comp	
Chromium, Total	4	4	µg/l	Annual	24-hr. Comp	
Copper, Total	4	4	µg/l	Annual	24-hr. Comp	
Cyanide, Total	60	60	µg/l	Annual	24-hr. Comp	
Lead, Total	4	4	µg/l	Annual	24-hr. Comp	
Nickel, Total	4	4	µg/l	Annual	24-hr. Comp	
Silver, Total	0.8	0.8	µg/l	Annual	24-hr. Comp	
2-Chlorophenol	1	1	µg/l	Annual	24-hr. Comp.	
Anthracene	3	3	µg/l	Annual	24-hr. Comp.	
2,4-DimethylPhenol	1	1	µg/l	Annual	24-Hr. Comp.	
Di-(N-butyl)Phthalate	1.0	1.0	µg/l	Annual	24-hr. Comp.	
Fluoranthene	0.8	0.8	µg/l	Annual	24-hr. Comp.	
Naphthalene	6	6	µg/l	Annual	24-hr. Comp.	
Pyrene	1	1	µg/l	Annual	24-hr. Comp.	
2,4,6-Trichlorophenol	2	2	µg/l	Annual	24-hr. Comp.	
2,4,5-Trichlorophenol	10	10	µg/l	Annual	24-hr. Comp.	
Pentachlorophenol	2	2	µg/l	Annual	24-hr. Comp.	
Styrene	1	1	µg/l	Annual	24-hr. Comp.	
Tetrachlorobenzenes	10	10	µg/l	Annual	24-hr. Comp.	
Pentachlorobenzene	0.4	0.4	µg/l	Annual	24-hr. Comp.	
Bromodichloromethane	0.4	0.4	µg/l	Annual	24-hr. Comp.	†
Chloroform	0.2	0.2	µg/l	Annual	24-hr. Comp	
Dibromochloromethane	0.4	0.4	µg/l	Annual	24-hr. Comp	

* Outfall 009 is treated groundwater from the collection trench around the site.

NOTES FOR EFFLUENT LIMITS AND ACTION LEVELS

(1) Unless otherwise permitted by the Regional Water Engineer, the semi-annual sampling should be conducted once between March 1 and April 30 ("Spring") and once between October 1 and November 30 ("Fall").

(2) The permit application must list all of the corrosion/scale inhibitors or biocidal-type compounds used by the permittee. If the use of new boiler/cooling water additives is intended, application must be made prior to use.

(3) The permittee shall take 24-hour composite samples at outfall 009 and the influent to the treatment units on a semi-annual basis, which shall be analyzed for all purgeable, Acid Extract, and Base/Neutral Priority Pollutants; all priority pollutant metals, Cyanide (Total), and Phenolics (Total). Analyses for Purgeable Priority Pollutants may be made by EPA Method 624, and Acid Extract/Base Neutral Priority Pollutants may be analyzed using EPA Method 625, and Organochlorine Pesticides and PCB's should be analyzed using EPA Method 608. The results of these analyses shall be tabulated, including both concentrations and mass loadings for each parameter at the outfall, and submitted to the Department as an addendum to the appropriate Discharge Monitoring Report (DMR) form.

SPECIAL CONDITIONS - BEST MANAGEMENT PRACTICES

1. The permittee shall maintain a Best Management Practices (BMP) plan, for the duration of the permit to prevent or minimize the potential for, release of significant amounts of toxic or hazardous pollutants to the waters of the State through plant site runoff; spillage and leaks; sludge or waste disposal; or drainage from raw material storage. The permittee shall update the BMP Plan within one year of the EDP.

2. The permittee shall review all facility components or systems (including material storage areas; in-plant transfer, process and material handling areas; loading and unloading operations; and sludge and waste disposal areas) where toxic or hazardous pollutants are used, manufactured, stored or handled to evaluate the potential for the release of significant amounts of such pollutants to the waters of the State. In performing such an evaluation, the permittee shall consider such factors as the probability of equipment failure or improper operation, settlement of facility air emissions, the effects of natural phenomena such as freezing temperatures and precipitation, fires, and the facility's history of spills and leaks. For hazardous pollutants, the list of reportable quantities as defined in 40 CFR, Part 117 may be used as a guide in determining significant amounts of releases. For toxic pollutants, the relative toxicity of the pollutant shall be considered in determining the significance of potential releases.

   The review shall address all substances present at the facility that are listed as toxic pollutants under Section 307(a)(1) of the Clean Water Act or as hazardous pollutants under Section 311 of the Act or that are identified as Chemicals of Concern by the Industrial Chemical Survey.

