MALCOLM PIRNIE

New York State Department of Environmental Conservation

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COMMISSIONER OF ENVIRONMENTAL CONSERVATION

Peter Scharf, P.E. - Project Engineer

Designated Representative

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Remedial Design Report

Fairchild Republic Main Plant
Groundwater Treatment and Recharge System
East Farmingdale, New York

Prepared for:

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Introduction

SECTION 1

Malcolm Pirnie, Inc. (Malcolm Pirnie) was retained by Mairoll, Inc. to prepare this 90 percent design of the groundwater extraction, treatment, and infiltration system to be constructed at the Fairchild Main Plant Site (MPS) located in East Farmingdale, New York (Site), as shown on Figure 1. This 90 percent design is based on the "Preliminary Remedial Design Report, 35 percent Completion", submitted by MAC Consultants (MAC) in February 2002 and comments provided by the NYSDEC in letters dated April 3, 2002 and June 11, 2003. This 90 percent design is consistent with the March 1998 Record of Decision (ROD) prepared by the New York State Department of Environmental Conservation (NYSDEC) for the MPS, which calls for a groundwater remedy that includes a groundwater capture, treatment, and recharge (pump and treat) system. The ROD selected a groundwater remedy that is protective of human health and the environment and describes this remedy conceptually, based on the available data presented in the Remedial Investigation and Feasibility Study (RI/FS). The MAC design report and the NYSDEC March 1998 ROD and comment letters are attached in Appendix A and Appendix B, respectively.

The steps to implement the remedy required by the ROD are detailed in the October 1999 Remedial Design Work Plan (RDWP) previously prepared and submitted by MAC and approved by the NYSDEC. The scope of the remedial design and the information to be obtained to design, construct, operate, and monitor the MPS remedy are presented in the RDWP.

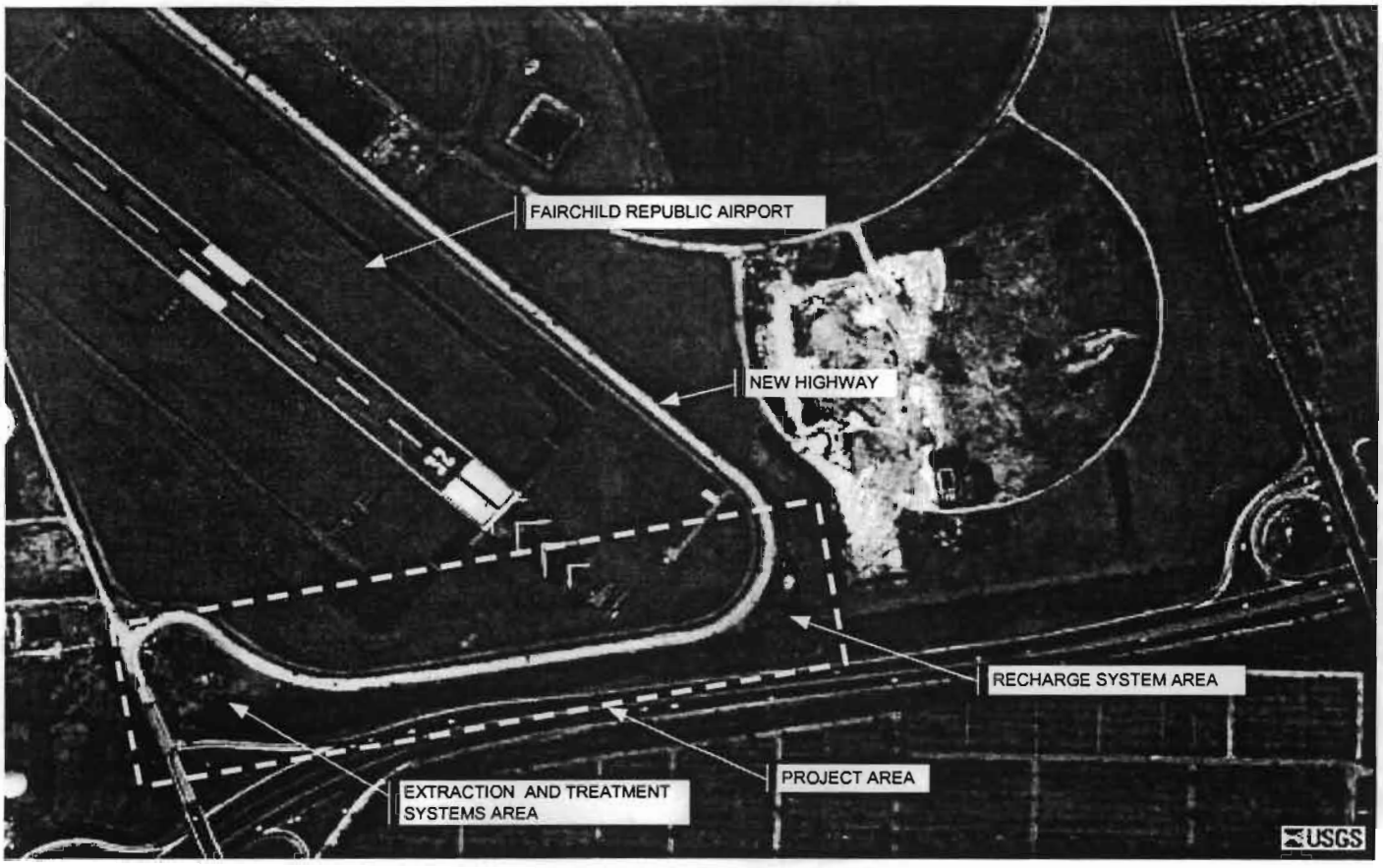
The RDWP specifies the preparation and submittal of this 90 percent complete, Remedial Design Report, and the following documents:

1. 90% Design Engineering Plans
2. 90% Design Engineering Specifications
3. 90% Complete Operation, Maintenance, and Monitoring Plan
4. Outpost Monitoring Plan
5. Remediation Monitoring Plan
6. Post-Remediation Monitoring Plan
7. State Pollution Discharge Elimination System (SPDES) Permit
8. Wellhead Treatment Contingency Plan
9. Site Restoration Plan

The Remedial Design Report and the 90 Percent Design Engineering Plans and Specifications are contained in this submittal.

A Pre Design Investigation (PDI) was conducted by MAC in accordance with the RDWP to determine the number, location, and depth of the extraction and monitoring wells, and to test a single well extraction and treatment system. The results of the PDI were used as the basis for the 90 percent design of the groundwater extraction, treatment, and recharge system.

FIGURE 1
FAIRCHILD REPUBLIC MAIN PLANT SITE
GROUNDWATER PUMP AND TREAT SYSTEM



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Remedial Design Objectives

SECTION 2

2.1 Design Objectives

The ROD requires a groundwater remedy that includes a groundwater extraction, treatment, and recharge (pump & treat) system capable of capturing total volatile organic compounds (VOC) at 1,000 part per billion (ppb). However, after the completion of the PDI by MAC and subsequent groundwater modeling by MAC and Malcolm Pirnie, the NYSDEC agreed to change the design criteria for the pump and treat system to capture groundwater containing total VOCs at a minimum of 200 ppb. This change was made because the PDI and groundwater modeling showed that this level of remediation was practicable given the new understanding of the plume dimensions and physical properties of the aquifer. This is documented in a letter from the NYSDEC to Mairoll, Inc. on June 11, 2003, and is included in Appendix B.

