OPERATION AND MAINTENANCE MANUAL

Stauffer Management Company
Town of Lewiston, New York

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1.0 INTRODUCTION

The Stauffer Management Company (SMC) Site (Site), is located in the Town of Lewiston, New York, immediately north of the Forebay for the Robert Moses Power Plant. Figure 1.1 presents the location of the Site and Figure 1.2 presents the layout of the Site.

Five remediation systems are currently being operated at the Site:

i) a groundwater extraction and treatment system;
ii) three soil vapor extraction (SVE) and treatment systems; and
iii) a dense non-aqueous phase liquid (DNAPL) recovery system.

This Operation and Maintenance (O&M) Plan has been developed to describe the operation, maintenance, and monitoring activities to be performed during the long-term operation of the remedial systems and includes:

i) description of equipment;
ii) normal O&M activities;
iii) routine inspection, monitoring, and laboratory testing requirements;
iv) potential operating problems and solutions;
v) records and recording mechanisms required; and
vi) safety plan.

1.1 BACKGROUND

The Site is a former chemical manufacturing facility owned and operated by Stauffer Chemical Company. All structures associated with the former plant have been demolished and a treatment building has been erected to house the groundwater treatment system and the SVE system for Area A. The two other SVE systems are mounted in trailers. The Area T4 trailer is located on-Site, southwest of the treatment building. The Area C trailer is located off-Site, beyond the southeast corner of the Site property. The DNAPL recovery system is housed on-Site in a wooden shed, west of the treatment building.

The major chemicals of concern in the groundwater at the Site have been identified in the Site-Specific Parameter List (SSPL) as follows:

i) carbon disulfide;

ii) carbon tetrachloride;
iii) chloroform;
iv) methylene chloride;
v) tetrachloroethene;
vi) benzene;
vii) chlorobenzene;
viii) toluene; and
ix) trichloroethene.

These chemicals have been detected at varying concentrations in the groundwater, subsurface soils, seeps, and surface water runoff at and in the immediate vicinity of the Site.

2.0 DESIGN OBJECTIVES

The objective of the groundwater and soil vapor treatment systems is to ensure adequate removal of the SSPL compounds. Treatment allows the water stream discharged from the groundwater treatment system to the Forebay to meet New York State Department of Environmental Conservation (NYSDEC) mandated discharge limits and allows the air stream discharged from both treatment systems to meet air discharge limits based on New York State Air Guide 1 Annual and Short-Term Guidance Concentrations.

The objective of the groundwater, soil vapor, and DNAPL extraction wells is to remediate the SSPL contamination in the soil, bedrock, and groundwater at the Site and its immediate vicinity. The groundwater extraction wells are also used to contain the groundwater on-Site and prevent migration of the contaminants off-Site to the Forebay, which leads to the Niagara River.

3.0 SYSTEM DESCRIPTION

The remedial systems currently being operated at the Site include:

i) three SVE systems, operated at locations referred to as Area A, Area C, and Area T4;

ii) a groundwater extraction and treatment system; and

iii) a DNAPL recovery system.

Descriptions of each of the systems are provided in the following sections.

3.1 AREA A

Area A occupies approximately 136,500 square feet near the center of the property, as shown on Figure 3.1. The remedial system at Area A consists of a combination of soil vapor and groundwater extraction and includes 32 SVE wells, three dual-phase groundwater/SVE wells, and a cover comprised of a polyvinyl chloride (PVC) geomembrane liner, a geotextile cushion, and stone. The locations of the wells are shown on Figure 3.1.

Each SVE well is connected to one of four header pipes which are connected to the vacuum blower housed in the north side of the treatment building. The SVE piping is mounted on a uni-strut/pipe strap support system.

The Area A SVE system is comprised of a skid with a moisture separator tank, an in-line filter, a vacuum blower, a discharge silencer, and a condensate removal pump. The SVE system also has a heat exchanger and granular activated carbon (GAC) adsorption units which are mounted separately on the concrete floor.

The air stream from the SVE wells is drawn into the separator tank. Moisture in the air stream is collected in the separator tank and pumped to the groundwater treatment system. From the separator tank, the air stream passes through an in-line filter prior to the vacuum blower and is then directed through a discharge silencer and heat exchanger to four vapor phase carbon adsorption units. There are two parallel trains of two 1,800-pound carbon units in series. In each train, the first carbon unit acts as the lead or primary contaminant removal unit and the second unit acts as the polish bed. The flow through the carbon units in each train can be alternated so that either of the carbon units

may act as the lead unit. When the carbon becomes saturated from organic vapors, the spent carbon is sent off-Site for regeneration. The air discharge from the carbon units is vented to the atmosphere.

The dual-phase Area A (DPA) wells are used to dewater the on-Site SVE areas. Wells DPA-201, DPA-202, and DPA-203 depress the groundwater elevation for the Area A SVE system. These wells yield approximately 2 to 5 gallons per minute (GPM) each. The water discharge from each of the three dual wells is piped through above ground forcemains with secondary containment to the treatment building at Area A and then piped to the groundwater treatment system. Compressed air from the air compressors in the main treatment building is supplied to each of the groundwater pumps and the condensate pump.

3.2 AREA C

Area C occupies approximately 19,350 square feet beyond the southeast corner of the Site property, as shown on Figure 3.2. Area C is the location of one of the landfills previously used by Stauffer.

The remedial system at Area C consists of three SVE wells and a cover comprised of a PVC geomembrane liner, a geotextile cushion, and stone. Each SVE well is connected to the SVE equipment trailer adjacent to Area C via SVE piping mounted on a uni-strut/pipe strap support system. The Area C treatment system is comprised of an SVE trailer with a moisture separator tank, an in-line filter, a vacuum blower, a discharge silencer, a heat exchanger, and GAC adsorption units.

The air stream from the SVE wells is drawn into the separator tank. Moisture collected in the separator is manually transferred to the groundwater treatment building. From the separator tank the air stream passes through an in-line filter prior to the vacuum blower and is then directed through a discharge silencer and heat exchanger to two 1,000-pound granular activated vapor phase carbon adsorption units in series. The first carbon unit acts as the lead or primary contaminant removal unit and the second unit acts as the polish bed. The direction of the flow through the carbon units can be alternated so that either unit may be used as the lead carbon unit. The spent carbon is sent off-Site for regeneration. The air discharge from the carbon units is vented to the atmosphere.

3.3 AREA T4

Area T4 occupies approximately 11,500 square feet near the southwest corner of the property, as shown on Figure 3.3. The remedial system at Area T4 consists of a combination of soil vapor and groundwater extraction and a cover comprised of a PVC geomembrane liner, a geotextile cushion, and stone. The system has three SVE wells and one dual-phase groundwater/SVE well. The locations of the wells are shown on Figure 3.3.

Each SVE well is connected to the SVE equipment trailer located at Area T4 via SVE piping mounted on a uni-strut/pipe strap support system. The Area T4 SVE system is comprised of an SVE trailer with a moisture separator tank, an in-line filter, a vacuum blower, a discharge silencer, a heat exchanger, an air compressor, and GAC adsorption units.

The air stream from the SVE wells is drawn into the separator tank. Moisture collected in the separator is manually transferred to the groundwater treatment building. From the separator tank the air stream passes through an in-line filter prior to the vacuum blower and is then directed through a discharge silencer and heat exchanger to four granular activated vapor phase carbon adsorption units. There are two parallel trains of two 200-pound carbon units in series. In each train, the first carbon unit acts as the lead or primary contaminant removal unit and the second unit acts as the polish bed. The flow through the carbon units in each train can be alternated so that either of the carbon units may act as the lead unit. The spent carbon is sent off-Site for regeneration. The air discharge from the carbon units is vented to the atmosphere.

Well DPT-261 is used to depresses the groundwater elevation for the Area T4 SVE system and yields approximately 100 gallons per day (GPD). The water discharge from the dual well is transmitted via an underground forcemain with secondary containment to the groundwater treatment system in the main treatment building. Compressed air is supplied to the groundwater pump from the air compressor.

3.4 BEDROCK GROUNDWATER EXTRACTION AND TREATMENT SYSTEM

The bedrock groundwater extraction system is comprised of three bedrock wells, EW-101, EW-102, and EW-103. The locations of the wells are shown on Figure 3.1. The extraction wells are used to contain the groundwater on-Site and prevent migration of

the contaminants off-Site to the Forebay and Niagara River. Each bedrock extraction well yields 3 to 30 GPM.

Underground forcemains with secondary containment convey the groundwater from each well to the treatment building. The groundwater treatment system is currently housed in the south side of the existing treatment building and the northwest addition to the treatment building.

The groundwater treatment system consists of a DNAPL separator, a carbon pump tank, a carbon feed pump, bag filters, liquid phase carbon beds, a carbon transfer spent water tank, a carbon transfer spent water pump, and an air stripper.

The system is designed to remove all the SSPL compounds in the liquid phase carbon.

3.4.1 DNAPL SEPARATOR

The DNAPL separator is designed to remove any DNAPL that may enter the system. The DNAPL separator receives water from the groundwater extraction wells, the treatment building sump pump, the carbon transfer spent water tank, and the Area A SVE separator tank. The water recovered from the extraction wells (EW-101, EW-102, and EW-103) and the dual-phase wells (DPA-201, DPA-202, DPA-203, and DPT-261) is pumped through flow totalizing meters to the DNAPL separator.

The DNAPL separator has a sight glass and sample taps to periodically inspect for DNAPL. If DNAPL is collected, it will be drummed for off-Site disposal. (Note: No DNAPL has been present to this point in operation). The drums are stored by the DNAPL separator on a secondary containment pallet.

The DNAPL Separator is vented to a vapor phase carbon drum for capture of any volatiles that may be present in the headspace of the DNAPL separator.

The DNAPL separator is manufactured by Great Lakes Environmental, Inc., and is designed for 100 GPM flow rate, continuous or intermittent flow. It can provide an effluent with less than or equal to 5 milligrams per liter (mg/L) of DNAPL.

3.4.2 CARBON PUMP TANK

Water from the DNAPL separator gravity flows to the carbon pump tank. This tank provides a minimal holding capacity (10 minutes) to regulate the flow from the DNAPL separator through the carbon system.

The carbon pump tank is vented to a vapor phase carbon drum for capture of any volatiles that may be present in the headspace of the carbon pump tank.

3.4.3 CARBON FEED PUMP

The carbon feed pump is sized to pump 100 GPM of water from the carbon pump tank through the bag filters, carbon beds, and into the air stripper. Flow from the carbon feed pump is regulated by a level control valve.

3.4.4 BAG FILTERS

The groundwater is pumped from the carbon pump tank through five bag filters prior to the liquid phase carbon. The bag filters remove suspended solids to 10 μm particle size to protect the liquid phase carbon from particulate fouling. The filters are sized to require minimum operator attention.

3.4.5 LIQUID PHASE CARBON BEDS

The liquid phase carbon is used as the primary groundwater treatment unit, and primarily absorbs the SSPL compounds carbon tetrachloride, chloroform, carbon disulfide, and tetrachloroethene. Two 20,000-pound liquid phase carbon beds operate in series in a lead-lag scenario. The first bed acts as the lead or primary contaminant removal bed and the second bed acts as the lag or polish bed. Data collected from the pilot study along with data from the first carbon change have indicated that chloroform is the first significant compound to breakthrough the lead bed.

Based on pilot test and operational data methylene chloride is anticipated to breakthrough the lead carbon bed slightly behind chloroform. If concentrations of methylene chloride increase it may breakthrough slightly ahead of chloroform. However, methylene chloride breakthrough can be air stripped from the water and discharged to the atmosphere without off-gas treatment.

During operation of the treatment system, sampling of the carbon interstage will be performed to evaluate the chloroform and methylene chloride breakthrough.

At methylene chloride breakthrough of the carbon interstage the air stripper will be brought online to ensure adequate treatment. At chloroform breakthrough the lead carbon will be changed and the air stripper shutdown.

When chloroform is detected between the beds, the carbon in the lead bed is changed. By alternating the position of in-line valves, the second bed becomes the lead bed and the bed with the fresh carbon becomes the lag or polish bed. The spent carbon is sent off-Site for regeneration. Based on operating data it is anticipated that two carbon changeouts will be required per year.

3.4.6 CARBON TRANSFER SPENT WATER TANK

A 5,500-gallon polyethylene tank is used to hold spent slurry water from carbon transfer and carbon backflush water. These waters are stored in the carbon transfer spent water tank and slowly fed through the DNAPL separator to the treatment system.

3.4.7 CARBON TRANSFER SPENT WATER PUMP

The carbon transfer spent water pump feeds the DNAPL separator with the water from the carbon transfer spent water tank. The pump is designed to feed the DNAPL separator at a flow of 10 to 35 GPM.

3.4.8 AIR STRIPPER

The air stripper facilitates transfer of any residual methylene chloride from the water stream to an air stream and discharges it to the atmosphere. Treated water will gravity flow to the New York Power Authority (NYPA) Forebay and the Niagara River via an underground outfall pipeline. The air stream is discharged through a 24-foot stack to the atmosphere.

3.4.9 TREATMENT SYSTEM CONTROLS

The control room for the groundwater treatment system and Area A SVE and treatment system is housed in the southeast corner of the treatment building. The groundwater treatment system utilizes a Modicon PLC, Wonderware Package Human Machine Interface (HMI), and autodialer for system control. All alarms are displayed and datalogged on the HMI. All unit operations are displayed on the HMI to provide remote monitoring of the treatment status. A copy of the PLC program is included as Appendix A. A copy of the HMI computer screens is included as Appendix B.

The system is designed to notify the operator via the autodialer in the event of high water level in the treatment building floor sump, power failure, air stripper shutdown, failure of the Area A SVE system, and/or extraction well emergency shutdown.

The system is designed to provide for remote dial-in to observe system operation status.

3.5 DNAPL RECOVERY SYSTEM

The DNAPL recovery system consists of a wooden equipment shed and a concrete secondary containment pad around existing well OW3.

The DNAPL well is manually sampled for quarterly analysis and inspection. If DNAPL is collected, it will be drummed for off-Site disposal.

4.0 SYSTEM OPERATION

4.1 GENERAL

The goals of the remediation at the Site are to ensure the protection of human health and the environment while eliminating or minimizing the migration of hazardous constituents in the groundwater to the Forebay and Niagara River. Successful remediation will reduce the concentrations of hazardous constituents within soil and groundwater to acceptable State and Federal levels consistent with the anticipated use of the property, and minimize potential human exposure with waste constituents.

To achieve these goals, the facility operator should adhere to the following general operation and maintenance guidelines:

i) keep the facility and equipment clean at all times;

ii) minimize downtime for all malfunctioning equipment;

iii) respond to all alarms as soon as possible;

iv) adhere to acceptable safe work practices to minimize safety hazards and potential personal injury;

v) use preventative maintenance procedures and review the manufacturer's operation and maintenance manuals for all major equipment;

vi) record all operation and maintenance activities in the appropriate log book;

vii) observe and be aware of the operating conditions in the treatment facility and investigate any changes; and

viii) stock an adequate supply of bag filters, drums, personal protective equipment, sampling equipment, and any other supplies necessary for routine monitoring and sampling activities.

4.2 NORMAL OPERATION

Under normal operating conditions the remedial systems are automatic and do not require continuous attention for their operation. The operator's duties include but are not limited to the following:

i) regular inspections;
ii) scheduled maintenance;
iii) unscheduled maintenance;
iv) data collection;
v) routine process sample collection; and
vi) troubleshooting of system malfunctions.

The treatment systems are designed to operate continuously, through the action of sensors and automatic controls. The systems are equipped with both automatic and manual system alarms and interrupts, which function to shut down the treatment systems. The automatic alarms and interrupts are installed to alert the operator of certain process conditions and to prevent an overflow situation or damage to equipment should a failure occur in the system. The manual interrupts are provided to allow operators a means to shut down the system to perform maintenance and repairs.

The system is equipped with the Wonderware HMI package to provide visualization of process conditions from the control room and via remote dial-in. The HMI package includes alarm summaries, logging, and trending capabilities that will be discussed in the individual treatment sections.

Appendix C consists of a list and description of the control interlocks for automatic shutdown and operation of the Area A SVE and groundwater treatment systems.

Table 6.1 includes a description of all system alarms and basic trouble shooting steps.

The process and instrumentation, mechanical, and electrical drawings are included in Appendix D for operator reference.

4.3 AIR COMPRESSORS

Compressed air for the groundwater treatment system and Area A treatment system is provided by two compressors located in the treatment building. The air compressors

are piped in parallel to a common header that branches off to the individual units. The compressors are operated by individual local on/off switches.

The primary air compressor is manufactured by Ingersoll Rand, Model 242 D5, and has a 5 horsepower (HP), 460 volt, 3-phase explosion proof meter. The compressor is designed for 17 standard cubic feet per minute (scfm) at 125 pounds per square inch (psi) compressor capacity. The secondary air compressor is manufactured by Ingersoll Rand, Model 234 C2, and has a 2 HP, 460 volt, 3-phase explosion proof motor. The compressor is designed for 6.5 scfm at 125 psi compressor capacity.

4.4 AREA A SVE SYSTEM

4.4.1 AREA A WELLS

Description

Area A consists of 32 SVE wells and three dual groundwater/SVE wells. The dual-phase wells are equipped with submersible bladder pumps that use compressed air and collapsible bladders to displace groundwater. The groundwater is piped into the treatment building at Area A and then to the groundwater treatment system. All 35 wells extract air, water vapor, and organic vapors from the Area A soil. The extracted air stream is transported by header pipes into the treatment building at Area A for removal of organic compounds.

Controls

Each of the dual-phase pumps is controlled by a series of timers in the programmable logic controller (PLC). The timers are used to adjust the stroke rate of each pump to optimize flow from the well.

The pump will operate any time there is sufficient water in the well (above low level), there is not a leak detected in the well chamber, and the groundwater treatment system can accept water.

The HMI package contains a screen for adjusting the stroke rate of the pumps, and visualization of realtime flow, alarms, and totalized flow at the individual wells.

4.4.2 AREA A SVE TREATMENT SYSTEM

The SVE system is equipped with an inlet separator/silencer manufactured by Universal Silencer VI Series, Model #VI-8. The separator tank is a 22-inch diameter by 60-inch high vertical carbon steel tank with 40 gallons liquid storage capacity. The separator tank is equipped with a bottom drain for condensate removal with an air diaphragm pump.

The separator tank is equipped with a high-high level switch to shut off the vacuum blower. The high-high level alarm will also trigger a corresponding light on the control panel. The separator tank is also equipped with a sight glass level gauge. Level probes in the sight glass turn the condensate pump on and off. Operation of the condensate pump (P-270) is controlled by a hand/off/auto switch at the main control panel (MCP) and a pump motor panel disconnect, both located in the control room.

The in-line filter is equipped with a 10 μ filter element and is designed for a nominal flow of 2,900 cubic feet per minute (cfm).

A high vacuum switch on the air line inlet to the blower will shut off the blower if the vacuum in the intake line gets above a certain point. The high vacuum alarm will also trigger an alarm light on the main control panel.

The vacuum blower is manufactured by M-D Pneumatics, Model #7017, and has a 75 HP, 230/460 volt, 3-phase, 60 Hz explosion proof motor. The blower is designed for 1,280 scfm required air flow. Operation of the SVE blower (B-230) is controlled from the main control room by a hand/off/auto switch at the MCP and the blower motor panel disconnect.

A high pressure switch on the discharge line of the blower will shut off the blower if the pressure in the discharge line gets above a certain point. The high pressure alarm will also trigger a corresponding light on the main control panel.

The heat exchanger (H-250), manufactured by Xchanger, Model AA-1000, is controlled from the main control room by a hand/off/auto switch at the MCP and the motor panel disconnect. A high temperature alarm on the discharge to the heat exchanger will shut off the heat exchanger fan motor and trigger a corresponding light on the main control panel.

The vapor phase GAC adsorption units are manufactured by Barneby-Sutcliffe, Model V1800, with a carbon capacity of 60 ft^3. The carbon units are designed for a maximum vapor flow of 1500 cfm and a maximum temperature of 120°F.

The discharge line is equipped with a flow gauge to measure instantaneous flow of the air stream prior to discharge to the atmosphere.

The Area A SVE system is PLC controlled from the main control room. The HMI package contains screens for symbolic visualization of the treatment system and historical trending for the SVE blower's inlet vacuum and discharge pressure, and the condensate pump's operating duration. All alarm points are tied to the PLC and displayed in the HMI package and main control panel.

4.5 AREA C SVE SYSTEM

4.5.1 AREA C WELLS

Area C consists of three SVE wells that extract air, water vapor, and organic vapors from the Area C soil. The extracted air stream is transported to the Area C SVE trailer for removal of organic compounds.

4.5.2 AREA C SVE TREATMENT SYSTEM

The SVE system is equipped with an inlet separator/silencer manufactured by Universal Silencer VI Series, Model #VI-4. The separator tank is equipped with a high level switch to shut off the vacuum blower. The high level alarm will also trigger a corresponding light on the Area C control panel. The separator tank is also equipped with a site glass level gauge. The separator tank is an 11 gallon carbon steel tank equipped with a drain valve on the bottom to allow for easy drainage of any moisture collected from the air stream.

The in-line filter is equipped with a 10 μ filter element and is designed for a nominal flow of 520 cfm.

A high vacuum switch on the air line inlet to the blower will shut off the blower if the vacuum in the intake line gets above a certain point. The high vacuum alarm will also trigger a corresponding light on the Area C control panel.

The vacuum blower is manufactured by M-D Pneumatics, Model #4009, and has a 10 HP, 230/460 volt, 3-phase, 60 Hz explosion proof motor. The blower is designed for 270 scfm required air flow. The SVE blower is controlled from the Area C trailer by a hand/off/auto switch and disconnect at the blower motor panel.

A high pressure switch on the discharge line of the blower will shut off the blower if the pressure in the discharge line gets above a certain point. The high pressure alarm will also trigger a corresponding light on the Area C control panel.

The heat exchanger, manufactured by Air Tech, Model 506, is controlled from the Area C trailer by a hand/off/auto switch and disconnect at the motor panel. A high temperature alarm on the discharge to the heat exchanger will shut off the heat exchanger blower motor and trigger a corresponding light on the Area C control panel.

The vapor phase GAC adsorption units are manufactured by Barneby-Sutcliffe, Model V500, with a carbon capacity of 16.7 ft^3. The carbon units are designed for a maximum vapor flow of 400 cfm and a maximum temperature of 120°F.

The discharge line to the atmosphere is equipped with a flow gauge to measure instantaneous flow and a methane analyzer to analyze the air stream for methane prior to discharge to the atmosphere. A high methane level switch will close the valve on the inlet to the separator tank.

The Area C trailer is a relay based control system. All controls are located at the Area C trailer. The unit will shutdown on high vacuum, high pressure, high temperature, or high methane. A single alarm indicating Area C SVE trouble is tied to the PLC and displayed on the HMI package and main control panel.

4.6 AREA T4 SVE SYSTEM

4.6.1 AREA T4 WELLS

Area T4 consists of three SVE wells and one dual groundwater/SVE well. The dual-phase well is equipped with a submersible bladder pump that uses compressed air and a collapsible bladder to displace groundwater. The groundwater is piped to the treatment system in the main building. All four wells extract air, water vapor, and organic vapors from the Area T4 soil. The extracted air stream is transported to the Area T4 SVE trailer for removal of organic compounds.

4.6.2 AREA T4 SVE TREATMENT SYSTEM

The SVE system is equipped with an inlet separator/silencer manufactured by Universal Silencer VI Series, Model No. VI-4. The separator tank is equipped with a high level switch to shut off the vacuum blower. The high level alarm will also trigger a corresponding light on the Area T4 control panel. The separator tank is also equipped with a site glass level gauge. The separator tank is a carbon steel tank with 11 gallons liquid storage capacity, and is equipped with a bottom drain valve for condensate removal.

The in-line filter is equipped with a 10 μ filter element and is designed for a nominal flow of 520 cfm.

A high vacuum switch on the air line inlet to the blower will shut off the blower if the vacuum in the intake line gets above a certain point. The high vacuum alarm will also trigger a corresponding light on the Area T4 control panel.

The vacuum blower is manufactured by M-D Pneumatics, Model #3206, and has a 7.5 HP, 230/460 volt, 3 phase, 60 Hz explosion proof motor. The blower is designed for 75 scfm required air flow. The SVE blower is controlled from the Area T4 trailer by a hand/off/auto switch and disconnect at the blower motor panel.

A high pressure switch on the discharge line of the blower will shut off the blower if the pressure in the discharge line gets above a certain point. The high pressure alarm will also trigger a corresponding light on the Area T4 control panel.

The heat exchanger, manufactured by Air Tech, Model 504, is controlled from the Area T4 trailer by a hand/off/auto switch and disconnect at the motor panel. A high temperature alarm on the discharge to the heat exchanger will shut off the heat exchanger blower motor and trigger a corresponding light on the Area T4 control panel.

The vapor phase GAC adsorption units are manufactured by Barneby-Sutcliffe, Model V170, with a carbon capacity of 6 ft^3. The carbon units are designed for a maximum vapor flow of 100 cfm and a maximum temperature of 110°F.

The discharge line to the atmosphere is equipped with a flow gauge to measure instantaneous flow.

The air compressor is manufactured by Ingersoll Rand, Model 234 C2, and has a 2 HP, 460 volt, 3-phase explosion proof motor. The compressor is designed for 6.5 scfm at 125 psi compressor capacity. The compressor is controlled by a local on/off switch at the Area T4 trailer.

The Area T4 trailer is a relay based control system. All controls are located at the Area T4 trailer. The unit will shutdown on high vacuum, high pressure, or high temperature. A single alarm indicating Area T4 trouble is tied to the PLC and displayed on the HMI package and main control panel.

4.7 BEDROCK GROUNDWATER EXTRACTION SYSTEM

4.7.1 BEDROCK GROUNDWATER EXTRACTION WELLS

Description

Each of the three groundwater extraction wells, EW-101, EW-102, and EW-103, are equipped with submersible pumps (P-101, P-102, and P-103, respectively). The specifications for each well and pump are as follows:

EW-101
8 inch steel well casing from 0 feet to 32 feet BGS
6 inch open corehole from 32 feet to 163 feet BGS (well bottom)
bottom of pump set at 158 BGS

EW-102
8 inch steel well casing from 0 feet to 13 feet BGS
6 inch steel well casing from 0 feet to 23 feet BGS
6 inch open corehole from 23 feet to 140 feet BGS
4 inch open corehole from 140 feet to 150.4 feet BGS (well bottom)
bottom of pump set at 145 BGS

EW-103
8 inch steel well casing from 0 feet to 27 feet BGS
6 inch open corehole from 27 feet to 163 feet BGS (well bottom)
bottom of pump set at 157 BGS

P-101
manufactured by Grundfos
designed for 20 GPM flow rate
1 ½ HP, 460 volt, 3-phase

P-102
manufactured by Grundfos
designed for 20 GPM flow rate
1 ½ HP, 460 volt, 3-phase

P-103
manufactured by Grundfos
designed for 40 GPM flow rate
5 HP, 460 volt, 3-phase

The operation of the submersible pumps is dependent on level switches that will turn the pump on at a predetermined high water level and turn the pump off at a predetermined low water level. Each pump is equipped with local hand/off/auto control switches. The pumps can also be turned on and off in unison from the HMI extraction well screen.

Each pump is equipped with interlocks through the PLC that will turn the pumps on and off and/or shut down the system based on predetermined conditions. A description of the interlocks and their respective functions is provided in Section 4.7.10. The interlocks will also trigger a corresponding alarm light on the main control panel.

Controls

The groundwater extraction wells are PLC controlled from the main control room. A description of the shutdown conditions for the extraction wells is included in the interlock descriptions in Appendix C.

The HMI package contains screens for visualization of individual pump operation, totalized flows, and alarm conditions. Historical trending for individual well flows is also provided.

4.7.2 DNAPL SEPARATOR

The DNAPL separator is a steel tank with a sloped bottom, manufactured by Great Lakes Environmental and designed for a 100 GPM flow rate. The secondary containment pallet for the DNAPL drums is manufactured by Envirostor, Model SD-455. The DNAPL collection drums are equipped with high level switches that will close the inlet valve on the separator to the drums. This high level alarm will trigger a corresponding alarm light on the main control panel.

The influent line to the DNAPL separator is equipped with totalized flow and instantaneous flow gauges to measure the total influent to the separator. The HMI package contains screens for symbolic visualization of the treamtent system and historical trending for the instantaneous and totalized flow into the DNAPL separator.

The DNAPL separator is equipped with high level switches that will shut down the extraction well pumps, the building sump pump, the carbon transfer spent water tank pump, and the Area A SVE system condensate removal pump in the event of a high water level in the DNAPL separator. This high level alarm will trigger a corresponding alarm light on the main control panel.

4.7.3 CARBON PUMP TANK

The carbon pump tank is a 1,000 gallon stainless steel tank with a conical bottom, manufactured by Sharpsville Container Corporation. The tank is equipped with a level transmitter that will open or close the level control valve and subsequently turn the carbon feed pump on or off depending on the level in the tank. A high level alarm on the tank will trigger a corresponding alarm light on the main control panel and will shutdown the extraction and dual-phase pumps as per the interlocks in Appendix C.

4.7.4 CARBON FEED PUMP

The level control valve regulates the level in the carbon pump tank by applying back pressure on the carbon feed pump. Operation of the pump (P-701) is controlled from the main control room by a hand/off/auto switch at the MCP and the pump motor panel disconnect. Low level in the carbon pump tank will shut off the carbon feed pump. A high level in the air stripper will also shut off the carbon feed pump. The carbon feed pump is a Goulds G&L Model SST-C5, designed for a 100 GPM flow rate, 7 ½ HP, 460 volt, 3-phase.

4.7.5 BAG FILTERS

The bag filter system, manufactured by Filtration Systems, consists of five single-bag houses piped together in parallel to common influent and effluent headers. A differential pressure transmitter that can be valved to read across the bag filters and/or the carbon beds is used to log pressures and establish a trend for efficient bag filter changing. The transmitter will also provide an alarm if the bag filters become fouled and need to be replaced.

The bag filter system uses 10 μm bags and is designed for a maximum system capacity of 500 GPM. The system is purposely oversized to reduce the need for operator intervention.

4.7.6 LIQUID PHASE CARBON BEDS

The liquid phase carbon beds are manufactured by Calgon Carbon Corporation. Each carbon unit has 20,000-pound carbon capacity. Each carbon vessel is equipped with rupture disk vents to protect the tanks from excessive pressure buildup.

Operation of the carbon beds is a passive operation. Adsorption of the organics occurs as water is passed through the carbon beds. Effective operation requires monitoring of the pressures, flows, and organic loadings in the carbon system. For further information on the carbon system, please refer to the Calgon Operation and Maintenance Manual in Appendix E.

The carbon is designed to remove all SSPL compounds from the groundwater stream. Of these compounds methylene chloride has the lowest affinity for carbon. Design data indicated that adsorption of methylene chloride on the carbon was not critical due to its low influent concentration to the system.

In the event of methylene chloride breakthrough in the carbon the methylene chloride would be removed by the air stripper and the air discharge would be within NYSDEC Air Guide 1 Criteria.

The HMI package contains screens for symbolic visualization of the treatment system and historical trending for the carbon pump tank level, the level control valve position, and the differential pressure across the bag filters and/or carbon adsorbers.

4.7.7 CARBON TRANSFER SPENT WATER TANK

The carbon transfer spent water tank is a 5,500-gallon high density polyethylene (HDPE) tank manufactured by IMG. The tank is equipped with low and high level switches to turn the carbon transfer spent water pump off at low level and on at high level. A high-high level alarm will trigger a corresponding alarm light on the main control panel.

4.7.8 CARBON TRANSFER SPENT WATER PUMP

The carbon transfer spent water pump is a Goulds G&L Model SST-C5, designed for 35 GPM flow rate, 2 HP, 460 volt, 3-phase. The operation of the carbon transfer spent water pump (P-731) is controlled from the main control room by a hand/off/auto switch at the MCP and the pump motor panel disconnect.

4.7.9 AIR STRIPPER

The air stripper system is manufactured by Shallow Tray and is designed with five low profile trays for a water influent rate of 100 GPM, minimum 900 scfm at 60 inches of water column. The air stripper blower is manufactured by American Fan and has a 30 HP, 460 volt, 3-phase, 60 Hz explosion proof motor. The blower (B-120) is controlled from the main control room by a hand/off/auto switch at the MCP and the blower motor panel disconnect, and local start/stop buttons.