3. Whenever the potential for a significant release of toxic or hazardous pollutants to State waters is determined to be present, the permittee shall identify Best Management Practices that have been established to minimize such potential releases. Where BMPs are inadequate or absent, appropriate BMPs shall be established. In selecting appropriate BMPs, the permittee shall consider typical industry practices such as spill reporting procedures, risk identification and assessment, employee training, inspections and records, preventive maintenance, good housekeeping, materials compatibility and security. In addition, the permittee may consider structural measures (such as secondary containment devices) where appropriate.

4. Development of the BMP plan shall include sampling of waste stream segments for the purpose of toxic "hot spot"* identification. The economic achievability of technology-based end-of-pipe treatment will not be considered until plant site "hot spot" sources have been identified, contained, removed or minimized through the imposition of site specific BMPs or application of internal facility treatment technology.

5. The BMP plan shall be documented in narrative form and shall include any necessary plot plans, drawings or maps. Other documents already prepared for the facility such as a Safety Manual or a Spill Prevention, Control and Countermeasure (SPCC) plan may be used as part of the plan and may be incorporated by reference. A copy of the BMP plan shall be maintained at the facility and shall be available to authorized Department representatives upon request. As a minimum, the plan shall include the following BMP's:

   a. BMP Committee
   b. Reporting of BMP Incidents
   c. Risk Identification and Assessment
   d. Employee Training
   e. Inspections and Records
   f. Preventive Maintenance
   g. Good Housekeeping
   h. Materials Compatibility
   i. Security

6. The BMP plan shall be modified whenever changes at the facility materially increase the potential for significant releases of toxic or hazardous pollutants or where actual releases indicate the plan is inadequate.

* A "hot spot" is a segment of an industrial facility; including but not limited to soil, equipment, material storage areas, sewer lines etc.; which contributes elevated levels of problem pollutants to the wastewater and/or storm water collection system of that facility. For the purposes of this definition, problem pollutants are substances for which end of pipe treatment to meet a water quality or technology requirement may, considering the results of wastestream segment sampling, be deemed unreasonable. For the purposes of this definition, an elevated level is a concentration or mass loading of the pollutant in question which is adequately higher than the end of pipe concentration of that same pollutant so as to allow for and economically justify removal and/or isolation of the segment and/or B.A.T. treatment of wastewaters emanating from the segment.

Whole Effluent Toxicity Testing

PARAMETER	EFFLUENT LIMIT		PQL	MONITORING ACTION LEVEL		UNITS	SAMPLE FREQUENCY	SAMPLE TYPE	FN
	Monthly Avg.	Daily Max.	Daily Max.	TYPE I	TYPE II				
WET - Acute Invertebrate				15.3		TUa	Quarterly	see footnote	1
WET - Acute Vertebrate				15.3		TUa	Quarterly	see footnote	1
WET - Chronic Invertebrate				101		TUc	Quarterly	see footnote	1
WET - Chronic Vertebrate				101		TUc	Quarterly	see footnote	1

Footnote
1. **Whole Effluent Toxicity Testing**

Testing Requirements - WET testing shall consist of **Chronic only**. WET testing shall be performed in accordance with 40 CFR Part 136 and TOGS 1.3.2 unless prior written approval has been obtained from the Department. The test species shall be *Ceriodaphnia dubia* (water flea - invertebrate) and *Pimephales promelas* (fathead minnow - vertebrate). Receiving water collected upstream from the discharge should be used for dilution. All tests conducted should be static-renewal (two 24 hr composite samples with one renewal for Acute tests and three 24 hr composite samples with two renewals for Chronic tests). The appropriate dilution series bracketing the IWC and including one exposure group of 100% effluent should be used to generate a definitive test endpoint, otherwise an immediate rerun of the test is required. WET testing shall be coordinated with the monitoring of chemical and physical parameters limited by this permit so that the resulting analyses are also representative of the sample used for WET testing. The ratio of critical receiving water flow to discharge flow (i.e. dilution ratio) is **50:1** for acute, and **100:1** for chronic. Discharges which are disinfected using chlorine should be dechlorinated prior to WET testing or samples shall be taken immediately prior to the chlorination system.

Monitoring Period - WET testing shall be performed at the specified sample frequency **during calendar years ending in 9 and 4.**

Reporting - Toxicity Units shall be calculated and reported on the DMR as follows: TUa = (100)/(48 hr LC50) or (100)/(48 hr EC50) (note that Acute data is generated by both Acute and Chronic testing) and TUc = (100)/(NOEC) when Chronic testing has been performed or TUc = (TUa) x (10) when only Acute testing has been performed and is used to predict Chronic test results, where the 48 hr LC50 or 48 hr EC50 and NOEC are expressed in % effluent. This must be done for both species and using the Most Sensitive Endpoint (MSE) or the lowest NOEC and corresponding highest TUc. Report a TUa of 0.3 if there is no statistically significant toxicity in 100% effluent as compared to control.