The proposed groundwater remedy is based on the operation of the following system components:

1. Two (2) extraction wells pumping at a combined pumping rate of 400 gallons per minute (gpm), with one well (PW-1, western-most well) pumping at a rate of 250 gpm and one well (PW-2, eastern-most well) pumping at a rate of 150 gpm;

2. One (1) low-profile air stripping system to remove the VOCs from the water/liquid phase to concentrations levels below the 5.0 ppb maximum contaminant level (MCL) set by the NYSDEC.

3. One (1) set of two (2) liquid phase granular activated carbon (GAC_{vapor}) treatment units, with the configuration of utilizing one unit with the second unit dedicated as a spare. The liquid phase GAC units will remove/polish the VOCs from the air stripper's discharge.

4. One (1) set of three (3) vapor phase granular activated carbon (GAC_{vapor}) treatment units, with the configuration of utilizing two units in series with the third unit dedicated as a spare. The vapor phase GAC units will remove the VOCs from the air stripper's off gas.

5. Two (2) sets of five (5) – 10' diameter x 10' high leaching chambers. Each set of five (5) leaching chambers will provide approximately 1,575 ft^2 of available leaching area. The normal operation will require one set of leaching pools on-line for the recharge, with the other set of pools dedicated as a spare.

The proposed groundwater pump and treat system's flows, stream concentrations, and equipment capacities are shown on the Process Flow Diagram (PFD), provided in the 90 percent construction drawings, and the corresponding mass balance calculations are provided in Appendix C.

2.2 Field Investigation And Aquifer Test

2.2.1 Aquifer Profiling and Pumping Well Installation

Aquifer profile borings were drilled and sampled by MAC to collect geologic and aquifer water quality data and to delineate the plume in areas where data were incomplete. The work was completed as described in the MAC Field Investigation and Aquifer Test Report, included in Appendix A. The aquifer profile borings were drilled, analyzed and tested at nine locations on Town of Babylon and Republic Airport properties. The aquifer profile data were used to select the number and depth of monitoring wells installed. The additional monitoring wells will be incorporated with the RI/FS monitoring wells and used for the long-term groundwater-monitoring program. Monitoring well locations are shown in the Field Investigation and Aquifer Test Report.

As described in the Field Investigation and Aquifer Test Report, an aquifer test/pilot test was conducted to generate data for the remedial design. An extraction well (PW-1) was installed and pumped at a constant rate of 250 gpm for 72 hours. The water was passed through an air-stripping tower and discharged to a recharge system that consisted of two interconnected leaching pools. The pumping and recharge tests were performed in October 2001. The results are given in Appendix A and are summarized below.

2.2.2 Aquifer Test

A constant-rate 72-hour pumping test was performed by MAC on the test well at a flow rate of 250 gpm. Groundwater was pumped from well PW-l to a low-profile air stripper to remove VOCs. The treated effluent from the air stripper was conveyed through a temporary six-inch diameter hose to the leaching pools, which was about 1,800 feet east of well PW-1. Water level measurements were collected from selected monitoring wells and piezometers during the test and water influent and effluent samples were collected from the treatment system twice a day during the test. After the 72-hour pump test, the pump was shut off and water level measurements were taken at the selected monitoring wells and piezometers. Based on the data attained from the aquifer test, which was then used to calibrate the existing MODFLOW groundwater flow model, the flow rate necessary to capture the required minimum of 200 ppb total VOC plume has been determined to be 400-gpm. The calibrated MODFLOW groundwater flow model run results, presented in Appendix E, are based on the use of two (2) groundwater extraction wells located 500 feet apart pumping at a combined flow rate of 400 gpm.

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Key Components of the Groundwater Treatment System

SECTION 3

The groundwater pump, treat and recharge system has been designed to extract and remove the VOC contaminated groundwater at a total flow rate of 400 gpm, as illustrated on the "Process Flow Diagram", provided in the 90% construction drawings attached.

The contaminated water will be pumped from two (2) groundwater extraction wells, approximately 500 feet apart, to the treatment/equipment building. The contaminated water will be treated using a low profile, induced draft air stripping system that is projected to reduce the VOC concentrations levels to below the 5.0 ppb maximum contaminant level (MCL) set for surface water discharges. The design also includes the necessary provisions for the installation of a liquid phase granular activated carbon (GAC_{liquid}) treatment unit, downstream of the air stripper's discharge, to provide secondary/polishing treatment of the air stripper's effluent. The provisions for the GAC_{liquid} treatment unit have been included into the overall building design, with the actual installation contingent on the actual air stripper performance and water quality. The final treated effluent will be pumped and discharged into a subsurface recharge system, consisting of a series of five (5) leaching chambers/pools approximately 1,875 feet from the proposed equipment and mechanical building. The air stripper's off-gas will be treated using a set of two (2) vapor phase granular activated carbon (GAC_{vapor}) treatment units configured in series, to remove the VOCs from the off-gas prior to the discharge into the atmosphere. The pumping well, treatment units, and recharge system are the key components of the remedial treatment system. The remedial design objective for each component and the rationale for selection of each unit are described below.

The proposed recovery wells, treatment system and recharge system will be constructed on the Town of Babylon parcel adjacent to the Southern State Parkway-Route 109 Interchange on New Highway, Farmingdale, New York. The parcel is undeveloped, overgrown with shrubs and trees. The site is bordered on the east by the St. Charles Cemetery, on the south by the Southern State Parkway, on the north by New Highway and Republic Airport's runway and on the west by a commercial building. The nearest developed property is a single parcel in commercial use approximately 400 feet west of the site. The nearest residence is approximately 2,000 feet to the south. The air stripper, and related mechanical and electrical equipment will be housed in a prefabricated metal building approximately 75 feet x 65 feet wide x 20 feet high.

3.1 Groundwater Extraction System

The remedial design objective of the pumping wells is to capture a minimum 200 ppb of VOC contaminated groundwater plume and to prevent further down gradient migration. The pumping test performed on test well PW-1 and subsequent groundwater modeling indicates that two wells will be required to capture the contaminated groundwater at a minimum VOC concentration of 200 ppb.

3.1.1 Well Construction

The existing groundwater extraction/pumping well (PW-1) was installed and tested by MAC. The well was constructed using direct rotary drilling methods. The well was drilled to an initial diameter of 12 inches and later reamed to a final diameter of 16 inches using a combination of Revert and Gel-X drilling fluids. A natural-gamma geophysical log was conducted and the screen design was determined. The pumping well (PW-1) was constructed with a WG #2 grain size filter pack, three sections of 30 slot wire wrapped stainless steel screen, 8-5/8 inch steel well casing and screen, bentonite /sand seal and bentonite grout. The pumping well screen was set in three sections; one 15 foot section at a depth of 125 feet to 140 feet, one 12 foot section at a depth of 157 feet to 172 feet and a 50 foot section set 180 feet to 230 feet below grade, because of the presence of clay layers encountered while drilling the borehole. A copy of the well construction log for extraction/pumping well PW-1 is provided in Appendix A, as Figure 1.