The air stripper is equipped with a sight glass and low and high level pH alarms that will trigger corresponding alarm lights on the main control panel. A high level alarm will trigger a corresponding alarm light on the main control panel and will shut down the carbon feed pump.

A Calsperse sequestering agent can be added to the water stream immediately upstream of the air stripper. The sequestering agent is pumped using a pump manufactured by LMI, designed for 14 GPD maximum, 115 volt, single phase. The operation of the pump in automatic mode is dependent on the water flow to the air stripper.

The air stream from the air stripper is directed to a moisture separator equipped with a sight glass. The collected water is pumped back to the DNAPL separator or carbon

pump tank. High and low level switches turn the condensate removal pump on at high level and off at low level. A high level alarm will trigger a corresponding alarm light on the main control panel.

The condensate removal pump is a Goulds G&L pump, ICS Model, ½ HP, 115/230 volt, single phase. The pump (P-181) is controlled from the main control room by a hand/off/auto switch at the MCP and the pump motor panel disconnect

4.7.10 BUILDING CONTAINMENT SUMP

The building containment system is designed to hold 110 percent of the capacity of the largest vessel. The building sump acts as the collection for all water that may leak or spill on the floor.

Any water collected in the building sump is pumped to the DNAPL separator. The sump pump (P-105) is equipped with a hand/off/auto switch located above the sump, a pump panel disconnect in the main control room, and level switches to turn the pump on at high level and off at low level. A high-high level will also trigger a corresponding alarm on the main control panel. If the sump high-high level alarm is triggered, all treatment equipment is shutdown. This triggers the autodialer alarm and requires an immediate response from operating personnel.

The flow from the sump is not included in the totalized flow to the DNAPL separator. The sump pump is manufactured by Serfilco, Model C4T34F-C2B, 1/3 HP, 230/460 volt, 3-phase.

5.0 ROUTINE OPERATION, MAINTENANCE, MONITORING, SAMPLING, AND REPORTING REQUIREMENTS

5.1 ROUTINE INSPECTION AND MAINTENANCE

Regular inspection and maintenance of the treatment systems shall be completed once per Site visit on a weekly basis. The regular inspection and maintenance activities shall include, but are not necessarily limited to, the following:

5.1.1 AREA A SVE SYSTEM

5.1.1.1 AREA SPECIFIC RULES

Area A SVE System

1. Turn on exhaust system five minutes before entering Area A SVE System Room.
2. Wear hearing protection whenever entering.
3. Only explosion-proof equipment is allowed in the Area A SVE Room.
4. Turn off exhaust fan when finished.

5.1.1.2 ROUTINE INSPECTION AND MAINTENANCE

The Area A SVE system should be inspected weekly to verify proper operation. Ensure blowers, compressors, heat exchangers are operating within appropriate ranges. SVE above ground piping will be inspected for integrity.

Record operating status of the Area A SVE system on the Operating Log sheet in the operator's logbook (see Table 5.1). Record operating conditions on the Area A SVE System Monitoring sheets (see Table 5.2) in the logbook.

5.1.1.3 MONITORING

Sampling of the Area A SVE air influent interstage, and effluent with an FID should be performed on a weekly basis and recorded on the Area A SVE logsheets.

Carbon changeout is required when the concentration in the stack effluent exceeds 10 pounds per day.

The equation to calculate emissions in pounds/day is as follows:

$$Q \times Ce \times T \times MW \times Cf = \text{Mass Pounds/Day}$$

Where:

Q	=	Air flowrate (ft^3/min)
Ce	=	Effluent concentration in ppmv
T	=	Time in minutes of daily operation
MW	=	Molecular weight of the compound (gr/mol.)
Cf	=	Conversion factor (0.0025 L-mol-lb/ft^3-L-gr)

A plot of the influent, interstage, and effluent concentrations should be maintained in the operators logbook on-Site.

5.1.2 AREA C SVE SYSTEM

5.1.2.1 AREA SPECIFIC RULES

Area C and T4 SVE Systems

1. Exhaust fan must be on five minutes before entering the trailer.
2. Hearing protection is required in each of the SVE trailers.
3. Turn off exhaust fan when finished.

5.1.2.2 ROUTINE INSPECTION AND MAINTENANCE

The Area C SVE system should be inspected weekly to verify proper operation. Ensure blowers, compressors, heat exchangers are operating within appropriate ranges. SVE above ground piping will be inspected for integrity.

Record operating status of the Area C SVE system on the Operating Log sheet in the operator's logbook (see Table 5.1). Record operating conditions on the Area C SVE Logsheet (see Table 5.3) in the logbook.

5.1.2.3 MONITORING

Sampling of the Area C SVE air influent interstage, and effluent with an FID should be performed on a weekly basis and recorded on the Area C SVE logsheet.

Carbon changeout is required when the concentration in the stack effluent exceeds 10 pounds per day.

The equation to calculate emissions in pounds/day is as follows:

$$Q \times Ce \times T \times MW \times Cf = \text{Mass Pounds/Day}$$

Where:

Q	=	Air flowrate (ft^3/min)
Ce	=	Effluent concentration in ppmv
T	=	Time in minutes of daily operation
MW	=	Molecular weight of the compound (gr/mol.)
Cf	=	Conversion factor (0.0025 L-mol-lb/ft^3-L-gr)

A plot of the influent, interstage, and effluent concentrations should be maintained in the operators logbook on-Site.

Verify temperature and methylene readings. The system may need to be shut down if influent temperatures exceed 100°F.

5.1.3 AREA T4 SVE SYSTEM

5.1.3.1 AREA-SPECIFIC RULES

Area C and T4 SVE Systems

1. Exhaust fan must be on five minutes before entering the trailer.
2. Hearing protection is required in each of the SVE trailers.
3. Turn off exhaust fan when finished.

5.1.3.2 ROUTINE INSPECTION AND MAINTENANCE

The Area T4 SVE system should be inspected weekly to verify proper operation. Ensure blowers, compressors, heat exchangers are operating within appropriate ranges. SVE above ground piping will be inspected for integrity.

Record operating status of the Area T4 SVE system on the Operating Log sheet in the operator's logbook (see Table 5.1). Record operating conditions on the Area T4 SVE logsheet (see Table 5.4) in the logbook.

5.1.3.3 MONITORING

Sampling of the Area T4 SVE air influent interstage, and effluent with an FID should be performed on a weekly basis and recorded on the Area T4 SVE logsheet.

Carbon changeout is required when the concentration in the stack effluent exceeds 10 pounds per day.

The equation to calculate emissions in pounds/day is as follows:

$$Q \times Ce \times T \times MW \times Cf = \text{Mass Pounds/Day}$$

Where:

Q	=	Air flowrate (ft^3/min)
Ce	=	Effluent concentration in ppmv
T	=	Time in minutes of daily operation
MW	=	Molecular weight of the compound (gr/mol.)
Cf	=	Conversion factor (0.0025 L-mol-lb/ft^3-L-gr)

A plot of the influent, interstage, and effluent concentrations should be maintained in the operators logbook on-Site.

5.1.4 GROUNDWATER EXTRACTION SYSTEMS

The groundwater extraction systems consist of three extraction wells (EW-1, EW-2, EW-3) and four dual-phase extraction wells (DPA-201, DPA-202, DPA-203, and DPA-261).

5.1.4.1 ROUTINE INSPECTION AND MAINTENANCE

Weekly recording of the flows from each extraction well and dual-phase well will be recorded in Table 5.5 of the operators logbook.

If flow from the wells is lower or higher than anticipated, a physical inspection of the flow meter, level instrumentation, and pump is warranted.

Weekly inspections of the leak detection ports for the extraction well double contained piping systems will be performed to verify pump integrity.

5.1.5 GROUNDWATER TREATMENT SYSTEM

5.1.5.1 AREA-SPECIFIC RULES

Groundwater Treatment Area

1. If opening the DNAPL separator, air monitoring must be performed.
2. Modified D PPE is required for replacement of DNAPL drums.
3. Modified D PPE is required for replacement of bag filters.

5.1.5.2 ROUTINE INSPECTION AND MAINTENANCE

Weekly Inspections

The weekly inspection of the treatment system will include:

i) general visual inspection of the treatment equipment for leaks, overflows, or malfunctions;

ii) inspection of process-indicating instruments, including sight glass on DNAPL separator;

iii) inspection of aboveground SVE piping;

iv) recording operating conditions in log book (see Table 5.6);

v) correction of operational problems;

vi) replacement of bag filters, if necessary, as indicated by differential pressure across bag filters (see Table 5.7); and

vii) repair or replacement of damaged parts.

All inspections will be recorded in the operator's logbook.

Semi-Annual

A semi-annual shutdown of the treatment system will be conducted to perform routine maintenance on the system components.

This will include inspections and cleaning of the DNAPL separator, carbon feed tank, bag filter housings, and carbon vessels.

Process Monitoring

Weekly samples will be collected from the groundwater influent and carbon interstage. The system effluent will be sampled weekly until 24 consecutive weeks of compliance with effluent discharge criteria are obtained, then effluent sampling will be monthly. These samples will be analyzed for the SSPL VOC compounds. On detection of methylene chloride at the carbon interstage, turn on the air stripper and collect weekly samples from the air stripper stack discharge and analyze for SSPL compounds.

A carbon change will be performed after detection of chloroform at the carbon interstage.

A mass balance of the influent, interstage, and effluent results will be performed over the life time of each carbon bed. After two carbon changes the mass balance will be used to evaluate the effectiveness of the treatment systems. This will be used to evaluate whether sampling frequencies can be modified.

Effluent sampling will be performed in accordance with the NYSDEC mandated discharge requirements (see Table 5.8).

5.1.6 DNAPL RECOVERY SYSTEM

The DNAPL recovery system located at OW-3 will be sampled on a quarterly basis. The samples will be evaluated for the presence of NAPL. Recovered NAPL will be stored in drums in the DNAPL shed and sent for off-Site disposal.

Operations and inspections of the quarterly event will be recorded in the operators logbook. If DNAPL is detected the operations of the DNAPL recovery system will be reevaluated.

5.1.7 FACILITIES, STRUCTURES, AND GROUNDS

Facility Structures and Grounds

Many routine inspections for facilities and grounds are to be carried out as operators perform daily work tasks. These routine inspection tasks include checking the appearance of the grass, shrubs, driveways, walkways, fencing, lighting, and containment areas. Inside the facility, the appearance of walls, floors, ceiling doors, windows, walkways, emergency equipment, lights, dikes, sumps, and equipment support structures should be checked. All abnormal conditions should be noted in the operators daily log and either be corrected immediately or placed on a schedule for maintenance. Abnormal conditions that affect safety or the integrity of the facility should be attended to on a priority basis.

In addition to routine weekly observations, every six months (at the end of winter and summer) the treatment plant buildings should be carefully checked to observe any deterioration such as failure of paint, cracks, open seams, leaks, and operation of doors, windows, and plumbing. Any problems found on six month inspections should be noted in the operations log and placed on a schedule for repair or maintenance. If there are no problems, it shall be so noted.

Containment Structures and Sumps

Containment structures and sumps are inspected weekly and during each site visit to determine that there are no signs of cracks or spills of liquid from vessels or piping within containment structures, or to the exterior areas of the sumps.

Storage Areas

Storage areas for supplies, tools, maintenance items and chemicals are checked weekly to ensure that they are kept clean, free from clutter and meet pertinent criteria of the site Health and Safety and Contingency Plan.

Safety Equipment

Safety equipment such as fire extinguishers, first-aid stations, emergency wash stations, and exit lights are checked weekly to ensure that they are in good working order, visible and accessible for their intended use and meet pertinent criteria of the site Health and Safety and Contingency Plans.

Tanks and Vessels

Process tanks and vessels and their support structures are inspected weekly for items including leaks and deterioration of protective coatings (such as paint), and the integrity of fittings and valves.

Piping Systems

Piping systems including fittings, valves, support structures, and support hangers should be inspected while performing weekly operations tasks to ensure that there are no leaks or spills or deterioration of insulation, tracing systems, or support structures.

Rotating Equipment

All rotating equipment including pumps, blowers, fans, and compressors are inspected while performing weekly operating tasks. Abnormal conditions such as vibration, missing guards, uncovered electrical boxes, unusual noises, or unusually high operating temperatures or pressures should be investigated and corrected whenever they are observed. In addition, follow each manufacturer's written maintenance procedures for lubrication, balancing, etc. according to the published schedules.

Instrument and Controls

The operation of the treatment plant is monitored and automatically controlled through a central control panel. This system is computer-controlled with manual override capability and logic program software to provide compliance verification, maintenance tracking, and semi-automatic system operation and adjustment. Audible and visual

alarms at the control panel are used to signal abnormal process conditions or equipment failures. Electrical interlocks are logically programmed to shut down all, or some, process system in response to specific failures in order to prevent major process upsets due to failure of a monitored parameter or piece of equipment.

As part of weekly tasks, the operator monitors performance of the automatic control system and takes corrective actions whenever abnormal condition or malfunctions occur. Specific alarms and the results of analytical tests are responded to and abnormal conditions are corrected as they occur. In addition, routine periodic maintenance is carried out per manufacturer's instructions for specific elements of the control systems.

Periodic maintenance includes replacement of filters, cleaning systems and lubricating control devices as called for in manufacturer's written maintenance instructions for each specific device. An outside repair firm is either contracted with or kept on call to perform repairs and maintenance on control systems which are beyond the capacity of the plant mechanic. It is the responsibility of the mechanic to advise the operator on maintaining inventories of critical wear and recommended spare parts as prescribed by the equipment manufacturer's maintenance manuals.

5.2 UNSCHEDULED MAINTENANCE

Unscheduled maintenance must be performed as required. Unscheduled inspection and maintenance activities may include the following:

i) changing liquid phase carbon in the groundwater treatment system;
ii) changing vapor phase carbon in the SVE systems; and
iii) responding to alarms as necessary.

6.0 POTENTIAL OPERATING PROBLEMS AND SOLUTIONS

This section presents suggested procedures to be implemented should the system exhibit the indicated malfunction. Table 6.1 shows the recommended troubleshooting techniques.

The operator is required to amend this section as experience is gained with the treatment facility.

7.0 SAFETY PLAN

The Health and Safety Plan (HASP) presented in Appendix G describes the health and safety procedures and emergency response guidelines to be implemented during the long-term O&M activities to be performed at the Site. The applicability of the HASP extends to all personnel who will be working at the Facility and visitors to the Site. All monitoring and sampling activities will be conducted in accordance with the HASP.
A summary of general safety and personal hygiene guidelines is provided below.

1. Eating at the Facility is prohibited except in the Control Room.

2. Smoking at the Facility is prohibited.

3. Individuals getting wet to the skin with effluent from the washing operation must wash the affected area immediately. If clothes in contact with skin are wet, then these must be changed.

4. Hands must be washed with soap and water before eating, drinking, smoking, and before using toilets at the facilities provided.

5. Waste will be properly stored until such time that it is disposed of in accordance with appropriate New York State regulations.

8.0 EQUIPMENT SPECIFICATIONS

The major equipment and component parts specifications associated with the SVE and groundwater treatment systems are provided in Appendix H with a summary of the equipment list in Table 8.1. The information presented is intended to supplement the equipment manufacturer's literature and specifications.

9.0 WASTE HANDLING

The following sections present the waste handling procedures that are implemented during operation of the remedial systems.

9.1 GROUNDWATER

Extracted groundwater is treated at the on-Site groundwater treatment facility. Treated water gravity flows to the NYPA Forebay and the Niagara River via an underground outfall pipeline.

9.2 VAPOR PHASE CARBON

Spent carbon generated by the vapor phase GAC adsorbers of the SVE systems is either disposed of off-Site at an appropriate landfill or sent off-Site for regeneration. Waste that has been designated as hazardous will be handled in accordance with applicable laws. All hazardous waste collections and disposals will be recorded on the logbook in Table 9.1.

9.3 LIQUID PHASE CARBON

Spent carbon generated by the liquid phase GAC adsorbers of the groundwater treatment system is sent off-Site for regeneration. Procedures for carbon transfer and carbon backwash are presented as Appendix F. Waste that has been designated as hazardous will be handled in accordance with applicable laws. All hazardous waste collections and disposals will be recorded on the logbook in Table 9.1.

9.4 PERSONAL PROTECTIVE EQUIPMENT

All spent personal protective equipment is stored on-Site for later disposal.

9.5 NAPL

Any NAPL collected in the sump of the DNAPL separator will be transferred to 55-gallon drums for off-Site disposal. Waste that has been designated as hazardous will

be handled in accordance with applicable laws. All hazardous waste collections and disposals will be recorded on the logbook in Table 9.1.

9.6 BAG FILTERS

Spent bag filters are collected in 55-gallon drums for off-Site disposal. Procedures for changing bag filters are presented as Appendix F. Waste that has been designated as hazardous will be handled in accordance with applicable laws. All hazardous waste collections and disposals will be recorded on the logbook in Table 9.1.

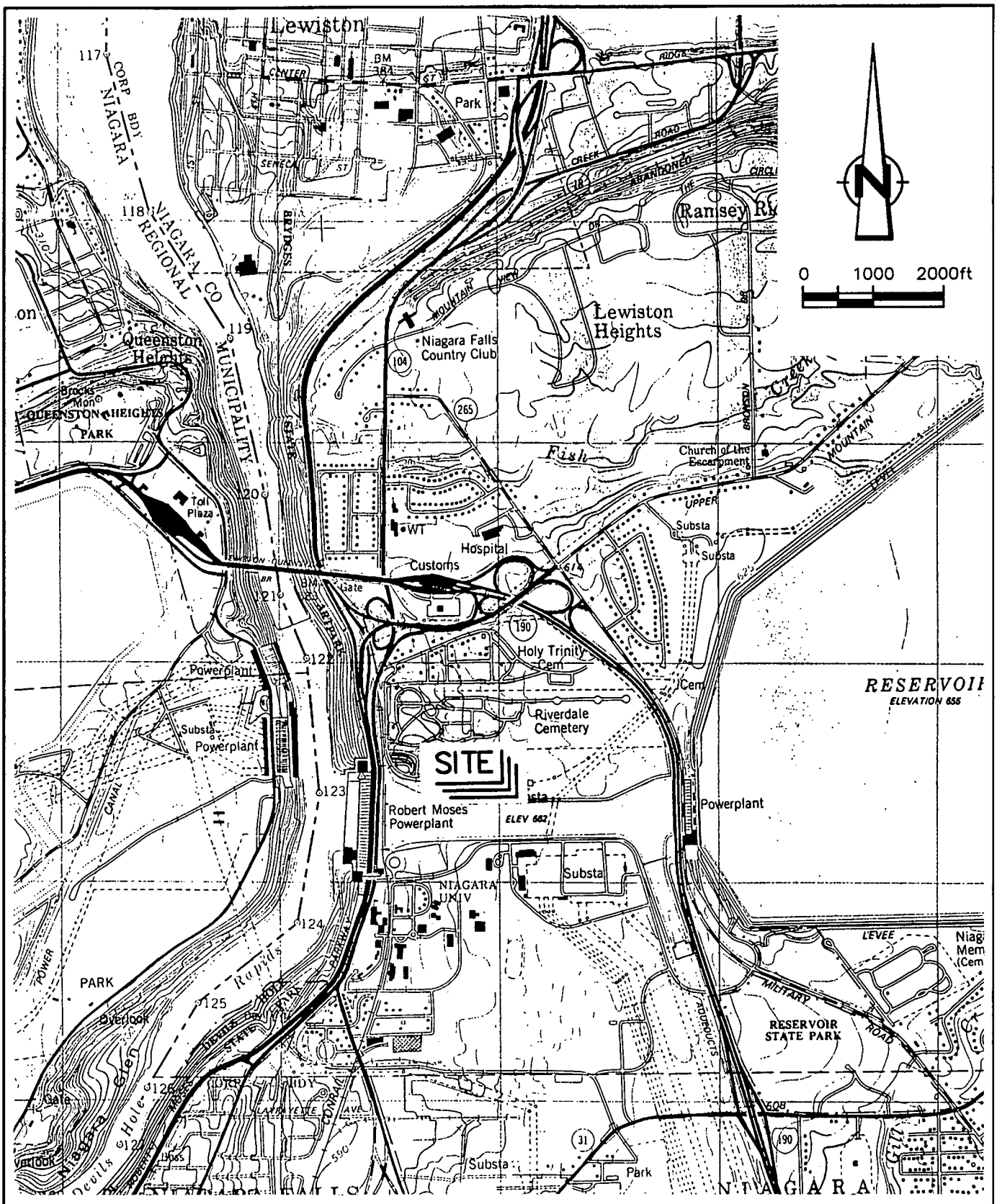

figure 1.1

SITE LOCATION
STAUFFER MANAGEMENT COMPANY
Niagara Falls, New York

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06488-00(004)GN-NF004 MAY 05/98

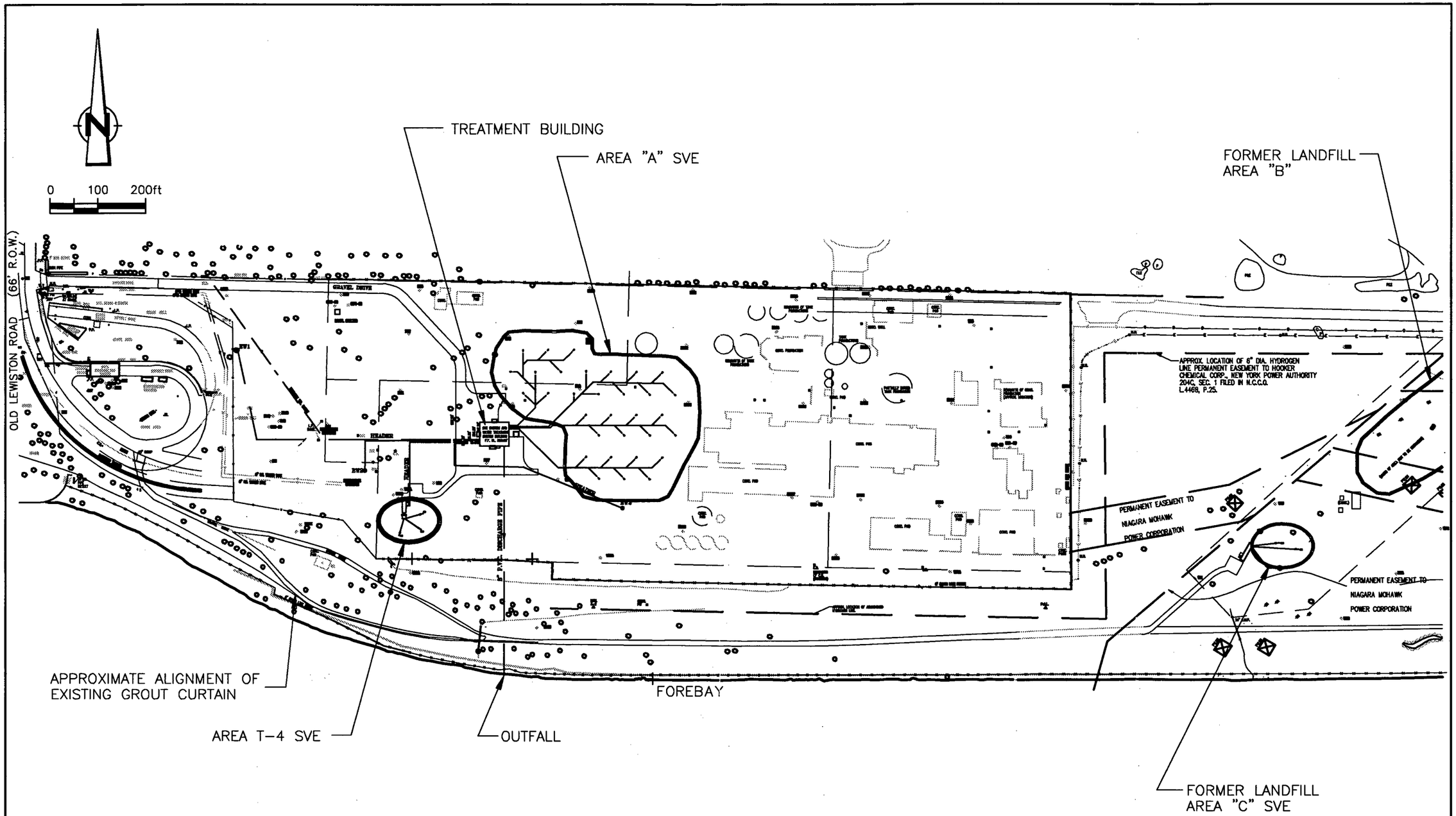

figure 1.2

SITE LAYOUT
STAUFFER MANAGEMENT COMPANY
Niagara Falls, New York

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PMA-1
PMA-11
52'6" (TYP.)
4" MIN. CRUSHED STONE (TYP.)
ANCHOR TRENCH
EWA-104
EWA-103
EWA-101
SLOPE
45° REDUCING LATERAL (TYPE 2)
45' (TYP.)
PMA-2
SVE WELL HEAD AND CONTROL VALVE (TYP.)
DPA-201
EWA-105
PMA-3
EWA-102
EWA-114
EWA-113
EWA-111
EWA-109
2"ø SCH. 40 CARBON STEEL SVE BRANCH (TYP.)
FLANGED FOR FUTURE EXPANSION (TYP.)
SVE/GW WELL HEAD AND CONTROL VALVE
PMA-12
PMA-4
DPA-202
EWA-106
EWA-107
EWA-118
EWA-112
EWA-110
PMA-13
EWA-108
SVE/GW WELL HEAD AND CONTROL VALVE
6"ø SCH. 40 CARBON STEEL SVE HEADER (TYP.)
PMA-5
PMA-8
SVE HEADER NO. 1
EWA-123
EWA-121
EWA-119
EWA-117
EWA-130
EWA-131
SVE HEADER NO. 2
SVE HEADER NO. 3
AREA A EQUIPMENT BUILDING
EWA-132
PMA-7
EWA-122
EWA-120
EWA-118
EWA-116
PMA-9
PMA-14
PMA-6
SVE/GW WELL HEAD AND CONTROL VALVE
SVE HEADER NO. 4
4" MIN. CRUSHED STONE x 6" WIDE (TYP.)
DPA-203
EWA-129
EWA-126
EWA-124
PMA-15
45° REDUCING LATERAL (TYPE 1)
W17
EWA-128
EWA-127
EWA-125
R
ANTICIPATED RADIUS OF INFLUENCE = 30' (TYP.)
PMA-10
EW3
595
594
596
599
598
603
0 20 40ft

figure 3.1
AREA "A" SVE SYSTEM
STAUFFER MANAGEMENT COMPANY
Niagara Falls, New York

CRA Services

06488-00(004)GN-NF001 APR 30/98

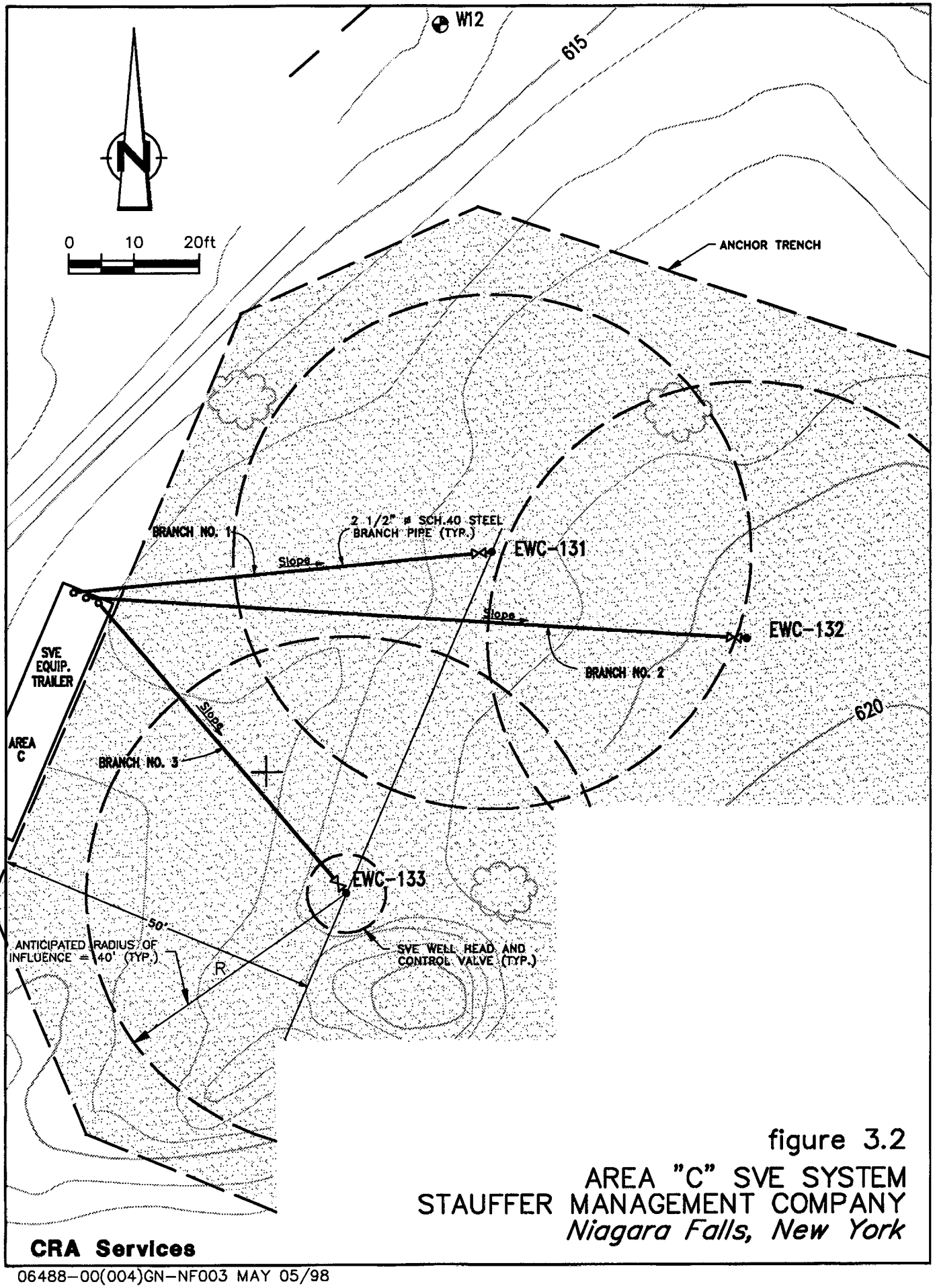

figure 3.2
AREA "C" SVE SYSTEM
STAUFFER MANAGEMENT COMPANY
Niagara Falls, New York

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06488-00(004)GN-NF003 MAY 05/98