The complete test report including all corresponding results, statistical analyses, reference toxicity data, daily average flow at the time of sampling and other appropriate supporting documentation, shall be submitted within 60 days following the end of each test period to the Toxicity Testing Unit. A summary page of the test results for the invertebrate and vertebrate species indicating TUa, 48 hr LC50 or 48 hr EC50 for Acute tests and/or TUc, NOEC, IC25, and most sensitive endpoints for Chronic tests, should also be included at the beginning of the test report.

WET Testing Action Level Exceedances - If an action level is exceeded then the Department may require the permittee to conduct additional WET testing including Acute and/or Chronic tests. Additionally, the permittee may be required to perform a Toxicity Reduction Evaluation (TRE) in accordance with Department guidance. If such additional testing or performance of a TRE is necessary, the permittee shall be notified in writing by the Regional Water Engineer. The written notification shall include the reason(s) why such testing or a TRE is required.

DISCHARGE NOTIFICATION REQUIREMENTS

a) The permittee shall maintain the existing identification signs at all outfalls to surface waters, which have not been waived by the Department in accordance with ECL 17-0815-a. The sign(s) shall be conspicuous, legible and in as close proximity to the point of discharge as is reasonably possible while ensuring the maximum visibility from the surface water and shore. The signs shall be installed in such a manner to pose minimal hazard to navigation, bathing or other water related activities. If the public has access to the water from the land in the vicinity of the outfall, an identical sign shall be posted to be visible from the direction approaching the surface water.

The signs shall have **minimum** dimensions of eighteen inches by twenty four inches (18" x 24") and shall have white letters on a green background and contain the following information:

N.Y.S. PERMITTED DISCHARGE POINT

SPDES PERMIT No.: NY_____

OUTFALL No. :____

For information about this permitted discharge contact:

Permittee Name: _____

Permittee Contact: _____

Permittee Phone: ( ) - ### - ####

OR:

NYSDEC Division of Water Regional Office Address:

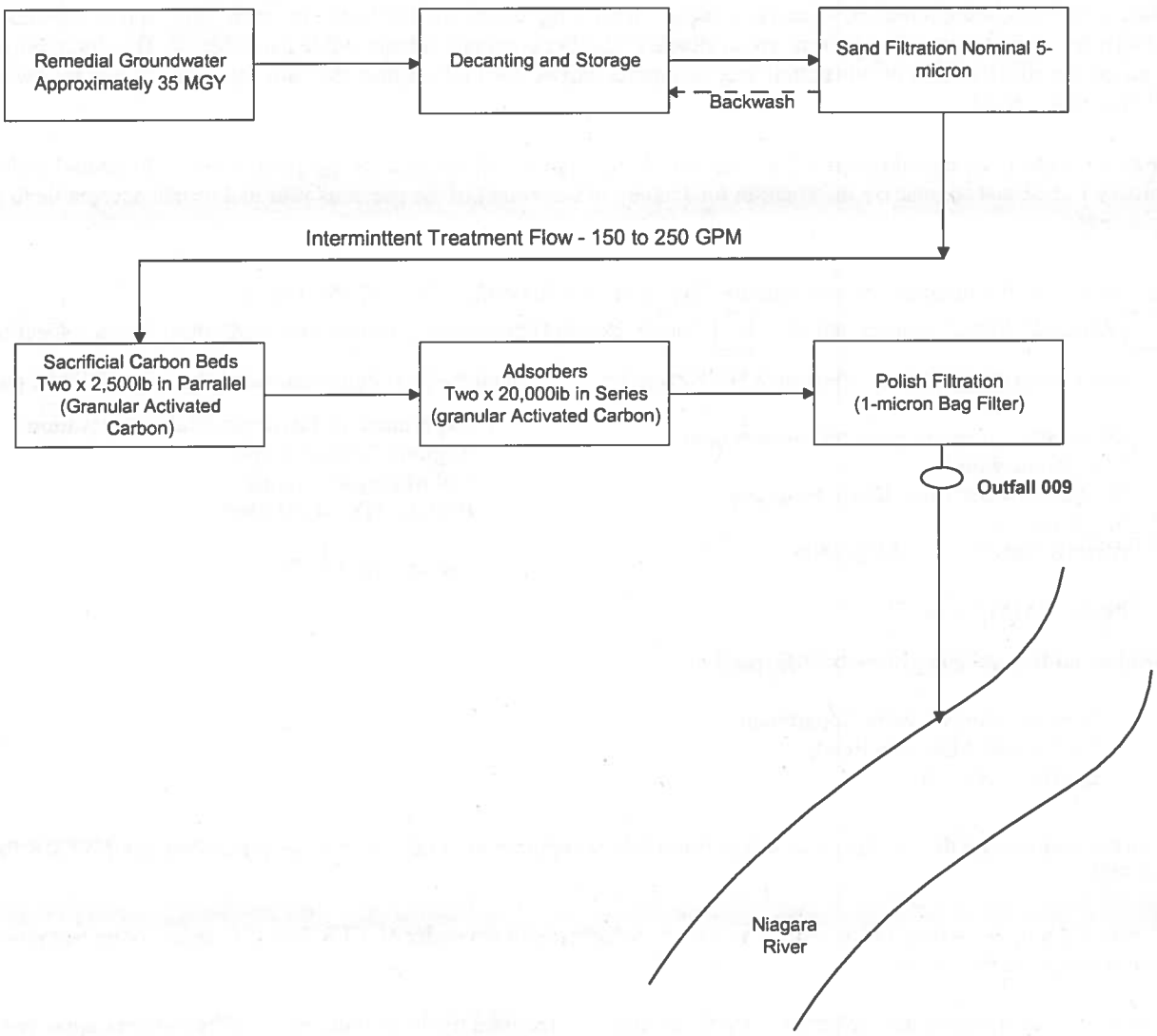
NYSDEC Division of Water Regional Phone: ( ) - ### -####