A second groundwater extraction/pumping well (PW-2) will be constructed using the same design, methods and materials as PW-1 and will be located approximately 500 feet east of PW-1, as shown on the enclosed 90% Construction plans. A pilot hole will be drilled for soil sampling and geophysical logging. Soil samples will be sent to a laboratory for grain size analysis and used with the geophysical logs to complete the design of the well and screening intervals.

3.1.2 Well Development

The existing groundwater extraction/pumping well's (PW-1) development was completed by MAC, using airlift methods to remove sediment from the screen and borehole. PW-1 was developed for 16 hours over two consecutive days. The results of the testing are provided in the MAC "Preliminary Remedial Design Report 35 Percent Completion", in Appendix A. The well development of the proposed groundwater extraction/pumping well, PW-2, will be completed the same as PW-1.

3.1.3 Well Pump Testing

A controlled 72 hour pumping test was completed on the existing well PW-1 at a flow rate of 250 gpm, by MAC, to determine if the well would meet the remedial design objectives and to provide data to calibrate the groundwater flow model. The reported maximum draw down (water level decline due to pumping) in PW-1 was approximately 11 feet at the conclusion of the 250 gpm pumping test. This result was used to determine the well's specific capacity of 22.7 $gpm/ft_{drawldown}$, which was then used in the design of the system hydraulics, submersible well pumps and piping. The results of the pump tests are provided in the MAC "Preliminary Remedial Design Report 35 Percent Completion", in Appendix A.

The results of the aquifer and well pump tests were used to calibrate the groundwater flow model. The groundwater flow model was used to determine the pumping rate (400 gpm) necessary to capture the required minimum 200 ppb of total VOCs, from the contaminant plume. The results of the groundwater modeling projections determined that it was necessary to pump a combined flow of 400 gpm, from the two wells. The modeling projections set the flow rate of well PW-1 at 250 gpm and the flow rate of well

PW-2 at 150 gpm. The specific well flow rates are necessary to extract the minimum VOC contamination as required by the ROD and the June 11, 2003 NYSDEC communication.

3.1.4 Well Pump and Piping Design

The groundwater well extraction/pumping systems are designed to convey the contaminated groundwater flows, from each specific well, through 4-inch diameter piping to the mechanical/equipment building and then combine the flows into a common 6-inch diameter force main that continues into the air stripper's inlet header/manifold. The design includes the installation of a check valve on each well pump's discharge piping to protect the pump and piping, from flow reversals and water hammer damage. The design also includes the installation of a gate valve and flow meter, in each well, to control and monitor flow. The hydraulic calculations used to determine pump and piping sizes and capacities, along with the discharge/recharge system piping are provided in Appendix E.

The well pumps will be vertical turbine type with submersible motors and power cables, designed for pumping volatile organic carbon (VOC) contaminated groundwater. The pumps are designed to perform with a 20 year service life. The pumping system details are as follows:

- Extraction/Recovery Well (PW-1): Submersible type, with maximum flow of 300 gpm at a total dynamic head (TDH) of 90 ft, operating at a minimum efficiency of 75%. Pump to fit an 8-inch internal diameter steel well casing.

- Extraction/Recovery Well (PW-2): Submersible type, with maximum flow of 200 gpm at a total dynamic head (TDH) of 85 ft, operating at a minimum efficiency of 75%. Pump to fit an 8-inch internal diameter steel well casing.

The pumping system control/alarm design includes the installation of a continuous water level sensing probe and a high discharge pressure switch, for each well, interlocked with the pump motor starter circuit. The purpose of these interlocks is to advise of the following:

- Water level: The system is designed to shut down the well pump in the event that the water level in the well drops below the pump motor and/or intake due to unforeseen circumstances, such as well screen fouling/plugging. The interlock is designed to prevent the pump motor from overheating and from running dry.

- High discharge pressure: The system is designed to shut down the well pump in the event that the pump is started under "dead head" conditions (i.e. no water flow) due to unforeseen circumstances, such as a valve being inadvertently closed. The interlock is designed to prevent the pump motor from overheating and from damaging the impellers and piping.

The pumping system design also includes the installation of a pressure gage and stilling well for manual level measurements, on each of the wellheads and discharge piping to monitor the system's performance. The instrumentation will be located inside a concrete well and valve vault/chamber, constructed of precast concrete flush with the grade over the well. The concrete chamber is designed to protect the well and to house the discharge piping, control valve, pressure switch and gauge, flow meter, along with the electrical and mechanical connections.

The location and configuration of the proposed groundwater extraction wells and pumping systems are shown on the 90 percent complete construction plans.

3.2 Groundwater Treatment System

3.2.1 Air Stripper System Design

The remedial design objective for the groundwater treatment system requires the removal of VOCs to meet New York State SPDES discharge standards for Class GA-1 groundwater (MCL = 5.0 ppb) at a flow rate of 400 gpm.

3.2.1.1 Pilot Testing

An air stripper system pilot test was performed and completed, by MAC, to determine the efficiency of the air stripper system's at a flow rate of 250 gpm and to investigate the requirements for chemical pretreatment. The pilot test was performed during the aquifer

test to confirm that the stripper will meet the remedial design objectives and efficiencies projected by the manufacturer North East Environmental Products, Inc (NEEP). The pilot test concluded that the selected air stripper provided the necessary treatment for the removal of the VOCs from the groundwater, as projected by the NEEP. The results of the testing are provided in Appendix A, and are used as a basis for this 90 percent design.

Chemical pretreatment of the influent groundwater to remove inorganics and minimize fouling was also evaluated during the preliminary design and pilot testing, completed by MAC. MAC previously reported that, during the preliminary design and pilot testing, dissolved solids including iron and manganese were found at only low concentrations and did not produce conditions that would require chemical pretreatment. MAC had determined that the low concentrations of inorganics would not be expected to increase and cause unusual clogging or fouling of the stripper or piping, during the remedial time frame. Consequently, MAC recommended that routine maintenance and cleanings of the stripper and piping be put into practice. The air stripper system is equipped with access and view ports at the end of each tray to facilitate the inspection, pressure washing/cleaning of each tray. The cleaning operations of the air stripper will be completed with the system off-line, and will require the use of only: a 12 foot long washer wand (provided by manufacturer of the air stripper system), a portable gasoline powered pressure washer, and an on-site 750 gallon treated water storage tank (full). The wash water shall be drained from the air stripper and discharged into the on-site holding tank, located inside the treatment/equipment building area.

3.2.1.2 Air Stripper Design

The proposed system design incorporates modifications to the existing Shallow Tray Model 41241 air stripper to increase the capacity to 400 gpm, with the required VOC removal efficiencies to meet New York State SPDES discharge standards for Class GA-1 groundwater (MCL = 5.0 ppb). The proposed air stripper system's design modifications include:

1. The addition of a fifth stripper tray, to achieve the necessary removal of VOCs at the flow rate of 400 gpm.
2. The upgrading /replacement of the existing air blower to provide a capacity of 2,400 CFM at an increased total static head of 35" w.c. The increased

capacity is required to force the off-gas, from the air stripper, through a series of vapor phase granular activated carbon treatment units and building exit/ceiling exhaust stack. The proposed blower design will also include reconfiguration of the blower connections and ductwork to provide an induced draft flow through the air stripper.