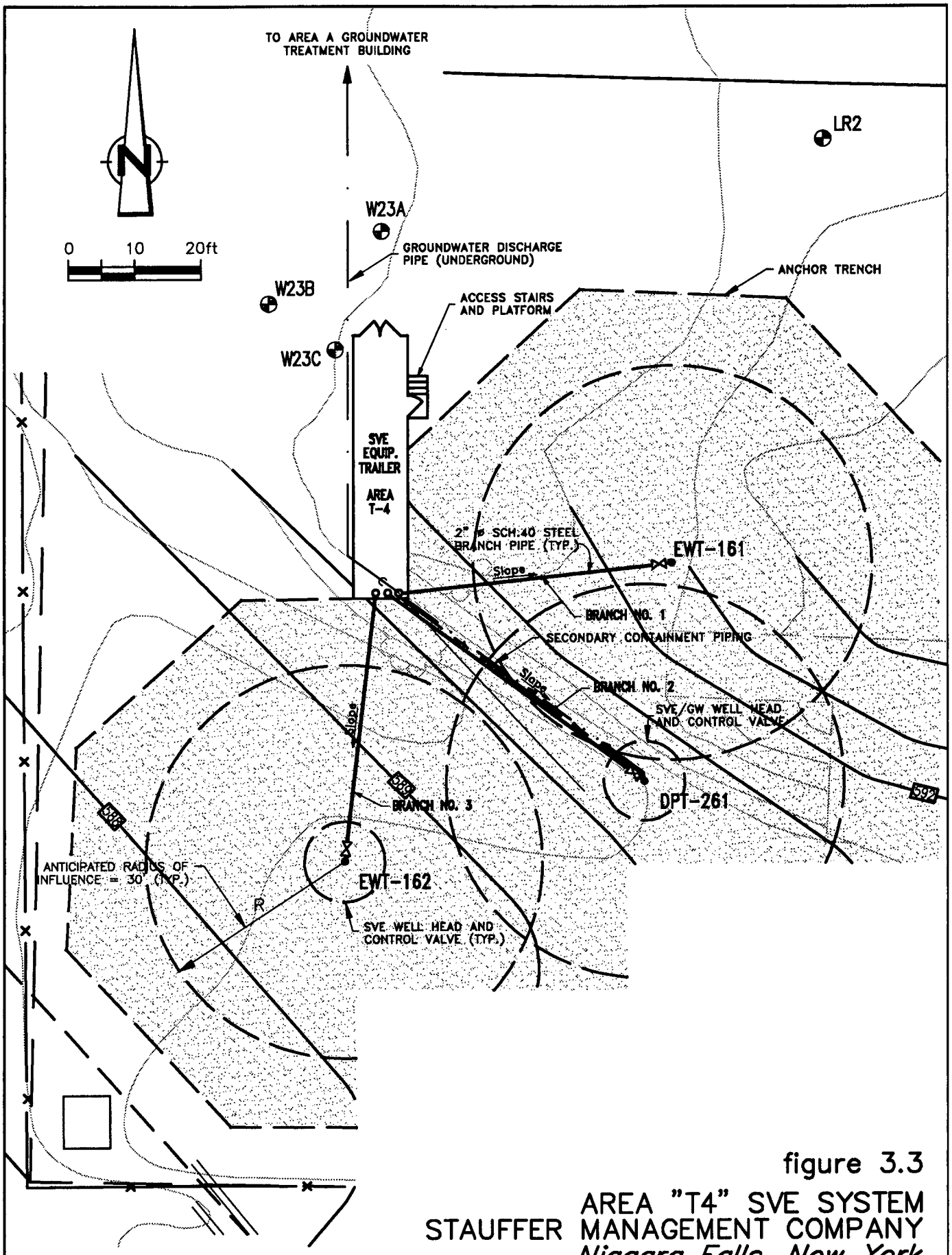


figure 3.3
AREA "T4" SVE SYSTEM
STAUFFER MANAGEMENT COMPANY
Niagara Falls, New York

CRA Services

06488-00(004)GN-NF002 MAY 05/98

TABLE 5.1
OPERATING LOG
STAUFFER MANAGEMENT COMPANY
LEWISTON, NEW YORK SITE

Date	*Time*	*System*	*Status*	*Reason*

TABLE 5.2
AREA A SVE SYSTEM MONITORING
OPERATIONS MONITORING
STAUFFER MANAGEMENT COMPANY
LEWISTON, NEW YORK

Date	Time	Initials	Computer Reads			Local Reads							
			Vacuum (In. Hg)	Pressure (psi)	Temp. (°F)	Field Vac. (In. Hg)	Influent Temp. (°F)	System Vacuum (In. Hg)	Silencer Temp. (°F)	Silencer Pressure (psi)	Heat XChgr Pressure (psi)	Air Flow (scfm)	Effluent Temp. (°F)

TABLE 5.2
AREA A SVE SYSEM MONITORING
SYSTEM PERFORMANCE AND ROUTINE CHECKS
STAUFFER MANAGEMENT COMPANY
LEWISTON, NEW YORK

Date	Time	Initials	FID Readings						Check for Water in Beds (Y/N)				Air Pump Oiled		Blower Inspection	
			Influent	Train 1		Train 2		Effluent (ppmv)	Train 1		Train 2		Full (Y/N)	Refilled (Y/N)	Oil Ok? (Y/N)	Belts Ok? (Y/N)
				Interstage (ppmv)	Lead (1/2)	Interstage (ppmv)	Lead (1/2)		Tank 1	Tank 2	Tank 1	Tank 2				

TABLE 5.3
AREA C SVE LOGSHEET
STAUFFER MANAGEMENT COMPANY
LEWISTON, NEW YORK

Date	*Time*	*Well 1 131 Vacuum (In. Hg)*	*Well 2 132 Vacuum (In. Hg)*	*Well 3 133 Vacuum (In. Hg)*	*Inlet Vacuum (In. Hg)*	*Temp Well 131 (°F)*	*Temp Well 132 (°F)*	*Temp Well 133 (°F)*	*Inlet Comb. Temp. (°F)*	*Blower Vacuum (In. Hg)*	*Silencer Pressure (psi)*	*Silencer Temp. (°F)*	*Exch. Pressure (psi)*	*Exch. Temp. (°F)*	*Effluent Pressure (psi)*	*Effluent Flow (CFM)*	*Methane (ppmv)*	*Background VOC (ppmv)*	*Influent VOC (ppmv)*	*Midpoint VOC (ppmv)*	*Effluent VOC (ppmv)*

TABLE 5.4
AREA T4 SVE LOGSHEET
STAUFFER MANAGEMENT COMPANY
LEWISTON, NEW YORK

Date	Time	Well 1 Vacuum (In. Hg)	Well 2 Vacuum (In. Hg)	Well 3 Vacuum (In. Hg)	Inlet Vacuum (In. Hg)	Inlet Comb. Temp. (°F)	Blower Vacuum (In. Hg)	Silencer Pressure (psi)	Silencer Temp. (°F)	Exch. Pressure (psi)	Exch. Temp. (°F)	Effluent Pressure (psi)	Effluent Flow (CFM)	FID READINGS				PRESSURES				Bkground VOC (ppmv)	Influent VOC (ppmv)	Effluent VOC (ppmv)
														Train A/B		Train C/D		Train A/B		Train C/D				
														Interstage (ppmv)	Lead (A/B)	Interstage (ppmv)	Lead (C/D)	Interstage (psi)	Lead (A/B)	Interstage (psi)	Lead (C/D)			

TABLE 5.5
GROUNDWATER EXTRACTION FLOW/TOTAL DATA
STAUFFER MANAGEMENT COMPANY
LEWISTON, NEW YORK

Date	Time	EW-1		EW-2		EW-3		T-4	DPA-201	DPA-202	DPA-203	KO POT
		Flow Rate (gpm)	Flow Total (Gal. x 10)	Flow Rate (gpm)	Flow Total (Gal. x 10)	Flow Rate (gpm)	Flow Total (Gal. x 10)	Flow Total (Gal. x 10)	Flow Total (Gal. x 10)	Flow Total (Gal. x 10)	Flow Total (Gal. x 10)	Flow Total (Gal. x 10)

TABLE 5.6
GROUNDWATER TREATMENT SYSTEM MONITORING
STAUFFER MANAGEMENT COMPANY
LEWISTON, NEW YORK

Date	*Time*	*System Inlet Flow Rate (gpm)*	*Carbon Feed Tank Level (inches)*	*Carbon Feed Pump Press. (psi)*	*Bag Filter Pressure (psi)*	*Carbon Inlet Pressure (psi)*	*Carbon Interstage Pressure (psi)*	*Carbon Outlet Pressure (psi)*	*Carbon Discharge Pressure (psi)*	*Initials*

TABLE 5.6
GROUNDWATER TREATMENT SYSTEM MONITORING
STAUFFER MANAGEMENT COMPANY
LEWISTON, NEW YORK

Date	*Time*	*Inlet Air Temp. (°F)*	*Blower Air Temp. (°F)*	*Stripper Vacuum (In. H_2O)*	*Stripper Differential Pressure (In. H_2O)*	*Stripper Blower Pressure (psi)*	*Effluent pH (s.u.)*	*Stripper Air Flow (scfm)*	*Effluent Air Temp. (°F)*	*Comments*

TABLE 5.7
BAG FILTER CHANGE-OUT LOG
STAUFFER MANAGEMENT COMPANY
LEWISTON, NEW YORK

Date	*Time*	*Differential Pressure*	*Comments*

TABLE 5.8

EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS
STAUFFER MANAGEMENT COMPANY
LEWISTON, NEW YORK

During the Period Beginning: *June 1, 1995*
and Lasting Until: *June 1, 2000*
The discharges from the treatment facility shall be limited and monitored by the operator as specified below.

Outfall Number and Effluent Parameter	*Discharge Limitations*		*Units*	*Minimum Monitoring Requirements*	
	Daily Avg.	*Daily Max.*		*Measurement Frequency*	*Sample Type*
Outfall 002 - Treated Groundwater					
Flow	Monitor	144,000	gpd	Continuous	Meter
pH (Range)	(6.0 to 9.0)		SU	Weekly	Grab
Benzene	Monitor	0.01	mg/L	Weekly[6]	Grab
Carbon tetrachloride	Monitor	0.01	mg/L	Weekly[6]	Grab
Chloroform	Monitor	0.01	mg/L	Weekly[6]	Grab
Tetrachloroethene	Monitor	0.01	mg/L	Weekly[6]	Grab
Toluene	Monitor	0.01	mg/L	Weekly[6]	Grab
1,2-trans-Dichloroethene	Monitor	0.01	mg/L	Weekly[6]	Grab
Methylene chloride	Monitor	0.01	mg/L	Weekly[6]	Grab
Carbon disulfide	Monitor	Monitor	mg/L	Monthly	Grab
1,4-Dichlorophenol	Monitor	0.01	mg/L	Quarterly	Grab
Hexachloroethane	Monitor	0.01	mg/L	Quarterly	Grab
Napthalene	Monitor	0.01	mg/L	Quarterly	Grab
Phenolics, Total	Monitor	0.01	mg/L	Quarterly	Grab
Arsenic, Total	Monitor	0.036	lb/d	Quarterly	Grab
Chromium, Total	Monitor	0.072	lb/d	Quarterly	Grab
Copper, Total	Monitor	0.1	lb/d	Quarterly	Grab
Lead, Total	Monitor	0.16	lb/d	Quarterly	Grab
Nickel, Total	Monitor	0.072	lb/d	Quarterly	Grab
Selenium, Total	Monitor	0.48	lb/d	Quarterly	Grab
Zinc, Total	Monitor	0.86	lb/d	Quarterly	Grab

Note:
(Water Treatment Chemicals): The permit application must list all the corrosion/scale inhibitors or biocidal-type compounds used by the permittee. If the use of new water treatment chemicals is intended, application must be made prior to use. The Kjell Corporation's sequesturant Aqua Mag is not approved for use in the groundwater treatment system.

TABLE 6.1
TROUBLESHOOTING GUIDELINES
STAUFFER MANAGEMENT COMPANY
LEWISTON, NEW YORK

Groundwater Extraction, Groundwater Treatment and Area A SVE Systems

Tag	*Alarm Description*	*Troubleshooting*	*Remedy*
LSH101, LSH 102, LSH103	Extraction Well High Level Alarm	Has there been sufficient time to dewater the well?	
		Is Well Pump Operating ?	Verify Pump is in Auto. Test operation by briefly operating the Pump in Manual Mode.
		Is there sufficient flow ?	Inspect forcemain for pluggage or leaks.
		Are there any additional Pump Alarms (eg. Pump High Pressure)	Check Other alarm sections . (NOTE: if Pump High Pressure, Level Low and Level High are all active at the same time it indicates a loss of control power at the well.)
		Pump will not run in Manual Mode.	Check Pump overload at Pump disconnect panel.
		Loss of Control Power	Reset breaker for well at the main control panel.
		Is the level Really High?	Probe may be coated. Clean / replace probe.
		Is the level control relay working properly?	Replace level relay.

TABLE 6.1
TROUBLESHOOTING GUIDELINES
STAUFFER MANAGEMENT COMPANY
LEWISTON, NEW YORK

Groundwater Extraction, Groundwater Treatment and Area A SVE Systems

Tag	*Alarm Description*	*Troubleshooting*	*Remedy*
LSL101, LSL102, LSL103	Extraction Well Low Level Alarm (*Note: this alarm is normally a notification of well pump shutdown.)*	Is the Pump in Auto?	The pump must be in Auto for proper start stop operation of the Extraction Pumps.
		Loss of Control Power	Reset breaker for well at the main control panel.
PSH101, PSH102, PSH103	Extraction Well High Pressure Alarm	Is the well pump dead headed?	Open the valve at the inlet to the treatment plant.
		When reset does the pump provide sufficient flow.	If no, inspect forcemain for blockage.
LAHH150	Building Sump High Level	Find source of water.	Repair or Remedy Water Source.
LAH155, LAH160	DNAPL Drum High Level	Close DNAPL Valve	Empty DNAPL Drum to Shipping Container.
LAH130	DNAPL Separator High Level	What is incoming flow to DNAPL Separator?	If flow is too high (>100 GPM) investigate source.
		Is line to Pump Tank Plugged.	Clean Line to Pumping Tank.

TABLE 6.1
TROUBLESHOOTING GUIDELINES
STAUFFER MANAGEMENT COMPANY
LEWISTON, NEW YORK

Groundwater Extraction, Groundwater Treatment and Area A SVE Systems

Tag	*Alarm Description*	*Troubleshooting*	*Remedy*
LSH700	Pumping Tank High Level	Is the Carbon Feed Pump Operating?	Check Hand/Off/Auto Switch Check Overload at Pump disconnect Panel.
		Is the flow to the DANPL Separator High (>100 GPM)	Investigate source of excess water.
		Is the control valve operating properly? (LCV701) (Note: at high level the control valve should be wide open.)	Investigate air to control valve and PLC signal.
		Are the Bag filters operating at a high differential pressure? (>20 PSI)	Change Bags.
		Is the Carbon System Operating at a high differential pressure?	Burp the carbon tp remove air that may have accumulated at the top of the vessel.
			Backwash the carbon to flush biological growth.
LAH730	Carbon Transfer Spent Water Tank	Is a backwash or carbon transfer in progress?	Discontinue and Drain Carbon Transfer Water Tank.
		Is water leaking to the Tank?	Repair leaking valve.
LAH135	Airstripper Sump High Level	Water level High in stripper sump.	Open valves at discharge.
		Is there a blockage in the discharge line to the Forebay.	Clean effluent Pipe.

TABLE 6.1
TROUBLESHOOTING GUIDELINES
STAUFFER MANAGEMENT COMPANY
LEWISTON, NEW YORK

Groundwater Extraction, Groundwater Treatment and Area A SVE Systems

Tag	*Alarm Description*	*Troubleshooting*	*Remedy*
AAH140, AAL140	Effluent pH Out of Range	Discontinue system Operation.	
		Is pH Probe calibrated properly	Cailbrate pH Probe.
		pH is truly out of Range?	Find source of pH excursion.
PAH200	Airstripper Blower High Discharge Pressure	Is there water in the stack?	Drain Stack.
			Check Vacuum and Airflow on Stripper.
LAH182	Moisture Separator Tank High Level	Is the stripper Vacuum High (>30" Water)	Adjust Air flow rate and stripper vaccum.
			Clean airstripper trays
		Is Pump Condensate Pump Operational?	Check Hand/Off/Auto Switch
			Check Overload at Pump disconnect Panel.
LAH630, LAH631, LAH632	Dual Phase Well Leak Detection	Check for Water in the Well head?	Find source of Water and repair piping.
		Level Switch Malfunction?	Repair / Replace level switch.

TABLE 6.1
TROUBLESHOOTING GUIDELINES
STAUFFER MANAGEMENT COMPANY
LEWISTON, NEW YORK

Groundwater Extraction, Groundwater Treatment and Area A SVE Systems

Tag	*Alarm Description*	*Troubleshooting*	*Remedy*
LAHH620, LAHH621, LAHH622	Dual Phase Extraction Well Level High	Has there been sufficient time to dewater the well?	
		Is Well Pump Operating ?	Verify air cycling a well head. Adjust cycle timers to properly operate the pump.
		Is there sufficient flow ?	Inspect forcemain for pluggage or leaks.
		Pump cycling / No Flow	Check diaphragm seal at pump head.
		Is the level Really High?	Probe may be coated. Clean / replace probe.
		Is the level control relay working properly?	Replace level relay.

TABLE 6.1
TROUBLESHOOTING GUIDELINES
STAUFFER MANAGEMENT COMPANY
LEWISTON, NEW YORK

Groundwater Extraction, Groundwater Treatment and Area A SVE Systems

Tag	*Alarm Description*	*Troubleshooting*	*Remedy*
LAHH310	SVE Separator Tank High Level	Is the Condensate Removal Pump Operating?	Check Pump for Operation.
		Is the Pump level control functioning.	Verify Operation of level controls.
		Is the level Really High?	Probe may be coated. Clean / replace probe.
PALL320	SVE High Vacuum	Is the air filter plugged.	Clean/Replace air filter.
		Is the SVE field providing adequate air volume.	Open more SVE wells.
			Open dilution air valve to supplement air flow.
PAHH325	SVE High Pressure	Is the air flow high (>1350 CFM)	Reduce air flow to 1280 CFM
		Is there moisture in the carbon?	Drain excess moisture from the carbon vessels.
		Is the Heat Exchanger plugged ?	Remove material from heat exchanger inlet.
TAHH336	SVE High Temperature	Is the Heat Exchanger operating?	Check Hand/Off/Auto Switch Check Overload at Exchanger disconnect Panel.
		Is the air flow high (>1350 CFM)	Reduce air flow to 1280 CFM

TABLE 8.1
EQUIPMENT SUMMARY
STAUFFER MANAGEMENT COMPANY
LEWISTON, NEW YORK

Item	*Manufacturer*	*Model/Description*
Well Pumps (P-101, P-102, P-103)	Grundfos	16S15-14, 16S15-14, 40S50-15
Air Compressor (GW Treatment #1)	Ingersoll Rand	242D5
Air Compressors (GW Treatment #2 and Area T4)	Ingersoll Rand	234C2
DNAPL Separator (T-100)	Great Lakes Environmental	SRC-100
Carbon Pump Tank (T-700)	Sharpseville Container Corp.	1,000 Gallon
Carbon Feed Pump (P-701) and Carbon Transfer Water Pump (P-731)	Goulds	SST-C5
Bag Filters (T-701A-E)	Filtration Systems	NC526V
Liquid-Phase Carbon System (T-720A&B)	Calgon Carbon Corp.	20,000# ea., Dual Modual
Carbon Transfer Water Tank (T-730)	IMG	5,500 Gallon
Air Stripper	Shallow Tray	5 trays, 900 cfm
Air Stripper Blower	American Fan	30 HP
Air Stripper Moisture Separator Pump (P-181)	Goulds	ICS
Air Stripper Calsperse Pump (P-110)	LMI	A741
Flow Indicating Transmitter (FE-104, FE-105, FE-110, FE-115, FE-120, FE-360, FE-361, FE-362, FE-363)	Sparling	Tiger Mag
Level Transmitter (LT-700)	Rosemount	1151 DP 4S12
Level Control Valve (LCV-701)	Protech/Automax	2" x 585 SR7
Differential Pressure Transmitter (DPT-715)	Rosemount	1151 DP 6S12

TABLE 8.1
EQUIPMENT SUMMARY
STAUFFER MANAGEMENT COMPANY
LEWISTON, NEW YORK

Item	*Manufacturer*	*Model/Description*
Area A Moisture Separator (T-210)	Universal Silencer	VI-8
Area A SVE Blower (B-230)	M-D Pneumatics	7017
Area A SVE Heat Exchanger (H-250)	Xchanger	AA-1000
Area A Vapor-Phase Carbon (CA-260A-D)	Barneby & Sutcliffe	V1800
Area C Moisture Separator (T-310)	Universal Silencer	VI-4
Area C SVE Blower (B-330)	M-D Pneumatics	4009
Area C SVE Heat Exchanger (H-350)	API, Air Tech Div.	
Area C Vapor-Phase Carbon (CA-360A&B)	Barneby & Sutcliffe	V500
Area T4 Moisture Separator (T-410)	Universal Silencer	VI-4
Area T4 SVE Blower (B-430)	M-D Pneumatics	3206
Area T4 SVE Heat Exchanger (H-450)	API, Air Tech Div.	
Area T4 Vapor-Phase Carbon (CA-460A-D)	Barneby & Sutcliffe	V170
PLC Program	Modicon	
HMI Software Package	WonderWare	

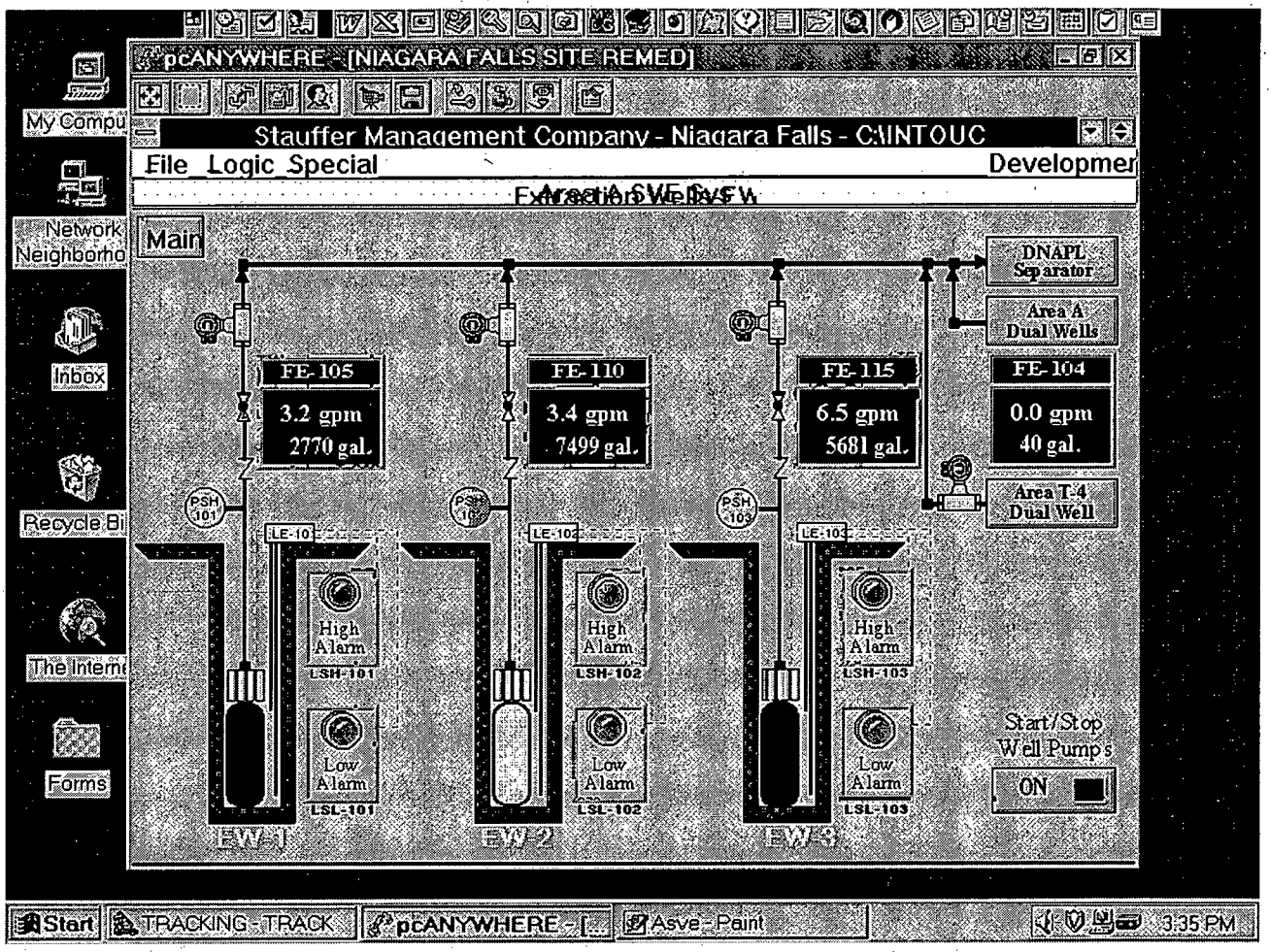
TABLE 9.1
HAZARDOUS WASTE ACCUMULATION/DISPOSAL LOG
STAUFFER MANAGEMENT COMPANY
LEWISTON, NEW YORK SITE

Drum/Container Number	*Contents*	*Accumulation Start Date*	*Accumulation End Date*	*Date Off-Site Disposal*	*Hazardous Waste Manifest Number*