b) For each discharge required to have a sign in accordance with a), the permittee shall provide for public review at a repository accessible to the public, copies of the Discharge Monitoring Reports (DMRs) as required by the **RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS** page of this permit. This repository shall be open to the public, at a minimum, during normal daytime business hours. The repository may be at the business office repository of the permittee or at an off-premises location of its choice (such location shall be the village, town, city or county clerk's office, the local library or other location as approved by the Department). In accordance with the **RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS** page of your permit, each DMR shall be maintained on record for a period of five years.

c) The permittee shall periodically inspect the outfall identification signs in order to ensure that they are maintained, are still visible and contain information that is current and factually correct.

MONITORING LOCATIONS

The permittee shall take samples and measurements, to comply with the monitoring requirements specified in this permit, at the location(s) specified below:



RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS

a) The permittee shall also refer to 6 NYCRR Part 750-1.2(a) and 750-2 for additional information concerning monitoring and reporting requirements and conditions.

b) The monitoring information required by this permit shall be summarized, signed and retained for a period of at least five years from the date of the sampling for subsequent inspection by the Department or its designated agent. **Also, monitoring information required by this permit shall be summarized and reported by submitting;**

[X] (if box is checked) completed and signed Discharge Monitoring Report (DMR) forms for each one month reporting period to the locations specified below. Blank forms are available at the Department's Albany office listed below. The first reporting period begins on the effective date of this permit and the reports will be due no later than the 28th day of the month following the end of each reporting period.

[ ] (if box is checked) an annual report to the Regional Water Engineer at the address specified below. The annual report is due by February 1 and must summarize information for January to December of the previous year in a format acceptable to the Department.

[ ] (if box is checked) a monthly "Wastewater Facility Operation Report..." (form 92-15-7) to the:

[ ] Regional Water Engineer and/or [ ] County Health Department or Environmental Control Agency specified below

Send the **original** (top sheet) of each DMR page to:

Department of Environmental Conservation
Division of Water
Bureau of Water Compliance Programs
625 Broadway
Albany, New York 12233-3506

Phone: (518) 402-8177

Send the **first copy** (second sheet) of each DMR page to:

Department of Environmental Conservation
Regional Water Engineer
270 Michigan Avenue
Buffalo, NY 14203-2999

Phone: 716-851-7070

Send an **additional copy** of each DMR page to:

Niagara County Health Department
5467 Upper Mountain Road
Lockport, NY 14094

c) Noncompliance with the provisions of this permit shall be reported to the Department as prescribed in 6 NYCRR Part 750-1.2(a) and 750-2.

d) Monitoring must be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit.

e) If the permittee monitors any pollutant more frequently than required by the permit, using test procedures approved under 40CFR Part 136 or as specified in this permit, the results of this monitoring shall be included in the calculations and recording of the data on the Discharge Monitoring Reports.

f) Calculation for all limitations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified in this permit.

g) Unless otherwise specified, all information recorded on the Discharge Monitoring Report shall be based upon measurements and sampling carried out during the most recently completed reporting period.

h) Any laboratory test or sample analysis required by this permit for which the State Commissioner of Health issues certificates of approval pursuant to section five hundred two of the Public Health Law shall be conducted by a laboratory which has been issued a certificate of approval. Inquiries regarding laboratory certification should be sent to the Environmental Laboratory Accreditation Program, New York State Health Department Center for Laboratories and Research, Division of Environmental Sciences, The Nelson A. Rockefeller Empire State Plaza, Albany, New York 12201.