3. The upgrading/replacement of the existing stripper discharge pump, to provide a flow capacity of 400 gpm at a total dynamic head (TDH) of 65 feet of water.

The proposed air-stripping unit is a low profile model, with five stripper trays to facilitate mass transfer of VOCs from the liquid to the vapor phase. The unit is a countercurrent flow model with the water containing VOCs applied at the top tray of the unit. Water flows through the full length of each baffled tray, and falls into the tray below as fresh air is induced, or forced (sucked) up through 5 mm diameter holes in each stripper tray. The air forms a froth of bubbles approximately six inches deep on the stripper tray, generating a large mass transfer surface area where the organics are volatilized. The necessary contact or residence time to reach required volatilization is achieved through the stripper dimensions and the number of trays. The proposed stripper is designed by NEEP for flow rates ranging from 200 gpm to 550 gpm. The manufacturer supplied performance projections demonstrating the air strippers removal efficiencies, along with the manufacturer's specifications and drawings are provided in Appendix F.

The design modifications also include changing the blower/air stripper configuration, from forced draft airflow to induced draft airflow. The air stripper's inlet will be open to the atmosphere, while the outlet will be connected to the suction side of the blower. The blower's outlet will then be connected flexible hose, continuing through a series of vapor phase granular activated carbon treatment units to remove the VOCs from the off-gas prior to discharging to the atmosphere.

The treated water collects in an existing holding tank (approximately 1,500 gallons), which is an integral part of the base of the stripper. The treated water is then taken from the holding tank and pumped through discharge piping to a recharge system of leaching chambers/pools. The holding tank and recharge system are equipped with float switches, which monitor the water levels and control the operation of the air stripper's discharge pump.

The location and configuration of the proposed air stripper system is shown on the enclosed 90 percent complete construction plans.

3.2.1.3 Blower Design

The proposed air stripper system modification includes the replacement of the existing blower to an upgraded/increased capacity of 2,400 CFM at a static head of 35" w.c. The upgraded capacity is required to convey the air stripper's off-gas from the air stripper's outlet through a series of vapor phase granular activated carbon treatment units. The proposed blower's inlet/suction will be connected to the air stripper's outlet and the blower's outlet will be connected to a series of granular activated carbon treatment units. A damper is to be installed between the blower's inlet connection and the air stripper's outlet connection, which will be used to make air flow adjustments to the system as required. The blower is designed as a centrifugal, direct driven type, with 50 HP motor operating at 3,450 rpm providing 2,400 CFM at a static head of 35 inches water column (wc).

The blower/air stripper's control and alarm design includes the installation of both high and low-pressure switches within the ductwork exiting the air stripper, to monitor duct pressures. The blower motor controls are designed to be interlocked with the motor starter circuits of the well pumps and the air stripper's discharge pump to prevent the well pumps and/or discharge pump from running, if the blower is not operating above the minimum and below the maximum required duct pressures. In addition to the high/low pressure switches, the control/alarm design includes interlocking the blower's motor starting circuit to the high-level switch located in the holding tank of the air stripper. The blower will shutdown and remain shutdown, if the high-level switch/alarm is activated within the holding tank in order to prevent flooding. The blower manufacturer's specifications, cut sheets and drawings are provided in Appendix F.

The location and configuration of the proposed air stripper's blower is shown on the enclosed 90 percent complete construction plans.

3.2.1.4 Discharge Pump Design

The proposed air stripper system modification includes the replacement of the existing discharge pump to an upgraded/increased capacity of 550 gpm at a total dynamic head (TDH) of 130 feet. The design of the proposed discharge pump includes the necessary provisions (i.e. capacity, flow and total dynamic head) required for the potential backwashing of a GAC_{liquid} treatment unit, if future conditions (i.e. performance, water quality, etc.) demand such a system. The discharge pump, under normal operating conditions, is required to provide 400 gpm of flow at a total dynamic head of 60 feet, which will be manually controlled through a gate valve. The hydraulic calculations used to determine discharge pump and piping sizes/capacities, are given in Appendix E.

The proposed pump shall be a close-coupled centrifugal type pump, driven at 3,600 RPM by a 20 HP totally enclosed fan motor. The existing air stripper is equipped with an integral steel support frame and is pre-piped to the holding storage tank at the base of the stripper, for the pump installation.

The discharge pump's control and alarm design includes the installation of high, low, and restart level switches within the holding tank at the base of the air stripper to monitor the water level and control the operation of the discharge pump. The high level switch is designed to shutdown the blower and well pumps, while the low and restart level switches are designed to control the starting and stopping operations of the discharge pump. The discharge pump will remain in operation until the water level in the holding tank drops below the low-level switch, and then restart once the water level rises above the restart-level switch. The discharge pump's motor controls are interlocked with the motor starter circuits of the well pumps, to prevent the well pump from running if the discharge pump is not operating within the required water levels. The discharge pump's motor controls are also interlocked with the level control of the recharge system's leaching pools, which is designed to prevent the discharge pump from running when the leaching pools are full and the high-level switch is activated.

The location and configuration of the proposed discharge pump is shown on the enclosed 90 percent complete construction plans.

3.2.1.5 Discharge Piping/Force Main Design

The proposed discharge piping/force main alignment has been designed to convey the treated groundwater flows, from the air stripper's holding tank to the recharge system's leaching pools, as shown on the enclosed 90 percent complete construction plans. The piping will be constructed within permanent/property easements and along the west side of New Highway within the existing right of way.

The proposed discharge piping/force main has been designed to convey sustained flows (maximum of 500-gpm) below a maximum velocity of 6.0 ft/sec. The proposed 6-inch diameter piping will normally convey flows of 400 gpm at a velocity of 4.07 ft/sec, with a maximum flow of 500 gpm at a velocity of 5.1 ft/sec. The discharge piping is 6 inch diameter PVC piping, approximately 1,850 linear feet long, and will be installed with a minimum 4 feet of cover to protect it from freezing. The hydraulic calculations that were performed to determine the discharge piping size and capacity are provided in Appendix F.

3.2.2 Liquid Phase – Granular Activated Carbon (GAC_{liquid}) Treatment System Design

The proposed air stripper system's modifications are designed to provide the necessary removal of the influent VOCs required to meet the New York State SPDES discharge standards for Class GA-1 groundwater of 5.0 ppb. Design provisions have been incorporated into the proposed remedial treatment system to permit for the future installation of liquid phase granular activated carbon (GAC_{liquid}) treatment. The GAC_{liquid} treatment is contingent on potential future groundwater quality changes and subsequent system performance. The design provisions include the necessary piping connections and increased equipment capacity (i.e. air stripper discharge pump) to add two (2) GAC_{liquid} treatment units, configured in series on a lead-lag arrangement, with one treatment unit providing secondary/polishing treatment of the air stripper effluent and the other unit as a standby.

The contingent GAC_{liquid} treatment units will include two units (8' diameter x 10' side sheet in size) each containing approximately 10,000 pounds of high-grade granular

activated carbon. The units are designed to connect to the air stripper's discharge piping downstream of the discharge pump and upstream of the effluent flow meter. The piping and valve configuration has been designed to allow for the operation of either both units in parallel, or one unit alone for treatment of the stripper effluent. The piping and valve design also include the necessary provisions to allow for individual vessel backwashing for the removal of any suspended particles that may enter the vessels from the air stripper. The backwashing operations are to be completed while the air stripper system is on-line and operating. The backwash operations will use the treated water stored in the air stripper's holding tank and the discharge pump to flush out the vessel and convey the rinse water to the recharge system. The discharge pump and piping is designed with sufficient capacity and valves to direct the backwash flows into either vessel separately, while discharging the rinse water to the recharge system.