APPENDIX A

TREATMENT SYSTEM PROGRAM

(FULL APPENDIX IS LOCATED AT SITE)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DNAPL Separator
Area A Dual Wells
Area T-4 Dual Well
FE-105
3.2 gpm
2770 gal.
FE-110
3.4 gpm
7499 gal.
FE-115
6.5 gpm
5681 gal.
FE-104
0.0 gpm
40 gal.
High Alarm
LSH-101
Low Alarm
LSL-101
High Alarm
LSH-102
Low Alarm
LSL-102
High Alarm
LSH-103
Low Alarm
LSL-103
Start/Stop Well Pumps
ON
EW-1
EW-2
EW-3
Start
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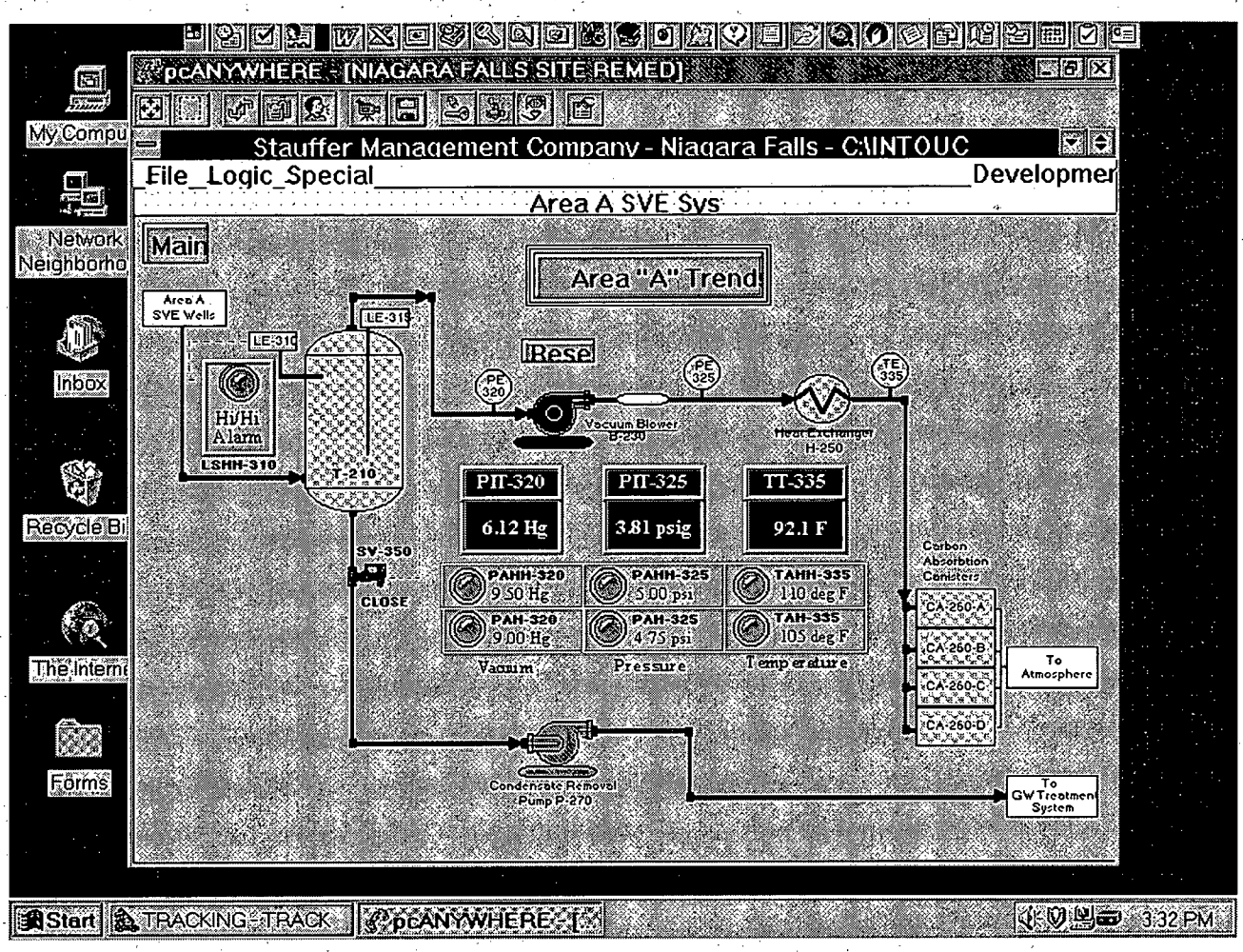
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Area "A" Trend
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Area A SVE Wells
LE-315
LE-310
Hi/Hi Alarm
LSHH-310
T-210
PE 320
PE 325
TE 335
Vacuum Blower B-230
Heat Exchanger H-250
PIT-320
6.12 Hg
PIT-325
3.81 psig
TT-335
92.1 F
SV-350
CLOSE
PAHH-320 9.50 Hg
PAH-320 9.00 Hg
Vacuum
PAHH-325 5.00 psi
PAH-325 4.75 psi
Pressure
TAHH-335 110 deg F
TAH-335 105 deg F
Temperature
Carbon Absorbtion Canisters
CA-260-A
CA-260-B
CA-260-C
CA-260-D
To Atmosphere
Condensate Removal Pump P-270
To GW Treatment System
My Compu
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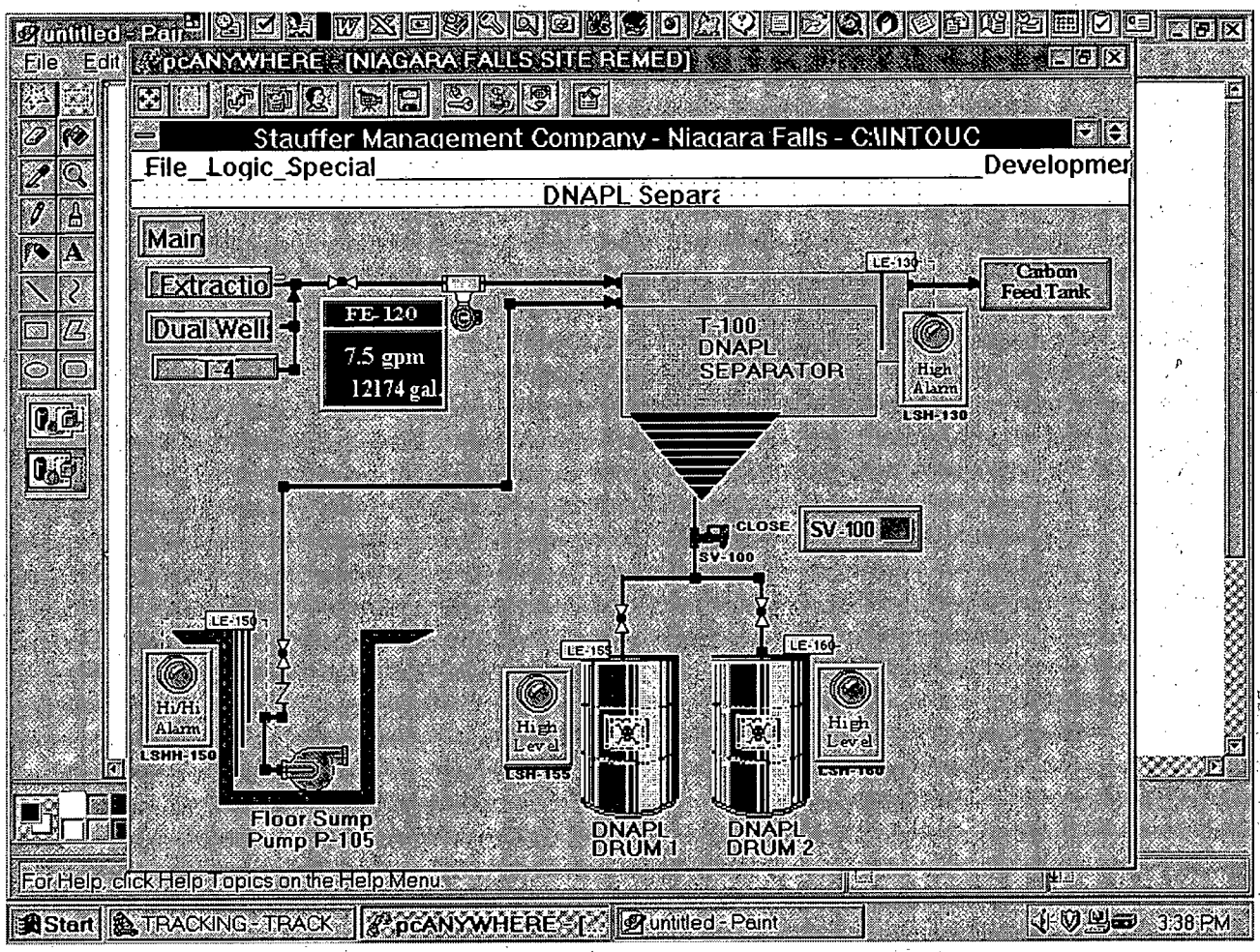
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Main
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Dual Well
FE-120
7.5 gpm
12174 gal
T-100
DNAPL
SEPARATOR
LE-130
Carbon
Feed Tank
High
Alarm
LSH-130
CLOSE
SV-100
SV-100
LE-150
Hi/Hi
Alarm
LSHH-150
LE-155
High
Level
LSH-155
LE-164
High
Level
LSH-160
Floor Sump
Pump P-105
DNAPL
DRUM 1
DNAPL
DRUM 2
For Help, click Help Topics on the Help Menu
Start
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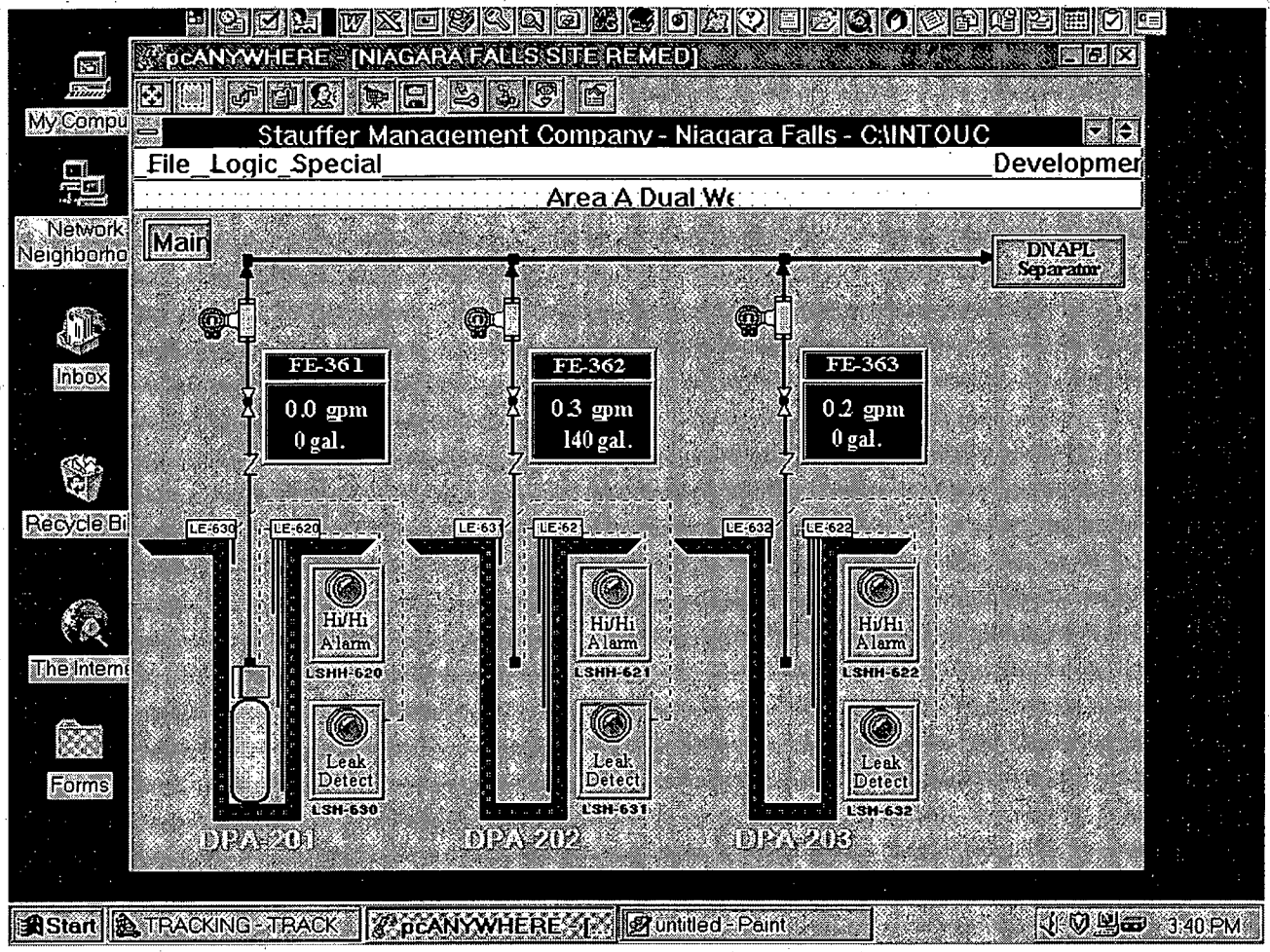
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DNAPL Separator
FE-361
0.0 gpm
0 gal.
FE-362
0.3 gpm
140 gal.
FE-363
0.2 gpm
0 gal.
LE-630
LE-620
LE-631
LE-62
LE-632
LE-622
Hi/Hi Alarm
LSHH-620
Leak Detect
LSH-630
Hi/Hi Alarm
LSHH-621
Leak Detect
LSH-631
Hi/Hi Alarm
LSHH-622
Leak Detect
LSH-632
DPA-201
DPA-202
DPA-203
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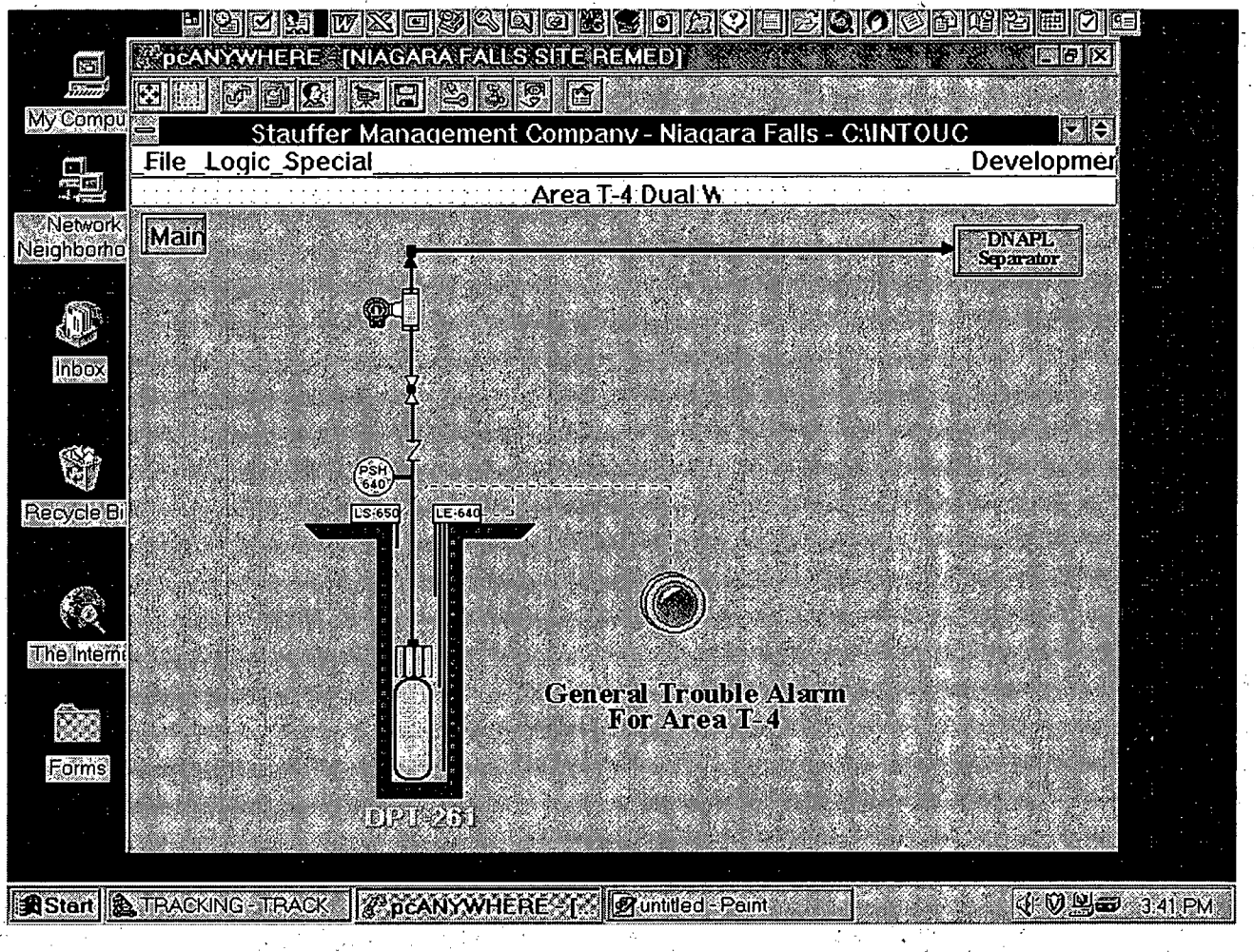
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DNAPL Separator
PSH 640
LS-650
LE-640
General Trouble Alarm For Area T-4
DPT-261
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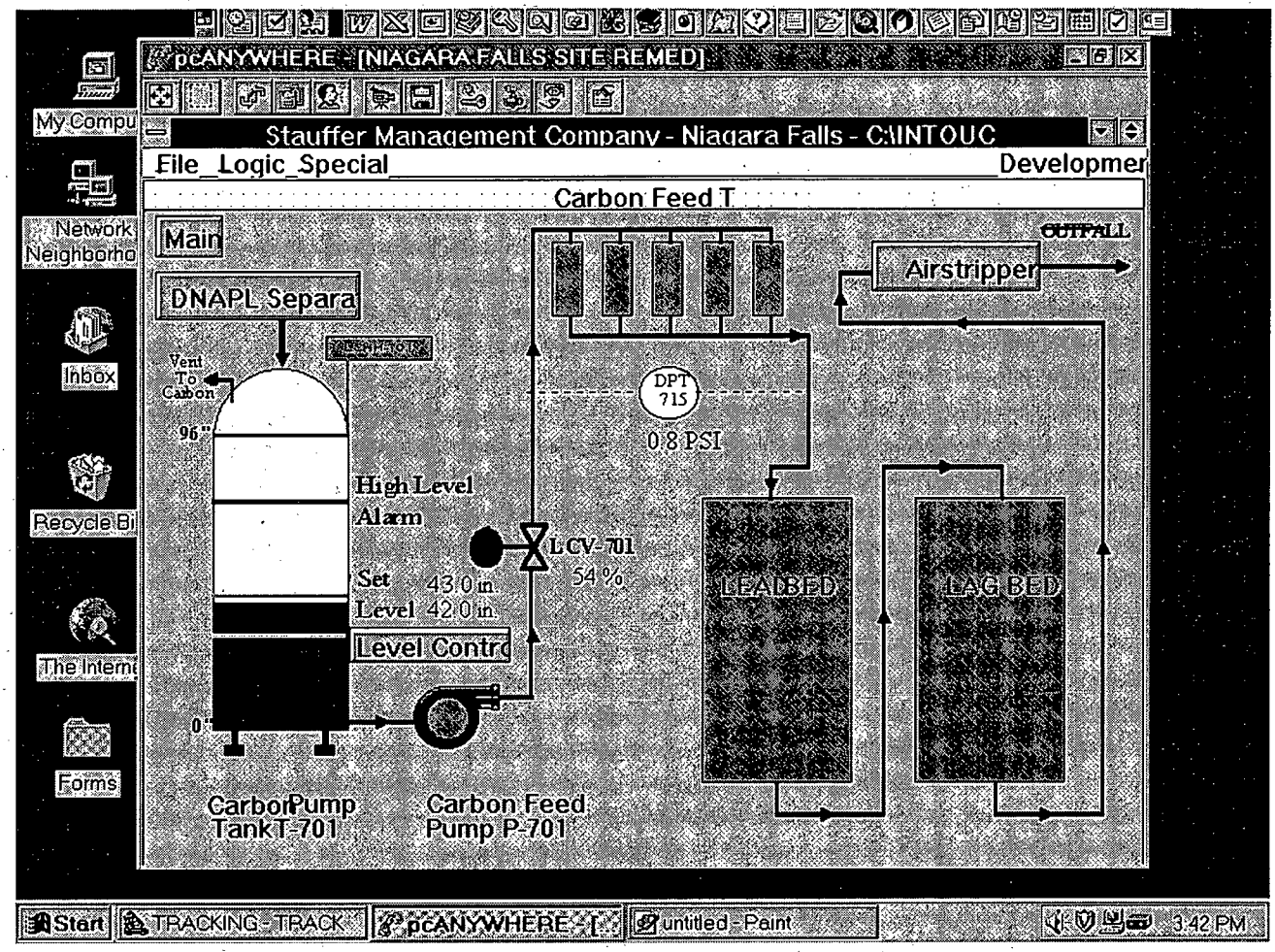
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Vent To Carbon
96"
0"
High Level Alarm
Set 43.0 in
Level 42.0 in
Level Contro
LCV-701
54 %
DPT 715
0.8 PSI
Airstripper
OUTFALL
LEADBED
LAG BED
Carbon Pump Tank T-701
Carbon Feed Pump P-701
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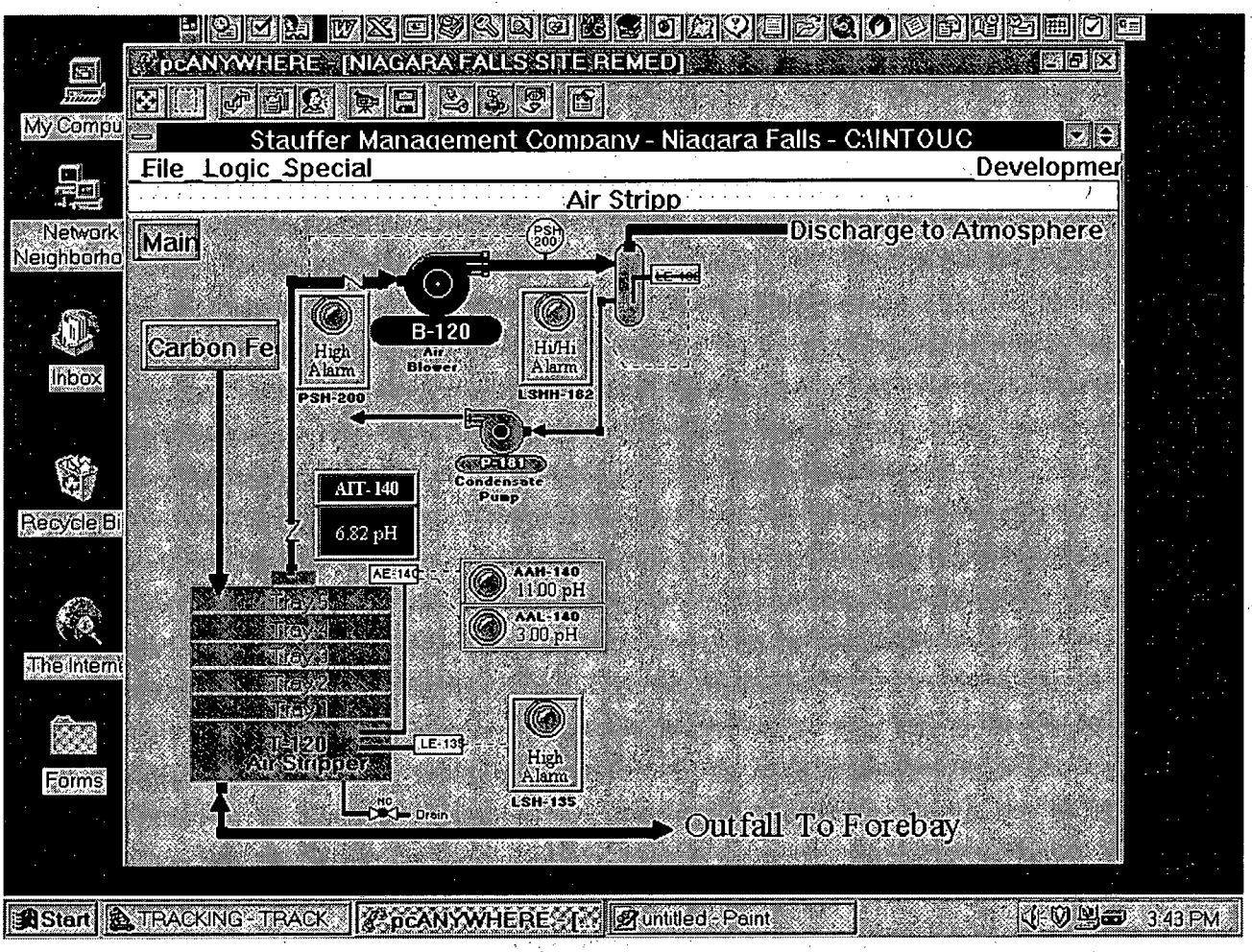
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Carbon Fe
Discharge to Atmosphere
PSH 200
B-120
Air Blower
High Alarm
PSH-200
Hi/Hi Alarm
LSHH-162
P-181
Condensate Pump
AIT-140
6.82 pH
AE-140
AAH-140
11.00 pH
AAL-140
3.00 pH
Tray 5
Tray 4
Tray 3
Tray 2
Tray 1
T-120
Air Stripper
LE-135
High Alarm
LSH-135
NC
Drain
Outfall To Forebay
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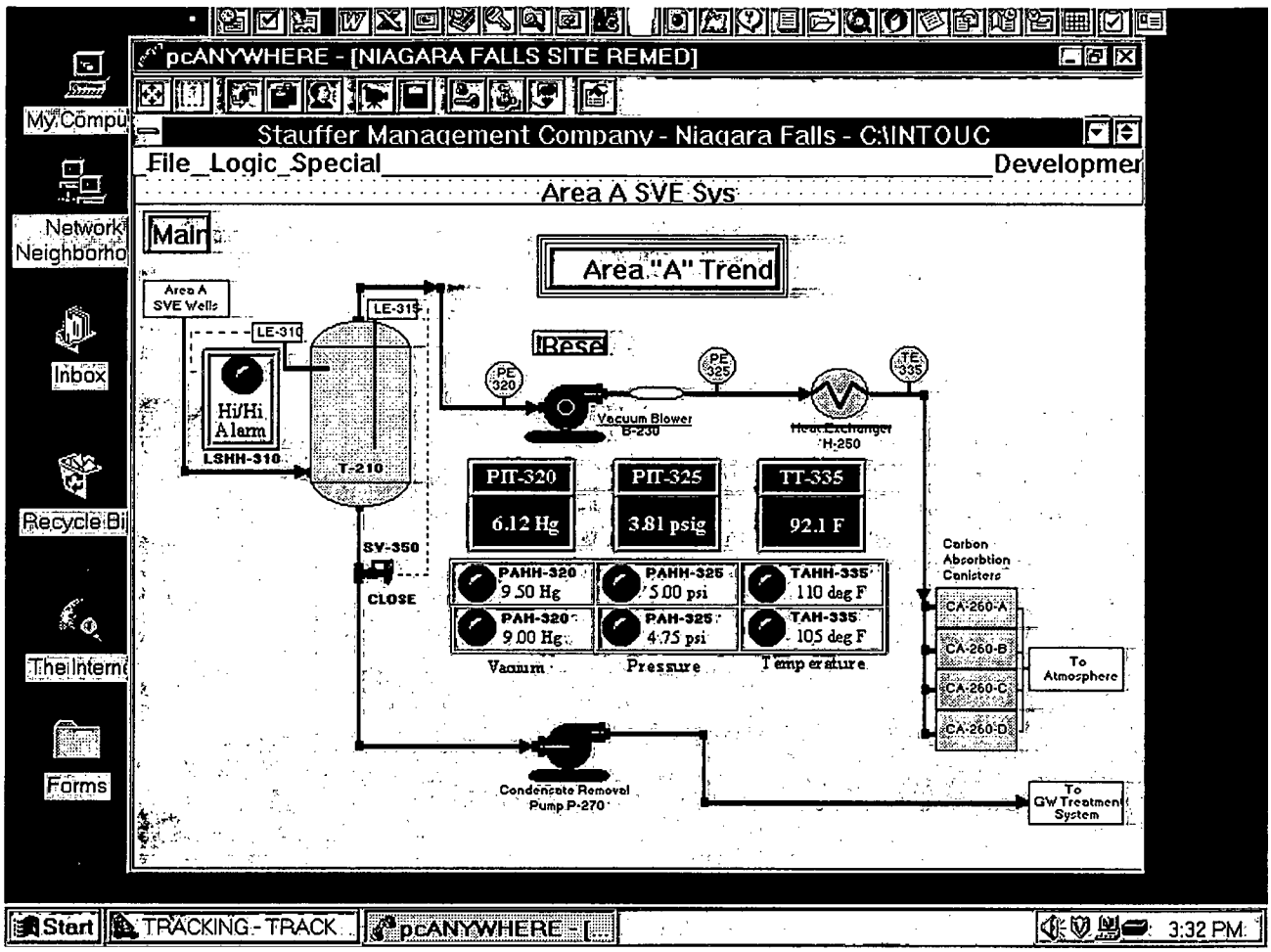
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Main
Area "A" Trend
Area A SVE Wells
LE-310
LE-315
Hi/Hi Alarm
LSHH-310
T-210
SV-350
CLOSE
Reset
PE 320
PE 325
TE 335
Vacuum Blower B-230
Heat Exchanger H-250
PIT-320
6.12 Hg
PIT-325
3.81 psig
TT-335
92.1 F
PAHH-320
9.50 Hg
PAH-320
9.00 Hg
PAHH-325
5.00 psi
PAH-325
4.75 psi
TAHH-335
110 deg F
TAH-335
105 deg F
Vacuum
Pressure
Temperature
Carbon Absorbtion Canisters
CA-260-A
CA-260-B
CA-260-C
CA-260-D
To Atmosphere
Condensate Removal Pump P-270
To GW Treatment System
Start
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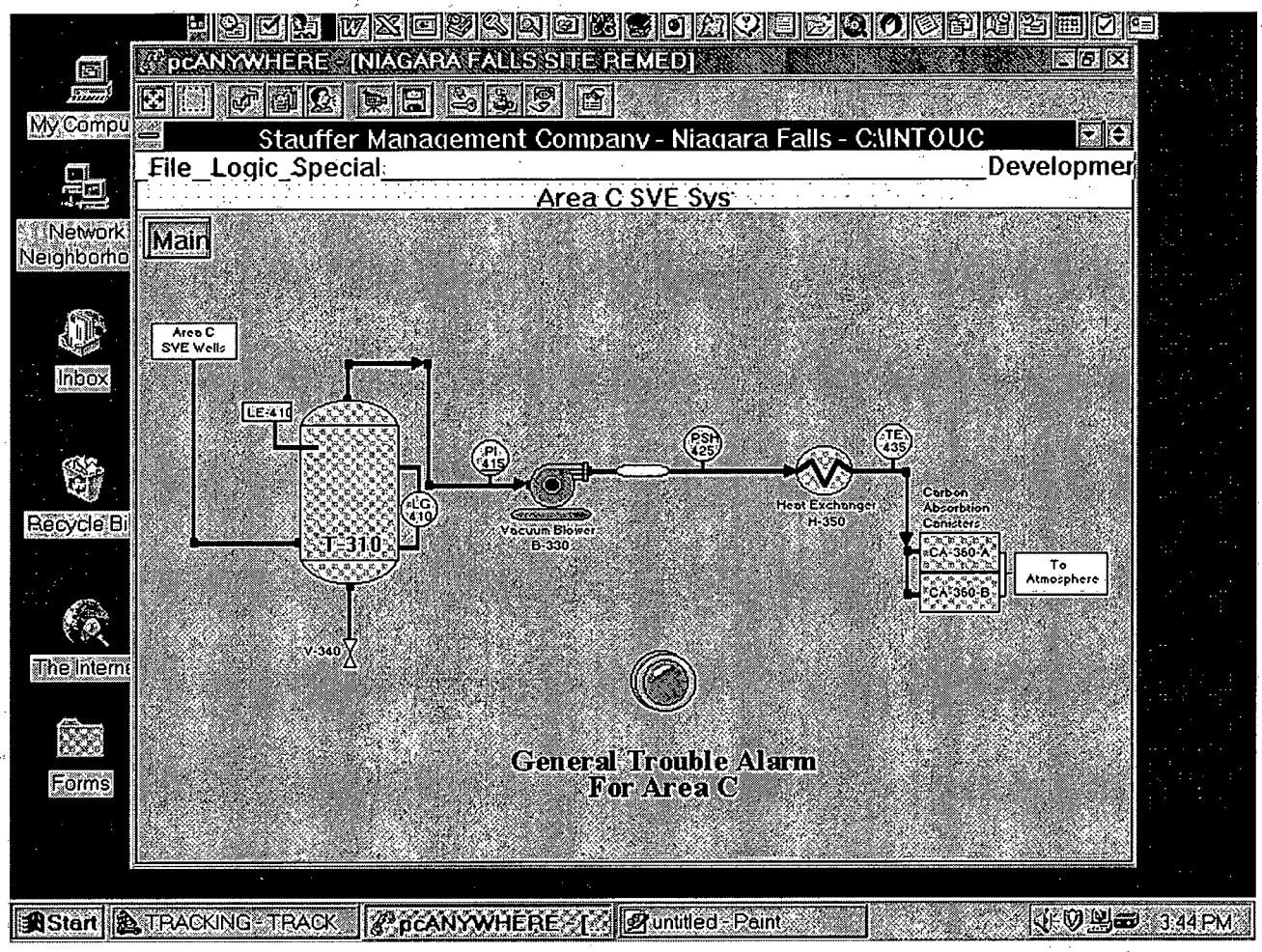
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Main
Area C SVE Wells
LE-410
T-310
LG-410
PI-415
Vacuum Blower B-330
PSH-425
TE-435
Heat Exchanger H-350
Carbon Absorbtion Canisters
CA-360-A
CA-360-B
To Atmosphere
V-340
General Trouble Alarm For Area C
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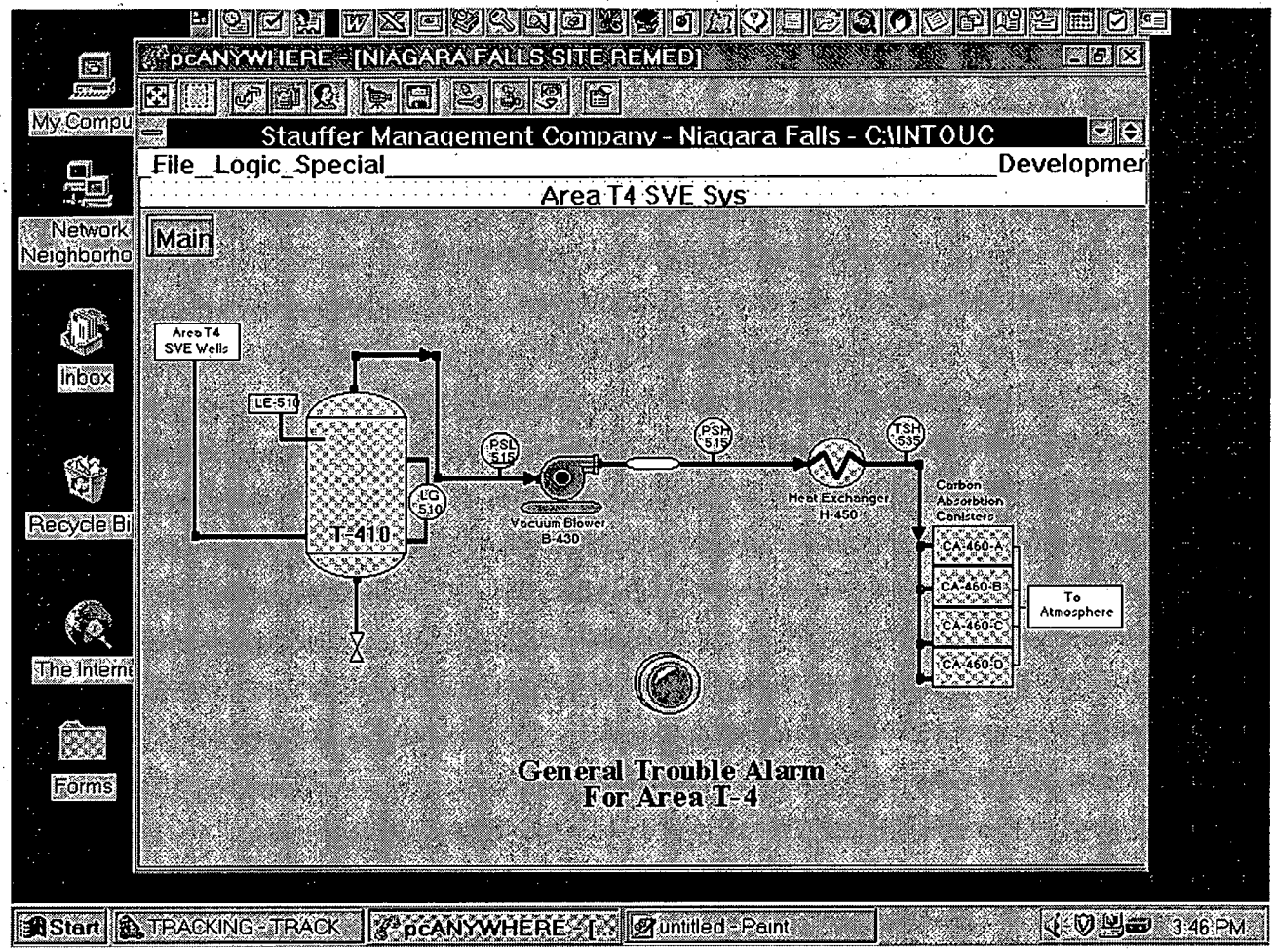
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T-410
LG 510
PSL 515
Vacuum Blower B-430
PSH 515
Heat Exchanger H-450
TSH 535
Carbon Absorbtion Canisters
CA-460-A
CA-460-B
CA-460-C
CA-460-D
To Atmosphere
General Trouble Alarm For Area T-4
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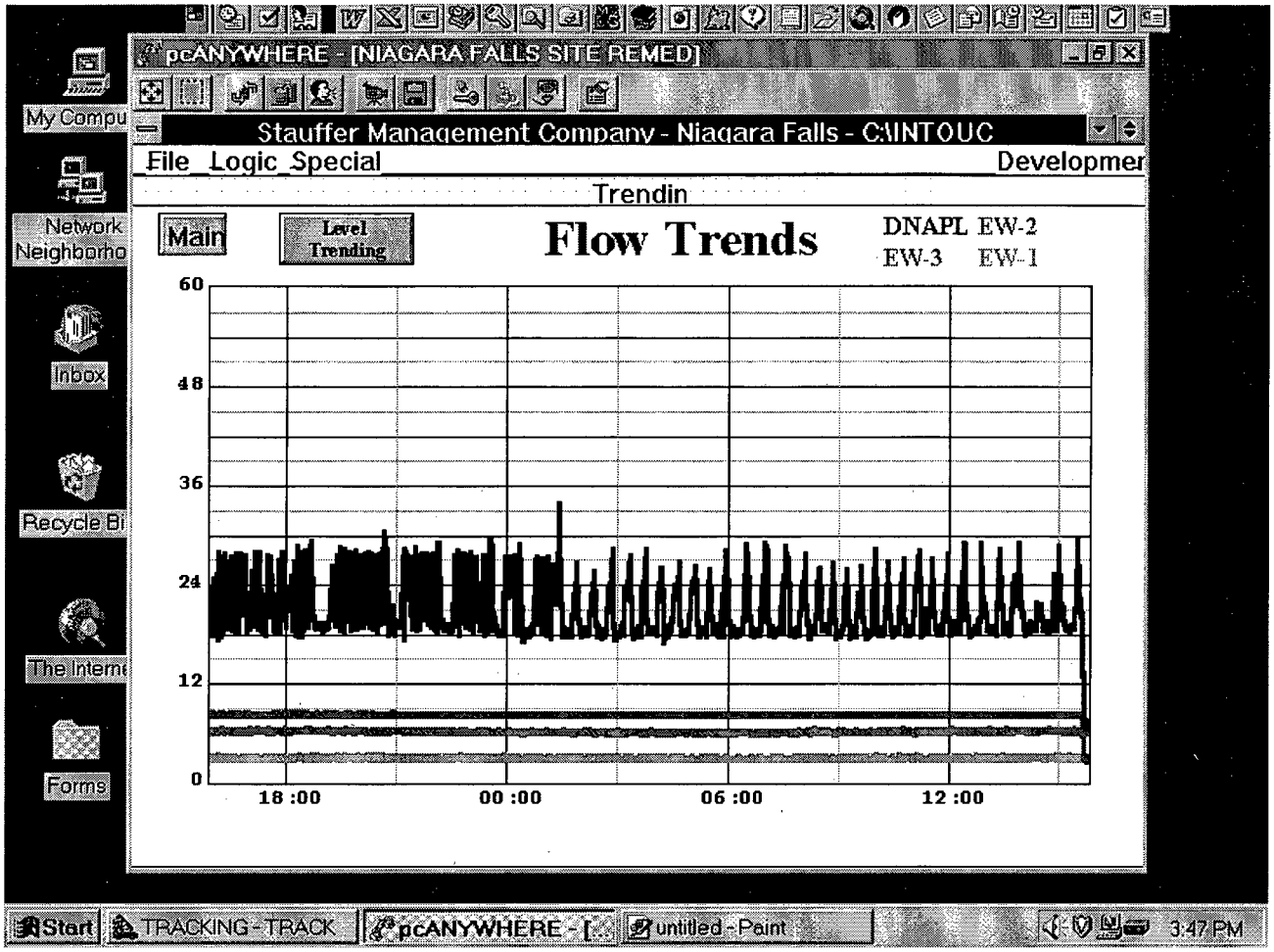
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Level Trending
Flow Trends
DNAPL EW-2
EW-3 EW-1
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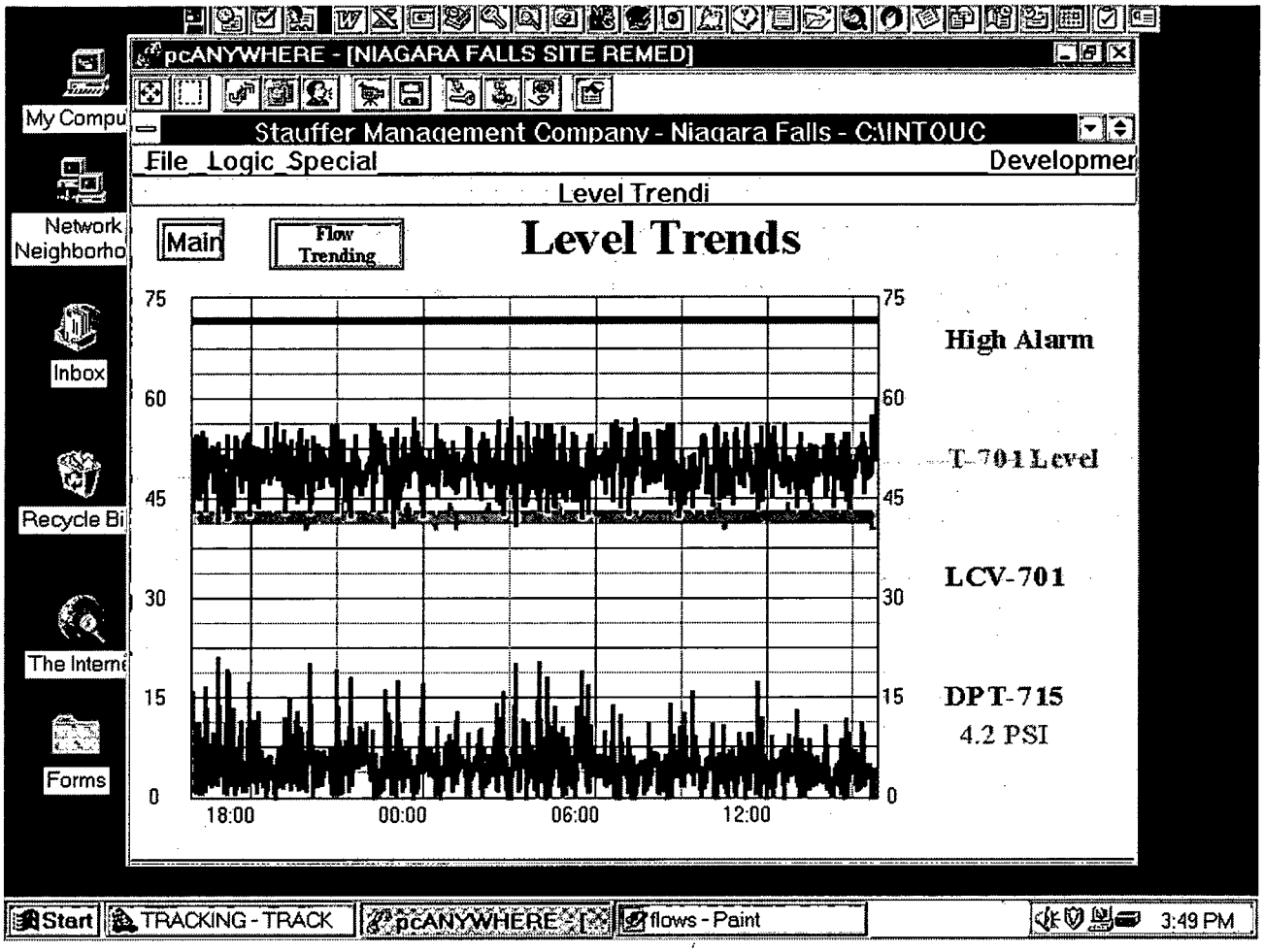
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Level Trendi
Main
Flow Trending
Level Trends
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18:00
00:00
06:00
12:00
High Alarm
T-701 Level
LCV-701
DPT-715
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flows - Paint
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REVISION NO.: 0