The GAC_{liquid} treatment units are designed to operate as a passive component of the air stripper system. The air stripper's control and alarms design provide the necessary safety and protection required for the GAC_{liquid} treatment system. The air stripper's discharge is designed to provide the necessary flow and pressure/head necessary to convey the flows from the air stripper's outlet, through the GAC_{liquid} treatment units and to the recharge system. The GAC_{liquid} treatment units each will be equipped with a carbon saturation indicator to monitor carbon bed change outs. The saturation indicator device works similarly to a litmus test, in that a color change is created, indicating when volatile organics have saturated the activate carbon and bed change out is required.

The location and configuration of the proposed GAC_{liquid} treatment system is shown on the enclosed 90 percent complete construction plans. The GAC_{liquid} treatment unit manufacturer (Barneby Sutcliffe Corporation) projections, specifications, and drawings are provided in Appendix G.

3.2.3 Vapor Phase Granular Activated Carbon (GAC_{vapor}) Treatment System Design

The off-gas emissions from the air stripper were previously evaluated by MAC during the aquifer and system pilot testing period. The emissions were estimated, using influent groundwater total VOC concentration data obtained during the testing and air stripper

performance projections, and compared to the NYSDEC's guidelines to evaluate the need for emission controls. At the treatment flow rate of 250 gpm, the emissions from the air stripper were determined to be within the guidelines set by the NYSDEC, therefore emission controls were not recommended.

The air stripper's performance projections and mass balance calculations have been revised to reflect the 400 gpm treatment flow rate, and clearly indicate the necessity to provide emission controls/treatment for the air stripper's off-gas stream. The untreated off-gas is projected to emit approximately 2,043 tons/year of total VOCs into the atmosphere, above the NYSDEC's guidelines. The results of the emission mass balance calculations are shown on the "Process Flow Diagram" provided in the 90 percent complete construction plans, and the basis of design and mass balance calculations are provided in Appendix C.

The GAC_{vapor} treatment units are designed to remove the VOCs from the air stripper's off-gas, prior to discharging into the atmosphere. The proposed GAC_{vapor} treatment units will consist of two units in series, with a third unit designated as a spare. The units are each designed to treat 2,400 CFM flow of off-gas from the air stripper. The manufacturer's projected carbon consumption rate is estimated at 96 lb_{GAC}/day at the extracted groundwater treatment flow rate of 400 gpm. The proposed treatment units are each designed with the following: dimensions of 8' (side shell) x 8' W x 8'-6" H, a cross sectional flow area of 64 square feet, and contains approximately 8,000 pounds of vapor phase granular activated carbon. The proposed GAC_{vapor} treatment units and projected consumption rate will result in carbon change outs approximately every 83 days, when operated 24 hrs/day 365 days/year. The GAC_{vapor} treatment unit manufacturer (Barneby Sutcliffe Corporation) performance projections, specifications, and drawings are provided in Appendix H.

The GAC_{vapor} treatment units will operate as a passive component of the air stripper system. The air striper's blower has been designed to provide the necessary airflow and static pressure to convey the off-gas flows from the air stripper's outlet, through the GAC_{vapor} treatment units and out the building's ceiling exhaust stack into the atmosphere. The GAC_{vapor} treatment units each will be equipped with a carbon saturation indicator to monitor carbon bed change outs. The saturation indicator device works similarly to a

litmus test, in that a color change is created, indicating when volatile organics have saturated the activate carbon and bed change out is required.

The location and configuration of the proposed vapor phase granular activated carbon treatment system is shown on the enclosed 90 percent complete construction plans.

3.3 Groundwater Recharge System

3.3.1 Recharge System, Leaching Chambers/Pools Design

The remedial design objective for the recharge component of the pump and treat system requires a recharge system capable of properly disposing the treated water at a flow rate of 400 gpm.

3.3.1.1 Pilot Testing

A recharge system pilot test was performed and completed, by MAC, to determine the available recharge loading/leaching rate and capacity of the proposed recharge area. The pilot testing was performed during the aquifer test, at a flow rate of 250 gpm, to determine a basis of design for the full-scale recharge system. The recharge system tested consisted of two precast concrete (8' diameter x 8' height) leaching rings, with approximately 200 square feet of available leaching area, installed in series approximately 50 feet apart. During the pilot test, water levels were monitored in the leaching rings and various monitoring wells/piezometers located within the proposed recharge area. The total leaching surface area available during the aquifer test was 500 ft^2, as reported by MAC. Consequently, the calculated leaching rate based on the recharge test flow rate of 250 gpm, or 360,000 GPD is 720 gal/ft^2-day. The water level data from the recharge area piezometers indicated that the recharge system could be enlarged to form a permanent system to accept groundwater recharge for long-term remediation. As a result of the recharge system pilot testing, precast concrete leaching rings/pools are the selected as the recharge option for the remediation system.

3.3.1.2 Recharge System Design

The recharge system design has been modified based on updated flow calculations. The revised calculations are provided in Appendix C.

The revised recharge loading/capacity rate is 900 GPD/ft^2, and is based on the pilot testing data and surface area values of the precast chambers/pools. The proposed design of the recharge system is based on a reduced recharge loading/capacity rate of 365 GPD/ft^2, to account for the anticipated fouling of the leaching surfaces by hardness and biological growth. At a design leaching rate of 365 GPD/ft^2 and a 400 gpm (576,000 GPD) treatment flow rate, the total required recharge/leaching surface area is 1,578 ft^2.

The recharge system design includes two (2) sets of five (5) 10' diameter x 10' side height precast concrete recharge/leaching pools, and will be constructed approximately 1,500 feet east of groundwater extraction well (PW-2) outside the capture zone. The two sets of pools are designed to function on a lead-lag configuration, with one set of pools online and the other as a standby. Each recharge/leaching chamber provides approximately 315 ft^2 of available leaching/surface area. Therefore, each set of five pools provides a total available leaching area of 1,575 ft^2, which is capable of treating up to 400 GPM. The leaching pool sets will be constructed in series, at a minimum of 50 feet apart from each other, connected by corrugated piping and a discharge line. The top of the leaching pools will have a precast concrete cover with a 2 foot diameter opening and will be finished flush with grade with access manholes. Butterfly valves will be installed in the discharge piping to divert the treated effluent to any of the two sets of leaching pools.

The recharge system's control and alarm design includes the installation of a high water level switch within the top of the first/leading leaching chamber, to monitor the water level. The high level switch is designed to be interlocked with the motor starter circuits of the well pumps, air stripper discharge pump and the air stripper blower, to prevent the system from operating during high-level alarm conditions.

The location and configuration of the proposed recharge system is shown on the 90 percent complete construction plans.

3.3.2 Recharge System Piezometers

The recharge system's effects on the water table will be observed with piezometers dedicated to the recharge site. The depth to the water table at the proposed recharge test site is approximately 20 feet below grade. The piezometers are to be used for water level measurements only and will be constructed out of 2 inch diameter PVC plastic. Four piezometers will be installed around the perimeter of the recharge site, as shown on the 90% complete plans. Each piezometer will be constructed of SCH. 40 PVC (casing and 20-slot well screen), with WG #1 grain size filter pack, completed flush to grade. The piezometers will be screened approximately 0.5 to 3 feet below the water table.

3.4 Telemetric Monitoring

The air stripper system and related controls have been designed as a telemetric remote monitoring and control system. The air stripper system is designed and equipped with a Sensaphone model 4100 auto-dialer. The auto-dialer is designed to monitor the following alarm conditions:

- System electrical power lost.
- Low water level alarm conditions, in each well.
- High discharge pressure alarm conditions, on the well pump discharge piping.
- Well pump failure or well shut down alarm conditions.
- High and/or low water level alarm conditions in the air stripper holding tank.
- High and/or low pressure alarm conditions in the air stripper/blower ductwork.
- High water level alarm conditions in either of the recharge/leaching system pools.

When an alarm condition occurs, the auto-dialer will call 4 user-programmed phone numbers to advise key personnel of the operating/alarm condition. In addition, the auto-dialer is designed to accept calls in order for key personnel to obtain a status report on the system's operation.

3.5 Treatment/Equipment Building Design

A treatment system equipment and mechanical storage building will be constructed to house and protect the electrical service panel, stripper and controls, flow monitoring and flow control equipment. The approximate dimensions of the building are 75 feet by 65 feet, with a total height of 20 feet. The building dimensions are based on the clearances recommended by the air stripper manufacturer and the dimensions of the equipment to be installed and maintained. The building will be designed and constructed as a prefabricated metal structure.

3.6 Pump and Treat System Reliability and Redundancy

The pump and treat system will be operated and maintained in accordance with the procedures described in the "Operation, Maintenance and Monitoring Plan", and manufacturer's literature and recommendations. The system design utilizes conventional technology. The equipment and labor needed to repair and/or replace the well pump, discharge pump, blower and related controls are readily available. Equipment shut down would be expected to be of short duration and given the slow movement of groundwater, the design does not include redundant wells, pumps and/or controls. Upon completion of the design plans and specifications, a detailed list of recommended spare parts and equipment will be developed. Spare parts critical to the system operation will be maintained in inventory and will be readily available to minimize downtime.

The GAC_{vapor} treatment system design incorporates three separate treatment vessels, with two operating in series in a lead-lag configuration and one designated as a spare. The system design includes a carbon saturation indicator, located on all vessels, to monitor the VOC breakthrough of each unit on-line. The system is designed to permit the operator to remove the unit in the "lead" position, from the system when it has reached saturation, and then change the unit in the "lag" position to the lead position and the spare unit in the "lag" position, and vice-versa.

The recharge system design incorporates two separate sets of leaching pools and the design is based on a long-term, reduced leaching rate. Although fouling of the recharge

system is expected over time, shut down of the pumping system would not be necessary, because the system is designed to permit the operator to remove pools from service, use standby pools and rotate pool usage.

MALCOLM PIRNIE

APPENDIX A

MAC CONSULTANTS, INC. "PRELIMINARY REMEDIAL DESIGN REPORT 35 PERCENT COMPLETION" DATED FEBRUARY 2002

NOTE:

This report has been previously submitted to the office of New York State Department of Environmental Conservation and is not provided herein.

MALCOLM PIRNIE

APPENDIX B

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, RECORD OF DECISION DATED MARCH 1998 AND SUBSEQUENT COMMENT LETTERS

Department of Environmental Conservation

Division of Environmental Remediation

Record of Decision

Fairchild Republic Main Plant Site
Town of Babylon, Suffolk County
Site Number 1-52-130

March 1998

New York State Department of Environmental Conservation
GEORGE E. PATAKI, *Governor* JOHN P. CAHALL, *Commissioner*

DECLARATION STATEMENT - RECORD OF DECISION

FAIRCHILD REPUBLIC MAIN PLANT SITE
EAST FARMINGDALE, SUFFOLK COUNTY, NEW YORK
Site No. 1-52-130

Statement of Purpose and Basis

The Record of Decision (ROD) presents the selected remedial action for the Fairchild Republic Main Plant Inactive Hazardous Waste Disposal Site which was chosen in accordance with the New York State Environmental Conservation Law (ECL). The remedial program selected is not inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan of March 8, 1990 (40CFR300).

This decision is based upon the Administrative Record of the New York State Department of Environmental Conservation (NYSDEC) for the Fairchild Republic Main Plant Inactive Hazardous Waste Disposal Site and upon public input to the Proposed Remedial Action Plan (PRAP) presented by the NYSDEC. A bibliography of the documents included as a part of the Administrative Record is included in Appendix B of the ROD.

Assessment of the Site

Actual or threatened release of hazardous waste constituents from this site, if not addressed by implementing the response action selected in this ROD, presents a current or potential threat to public health and the environment.

Description of Selected Remedy

Based upon the results of the Remedial Investigation/Feasibility Study (RI/FS) for the Fairchild Republic Main Plant Site (MPS) and the criteria identified for evaluation of alternatives, the NYSDEC has selected a groundwater pump and treat remedy with a public supply wellhead treatment contingency. The pump and treat system will be designed to intercept the 1,000 ppb total VOC plume south of the Main Plant Site.

Declaration

The selected remedy is protective of human health and the environment, complies with State and federal requirements that are legally applicable or relevant and appropriate to the remedial action to the extent practicable, and is cost effective. This remedy utilizes permanent solutions and alternative treatment or resource recovery technologies, to the maximum extent practicable, and satisfies the preference for remedies that reduce toxicity, mobility, or volume as a principal element.

3/30/98
Date

Michael J. O'Toole, Jr., Director
Division of Environmental Remediation

The primary elements of the selected remedy are as follows:

1. A predesign investigation to determine the geology of and the optimum location for the groundwater extraction wells. The predesign investigation and the long term monitoring program will also include the development of a groundwater model of the aquifer, plume tracking, plume tracking updates and plume modeling periodic updates.

2. A remedial design program to verify the components of the design and provide the details necessary for the construction, operation and maintenance, and monitoring of the remedial program.

3. Groundwater extraction to address contamination above 1,000 ppb of the total VOC plume to the south of the MPS.

4. The long-term monitoring of the extraction well system.

5. The required installation and quarterly monitoring for VOCs of outpost monitoring wells installed for the East Farmingdale Water District Wells S-66556 and S-79105; the Suffolk County Water Authority Albany Avenue Wells S-34595, S-47886 and S-6305; and the Suffolk County Water Authority Tenety Avenue Wells S-20460 and S-37681. If necessary, outpost monitoring will be added for the Suffolk County Water Authority North Fifth Street Well S-29491 and/or Lambert Avenue Well S-22351 and/or Great Neck Road Wells S-51214 and S-54568.

6. A wellhead treatment contingency plan for the design, construction, operation and maintenance of wellhead treatment systems, if necessary.

7. The East Farmingdale Route 109 and SCWA Tenety and Albany Avenue Wellfields will be sampled on a monthly basis for total volatile organic compounds.