INTERLOCK 01 **June 2, 1997**

SHUTDOWN PUMP P-101, EXTRACTION WELL EW-101

Reference: P & ID Drawing EF-1, EF-2

Purpose: To prevent damage to pump P-101 by running without water or with high discharge pressure.

The following control actions will take pace:

- Pump P-101 will shut down

When any of the conditions listed below occur:

- Level in Extraction Well EW-101 is below LSL-101
  LAL-101 will alarm
- Pressure in line 2"GW-01-CS is above setpoint of PSH-101
  PAH-101 will alarm
- Interlock 05 is tripped - Shutdown flow to DNAPL separator

After ALL conditions below occur:

- Level in Extraction Well EW-101 is above LSL-101
  LAL-101 will clear
- Pressure in line 2"GW-01-CS is below setpoint of PSH-101
  PAH-101 will clear
- Interlock 05 is cleared - Shutdown flow to DNAPL separator

Then:

- Pump P-101 will be enabled for normal operation

REVISION NO.: 0

INTERLOCK 02 June 2, 1997

SHUTDOWN PUMP P-102, EXTRACTION WELL EW-102

Reference: P & ID Drawing EF-1, EF-2

Purpose: To prevent damage to pump P-102 by running without water or with high discharge pressure.

The following control actions will take pace:

- Pump P-102 will shut down

When any of the conditions listed below occur:

- Level in Extraction Well EW-102 is below LSL-102
  LAL-102 will alarm
- Pressure in line 2"GW-02-CS is above setpoint of PSH-102
  PAH-102 will alarm
- Interlock 05 is tripped - Shutdown flow to DNAPL separator

After ALL conditions below occur:

- Level in Extraction Well EW-102 is above LSL-102
  LAL-102 will clear
- Pressure in line 2"GW-02-CS is below setpoint of PSH-102
  PAH-102 will clear
- Interlock 05 is cleared - Shutdown flow to DNAPL separator

Then:

- Pump P-102 will be enabled for normal operation

REVISION NO.: 0

INTERLOCK 03 June 2, 1997

SHUTDOWN PUMP P-103, EXTRACTION WELL EW-103

Reference: P & ID Drawing EF-1, EF-2

Purpose: To prevent damage to pump P-103 by running without water or with high discharge pressure.

The following control actions will take pace:

- Pump P-103 will shut down

When any of the conditions listed below occur:

- Level in Extraction Well EW-103 is below LSL-103
  LAL-103 will alarm
- Pressure in line 2"GW-03-CS is above setpoint of PSH-103
  PAH-103 will alarm
- Interlock 05 is tripped - Shutdown flow to DNAPL separator

After ALL conditions below occur:

- Level in Extraction Well EW-103 is above LSL-103
  LAL-103 will clear
- Pressure in line 2"GW-03-CS is below setpoint of PSH-103
  PAH-103 will clear
- Interlock 05 is cleared - Shutdown flow to DNAPL separator

Then:

- Pump P-103 will be enabled for normal operation

REVISION NO.: 0

INTERLOCK 04 **June 2, 1997**

CLOSE SV-100

Reference: P & ID Drawing EF-2

Purpose: To prevent overfilling of DNAPL Drums.

The following control actions will take pace:

- SV-100 will close

When any of the conditions listed below occur:

- Level in Drum 1 exceeds LSH-155
  LAH-155 will alarm
- Level in Drum 2 exceeds LSH-160
  LAH-160 will alarm

After ALL conditions below occur:

- Level in Drum 1 is below LSH-155
  LAH-155 will clear
- Level in Drum 2 is below LSH-160
  LAH-160 will clear

Then:

- SV-100 will be enabled for normal operation

REVISION NO.: 1

INTERLOCK 05 April 28, 1998

STOP FLOW TO DNAPL SEPARATOR

Reference: P & ID Drawing EF-1, EF-2

Purpose: To prevent water flow to DNAPL separator.

The following control actions will take pace:

- Pump P-101, Extraction Well EW-101, will shutdown
- Pump P-102, Extraction Well EW-102, will shutdown
- Pump P-103, Extraction Well EW-103, will shutdown
- Pump DPA-201, Dual Well 201, will shutdown
- Pump DPA-202, Dual Well 202, will shutdown
- Pump DPA-202, Dual Well 202, will shutdown
- Pump P-731, Carbon Transfer Spent Water Pump, will shutdown
- Pump P-270, Condensate Removal Pump

When any of the conditions listed below occur:

- Level in DNAPL Separator above LSH-130
  LAH-130 will alarm
- Level in Floor Sump Pump is above LSHH-150
  LAHH-150 will alarm
- Level in Carbon Pump Tank is above LSH-700
  LAH-700 will alarm

After ALL conditions below occur:

- Level in DNAPL Separator is below LSH-130
  LAH-130 will clear
- Level in Floor Sump Pump is below LSHH-150
  LAHH-150 will clear
- Level in Carbon Pump Tank is below LSH-700
  LAH-700 will clear

Then:

- Pump P-101, Extraction Well EW-101, will be enabled for normal operation
- Pump P-102, Extraction Well EW-102, will be enabled for normal operation
- Pump P-103, Extraction Well EW-103, will be enabled for normal operation
- Pump P-731, Carbon Transfer Spent Water Pump, will be enabled for normal operation
- Pump P-270, Condensate Removal Pump, will be enabled for normal operation

REVISION NO.: 0

INTERLOCK 06 June 2, 1997

SHUTDOWN PUMP P-105, FLOOR SUMP PUMP

Reference: P & ID Drawing EF-2

Purpose: To prevent damage to pump P-105 by running without water.

The following control actions will take pace:

- Pump P-105 will shutdown

When any of the conditions listed below occur:

- Level in Floor Sump is below LSL-150
- Interlock 05 is tripped - Shutdown flow to DNAPL separator

After ALL conditions below occur:

- Level in Floor Sump is above LSH-150
- Interlock 05 is cleared - Shutdown flow to DNAPL separator

Then:

- Pump P-105 will be enabled for normal operation

REVISION NO.: 0

INTERLOCK 07 June 2, 1997

SHUTDOWN PUMP P-110, SEQUESTERING AGENT METERING PUMP

Reference: P & ID Drawing EF-2

Purpose: To prevent sequestering agent from being added when no water flow is present.

The following control actions will take pace:

- Pump P-110 will shutdown

When any of the conditions listed below occur:

- Interlock 05 tripped - Shutdown flow to DNAPL separator

After ALL conditions below occur:

- Interlock 05 is cleared - Shutdown flow to DNAPL separator

Then:

- Pump P-101 will be enabled for normal operation

Operator may:

- Manually operate pump using local start/stop pushbuttons.

REVISION NO.: 1

INTERLOCK 08 April 28, 1998

SHUTDOWN PUMP P-701, CARBON FEED PUMP

Reference: P & ID Drawing EF-3, EF-4

Purpose: To prevent damage to pump P-101 by running with high discharge pressure.

The following control actions will take pace:

- Pump P-701 will shut down

When any of the conditions listed below occur:

- Level in Air Stripper is above LSH-135
  LAH-135 will alarm
- Differential Pressure through Filtration System is above setpoint of DPT-715
- Level in Carbon Feed Tank, T-701, is below low level setpoint.

After ALL conditions below occur:

- Level in Air Stripper is below LSH-135
  LAH-135 will clear
- Differential Pressure through Filtration System is below setpoint of DPT-715
- Level in Carbon Feed Tank, T-701, is above Pump Start Level.

Then:

- Pump P-701 will be enabled for normal operation

REVISION NO.: 1

INTERLOCK 09 April 28, 1998

SHUTDOWN PUMP P-731, CARBON TRANSFER SPENT WATER PUMP

Reference: P & ID Drawing EF-2, EF-4

Purpose: To prevent damage to pump P-731 by running without water or with high discharge pressure.

The following control actions will take pace:

- Pump P-731 will shut down

When any of the conditions listed below occur:

- Level in Tank T-730, Carbon Transfer Spent Water Tank is below Pump Shutoff Level, LSL-730.
- Interlock 05 is tripped - Shutdown flow to DNAPL separator

After ALL conditions below occur:

- Level in Tank T-730, Carbon Transfer Spent Water Tank is above LSH-730
- Interlock 05 is cleared - Shutdown flow to DNAPL separator

Then:

- Pump P-731 will be enabled for normal Automatic operation.

REVISION NO.: 0

INTERLOCK 10 June 2, 1997

SHUTDOWN PUMP P-181, CONDENSATE PUMP

Reference: P & ID Drawing EF-4

Purpose: To prevent Air Stripper from overflowing.

The following control actions will take pace:

- Pump P-181 will shut down

When any of the conditions listed below occur:

- Level in Air Stripper is above LSH-135
  LAH-135 will alarm

After ALL conditions below occur:

- Level in Air Stripper is below LSH-135
  LAH-13 will clear

Then:

- Pump P-181 will be enabled for normal operation

Operator may:

- Manually operate pump using local start/stop pushbuttons.

REVISION NO.: 0

INTERLOCK 11 June 2, 1997

SHUTDOWN BLOWER B-120, AIR BLOWER

Reference: P & ID Drawing EF-4

Purpose: To prevent damage to blower B-120 by running with high discharge pressure.

The following control actions will take pace:

- Blower B-120 will shut down

When any of the conditions listed below occur:

- Pressure in blower discharge line is above setpoint of PSH-200
  PAH-200 will alarm
- Interlock 09 is tripped - Shutdown Pump P-731, Carbon Transfer Spent Water Pump

After ALL conditions below occur:

- Pressure in blower discharge line is below setpoint of PSH-200
  PAH-200 will clear
- Interlock 09 is cleared - Shutdown Pump P-731, Carbon Transfer Spent Water Pump

Then:

- Blower B-120 will be enabled for normal operation

Operator may:

- Manually operate blower using local start/stop pushbuttons.

REVISION NO.: 1

INTERLOCK 12 April 28, 1998

SHUTDOWN BLOWER B-230, VACUUM BLOWER CA-260

Reference: P & ID Drawing EF-5

Purpose: To prevent damage to Blower B-230 by running with high discharge pressure.

The following control actions will take pace:

- Blower B-230 will shut down

When any of the conditions listed below occur:

- Pressure in line 8"-VE-09-CS-1 is above setpoint High-High Pressure Setpoint
  PAH-325 will alarm
- Vacuum in line 10"-VE-06-CS is above High-High Vacuum Setpoint.
  PAL-320 will alarm

After ALL conditions below occur:

- Pressure in line 8"-VE-09-CS-1 is below setpoint
  PAH-325 will clear
- Pressure in line 10"-VE-06-CS is above setpoint
  PAL-320 will clear

Then:

- Blower B-230 will be enabled for normal operation

REVISION NO.: 1

INTERLOCK 13 April 28, 1998

SHUTDOWN PUMP P-270, CONDENSATE REMOVAL PUMP CA-260

Reference: P & ID Drawing EF-5

Purpose:

The following control actions will take pace:

- Pump P-270 will shut down

When any of the conditions listed below occur:

- Interlock 05 is tripped - Shutdown flow to DNAPL separator
- The level in the Separator Tank is below LSL-315.

After ALL conditions below occur:

- Interlock 05 is cleared - Shutdown flow to DNAPL separator
- The level in the Separator tank is above LSH-315.

Then:

- Pump P-270 will be enabled for normal operation

REVISION NO.: 0

INTERLOCK 15 June 2, 1997

SHUTDOWN BLOWER B-330, VACUUM BLOWER CA-360

Reference: P & ID Drawing EF-6

Purpose: To prevent damage to Blower B-330 by running with high discharge pressure.

The following control actions will take pace:

- Blower B-330 will shut down

When any of the conditions listed below occur:

- Pressure in line 4"-VE-08-CS-1 is above setpoint of PSH-425
  PAH-425 will alarm
- Pressure in line 4"-VE-07-CS is below setpoint of PSL-415
  PAL-415 will alarm

After ALL conditions below occur:

- Pressure in line 4"-VE-08-CS-1 is below setpoint of PSH-425
  PAH-425 will clear
- Pressure in line 4"-VE-07-CS is above setpoint of PSL-415
  PAL-415 will clear

Then:

- Blower B-330 will be enabled for normal operation

REVISION NO.: 0

INTERLOCK 16 June 2, 1997

SHUTDOWN BLOWER B-430, VACUUM BLOWER CA-460

Reference: P & ID Drawing EF-6

Purpose: To prevent damage to Blower B-430 by running with high discharge pressure.

The following control actions will take pace:

- Blower B-430 will shut down

When any of the conditions listed below occur:

- Pressure in line 3"-VE-08-CS-1 is above setpoint of PSH-525
  PAH-525 will alarm
- Pressure in line 3"-VE-07-CS is below setpoint of PSL-515
  PAL-515 will alarm

After ALL conditions below occur:

- Pressure in line 3"-VE-08-CS-1 is below setpoint of PSH-525
  PAH-525 will clear
- Pressure in line 3"-VE-07-CS is above setpoint of PSL-515
  PAL-515 will clear

Then:

- Blower B-430 will be enabled for normal operation

REVISION NO.: 1

INTERLOCK 17 **April 28, 1998**

SHUTDOWN PUMP DPA-201, Dual PHASE Well 201 Area A

Reference: P & ID Drawing EF-8

Purpose: To prevent damage to pump DPA-201 by running without water while there is an active leak in the piping.

The following control actions will take pace:

- Pump DPA-201 will shut down

When any of the conditions listed below occur:

- Level in Extraction Well DPA-201 is below LSL-620
  LAL-620 will alarm
- The leak detector in well chamber DPA-201 is tripped (LSH-630)
  LSH-630 will alarm
- Interlock 05 is tripped - Shutdown flow to DNAPL separator

After ALL conditions below occur:

- Level in Extraction Well DPA-201 is above LSH-620
- The leak detector in well chamber DPA-201 is cleared (LSH-630)
- Interlock 05 is cleared - Shutdown flow to DNAPL separator

Then:

- Pump DPA-201 will be enabled for normal operation

REVISION NO.: 1

INTERLOCK 18 April 28, 1998

SHUTDOWN PUMP DPA-202, Dual PHASE Well 202 Area A

Reference: P & ID Drawing EF-8

Purpose: To prevent damage to pump DPA-202 by running without water while there is an active leak in the piping.

The following control actions will take pace:

- Pump DPA-202 will shut down

When any of the conditions listed below occur:

- Level in Extraction Well DPA-202 is below LSL-621
  LAL-621 will alarm
- The leak detector in well chamber DPA-202 is tripped (LSH-631)
  LSH-631 will alarm
- Interlock 05 is tripped - Shutdown flow to DNAPL separator

After ALL conditions below occur:

- Level in Extraction Well DPA-202 is above LSH-621
- The leak detector in well chamber DPA-202 is cleared (LSH-631)
- Interlock 05 is cleared - Shutdown flow to DNAPL separator

Then:

- Pump DPA-202 will be enabled for normal operation

REVISION NO.: 1

INTERLOCK 19 April 28, 1998

SHUTDOWN PUMP DPA-203, Dual PHASE Well 203 Area A

Reference: P & ID Drawing EF-8

Purpose: To prevent damage to pump DPA-203 by running without water while there is an active leak in the piping.

The following control actions will take pace:

- Pump DPA-203 will shut down

When any of the conditions listed below occur:

- Level in Extraction Well DPA-203 is below LSL-622
  LAL-622 will alarm
- The leak detector in well chamber DPA-203 is tripped (LSH-632)
  LSH-632 will alarm
- Interlock 05 is tripped - Shutdown flow to DNAPL separator

After ALL conditions below occur:

- Level in Extraction Well DPA-203 is above LSH-622
- The leak detector in well chamber DPA-203 is cleared (LSH-632)
- Interlock 05 is cleared - Shutdown flow to DNAPL separator

Then:

- Pump DPA-203 will be enabled for normal operation

PROCESS / INSTRUMENT LINES

- MAIN PROCESS LINE
- SECONDARY PROCESS LINE
- UNDEFINED SIGNAL
- PNEUMATIC SIGNAL
- ELECTRICAL SIGNAL
- CAPILLARY TUBE
- ELECTROMAGNETIC OR SONIC SIGNAL (GUIDED)
- ELECTROMAGNETIC OR SONIC SIGNAL (NOT GUIDED)
- INTERNAL SYSTEM LINK
- HYDRAULIC SIGNAL
- MECHANICAL LINK
- ELECTRICAL BINARY SIGNAL
- MAIN PROCESS FLOW INDICATION
- SECONDARY PROCESS FLOW INDICATION
- OFF PAGE CONNECTOR (TO / FROM SHEET No.)
- UTILITY IN/OUT (UTILITY)

LINE SYMBOLS

- BALL VALVE (BA–)
- BUTTERFLY VALVE (BU–)
- GATE VALVE (GA–)
- GLOBE VALVE (GL–)
- THREE WAY VALVE (FAIL OPEN TO PATH A–C)
- FOUR WAY VALVE (FAIL OPEN TO PATH A–C AND B–D)
- CHECK VALVE (CH–)
- REDUCER
- FLEXIBLE PIPE
- BLIND FLANGE
- HOSE CONNECTION
- SCREWED CAP, CLEANOUT
- Y–LINE STRAINER
- SPECIFICATION CHANGE
- LEVEL DEVICE, FLOAT TYPE
- BLOCK & BLEED VALVE SETUP (BB)
- TIE POINT TO EXISTING SYSTEM (TP/1)
- RESTRICTION ORIFICE
- FLOW STRAIGHTENING VANE
- SPECIALITY PART (SP/4)
- STATIC MIXER
- AIR VENT, AUTOMATIC (AV)
- FILTER/REGULATOR/LUBRICATOR
- FILTER/REGULATOR
- DAMPER OR LOUVER
- EQUIPMENT INSULATED WITH X" OF INSULATION (X")

INSTRUMENT SYMBOLS

- LOCALLY MOUNTED INSTRUMENTS
- PANEL MOUNTED INSTRUMENTS (PNL A) — A = PANEL No. WHEN MORE THAN ONE PANEL IS PRESENT
- BEHIND BOARD MOUNTED INSTRUMENTS
- IN LINE INSTRUMENTS AS INDENTIFIED
- SIGHT GLASS (SG)
- RUPTURE DISC
- PRESSURE RELIEF VALVE
- VACUUM RELIEF VALVE
- CONSERVATION VENT (V P)
- PRESSURE REDUCING REGULATOR (SELF CONTAINED)
- BACKPRESSURE REGULATOR (SELF CONTAINED)
- LEVEL REGULATOR WITH MECHANICAL LINKAGE
- TEMPERATURE ELEMENT WITH THERMOWELL (TE)
- DIAPHRAM ACTUATOR, SPRING–OPPOSED
- CYLINDER ACTUATOR SPRING – OPPOSED
- ROTARY MOTOR ACTUATOR (M)
- SOLENOID ACTUATOR (S)
- HAND ACTUATOR OR HANDWHEEL
- AIR ACTUATED VALVE W/POSITIONER
- VALVE FAIL SYMBOLS (ATO/FC)
  - ATO – AIR TO OPEN
  - ATC – AIR TO CLOSE
  - FO – FAIL OPEN
  - FC – FAIL CLOSED
  - FL – FAIL LOCKED (LAST POSITION)
  - FI – FAIL INDETERMINATE
- TARGET TYPE FLOW SENSOR (FT)
- SINGLE PORT PITOT TUBE (PT)
- AVERAGING PITOT TUBE (FE)
- MAGNETIC FLOWMETER (FM)
- TURBINE OR PROPELLER FLOWMETER (FT)
- POSITIVE–DISPLACEMENT FLOWMETER
- VARIABLE AREA FLOWMETER (FI)
- DIAPHRAM SEAL WITH PRESSURE LEAD LINE (PI)
- DIAPHRAM SEAL (LINE–MOUNTED) (PI)
- SIGNAL CONVERTER (INPUT/OUTPUT) (XY)
  - [*E – VOLTAGE, P – PNEUMATIC; I – CURRENT, B – BINARY (MODBUS, RS232...)]
- MOTOR (M)
- PILOT LIGHT (COLOR)

SUBSCRIPTS

LIGHTS
- A = AMBER
- B = BLUE
- C = CLEAR
- G = GREEN
- R = RED
- W = WHITE
- Y = YELLOW

PUSHBUTTONS
- ES = EMERGENCY STOP
- J = JOG
- L = LOCAL PANEL
- LO = LOCK OUT
- SP = STOP
- ST = START

TYPICAL ISA LETTER COMBINATIONS

First–Letters	Initiating or Measured Variable	Controllers: Recording	Controllers: Indicating	Controllers: Blind	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)
- FX (Accessories)
- TJR (Scanning Recorder)
- LLH (Pilot Light)
- LOH (Level Control High)
- PFR (Ratio)
- KQI (Running Time Indicator)
- QQI (Indicating Counter)
- WIOC (Rate–of–Weight–Loss Controller)
- HMS (Hand Momentary Switch)
- LCL (Level Control Low)

DISTRIBUTED CONTROL / SHARED DISPLAY INSTRUMENTS

- INDICATOR/CONTROLLER/RECORDER OR ALARM POINTS – USUALLY USED TO INDICATE VIDEO DISPLAY
  • NORMALLY ACCESSIBLE TO OPERATOR
- DISTRIBUTED CONTROL INTERCONNECTING LOGIC CONTROLLER OR PC WITH BINARY OR SEQUENTIAL LOGIC FUNCTIONS
  • NORMALLY ACCESSIBLE TO OPERATOR
- INPUT ALARMS: PAH – HIGH; PAL – LOW; dP/dT – RATE CHANGE; PDA – DEVIATION
  OUTPUT ALARMS: XAH – HIGH; XAL – LOW; d/dT – RATE CHANGE
  MISCELLANEOUS: PR – TREND
  • NORMALLY ACCESSIBLE TO OPERATOR
- OLC – OPERATIONAL LIGHTED CONTROL
  OA – OPERATIONAL ALARM (STATUS)
  SP – STOP/INHIBIT FUNCTION FROM CRT
  ST – START/ENABLE FUNCTION FROM CRT
  A – AUTO ON/OFF FUNCTION FROM CRT
  O – OFF FUNCTION FROM CRT
  H – HAND/MANUAL FUNCTION FROM CRT
- NORMALLY BLIND OPERATION
  • NOT NORMALLY ACCESSIBLE TO OPERATOR
- DISTRIBUTED CONTROL INTERCONNECTING LOGIC CONTROLLER OR PC WITH BINARY OR SEQUENTIAL LOGIC FUNCTIONS NUMBER IN DIAMOND REFERS TO PROCESSOR NUMBER; NUMBER OUTSIDE DIAMOND REFERS TO SEQUENCE NUMBER

INSTRUMENT / PROCESS LINES DESIGNATIONS

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

NO.	REVISIONS	DRAWN	CHKD.	APP.	DATE

SCALE : NONE

PROJECT NUMBER: 6488–76 | FILE NAME: 06488–76(000)EF–NF000

TreaTek – CRA™ COMPANY

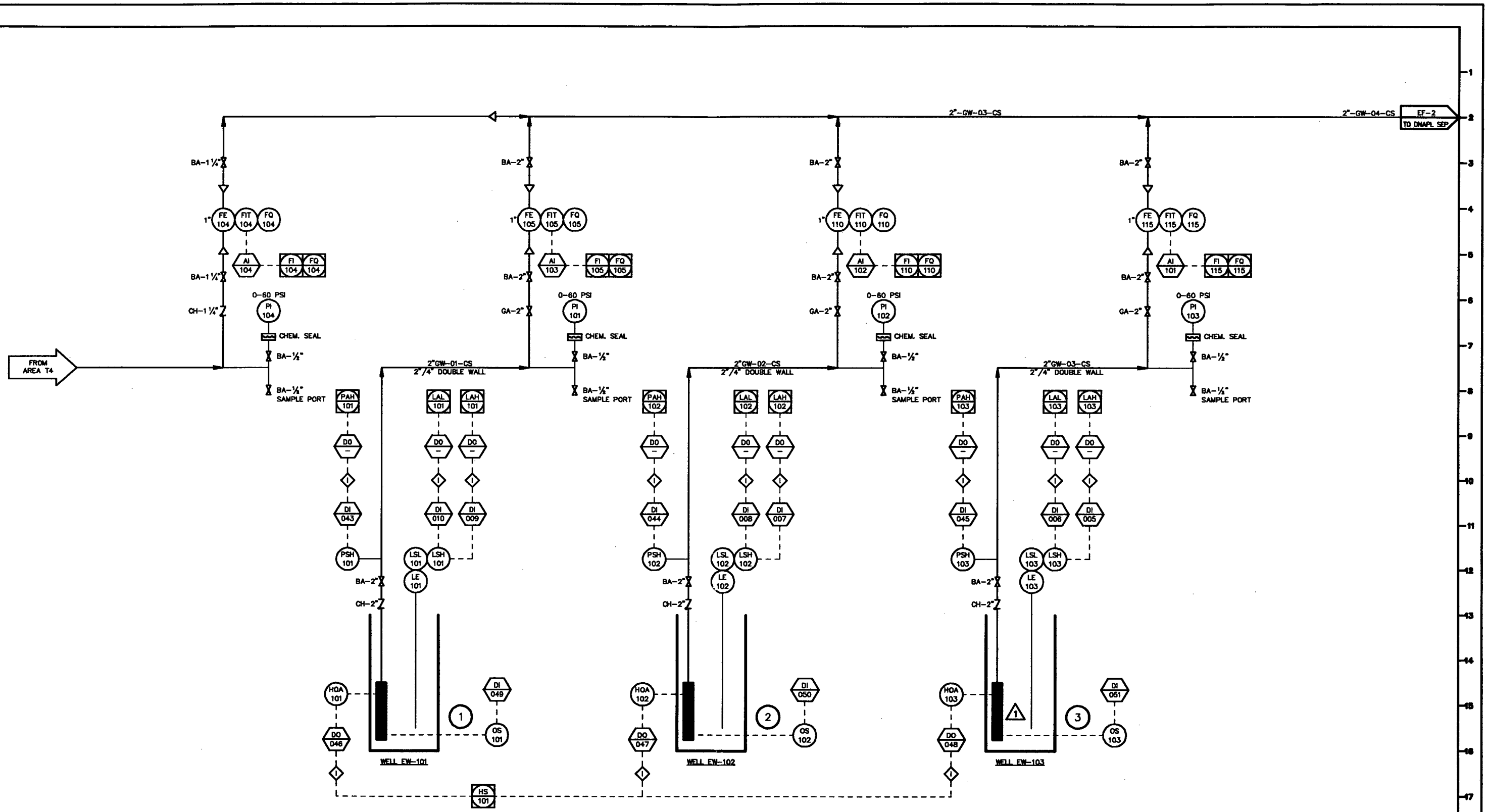
DRAWN BY: BAB | DATE: 05/17/97
DESIGNED BY: | DATE:
APPROVED: | DATE:

STAUFFER MANAGEMENT COMPANY
NIAGARA FALLS SITE, LEWISTON, N.Y.

DWG. 6488–EF–0 SHT.