8. Connection of any private drinking water wells within and around an area between Route 110 and Great Neck Road, Wellwood Avenue and Sunrise Highway.

New York State Department of Health Acceptance

The New York State Department of Health concurs with the remedy selected for this site as being protective of human health.

TABLE OF CONTENTS

RECORD OF DECISION

FAIRCHILD REPUBLIC
MAIN PLANT SITE

East Farmingdale, Suffolk County, New York
Site No. 1-52-130
March 1998

SECTION 1: SITE LOCATION AND DESCRIPTION

The Fairchild Republic Main Plant Site (see Figure 1) is comprised of 4.5 acres of a former facility of approximately 88 acres in East Farmingdale, Suffolk County, New York. The Main Plant Site is bounded by Route 110 (Broad Hollow Road) to the west; the Long Island Railroad (LIRR) to the north; New Highway to the east; and Republic Airport to the south. There are 4.5 acres in the southeast portion of the Fairchild property that represents the current boundary of the Fairchild Republic Main Plant Site (NYSDEC Inactive Hazardous Waste Disposal Site No. 1-52-130).

SECTION 2: SITE HISTORY

2.1: Operational/Disposal History

Fairchild Republic manufactured aircraft and related parts from 1931 to 1987. The total Fairchild Main Plant property in East Farmingdale (88 acres) consists of two parcels (see Figure 1). Parcel one is located south of Conklin Street and contains the 4.5 acre NYSDEC listed site. This parcel was first used as a runway in 1927. Seversky Aircraft operated at the site from 1931 to 1939. Republic Aviation Corporation purchased Seversky Aircraft in 1939. Numerous manufacturing buildings were built or expanded in the 1940's. Fairchild Industries, Inc. took possession of the property in 1965 when it acquired assets of Republic Aviation Corporation.

Parcel two (approximately 13 acres) is north of Conklin Street and Buildings 53, 54, and 55 were located here. The Ranger Aircraft Engine Corporation purchased the property in 1927 and constructed manufacturing and test facilities for aircraft engines. Republic Aviation Corporation purchased the property in 1955 and used the existing facilities for research and development and office space. The Farmingdale Company owned the property from 1965 to 1972. Fairchild Industries purchased the property in 1972 and used it as warehouse and office space until closing in 1987. Parcel two has been removed from the original listing of the Main Plant Inactive Hazardous Waste Disposal Site.

The Fairchild Republic Main Plant closure plan was submitted to the NYSDEC in 1987 under the Resource Conservation and Recovery Act (RCRA) requirements. The approved plan was implemented from 1987 through 1988. The site closure included the removal of hazardous materials, residues, and all above and underground storage tanks, except four 15,000 gallon fuel oil tanks, which were removed in 1992.

Fairchild Republic Main Plant manufacturing operations did not change significantly from the mid-1940s to 1987. Building 17 was the primary manufacturing area with processes including chemical milling, alodining, anodizing, vapor degreasing, titanium descaling, and cadmium plating. Process chemicals used in this area included nitric acid, chromic acid, sulfuric acid, sodium hydroxide, toluene, tetrachloroethylene (PCE), trichloroethylene (TCE), 1,1,1-trichloroethane (1,1,1-TCA), and nitric/hydrofluoric acid solutions. PCE, TCE, and 1,1,1-TCA were also used in other areas of the Main Plant.

PCE was substituted for toluene as a coatings vehicle to conform with air pollution regulations beginning in 1975. Years later, the piping from the PCE tank was found to be leaking, creating a source of PCE soil and groundwater contamination. The TCE soil and groundwater contamination came from the vapor degreaser operations, from TCE that occurs in non-reagent grade PCE, and as a breakdown product of PCE.

The Main Plant industrial water supply was always obtained from groundwater wells. The average pumping rate listed in the RI Report was estimated at 1.7 million gallons per day. Non-contact industrial and air conditioning cooling water, treated wastewater, and stormwater were discharged through the storm sewer to the Old Recharge Basin located west of the site beginning in the early 1940s (See Figure 1.)

The Old Recharge Basin historically introduced low level volatile organic compound (VOC) contamination to the groundwater beneath Republic Airport. This low level groundwater plume has commingled with higher concentration contamination from an unknown upgradient VOC source. The Remedial Investigation for the Old Recharge Basin (ORB) has shown that the ORB is no longer a source of groundwater contamination. A Record of Decision was signed for the ORB in June 1996.

Fairchild Republic constructed a wastewater treatment plant at the Main Plant Site (MPS) in 1950 to reduce hexavalent chromium to trivalent chromium and to precipitate metal hydroxides in wastewater from the chemical milling, alodine process, anodizing, spotweld wash, and paint shop operations. The plant was located adjacent to the south wall of Building 17. Wastewater was treated in batches from 1950 to 1963. The treatment plant was upgraded in 1963 to handle continuous waste streams and again in 1986 to meet publicly owned treatment works pretreatment standards. The MPS treatment plant effluent was diverted to the NYSDOT sewage treatment plant located on the Republic Airport property in 1981. In 1986, the MPS treatment plant was

connected to the Suffolk County Publicly Owned Treatment Works. Shortly thereafter in 1987 Fairchild Republic ceased manufacturing operations at the Main Plant.

Fairchild connected homes with private wells to public water that were identified within an area between Route 110 and Great Neck Road, Wellwood Avenue and Sunrise Highway. Fairchild agreed to do this work, but by doing so, Fairchild was not confirming that the contamination in these wells was from Fairchild nor were these connections made in response to any water quality problems necessarily attributable to Fairchild. Any private wells identified in this area of concern that are being used as a source of drinking water will be offered the opportunity to connect, at no cost to the homeowner, to the Suffolk County Water Authority (SCWA) public water supply by the Record of Decision.

Two abandoned 550 gallon underground storage tanks were discovered and removed during the excavation of site soils in February 1998. Both underground storage tanks were found within the boundaries of the inactive hazardous waste site. One of the recently discovered tanks was next to the vapor degreaser. Based on the analytical results from sludge samples, the leaking tank was used to store trichloroethene. The tank location was within the zone of influence of the soil vapor extraction system described in Section 3.2. The second 550 gallon tank also contained a sludge material. The analysis showed the contents to be waste paint.

2.2: Remedial History

1987-8: Phase 2 Hydrogeological Investigation and Report by Geraghty and Miller, Inc.
1988: MPS Resource Conservation and Recovery Act work plan and closure by Eder Associates; including removal of 95 above and below ground tanks, hazardous materials and residues.
1989: The MPS listed as a Class 2 inactive hazardous waste disposal site due to past disposal practices.
1990: Supplemental Phase 2 Report, Geraghty and Miller, Inc.
1991: Fairchild/Grumman Wind Tunnel Investigation and catch basin removal.
1992: Summary of Environmental Investigations Report, Geraghty and Miller, Inc.
1992: MPS RI/FS Consent Order signed.
1992: Initiate Remedial Investigation fieldwork.
1992: Building 42 soil resampled.
1993: 13 fuel oil tanks removed.
1994: Petition for and acceptance of reduction of MPS Site boundary.
1994: Building 18, 18A, 20, 25, 27, 29, 30, 30A, 38, 39, 42, 43, 44, 45, 46, 63 and 64 demolition.
1995-6: Design and installation of Building 17 Soil Vapor Extraction IRM.
1996-7: Connection of downgradient private wells within a specified area to municipal water supply.
1996-7: Area 5 Inactive Hazardous Waste Area Soil Sampling.