ENGINEERING FLOW SHEET LEGEND

05/13/98



PLANT ID.	P-101 (1)	P-102 (2)	P-103 (3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
NAME	GROUNDWATER EXTRACTION WELL EW-101 PUMP	GROUNDWATER EXTRACTION WELL EW-102 PUMP	GROUNDWATER EXTRACTION WELL EW-103 PUMP											
MATERIAL														
SIZE														
CAPACITY	20 GPM @ 200' H	20 GPM @ 200' H	40 GPM @ 320' H											
TEMP/PRESS														
HP/V/RPH	1.5/460/ 3450	1.5/460/3450	5/460/3450											
WEIGHT														
MANUFACTURE	GRUNDFOS	GRUNDFOS	GRUNDFOS											
MODEL	16S15-14	16S15-14	40S50-15											
VENDOR														

NO.	DESCRIPTION	DATE	APPR. BY	MADE BY
3	AS BUILT	2/98		
2	AS BUILT	1/97		
1	REPLACED EW-3	7/96		

REVISIONS

FILE NAME: 06488-76(000)EF-NF001

TreaTek – CRA™ COMPANY

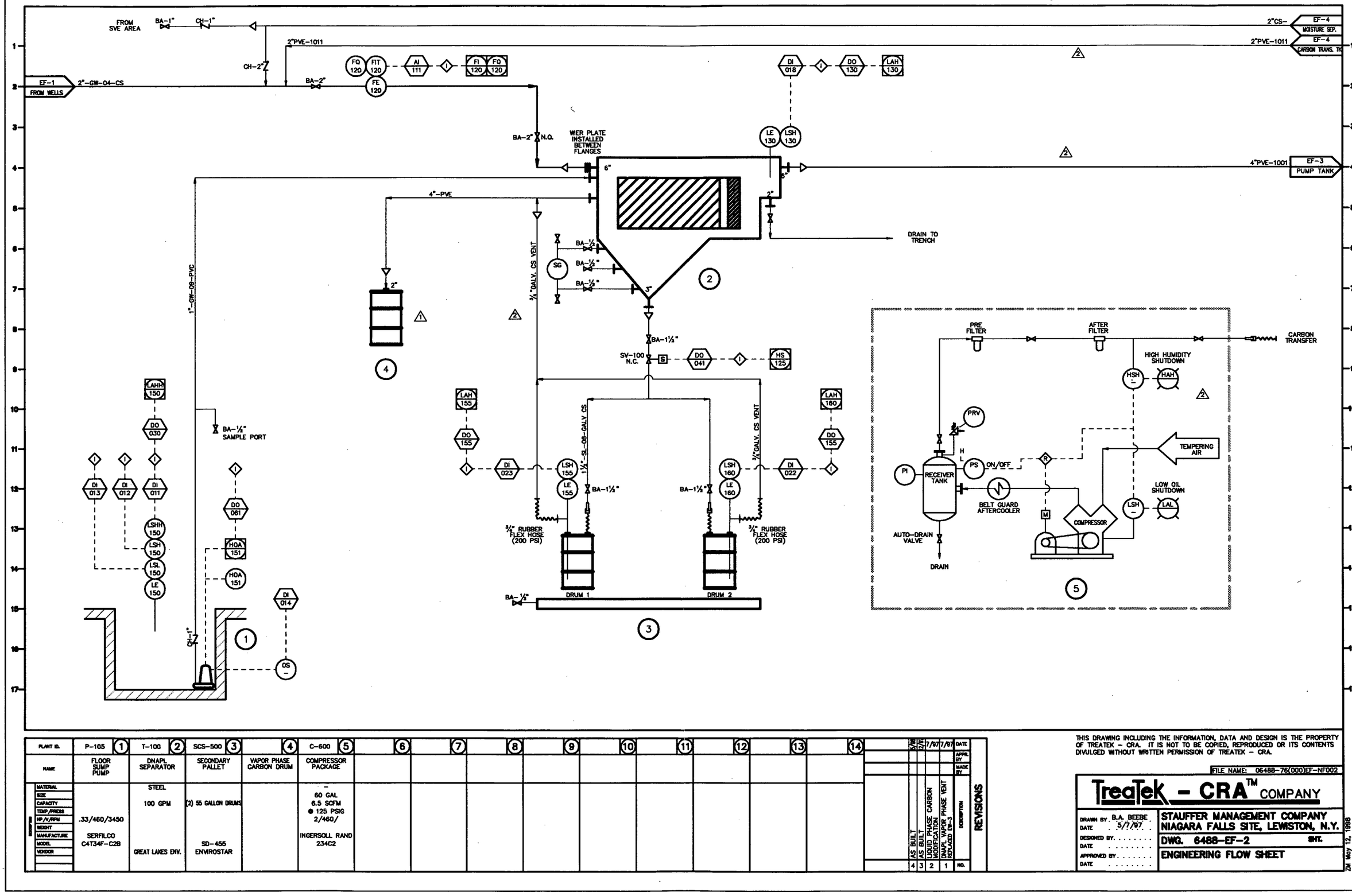
DRAWN BY B.A. BEEBE
DATE 5/7/97
DESIGNED BY
DATE
APPROVED BY
DATE

STAUFFER MANAGEMENT COMPANY
NIAGARA FALLS SITE, LEWISTON, N.Y.

DWG. 6488-EF-1 SHT.

ENGINEERING FLOW SHEET

ZM May 12, 1998



PLANT ID.	P-105 (1)	T-100 (2)	SCS-500 (3)	(4)	C-600 (5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
NAME	FLOOR SUMP PUMP	DNAPL SEPARATOR	SECONDARY PALLET	VAPOR PHASE CARBON DRUM	COMPRESSOR PACKAGE									
MATERIAL		STEEL			-									
SIZE					60 GAL									
CAPACITY		100 GPM	(2) 55 GALLON DRUMS		6.5 SCFM @ 125 PSIG									
TEMP./PRESS					2/460/									
HP/V/RPH	.33/460/3450													
WEIGHT														
MANUFACTURE	SERFILCO				INGERSOLL RAND									
MODEL	C4T34F-C2B		SD-455		234C2									
VENDOR		GREAT LAKES ENV.	ENVIROSTAR											

NO.	DESCRIPTION	MADE BY	APPR. BY	DATE
4	AS BUILT	ZJK		7/97
3	AS BUILT	ZJK		7/97
2	LIQUID PHASE CARBON MODIFICATION			
1	DNAPL VAPOR PHASE VENT REPLACED EF-3			

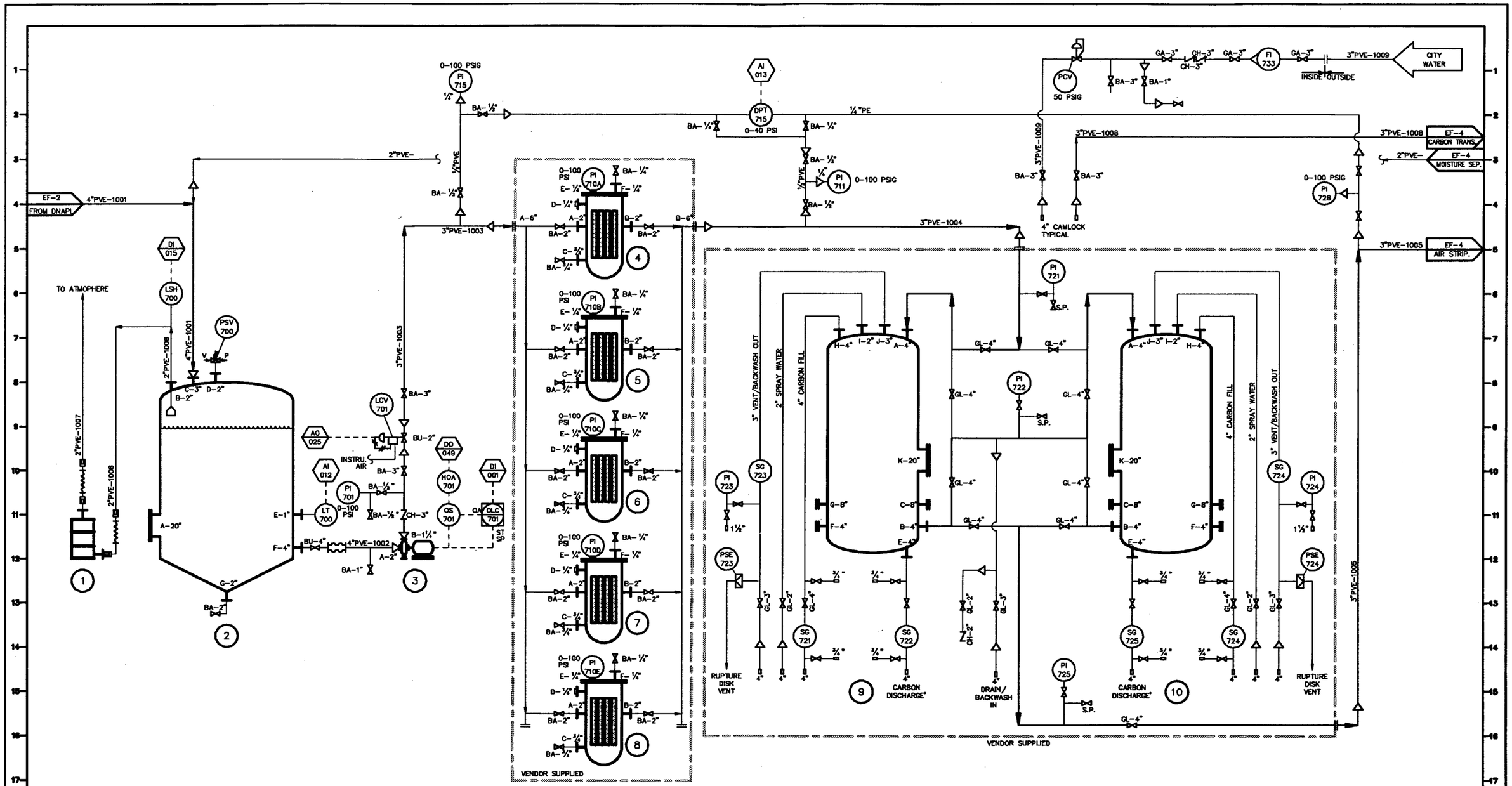
REVISIONS

FILE NAME: 06488-76(000)EF-NF002

TreaTek - CRA™ COMPANY

DRAWN BY. B.A. BEEBE	STAUFFER MANAGEMENT COMPANY
DATE 5/7/97	NIAGARA FALLS SITE, LEWISTON, N.Y.
DESIGNED BY.	DWG. 6488-EF-2 SHT.
DATE	ENGINEERING FLOW SHEET
APPROVED BY.	
DATE	

ZJK May 12, 1998



PLANT ID.	1	T-700 2	P-701 3	T-710A 4	T-710B 5	T-710C 6	T-710D 7	T-710E 8	T-720A 9	T-720B 10	11	12	13	14
NAME	VAPOR CARBON DRUM	CARBON PUMP TANK	CARBON FEED PUMP	BAG FILTER No. 1	BAG FILTER No. 2	BAG FILTER No. 3	BAG FILTER No. 4	BAG FILTER No. 5	LIQUID PHASE CARBON VESSEL No. 1	LIQUID PHASE CARBON VESSEL No. 2				
MATERIAL		SS316	304SS											
SIZE			1 1/4x2-6											
CAPACITY	55 GALLON	1000 GALLON	100 GPM @ 126'TDH											
TDMP/PRESS														
HP/V/RPM			7.5/460/3500											
WEIGHT														
MANUFACTURE			G&L											
MODEL			SST-C5											
VENDOR														
						10um 500 GPM			10' DIA. 20000 POUND 150'F/75 PSIG	10' DIA. 20000 POUND 150'F/75 PSIG				
									80000 POUND	80000 POUND				
									CALGON CARBON	CALGON CARBON				
						FILTRATION SYSTEMS								

DESCRIPTION

NO.	DESCRIPTION	DATE
3	AS BUILT	5/98
2	AS BUILT	2/98
1	LIQUID PHASE CARBON MODIFICATION	7/97

REVISIONS

DATE
APPR. BY
MADE BY

FILE NAME: 06488-76(000)EF-NF003

TreaTek – CRA™ COMPANY

DRAWN BY. B.A. BEEBE
DATE 5/7/97
DESIGNED BY.
DATE
APPROVED BY.
DATE

STAUFFER MANAGEMENT COMPANY
NIAGARA FALLS SITE, LEWISTON, N.Y.

DWG. 6488-EF-3 SHT.

ENGINEERING FLOW SHEET

ZM May 12, 1998

EF-2 TO DNAPL 2"CS-

EF-2 TO DNAPL 2"PVE-1011

EF-3 FROM CARBON 3"PVE-1008

EF-2 TO CARBON RINSE TANK 2"PVE-

EF-3 FROM CARBON 3"PVE-1005

BA-2" 2'-0" 2"CS 2"CS BA-2" BA-2" FROM SVE AREA

VACUUM BREAK AV VACUUM BREAK AV 3"PVE-1005 10"PVC-40

FROM ATMOSPHERE

TO ATMOSPHERE

DI 058 LAH 730 LSH 730 DI 059 LSHH 730 LSL 730 DI 060

D-18" E-3" A-3" F-3"

2"PVE-1011 BA-2" 6-60 GPM FI 733 DO 050 PI 732 BA-½" BA-½" BA-2" HS 731 HOA DI 016 CH-2" OS 731 OA OLC 731 ST SP

BA-2" C-2" B-3" BU-3" 3"PVE-1010 B-1" A-2" BA-1"

1 2

6'-0" CH-3" BA-½"

TI 190 PI 190 8"PVC BU-8" E-8" SG 120 BA-1" D-1"

A-3" B-10"

LAH 135 DI 048 LSH 135 LE 135 AAH 140 AAL 140 AI 140 AI 100 AE 140 AIT 140

BA-4" C-4" BA-½" SAMPLE PORT

5

PSL 185 PSH 185 PI 185 DO 056 HOA 190 HOA 190 DI 057 DI 055 OS 190 PI 195 TI 195 BU-8" BU-8" BU-8"

8

PAH 200 DI 047 PSH 200 8"PVE- SAMPLE PORT SG 181 BU-8" FE 205 FIT 205 LAH 182 DI 052 DI 053 LSH 182 LSL 182 LE 182 SAMPLE PORT

6

BA-2" CH-1½" 2" BA-2" DO 062 HS 181 HOA OS 181 DI 056 OLC 181

7

HOA 110 DO 051

3

½"PE Z

4

DRAIN TO TRENCH

12" GW-4"-07-PVC GRAVITY DRAIN EFFULENT DISCHARGE TO FOREBAY

PLANT ID.	T-730 (1)	P-731 (2)	P-110 (3)	T-115 (4)	T-120 (5)	T-181 (6)	P-181 (7)	B-120 (8)	(9)	(10)	(11)	(12)	(13)	(14)
NAME	CARBON TRANSFER SPENT WATER TANK	CARBON TRANSFER SPENT WATER PUMP	SEQUESTERING AGENT METERING PUMP	SEQUESTERING AGENT DRUM	AIR STRIPPER	MOISTURE SEPARATOR	CONDENSATE PUMP	AIR BLOWER						
MATERIAL	HDPE	304SS												
SIZE		1x2-8												
CAPACITY	5500 GALLON	35 GPM @ 61'TDH	14 GPD (MAX.)	55 GALLONS	100 GPD									
TEMP/PRESS														
HP/V/RPM		2/460/3500	VARIABLE				.5/115-230/	30/460/3500						
WEIGHT														
MANUFACTURE	IMG	GOULDS SST-C5	LMI	REMEDE PRODUCTS	SHALLOW TRAY		GOULDS G&L ICS ESBBROOK 5" IMP	AMERICAN FAN						
MODEL														
VENDOR														

NO.	DESCRIPTION	MADE BY	APPRD. BY	DATE
3	AS BUILT			5/98
2	AS BUILT			12/96
1	LIQUID PHASE CARBON MODIFICATION			7/97

REVISIONS

FILE NAME: 06488-76(000)EF-NF004

TreaTek - CRA™ COMPANY

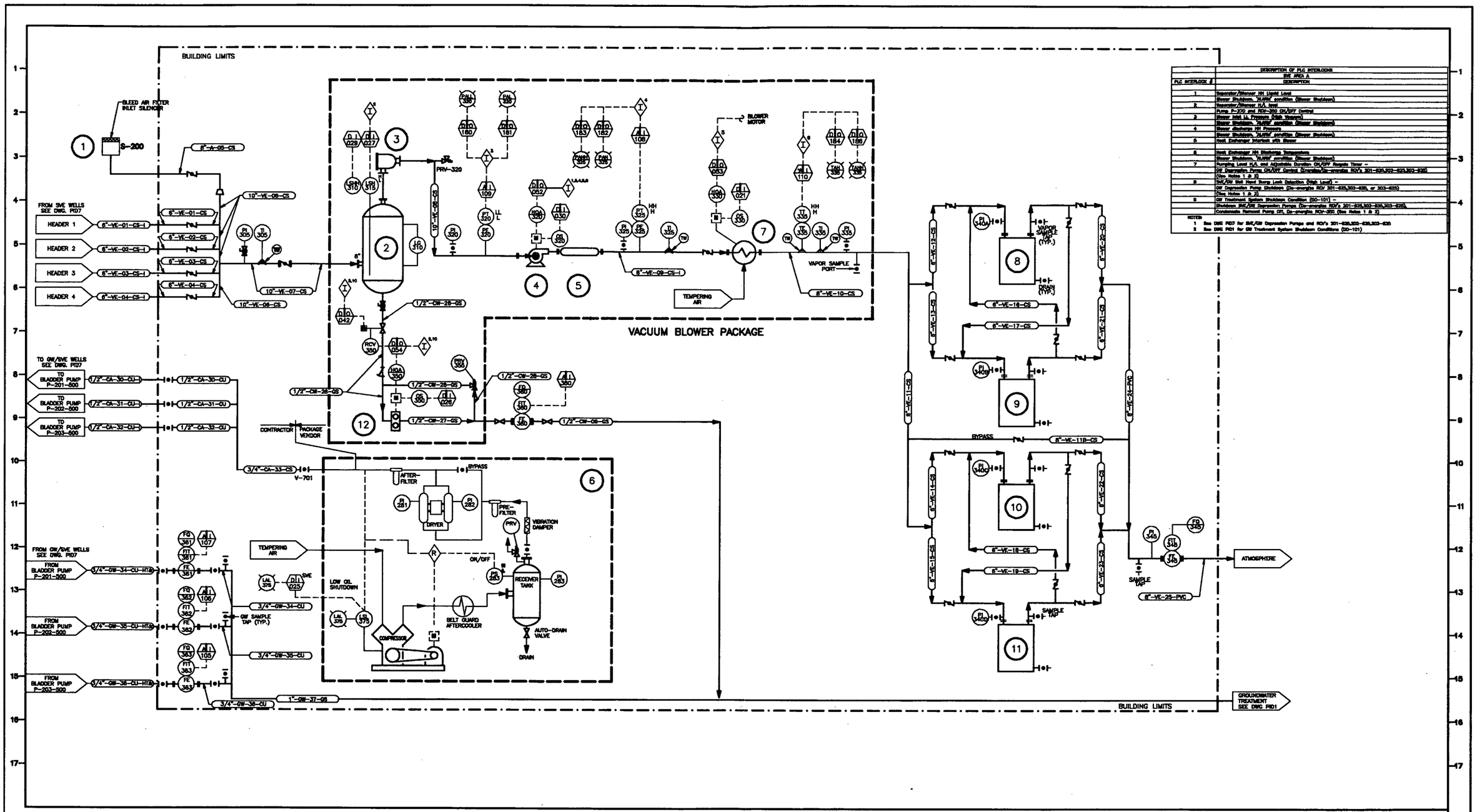
DRAWN BY B.A. BEEBE
DATE 5/7/97
DESIGNED BY
DATE
APPROVED BY
DATE

STAUFFER MANAGEMENT COMPANY
NIAGARA FALLS SITE, LEWISTON, N.Y.

DWG. 6488-EF-4 SHT.

ENGINEERING FLOW SHEET

ZM May 12, 1998



DESCRIPTION OF PLC INTERLOCKS SVE AREA A	
PLC INTERLOCK #	DESCRIPTION
1	Separator/Blower HH Liquid Level (Blower Shutdown, "ALARM" condition (Blower Shutdown))
2	Separator/Blower H/A level
	Pump P-270 and RCV-350 ON/OFF Control
3	Blower Inlet LL Pressure (High Vacuum) (Blower Shutdown, "ALARM" condition (Blower Shutdown))
4	Blower discharge HH Pressure (Blower Shutdown, "ALARM" condition (Blower Shutdown))
5	Heat Exchanger interlock with Blower
6	Heat Exchanger HH Discharge Temperature (Blower Shutdown, "ALARM" condition (Blower Shutdown))
7	Pumping Level H/A and Adjustable Duration ON/OFF Recycle Timer – GW Depression Pumps ON/OFF Control (Overrides/De-energize RCV's 201-635,302-635,303-635) (See Notes 1 & 2)
8	SVE/GW Well Head Sump Leak Detection (High Level) – GW Depression Pump Shutdown (De-energize RCV 301-635,302-635, or 303-635) (See Notes 1 & 2)
9	GW Treatment System Shutdown Condition (DO-101) – Shutdown SVE/GW Depression Pumps (De-energize RCV's 201-635,302-635,303-635), Condensate Removal Pump (P, De-energize RCV-350) (See Notes 1 & 2)

NOTES:
1. See DWG PID7 for SVE/GW Depression Pumps and RCV's 301-635,302-635,303-635
2. See DWG PID1 for GW Treatment System Shutdown Conditions (DO-101)

PLANT ID.	S-200 (1)	T-210 (2)	F-220 (3)	B-230 (4)	S-240 (5)	CP-280 (6)	H-250 (7)	CA-260A (8)	CA-260B (9)	CA-260C (10)	CA-260D (11)	P-270 (12)	(13)	(14)
NAME	BLEED AIR INLET SILENCER	SEPARATOR TANK	IN-LINE FILTER	VACUUM BLOWER	DISCHARGE SILENCER	AIR COMPRESSOR PACKAGE	HEAT EXCHANGER	CARBON ADSORPTION UNIT	CARBON ADSORPTION UNIT	CARBON ADSORPTION UNIT	CARBON ADSORPTION UNIT	CONDENSATE REMOVAL PUMP		
DESCRIPTION: MATERIAL	STEEL	S.S.	10u	CAST IRON	CARBON STEEL	CAST IRON	–	S.S.	S.S.	S.S.	S.S.			
SIZE	6" NPTM	22"DIA. x 60"H	2,900 CFM	–	8" 125# FLANGE	80 GAL. HORIZ.	–	5'DIA. x 7'3"H	5'DIA. x 7'3"H	5'DIA. x 7'3"H	5'DIA. x 7'3"H			
CAPACITY	10u POLYESTER	40 GAL.		1,280 SCFM	1,920 CFM	17 SCFM	1,000 CFM	1,000 CFM	1,000 CFM	1,000 CFM	1,000 CFM			
TEMP/PRESS		20"HG/15PSI		1.5 PSIG (DISCH.)		@ 125 PSIG	–							
HP/V/RPM				7.5/460/1760		5/460/1725	.5/230-460/							
WEIGHT								1800# CARBON	1800# CARBON	1800# CARBON	1800# CARBON			
MANUFACTURE		UNIVERSAL SILENCER				INGERSOLL	XCHANGER	BARNEBY & SUTCLIFFE	BARNEBY & SUTCLIFFE	BARNEBY & SUTCLIFFE	BARNEBY & SUTCLIFFE	WILDEN		
MODEL		VI-8	385TTE			2420D5	AA-1000	V1800	V1800	V1800	V1800	M-1		
VENDOR			US ELECTRIC				ELECTROLAB					GLAUBER		

REVISIONS				
NO.	DESCRIPTION	MADE BY	APPR. BY	DATE
1	AS BUILT	S/M		

PROJECT NUMBER: 6488-76 | FILE NAME: 06488-76(000)EF-NF005

TreaTek – CRA™ COMPANY

DRAWN BY .....
DATE 04/24/97
DESIGNED BY .....
DATE .....
APPROVED .....
DATE .....

STAUFFER MANAGEMENT COMPANY
NIAGARA FALLS SITE, LEWISTON, N.Y.
DWG. 6488-EF-5 SHT.
ENGINEERING FLOW SHEET
VACUUM BLOWER & COMPR. SYSTEMS

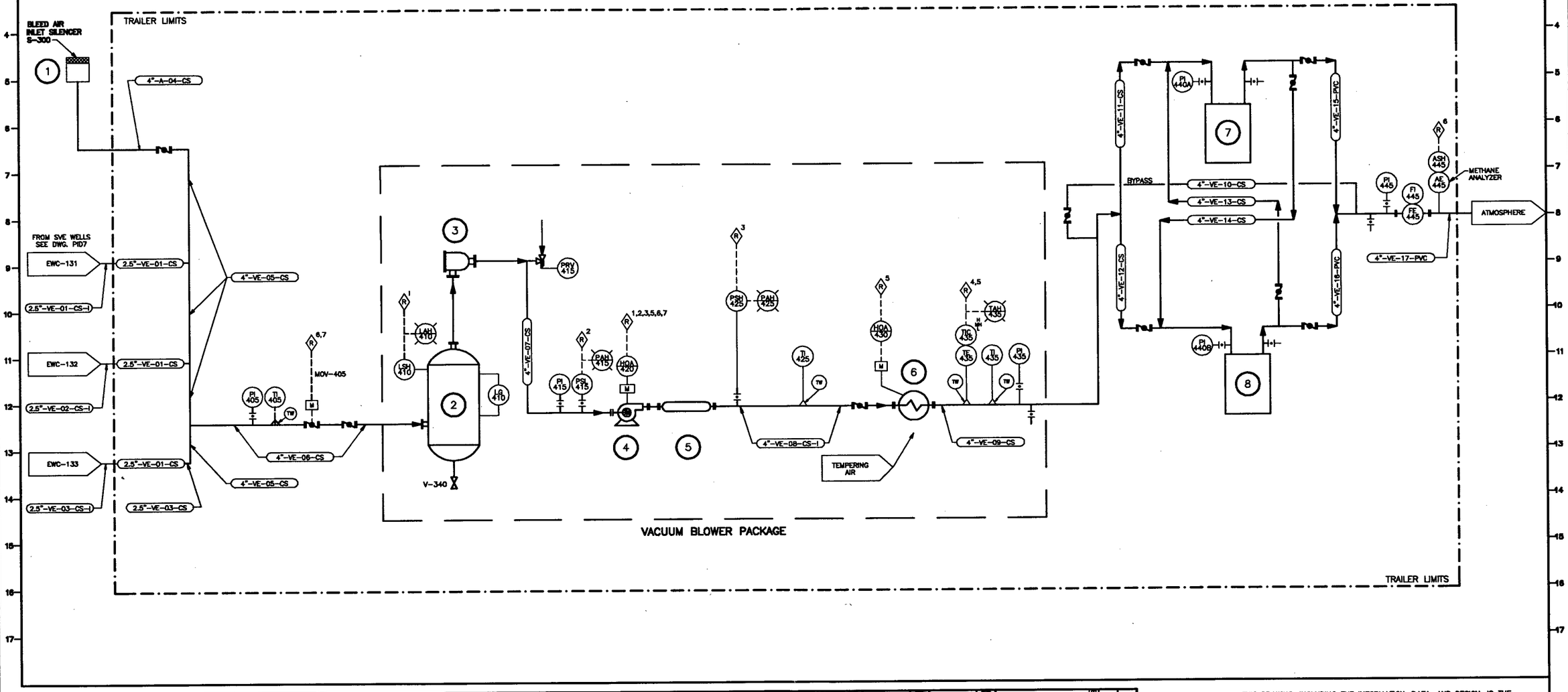
05/12/98

NOTES:

ALARM SYSTEM IN THIS AREA SHALL BE TRANSMITTED TO SVE PLC LOCATED IN SVE/GROUNDWATER TREATMENT BUILDING CONTROL ROOM.

	DESCRIPTION OF RELAY INTERLOCKS
	SVE AREA C.
RELAY INTERLOCK #	DESCRIPTION
1	Separator/Silencer High Liquid Level Blower Shutdown
2	Blower Inlet Low Pressure (High Vac.) Blower Shutdown
3	Blower Discharge High Pressure Blower Shutdown
4	Heat Exchanger ON/OFF Temperature Control (MEDIUM HIGH/LOW)
5	Heat Exchanger Discharge High Temperature Blower Shutdown.
6	High Methane Concentration – Shutdown Blower and Close MOV-405
7*	High Extracted Soil Gas Temperature – Shutdown Blower and Close MOV-405

NOTE:
* See DWG PID7 for Extracted Soil Gas Temperature Switches



PLANT ID.	S-300 (1)	T-310 (2)	F-320 (3)	B-330 (4)	S-340 (5)	H-350 (6)	CA-360A (7)	CA-360B (8)	(9)	(10)	(11)	(12)	(13)	(14)
NAME	BLEED AIR INLET SILENCER	SEPARATOR TANK	IN-LINE FILTER	VACUUM BLOWER	DISCHARGE SILENCER	HEAT EXCHANGER	CARBON ADSORPTION UNIT	CARBON ADSORPTION UNIT						
DESCRIPTION: MATERIAL	STEEL	S.S.		CAST IRON	CARBON STEEL	–	CARBON STEEL	CARBON STEEL						
DESCRIPTION: SIZE	10u	14"DIA. x 41.5"H	10u	–	4" 125# FLANGE	–	4'10"DIA.x4'10"H	4'10"DIA.x4'10"H						
DESCRIPTION: CAPACITY		11 GAL.	520 CFM	270 SCFM	480 CFM	1,100 CFM	400 CFM	400 CFM						
DESCRIPTION: TEMP/PRESS		20"HG/15PSI		1.5 PSIG (DISCH.)		–								
DESCRIPTION: HP/V/RPM				10/460/		.16/115/								
DESCRIPTION: WEIGHT						–								
DESCRIPTION: MANUFACTURE		UNIVERSAL SILENCER												
DESCRIPTION: MODEL		VI-4												
DESCRIPTION: VENDOR														

AS BUILT	NO.	DESCRIPTION	MADE BY	APPR. BY	DATE
	1				

REVISIONS

PROJECT NUMBER: 6488-76 | FILE NAME: 06488-76(000)EF-NF006

TreaTek – CRA™ COMPANY

DRAWN BY .....
DATE 04/24/97
DESIGNED BY .....
DATE .....
APPROVED .....
DATE .....

STAUFFER MANAGEMENT COMPANY
NIAGARA FALLS SITE, LEWISTON, N.Y.

DWG. 6488-EF-6 SHT.

ENGINEERING FLOW SHEET
VACUUM BLOWER

05/13/98

SVE EQUIP. TRAILER LIMITS

BLEED AIR INLET SILENCER

1 S-400

3"-A-04-CS

FROM SVE WELLS SEE DWG. PID7

EWT-181 2"-VE-01-CS-I 2"-VE-01-CS

DPT-261 2"-VE-02-CS-I 2"-VE-02-CS

EWT-182 2"-VE-03-CS-I 2"-VE-03-CS

3"-VE-05-CS

PI 505 TI 505 TW

3"-VE-06-CS

2 LSH 510 LAH 510 LG 510

3"-VE-07-CS

PRV-515 PI 515 PAL 515

3 R1

R2 PAL 515 HOA 520 M

R1,2,3,4,5

4 5

R3 PAH 525 PSH 525 PI 525 TI 525 TW

3"-VE-08-CS-I

TEMPERING AIR

R4 HOA 530 M

BLOWER MOTOR

6

R5 TAH 535 TSH 535 TI 535 TW PI 535 TW

VAPOR SAMPLE TAP

3"-VE-09-CS

FLOW

NOTE:

PIPING MATERIALS GALV. CARBON STL. MIXED WITH VICTAULIC COUPLINGS/SCREWED MAKE UP PIECES.

VACUUM BLOWER PACKAGE

	DESCRIPTION OF RELAY INTERLOCKS
	SVE AREA T-4
RELAY INTERLOCK #	DESCRIPTION
1	Separator/Silencer High Liquid Level Blower Shutdown
2	Blower Inlet Low Pressure (High Vac.) Blower Shutdown
3	Blower Discharge High Pressure Blower Shutdown
4	Heat Exchanger Interlock with Blower
5	Heat Exchanger Discharge High Temperature Blower Shutdown
6	Well Head Sump Leak Detection GW Pump Shutdown (De-energize RCV-701)
7	GW Treatment System Shutdown Condition (DO-101) - Shutdown SVE/GW
	Depression Pump (De-energize RCV-550) - (See Notes 1 & 2)

NOTES:
1 See DWG PID7 for SVE/GW Depression Pump
2 See DWG PID1 for GW Treatment System Shutdown Conditions (DO-101)

NOTES:

ALARM SYSTEM IN THIS AREA SHALL BE TRANSMITTED TO SVE PLC LOCATED IN SVE/GROUNDWATER TREATMENT BUILDING.

DPT-261 GW DEPRESSION PUMP P-261-510 3/8"-CA-25-CU-I

DPT-261 GW DEPRESSION PUMP P-261-510

3/8"-CA-25-CU

DO 063 R6,7 N.C. SV-550

3/4" / 1 1/2" - GW-28-SU/PVC-HTR

7 PI 471 PI 472 DRYER PRV VIBRATION DAMPER

TEMPERING AIR

ON/OFF PS 473 RECEIVER TANK PI 473

LOW OIL SHUTDOWN LAL LSL 470 BELT GUARD AFTERCOOLER

COMPRESSOR M AUTO-DRAIN VALVE DRAIN

COMPRESSOR PACKAGE CP-470

ABOVE GROUND SECONDARY CONTAINMENT

UNDERGROUND SECONDARY CONTAINMENT

1 1/4" / 3"-GW-27-CS/PVC

GROUNDWATER TREATMENT SEE DWG. EF-

3" FLOW

#7 NC #8 #9 SAMPLE PORT #12 #13 NC #11 #14

#1 #3 NC #5 #4 #6 #2 SAMPLE PORT

PI 545 PI 545 FE 545 ATMOSPHERE

PI 540A PI 540B PI 540C PI 540D PI 540E

1 1/2" FLEX HOSE (TYP.)

8 9 10 11

SVE EQUIP. TRAILER LIMITS

PLANT ID.	S-400 (1)	T-410 (2)	F-420 (3)	B-430 (4)	S-440 (5)	H-450 (6)	CP-470 (7)	CA-460A (8)	CA-460B (9)	CA-460C (10)	CA-460D (11)	(12)	(13)	(14)
NAME	BLEED AIR INLET SILENCER	SEPARATOR TANK	IN-LINE FILTER	VACUUM BLOWER	DISCHARGE SILENCER	HEAT EXCHANGER	COMPRESSOR PACKAGE	CARBON ADSORPTION UNIT	CARBON ADSORPTION UNIT	CARBON ADSORPTION UNIT	CARBON ADSORPTION UNIT			
DESCRIPTION: MATERIAL	STEEL	S.S.		CAST IRON	CARBON STEEL	–	–	16GA STEEL	16GA STEEL	16GA STEEL	16GA STEEL			
SIZE	3" NPTM	14"DIA.x41.5"H	10u	–	2-1/2" 125# FL	–	60 GAL	55 GAL DRUM	55 GAL DRUM	55 GAL DRUM	55 GAL DRUM			
CAPACITY	10u	11 GAL. MIN.	300 CFM	75 SCFM	190 CFM	1,100 CFM	6.5 SCFM	100 CFM	100 CFM	100 CFM	100 CFM			
TEMP./PRESS		20"HG/15PSI		1 PSIG (DISCH.)		–	● 125 PSIG							
HP/V/RPM				7.5/460/		.16/115/	2/460/1725							
WEIGHT														
MANUFACTURE							INGERSOLL RAND							
MODEL		UNIVERSAL SILENCER VI-4					234C2	PROTECT 1	PROTECT 1	PROTECT 1	PROTECT 1			
VENDOR								BARNEBY & SUTCLIFFE	BARNEBY & SUTCLIFFE	BARNEBY & SUTCLIFFE	BARNEBY & SUTCLIFFE			

AS BUILT	NO.	DESCRIPTION	MADE BY	APPR. BY	DATE
	1	REVISIONS			

PROJECT NUMBER: 6488-76 FILE NAME: 06488-76(000)EF-NF007

TreaTek - CRA™ COMPANY

DRAWN BY ..... DATE 04/24/97

DESIGNED BY ..... DATE .....

APPROVED ..... DATE .....

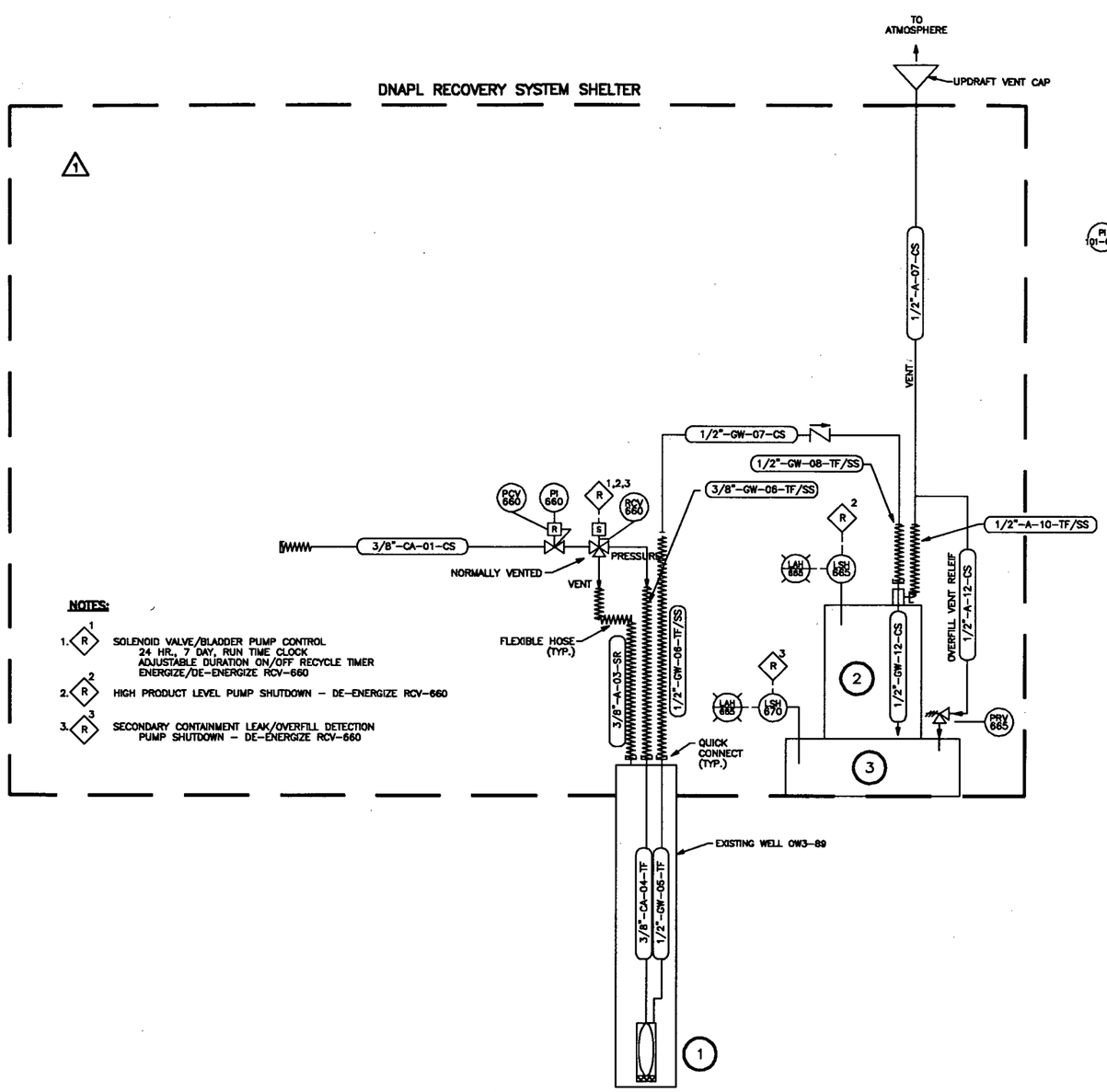
STAUFFER MANAGEMENT COMPANY
NIAGARA FALLS SITE, LEWISTON, N.Y.

DWG. 6488-EF-7 SHT.

ENGINEERING FLOW SHEET
VACUUM BLOWER & COMPR. SYSTEMS

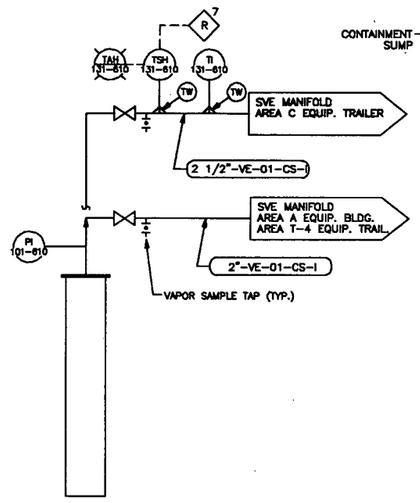
06/12/98

DNAPL RECOVERY SYSTEM SHELTER



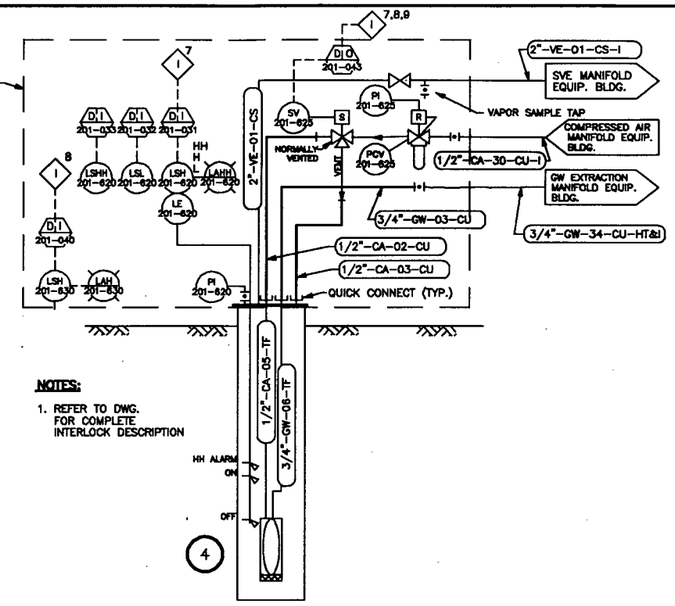
NOTES:

1. R 1 — SOLENOID VALVE/BLADDER PUMP CONTROL 24 HR., 7 DAY, RUN TIME CLOCK ADJUSTABLE DURATION ON/OFF RECYCLE TIMER ENERGIZE/DE-ENERGIZE RCV-660
2. R 2 — HIGH PRODUCT LEVEL PUMP SHUTDOWN – DE-ENERGIZE RCV-660
3. R 3 — SECONDARY CONTAINMENT LEAK/OVERFILL DETECTION PUMP SHUTDOWN – DE-ENERGIZE RCV-660



SVE EXTRACTION WELL-EWA-101

TYPICAL OF EXTRACTION WELLS EWA-102 THROUGH EWA-132, EWT-161, EWT-162, EWC-131 THROUGH EWC-133



NOTES:

1. REFER TO DWG. FOR COMPLETE INTERLOCK DESCRIPTION

AREA A SVE/GW EXTRACTION WELL-DPA 201
TYPICAL OF EXTRACTION WELLS DPA 202 AND 203

NOTES:

1. REFER TO DWG. FOR COMPLETE INTERLOCK DESCRIPTION

AREA T-4 SVE/GW EXTRACTION WELL - DPT 261

PLANT ID.	P-610 (1)	T-620 (2)	C-630 (3)	P-201-500 (4)	P-261-510 (5)	6	7	8	9	10	11	12	13	14
NAME	PRODUCT RECOVERY PUMP	PRODUCT RECOVERY DRUM	CONTAINMENT PALLET	GROUNDWATER DEPRESSION PUMP	GROUNDWATER DEPRESSION PUMP									
DESCRIPTION: MATERIAL	SS	CARBON STEEL	CARBON STEEL	SS	SS									
SIZE	1.75"O.D.x23.63"L	55 GAL	55 GAL	3.0"O.D. x 40"L	3.5"O.D. x 52"L									
CAPACITY				–	6 GPM									
TEMP./PRESS				–	● 60' TDH									
HP/V/RPM														
WEIGHT														
MANUFACTURE														
MODEL														
VENDOR														

NO.	DATE	APPR. BY	MADE BY	DESCRIPTION
1				AS BUILT 5/96
2				LIQUID PHASE CARBON MODIFICATION 97/01

REVISIONS

PROJECT NUMBER: 6488-76 | FILE NAME: 06488-76(000)EF-NF008

TreaTek - CRA™ COMPANY

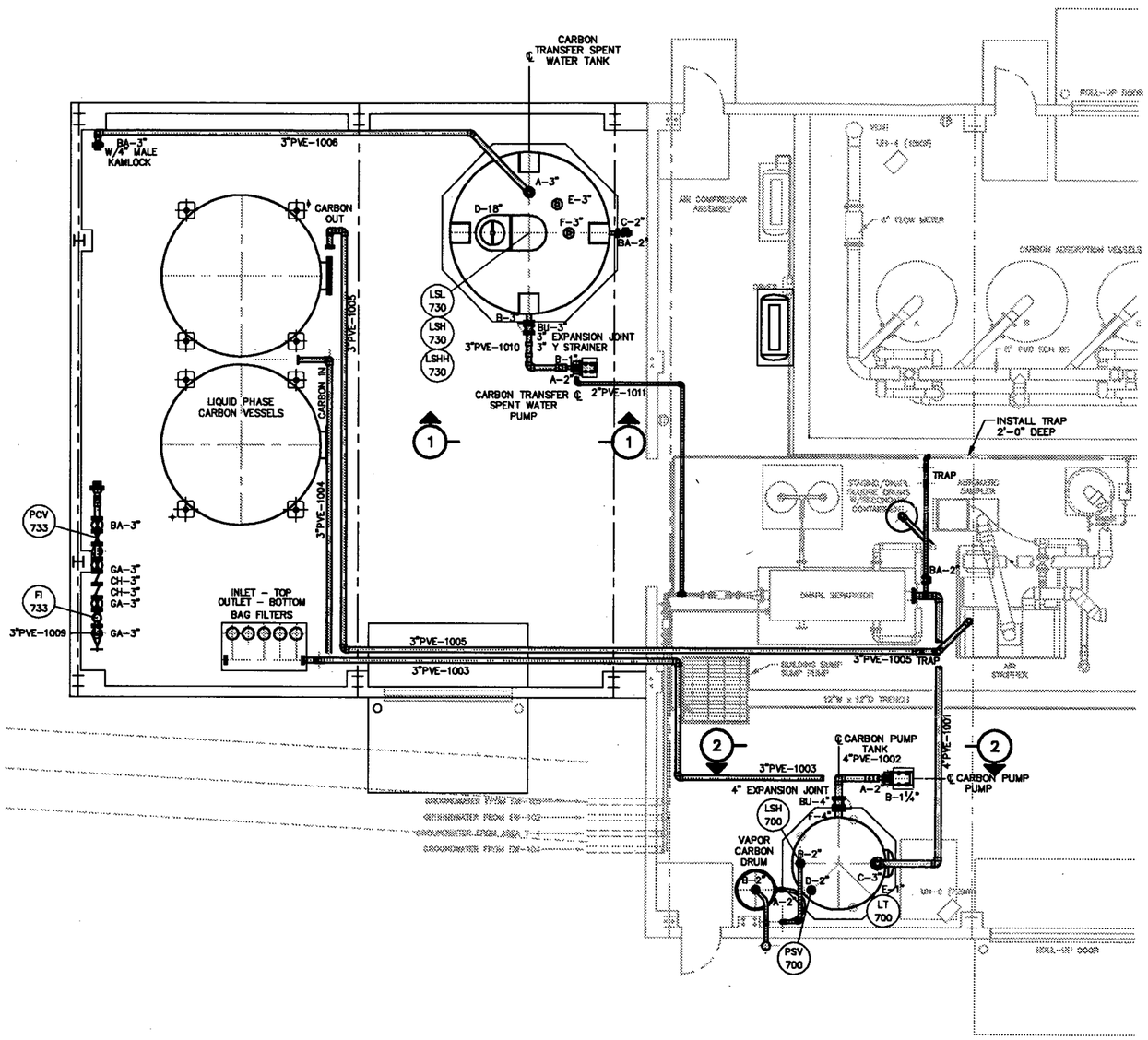
DRAWN BY ..... DATE 04/24/97
DESIGNED BY ..... DATE .....
APPROVED ..... DATE .....

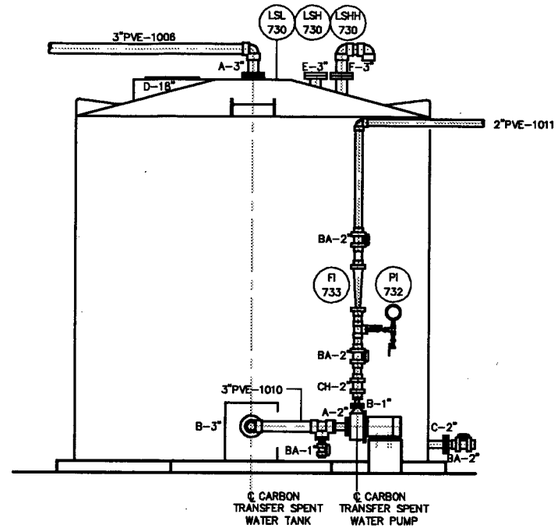
STAUFFER MANAGEMENT COMPANY
NIAGARA FALLS SITE, LEWISTON, N.Y.

DWG. 6488-EF-8 SHT.

ENGINEERING FLOW SHEET
DNAPL RECOVERY SYSTEM

05/12/98





SECTION 1

SCALE: ½" = 1'-0"

SECTION 2

SCALE: ½" = 1'-0"

NO.	REVISIONS	DRAWN	CHKD.	APP.	DATE
1	AS BUILT				12/97

SCALE : 1/4" = 1'-0"

PROJECT NUMBER: 6488-76 FILE NAME: 06488-76(000)MP-NF001

TreaTek – CRA™ COMPANY

DRAWN BY B.A. BEEBE
DATE 05/09/97
DESIGNED BY B.A. BEEBE
DATE
APPROVED
DATE

STAUFFER MANAGEMENT COMPANY
NIAGARA FALLS SITE, LE TON, N.Y.

DWG. MP-1 SHT.

TREATMENT BUILDING EQUIPMENT LAYOUT

05/12/98

APPENDIX E

VENDOR INFORMATION/MANUALS

(FULL APPENDIX IS LOCATED AT SITE)

PROCEDURE FOR BAG FILTER CHANGE

Bag filters should be replaced when the differential pressure across the bag filter system is over 10 pounds per square inch (psi) under normal flow rates.

These procedures can be done one filter housing at a time (as written) or for groups of two or three filter housings at once to save time.

1. Close the influent and effluent valves at an individual filter housing.
2. Connect a garden hose from the bag filter drain header to the collection sump. Open the drain header valve.
3. At the filter housing, open the bottom drain valve and the top vent valve.
4. Open the top lid of the filter housing and remove the bag filter. Pour any excess water into a bucket.
5. Lay the wet filter bag over the extraction well piping to dry before placing in a drum.
6. Install a new bag filter. The bag should be pushed to the bottom of the filter basket, with the bag's top ring snug with the top of the basket.
7. Pour any water from the bucket into the open bag filter housing. Close the top lid of the filter housing.
8. Close the bottom drain valve and the top vent valve at the filter housing.
9. Slowly open the influent (top) valve then the effluent (bottom) valve at the filter housing.
10. Repeat the above steps for the remaining filter bags.
11. Close the drain header valve and disconnect the garden hose.

PROCEDURE FOR CARBON TRANSFER

Transfer Spent Carbon to the Trailer

Turn System Off (Optional)

Carbon transfer can be performed with the system initially off or with the system running in single stage carbon flow. For later steps, when the recycle tank needs to be pumped out, the system will have to be on.

1. Close ball valve at air compressor.

2. Turn off the extraction well pumps at the computer.

3. Turn off the carbon tank pump at the main control panel switch.

4. Wait for 5 minutes. Turn off the air stripper blower and the Area A blower at the main control panel switch and pump panel disconnect.

Transfer Spent Carbon

5. Close all valves on the adsorber with spent carbon.

6. Connect a 4" flexible hose (provided by Calgon) from the adsorber carbon discharge line to the trailer carbon fill line.

7. Connect a 3" or 4" flexible hose from the trailer carbon discharge/drain line to the recycle tank influent line.

8. Open the trailer vent line valve. Note: If gravity draining the trailer is not feasible, leave the vent valve closed to move water to the recycle tank under pressure.

9. Open the spent carbon septa valves (T-8, T-9, and T-10 on the standard trailer) on the line off the trailer's lower hopper sidewall, and the recycle tank 3" PVC valve to allow draining off excess transfer water (and trailer venting for non-gravity flow).

10. Open the trailer carbon fill line valve.

11. Use a garden hose with ¾" Kamlock fitting to fill the transfer line with potable water. Connect the hose to the adsorber carbon discharge line's flush-out connection farthest from the adsorber. This aids in initial carbon transfer.

12. Open the garden hose valves at the potable line and carbon discharge line to fill the 4" carbon transfer hose with water. This should only take a few minutes.

13. Close the applicable garden hose valves, but leave the garden hose connected for future use.

14. Connect the compressed air line to the adsorber carbon fill line's ¾" flush-out connection above the 4" globe valve.

15. Open the air line valves slowly and pressurize the adsorber to 25 to 30 psig.

16. Open the adsorber carbon discharge valve and begin transferring the spent carbon to the trailer. This should take 20 to 30 minutes.

Heel Removal

To remove the final amount of carbon (the "heel") from the adsorber, add potable water through the 3" drain line and then the 2" spray water line.

17. Connect a 3" or 4" flexible hose from the potable line to the adsorber drain line and position the adsorber valves to direct water to the influent port. Disconnect the flexible hose from the drain line and connect it to the spray water line and open the necessary valves.

18. Observe the sight glass on the adsorber discharge line for when all the spent carbon has been removed. Heel removal should take about 5 minutes.

19. Close the valves on the potable line and adsorber spray line. Disconnect the flexible hose.

End Spent Carbon Transfer

20. Close the air line valves and disconnect the air line hose.

21. Open the adsorber vent line valve.

22. Close the adsorber carbon discharge valve.

23. Open the garden hose valves at the potable line and the adsorber carbon discharge line's flush-out connection to flush carbon traces out of the transfer hose.

24. Close the applicable garden hose valves and disconnect the garden hose.

25. Close the trailer carbon fill line valve and bleed and disconnect the 4" carbon transfer hose.

Drain Water from the Trailer

26. Close all valves on the trailer.

27. Connect the air line hose to the trailer carbon fill line's ¾" connection.

28. Open the air line valves slowly and pressurize the trailer to 15 psig. Pressurizing the trailer quickens the draining process.

29. The flexible hose should already be connected from the trailer carbon discharge/drain line to the recycle tank influent line. If not, do so now.

30. Open the spent carbon septa valves to drain water from the spent carbon slurry in the trailer. The 3" PVC recycle tank valve should already be open.

31. When the spent carbon is done draining, close the air line valves and disconnect the air line hose. Close the 3" PVC recycle tank valve to prevent backflow into the trailer.

32. Slowly open the trailer vent line valve to ventilate the trailer.

33. When venting is complete, close all valves on the trailer.

34. Bleed and disconnect the flexible spent carbon drain hose.

35. The recycle tank should now be about half-full of water. Draining of the tank should start before the adsorber is filled with fresh carbon. Since the water from the spent carbon transfer should have few fines, it can be sent directly through the system (single carbon stage flow). To drain the recycle tank, refer to the steps at the end of this procedure.

The trailer is now full of drained, spent carbon.

Transfer Fresh Carbon from the Trailer to the Adsorber

Fill the Trailer with Water

To save time, the trailer can be filled with water while the recycle tank is draining and the system is running.

36. Connect a 4" flexible hose from the potable line to the trailer to create a slurry. The flexible hose can be connected to either the trailer carbon fill line (for downflow filling) or the trailer carbon discharge/drain line (for upflow filling).

37. Open one top manway and the trailer vent line valve to ventilate the trailer during filling.

38. Open the trailer water line valve(s) [valve T-2 for downflow, or the fresh carbon septa valves (T-8, T-9, and T-10 on the standard trailer) for upflow].

39. Open the potable water line valves and fill the trailer. About 5,000 gallons of water are required if the carbon is delivered dry. About 4,000 gallons of water are required if the carbon is wetted prior to delivery. Determine the amount of water needed by observing the water level through the trailer manway or observing the potable water meter.

40. Close the potable water line valves in the building and at the trailer.

41. Close the trailer vent line valve and manway.

42. Bleed and disconnect the 4" flexible hose end at the potable line. Disconnect the other end of the 4" hose from the trailer carbon fill line (only applicable if the trailer was filled downflow).

Transfer Carbon to the Adsorber

Before the fresh carbon transfer can start, the recycle tank should have at least 2,000 gallons of available capacity.

43. Close all valves on the empty adsorber.

44. Open the adsorber vent line valve (V-10 or V-11).

45. Connect a 3" or 4" flexible hose from the potable line to the adsorber carbon discharge line.

46. Open the potable line valves and the adsorber carbon discharge line valve to fill the adsorber with a water cushion of about 2,000 gallons. Observe the potable water meter to determine when to stop adding water.

47. Close the potable line valves and the adsorber carbon discharge line valve. Bleed and disconnect the flexible hose.

48. Connect a 4" flexible hose from the trailer carbon discharge/drain line to the adsorber carbon fill line.

49. Use a garden hose with ¾" Kamlock fitting to fill the 4" transfer hose with potable water. Connect the garden hose to the adsorber carbon fill line's flush-out connection below the 4" valve. This aids in initial carbon transfer.

50. Open the garden hose valves at the potable line and carbon fill line to fill the carbon transfer hose with water. This should only take a few minutes.

51. Close the applicable garden hose valves and disconnect the hose.

52. Connect the compressed air line to the trailer carbon fill line's ¾" connection.

53. Open the air line valves slowly and pressurize the trailer to 15 psig.

54. Open the adsorber carbon fill line valve.

55. The Calgon Carbon driver will open the trailer carbon discharge valves to start transferring the fresh carbon to the adsorber.

56. Soon after the carbon transfer begins, connect a 3" or 4" flexible hose from the adsorber vent line to the recycle tank influent line to dispose of excess transfer water.

57. Open the 3" PVC recycle tank valve (vent line valve should already be open).

End Fresh Carbon Transfer

58. When the fresh carbon transfer is finished, close the compressed air line valves and allow the trailer to ventilate through the adsorber vent line.

59. Close the adsorber vent line valve and the recycle tank valve.

60. Open the trailer vent line valve for additional venting.

61. When venting is complete, close all valves at the trailer. Close the adsorber fill line valve.

62. Bleed and disconnect the flexible hoses. Disconnect the compressed air line.

Wetting and Backwashing the Fresh Carbon

63. The recycle tank should now be filled with water and some fines from the fresh carbon transfer. Allow the fines in the recycle tank to settle and follow the steps below to drain the recycle tank.

64. If the carbon was delivered dry, allow the carbon to stand in water for 24 hours to wet the carbon. If the carbon was delivered wet, this step may be reduced or omitted. To reduce downtime, run the system in single carbon stage flow while waiting for fresh carbon wetting.

65. After wetting is finished, backwash the fresh carbon to further remove fines and trapped air (see backwash procedures). When backwashing is finished, the treatment system should be running with the fresh carbon in the lag bed.

66. Allow the carbon fines to settle and drain the backwash water from the recycle tank.

Draining the Recycle Tank

The recycle tank must be drained while the treatment system is running. There is too little storage capacity to drain the recycle tank with the system off.

If heavy fines are present, divert flow through the portable bag filter unit before it enters the DNAPL separator. Filtering can be done with the recycle tank pump or by gravity. For pumping through the filter, remove the rotometer in the recycle tank effluent line and install 2" Kamlocks for filter influent and effluent. For gravity filtering, install a 2" Kamlock and hose from the 2" ball valve at the bottom of the recycle tank to the bag filter inlet. The bag filter effluent can be drained/siphoned to the sump.

The steps below only apply when *pumping* out the recycle tank.

67. Open the 3" butterfly valve and the two 2" ball valves in the line exiting the recycle tank.

68. In the control room, turn the recycle tank pump (P-731) on and drain the entire tank.

69. Turn the recycle tank pump (P-731) off at both the main control panel switch and the pump panel disconnect.

70. Close the 3" butterfly valve and the two 2" ball valves in the line exiting the recycle tank.

CALGON

CALGON CARBON CORPORATION

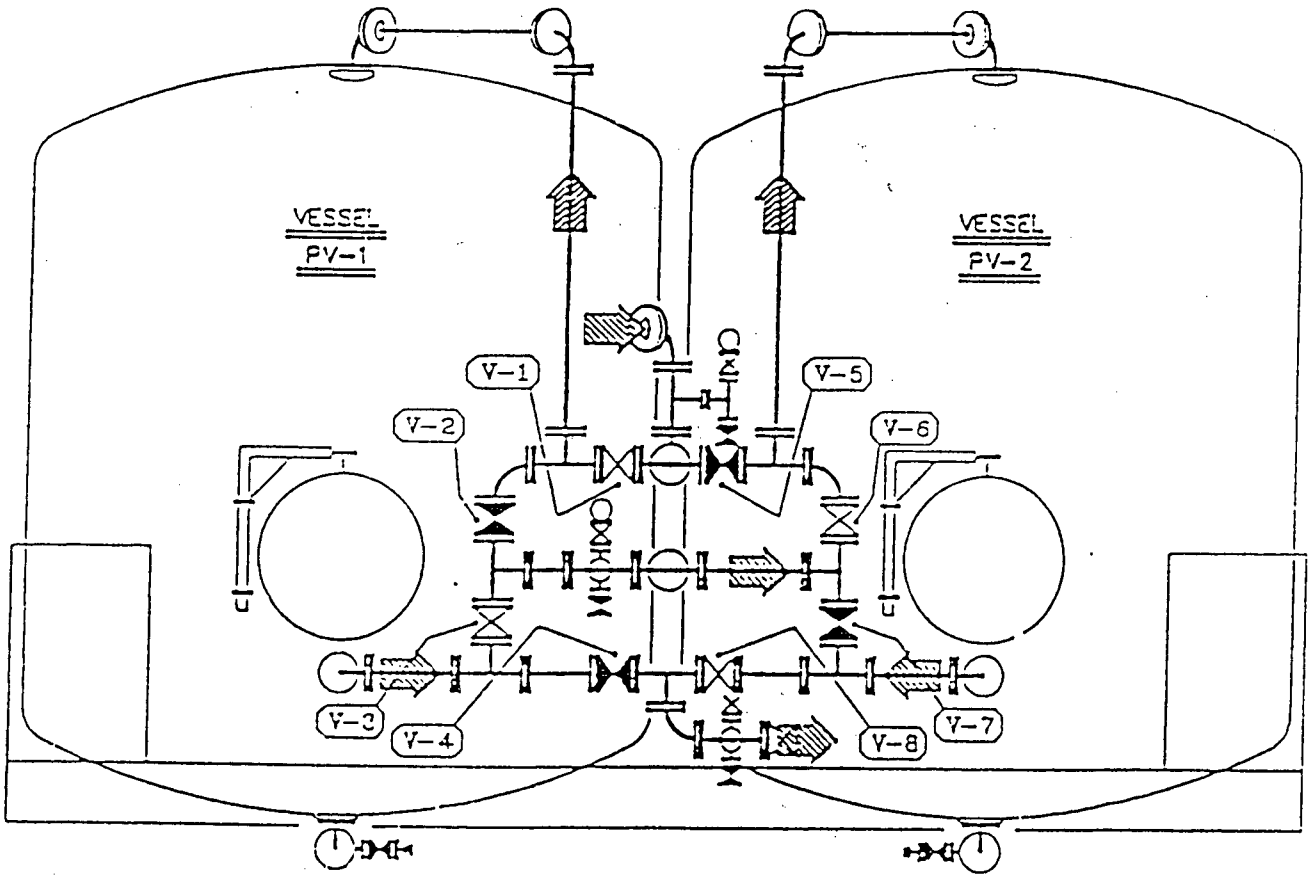
SYSTEM OPERATION

VALVE DIAGRAM

FIGURE 1

SERIES FLOW
VESSEL PV-1 TO PV-2

FRONT VIEW



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DUAL MODULE SYSTEM

PROCESS PIPING

SYSTEM OPERATION

VALVE DIAGRAM

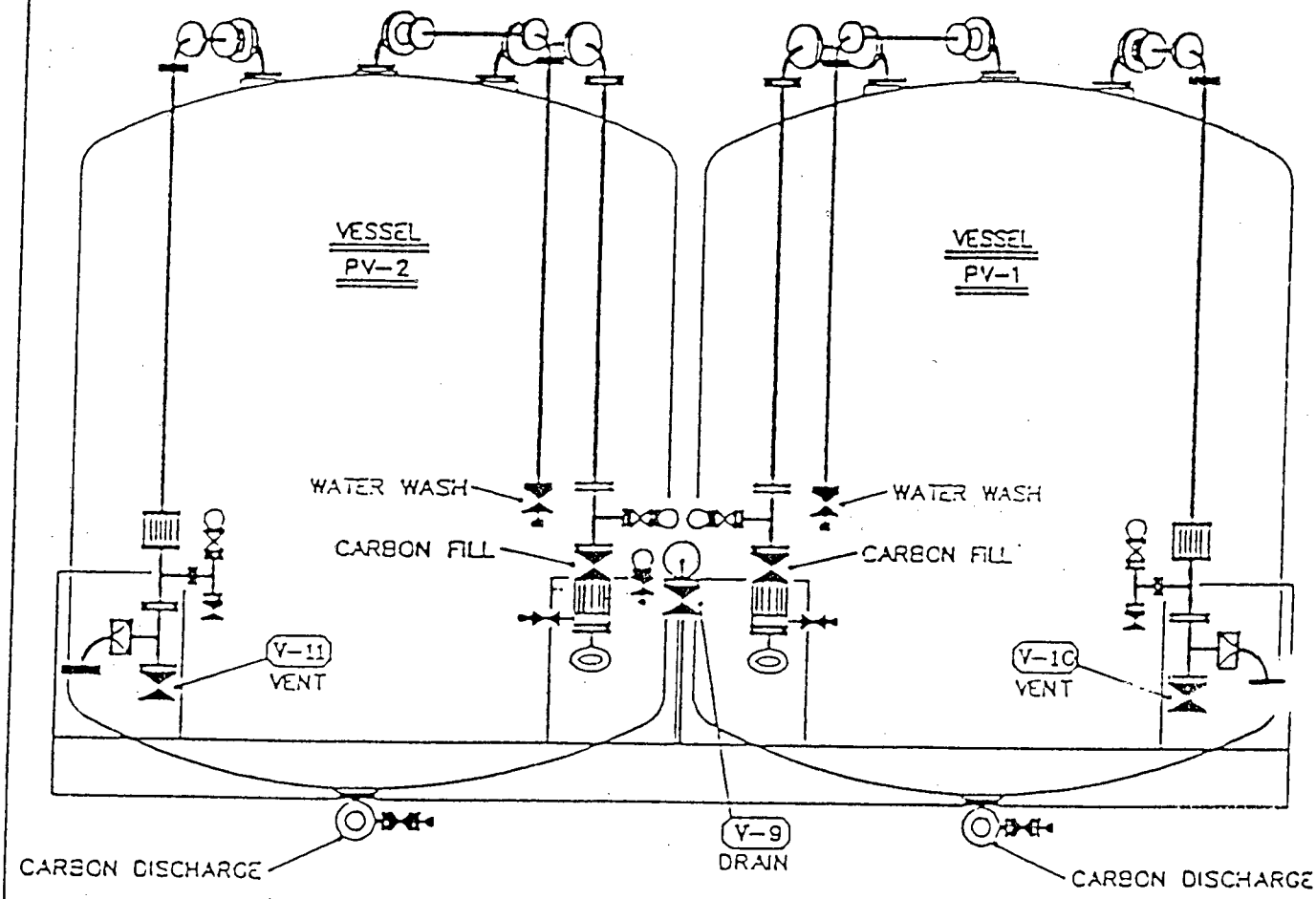
CALGON

CALGON CARBON CORPORATION

SERIES FLOW
VESSEL PV-1 TO PV-2

FIGURE 1

BACK VIEW



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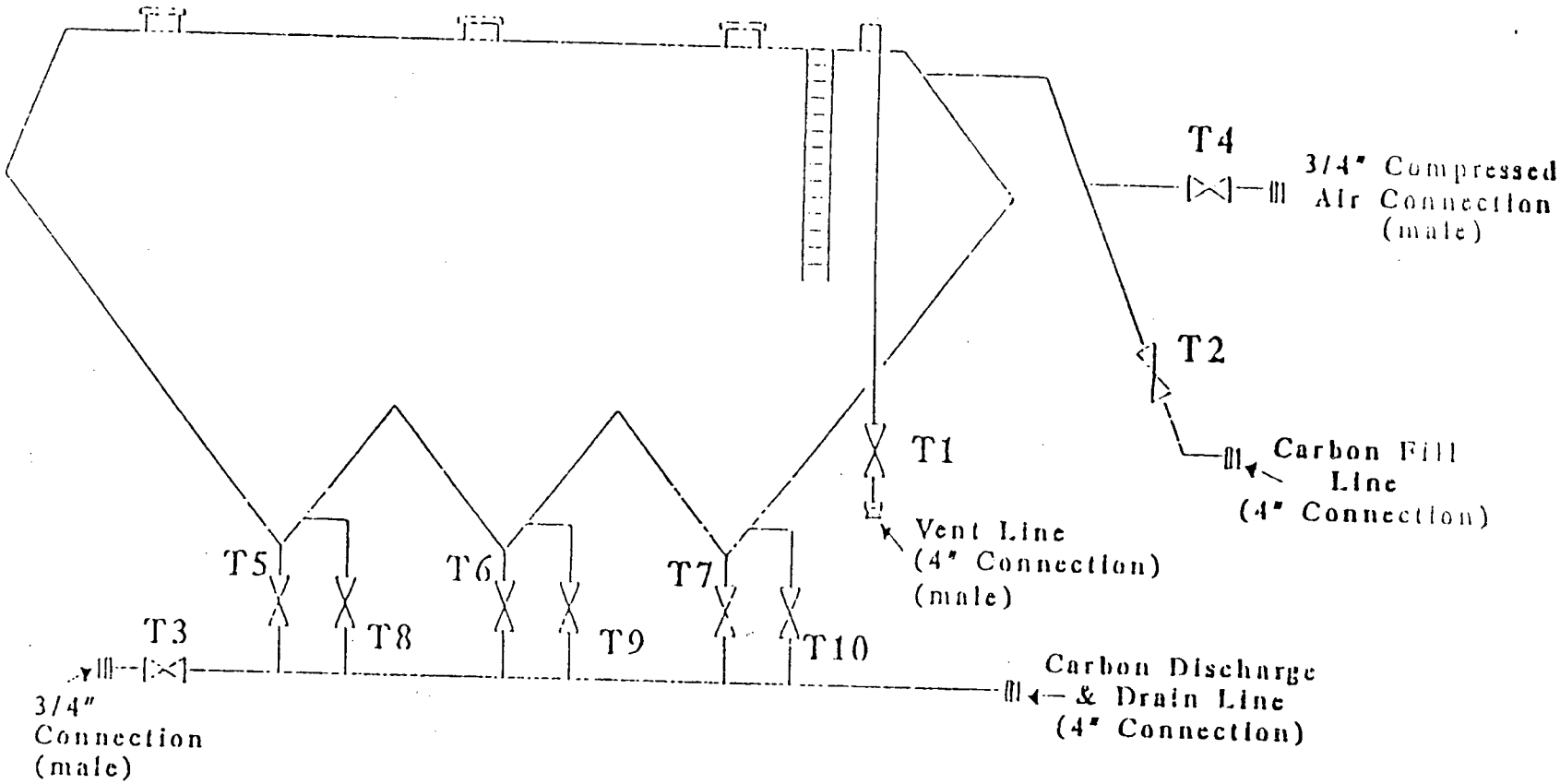
DUAL MODULE SYSTEM

UTILITY AND CARBON TRANSFER PIPING

Figure 6: Calgon Carbon Standard Trailer



Note: 1) For Industrial Trailers, the Carbon Fill & Discharge connections are Kamlock style (male)

2) For Food Grade Trailers, the Carbon Fill & Discharge connections are Kamlock style (female)

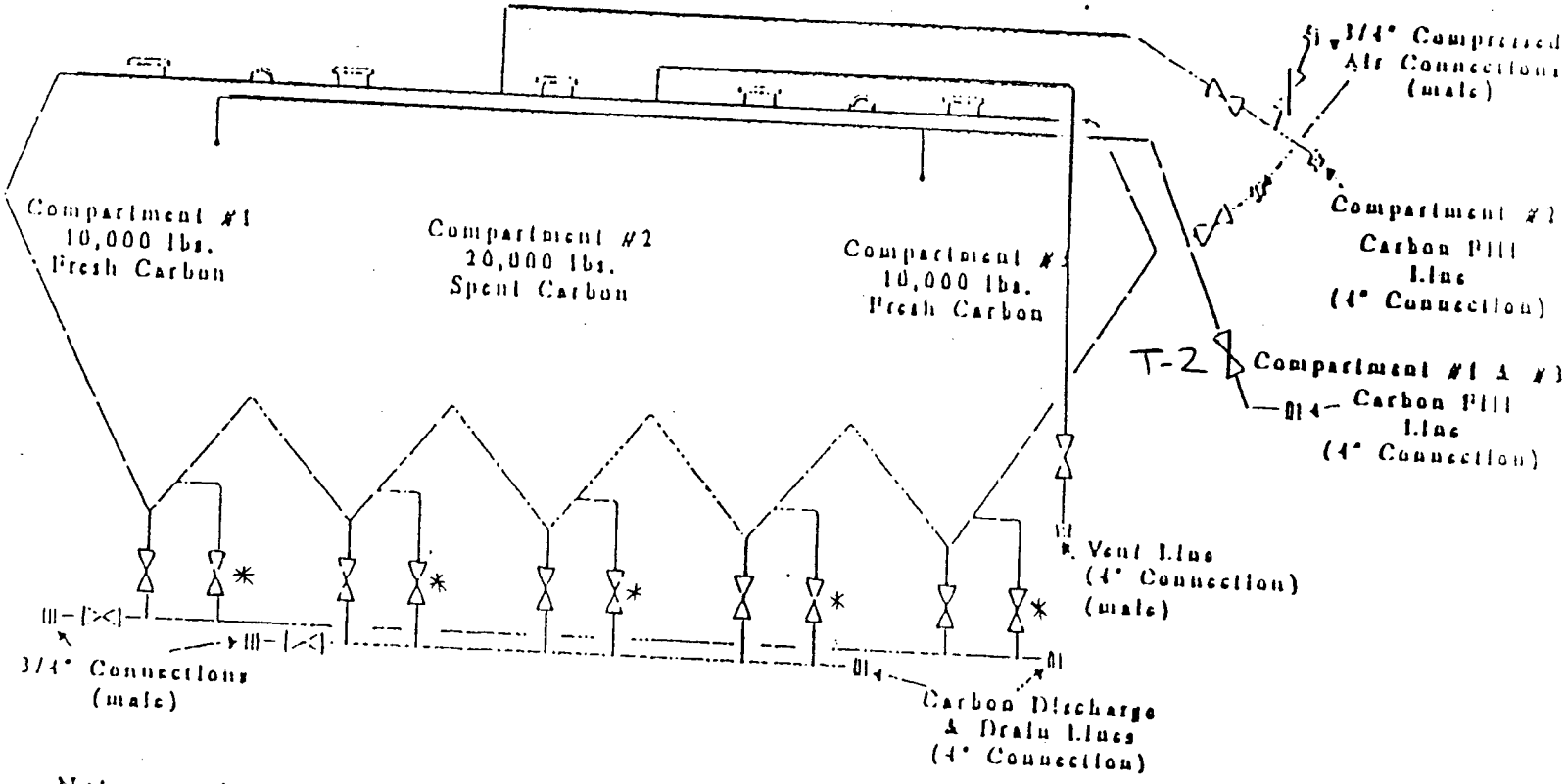
3) All other connections are male Kamlock for ALL trailers

4) Maximum Operating Pressure = 15 psig

Rev. 1
3/5/93

CALGON
CALGON CARBON CORPORATION

Figure 8: Calgon Carbon Triple Hopper Trailer



Note:

1) For Industrial Trailers, the Carbon Fill & Discharge connections are Kamlock style (male)
2) For Food Grade Trailers, the Carbon Fill & Discharge connections are Kamlock style (female)
3) All other connections are male Kamlock for A.L. trailers
4) Maximum Operating Pressure = 15 psig

* Septa valves

Rev. 0
5/13/92

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PROCEDURE FOR BACKWASHING A CARBON BED

This procedure is written to allow carbon backwashing while the system is running. For backwashing while the system is off, some steps can be eliminated; see steps marked with an asterisk "*".

1. Select the vessel to be backwashed. This will usually be the lead bed or the bed that has just received carbon.

2. Connect a 3" flexible hose from the potable line to the carbon drain (backwash influent supply).

3. Connect the other 3" flexible hose from the vent line of the vessel to be backwashed to the recycle tank line (backwash effluent discharge).

4. Open the 3" PVC ball valve (located near the floor) for the recycle tank line.

*5. Open valves V-5 and V-8 if left bed (pressure vessel #1, PV-1) is to be backwashed; this allows flow through PV-2. Open valves V-1 and V-4 if right bed (PV-2) is to be backwashed; this allows flow through PV-1. *This step can be omitted if the system is off during backwashing.

6. Slowly open or close valves as necessary based on the table below. Carbon beds are still under pressure.

VESSEL TO BE BACKWASHED

	LEFT (PV-1)	RIGHT (PV-2)
V-1	*CLOSED	OPEN
V-2	*CLOSED	CLOSED
V-3	*OPEN	CLOSED
V-4	*CLOSED	OPEN
V-5	OPEN	*CLOSED
V-6	CLOSED	*CLOSED
V-7	CLOSED	*OPEN
V-8	OPEN	*CLOSED
V-9	OPEN	OPEN
V-10	OPEN	CLOSED
V-11	CLOSED	OPEN
V-12	OPEN	OPEN

All other valves can stay in their previous state.
*If backwashing while system is off, only change the position of these 4 valves.

7. Open the red gate valve on the potable line. Slowly open the 3" PVC ball valve (located near the floor) on the potable line to allow clean water to upflow through the bed.

8. Continue backwashing for 30 to 45 minutes, or until sight glass on vent line (backwash effluent) is clear or the recycle tank reaches high level.

9. Close drain valve V-9 and vent line valves V-10 and V-11.

10. Close the two 3" PVC ball valves (located near the floor) for the recycle tank line and the potable line. Close the potable line red gate valve.

11. Disconnect the two 3" flexible hoses.

12. Adjust valves to return carbon beds to series operation as shown in the table below. To avoid dead-heading the pump, open all applicable valves before closing any valves. Carbon beds are under pressure, slowly open or close valves.

RETURN TO SERIES OPERATION

	PV-1 to PV-2	**PV-2 to PV-1**
V-1	OPEN	CLOSED
V-2	CLOSED	OPEN
V-3	OPEN	CLOSED
V-4	CLOSED	OPEN
V-5	CLOSED	OPEN
V-6	OPEN	CLOSED
V-7	CLOSED	OPEN
V-8	OPEN	CLOSED
V-9	CLOSED	CLOSED
V-10	CLOSED	CLOSED
V-11	CLOSED	CLOSED
V-12	OPEN	OPEN

All other valves can stay in their previous state.

Draining the Recycle Tank

The recycle tank must be drained while the treatment system is running. There is too little storage capacity to drain the recycle tank with the system off. When possible, allow any solids or fines to settle before draining the recycle tank.

If heavy fines are present, divert flow through the portable bag filter unit before it enters the DNAPL separator. Filtering can be done with the recycle tank pump or by

gravity. For pumping through the filter, remove the rotometer in the recycle tank effluent line and install 2" Kamlocks for filter influent and effluent. For gravity filtering, install a 2" Kamlock and hose from the 2" ball valve at the bottom of the recycle tank to the bag filter inlet. The bag filter effluent can be drained/siphoned to the sump.

The steps below only apply when *pumping* out the recycle tank.

13. Open the 3" butterfly valve and the two 2" ball valves in the line exiting the recycle tank.

14. In the control room, turn the recycle tank pump (P-731) on.

15. Turn the recycle tank pump (P-731) off at both the main control panel switch and the pump panel disconnect.

16. Close the 3" butterfly valve and the two 2" ball valves in the line exiting the recycle tank.

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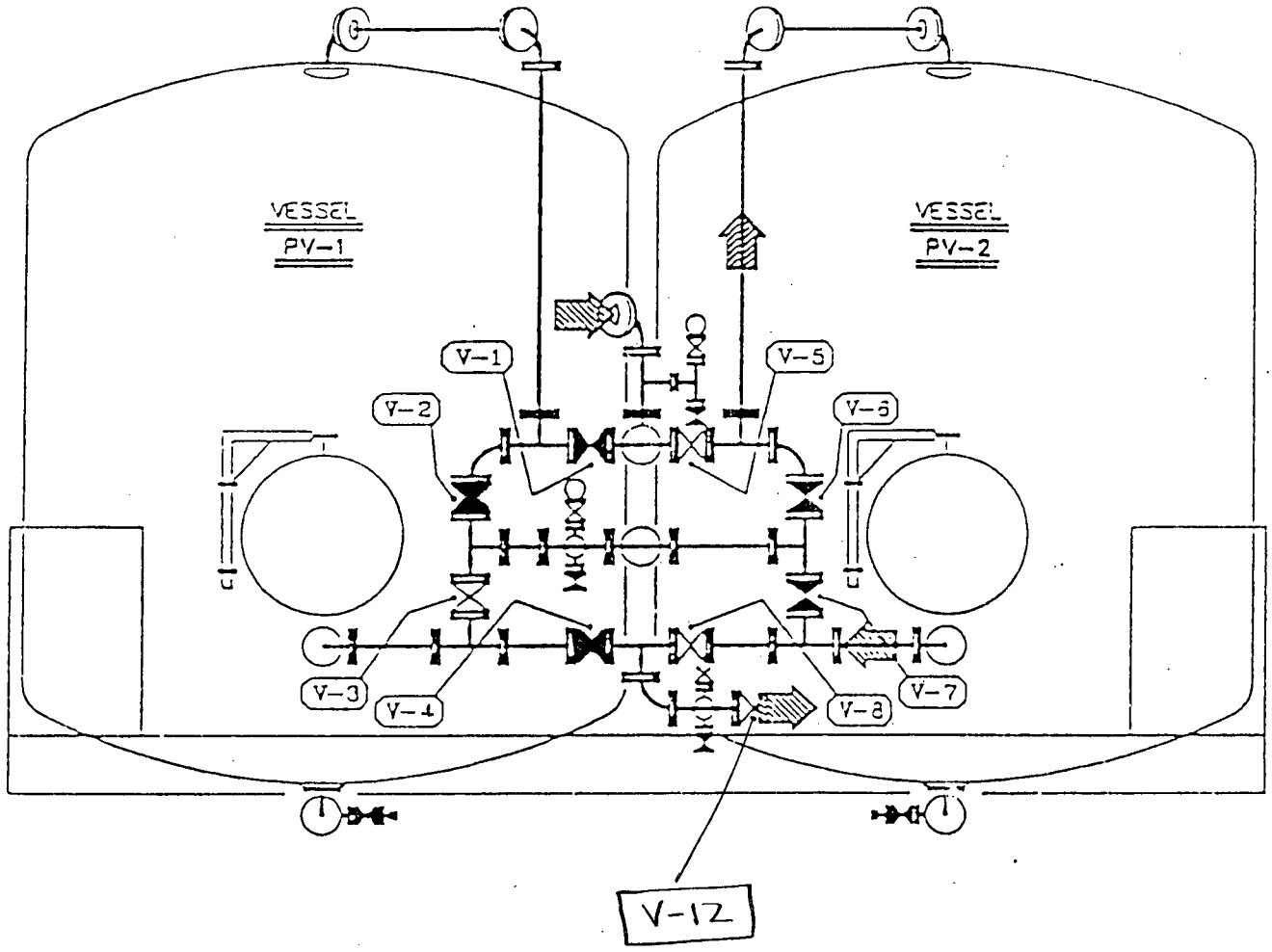
SYSTEM OPERATION

VALVE DIAGRAM

FIGURE 2

SINGLE STAGE FLOW
TO VESSEL PV-2, Backwash PV-1

FRONT VIEW



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DUAL MODULE SYSTEM

PROCESS PIPING

SYSTEM OPERATION

VALVE DIAGRAM

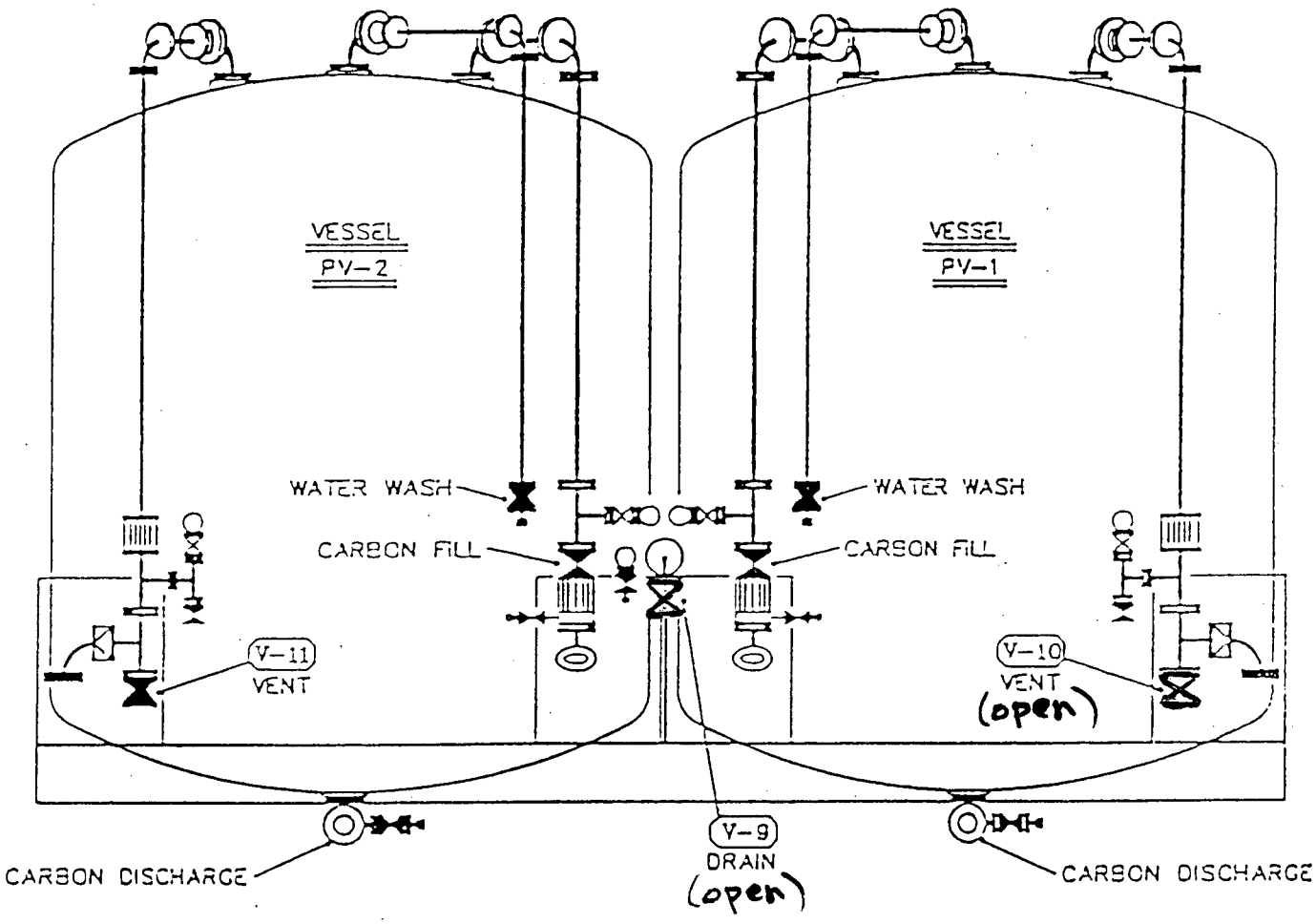
CALGON

CALGON CARBON CORPORATION

SINGLE STAGE FLOW
TO VESSEL PV-2, Backwash PV-1

FIGURE 2

BACK VIEW



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DUAL MODULE SYSTEM

UTILITY AND CARBON TRANSFER PIPING

CALGON

CALGON CARBON CORPORATION

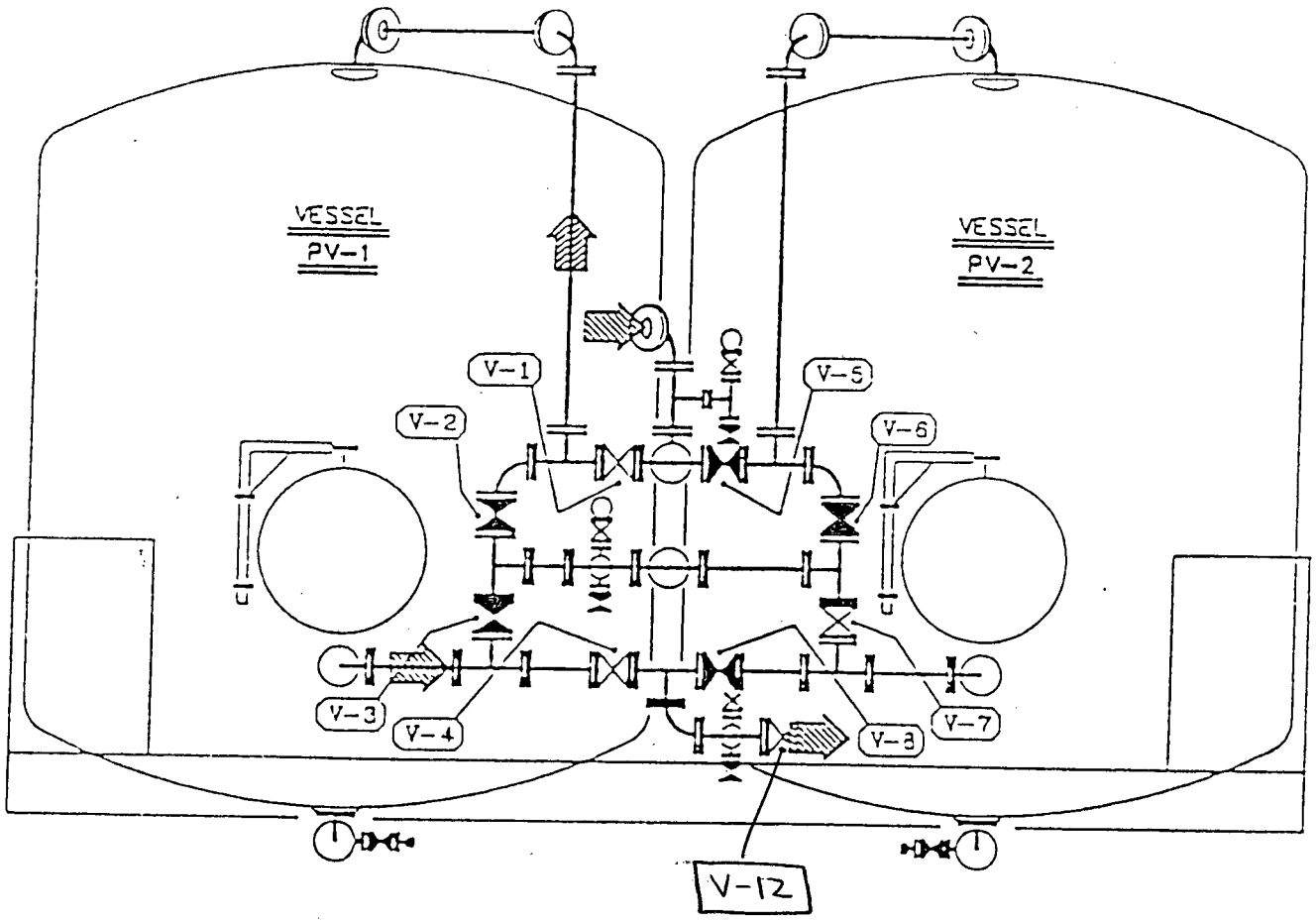
SYSTEM OPERATION

VALVE DIAGRAM

FIGURE 4

SINGLE STAGE FLOW
TO VESSEL PV-1, Backwash PV-2

FRONT VIEW



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DUAL MODULE SYSTEM

PROCESS PIPING

SYSTEM OPERATION

VALVE DIAGRAM

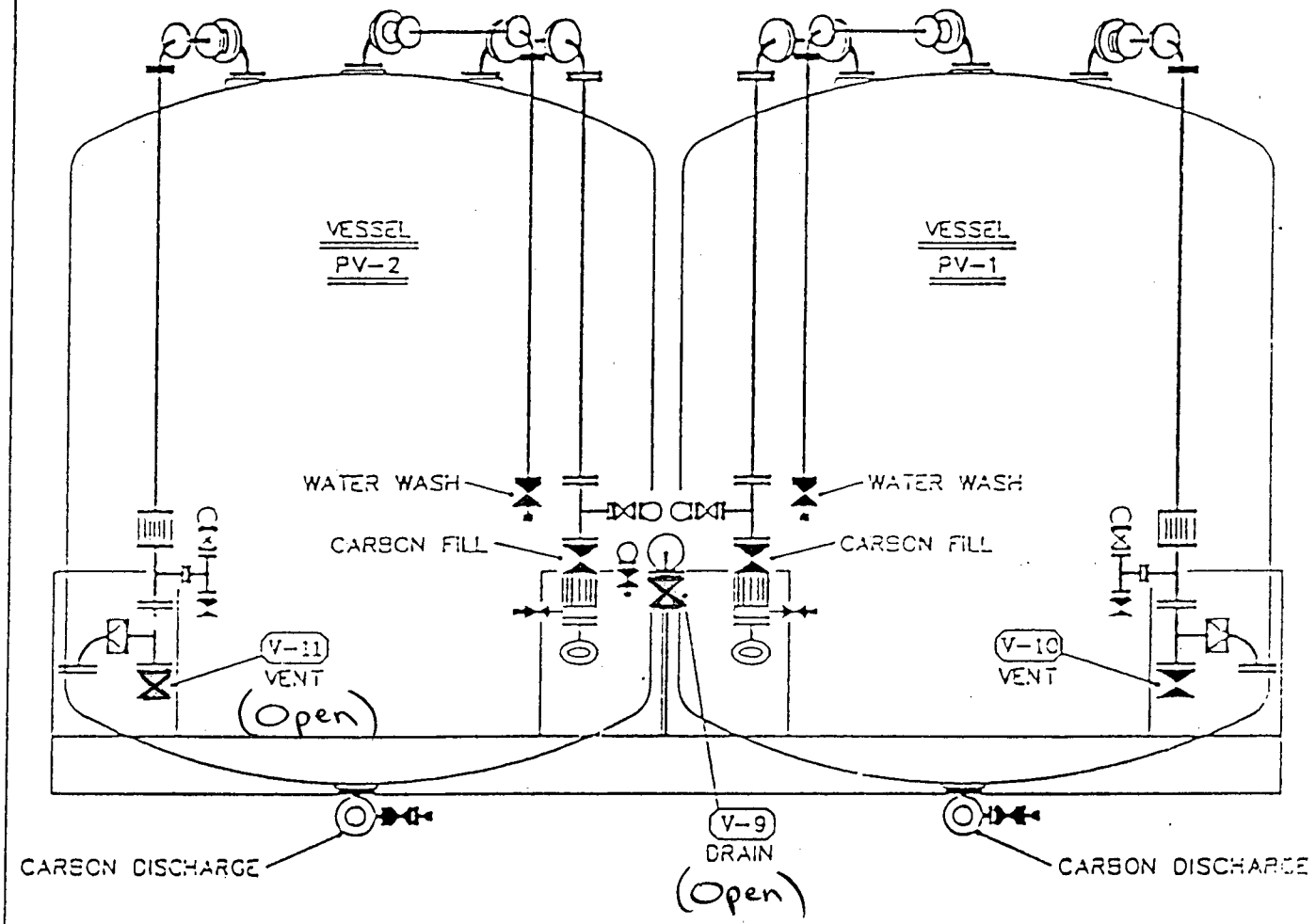
CALGON

CALGON CARBON CORPORATION

SINGLE STAGE FLOW
TO VESSEL PV-1, Backwash PV-2

FIGURE 4

BACK VIEW



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DUAL MODULE SYSTEM

UTILITY AND CARBON TRANSFER PIPING

APPENDIX G

HEALTH AND SAFETY PLAN

(FULL APPENDIX IS LOCATED AT SITE)

APPENDIX H

EQUIPMENT SPECIFICATIONS

(FULL APPENDIX IS LOCATED AT SITE)