1996-7: Building 17, 19, 19A, 32, 33, 53 and 55 demolition.
1997: Final Main Plant Site Remedial Investigation/Feasibility Study (RI/FS) Reports.

SECTION 3: CURRENT STATUS

In response to a determination that the presence of hazardous waste at the Site presents a significant threat to human health and/or the environment, Fairchild Republic has recently completed the Remedial Investigation/Feasibility Study (RI/FS) for the Main Plant Site. The RI/FS documents can be found in the document repositories listed in Section 8.

3.1: Summary of the Remedial Investigation

The purpose of the RI was to define the nature and extent of any contamination resulting from previous activities at the site. The RI was conducted in 2 phases. The first phase was conducted between August 1992 and January 1993 and the second phase between September 1993 and February 1994. A report entitled Fairchild Industries, Inc. Main Plant Site Remedial Investigation Report, May 1997 describes the field activities and findings of the RI in detail. Data from previous investigations and additional sampling efforts in 1996 and 1997 for Old Recharge Basin fill materials were also compiled in the Main Plant Site RI Report. The RI included the following activities:

- *Installation of monitoring wells and soil borings.*
- *Chemical analysis of soil and groundwater samples.*
- *Soil gas surveys for volatile organic compounds.*
- *Groundwater hydrogeologic conditions and physical properties of site soils.*
- *Compiling all previous data generated by the Site closure and investigations.*
- *Additional site sampling for soils to be used in filling the Old Recharge Basin.*

To determine which media (soil, groundwater, etc.) contain contamination at levels of concern, the RI analytical data was compared to environmental Standards, Criteria, and Guidance values (SCGs). Groundwater, drinking water, and surface water SCGs identified for the Main Plant Site were based on NYSDEC Ambient Water Quality Standards and Guidance Values and 10 NYCRR Part 5 of NYS Sanitary Code. NYSDEC Technical and Administrative Guidance Memorandum (TAGM) 4046 Soil Cleanup Guidelines for the Protection of Groundwater, background conditions, and risk-based remediation criteria were used as SCGs for soils.

Based upon the results of the remedial investigation in comparison to the SCGs and potential public health and environmental exposure routes, certain areas and media of the site require remediation. These are summarized below. More complete information can be found in the RI Report.

Chemical concentrations are reported in parts per billion (ppb), parts per million (ppm), and parts per billion by volume (ppbv) for air samples. For comparison purposes, SCGs are given for each medium. (See Table 1.)

3.1.1: Nature of Contamination

As described in the RI Report, many soil, groundwater and soil gas samples were collected at the Site to characterize the nature and extent of contamination. These samples were analyzed for volatile and semi-volatile organic compounds, pesticides, polychlorinated biphenyls (PCBs) and inorganics (metals). Overall, chlorinated volatile organic compounds (VOCs), mainly trichloroethylene (TCE) and perchlorothylene (PCE) are the contaminants of concern for this site. Discrete areas of site soils also contained chromium above NYSDEC TAGM 4046 guidelines but below hazardous levels of concern as substantiated by the Toxicity Characteristic Leaching Procedure (TCLP). The TCLP test is used to define a hazardous waste for disposal purposes.

3.1.2: Extent of Contamination

Table 1 summarizes the extent of contamination for the contaminants of concern in the soils and groundwater and compares the data with the proposed remedial action levels (SCGs) for the Site. Some chemical concentrations no longer exist due to previously implemented interim remedial measures (IRMs). See Section 3.2. The following are the media which were investigated and a summary of the findings of the investigation:

Soil

The most significant manufacturing and process areas were located in Building 17 (see Figure 1). The alodine and chemical milling tanks, vapor degreaser, and PCE and TCA tanks were located along the southern wall. It is this area that comprises most of the currently listed 4.5 acre site. The soils beneath the slab and adjacent to Building 17 were found to be contaminated with VOCs; mainly TCE and PCE. The alodine and chemical milling areas under Building 17 and sulfuric anodizing area under Building 42 also contain levels of chromium above NYSDEC TAGM 4046 soil values.

The highest soil gas concentrations were found near the former PCE tank and near the vapor degreaser area beneath Building 17. These concentrations ranged from non-detect (ND) to 1,300 ppmv for TCE, ND to 23,000 ppmv for PCE, ND to 690 ppmv for dichloroethylene (DCE, cis & trans), ND to 61 ppmv for trichloroethane (TCA) and ND to 0.016 ppmv for vinyl chloride. There are no standards or guidance values for soil gas concentrations.

Comparative soil sample results ranged from ND to 4.4 ppm for TCE, ND to 4 ppm for PCE, ND to 0.14 ppm for DCE, ND to 0.013 ppm for TCA and 2.6 to 791 ppm for chromium. Most detectable results for soils were below NYSDEC TAGM 4046 soil cleanup values of 0.7 ppm for TCE, 1.4 ppm for PCE, 0.4 ppm for DCE, 0.8 ppm for TCA and 50 ppm for chromium. The chromium contaminated soils did not fail TCLP and were excavated and removed from the Site.

Groundwater

The direction of groundwater for both the shallow and deep zone is illustrated in Figure 2. The RI determined that Building 17 is a significant source area for VOC groundwater contamination. There is an extensive PCE plume that is well defined emanating from the area of the former PCE tank. This plume is moving south-southeast beneath the runways of Republic Airport as shown on Figure 3. In the area of the MPS Site, the glacial aquifer flow in the horizontal direction is about 1.5 feet/day.

No information exists on the duration of TCE use or discharges at the MPS. The vapor degreaser is a source of contamination of TCE (see Figure 4). However, the TCE plume is not as well defined as the PCE plume for the following reasons: (1) the former high volume MPS groundwater production wells and the new recharge basins on the MPS Site (see Figure 2) may have affected the offsite migration of the plume, especially in the glacial aquifer; and (2) off-site sources of TCE, including the Old Recharge Basin (ORB), may have impacted the western portion of the groundwater plume beneath Republic Airport. Furthermore, the downgradient extent of the MPS VOC plume has never been fully established. However, it does extend south of Republic Airport.

Under Building 17, there is no clay layer separating the glacial and Magothy aquifers. However, there is an unnamed clay layer separating the upper Magothy from the lower Magothy. Elevated levels of PCE have migrated downward through the glacial aquifer toward the top of a clay layer confining unit separating the upper and lower portions of the Magothy aquifer. The RI soil borings indicate this clay layer is continuous throughout the area of concern as shown on Figure 5. Deep aquifer testing below this clay formation found no VOCs and indicated that this clay layer has restricted downward migration and enhanced lateral migration of contaminated groundwater flow.

A limited sampling of MPS groundwater wells was conducted in February 1997. The data revealed that the shallow and deep VOC groundwater contamination beneath the Main Plant Site had dropped significantly and moved downgradient. For example MW-19D, located just downgradient of the Building 17 source areas, decreased from 3,600 ppb PCE to 142 ppb of PCE.

Some benzene, toluene, ethylbenzene and xylene (BTEX) was found in upgradient MW-3 from an offsite spill that has since been remediated. The February 1997 sampling round that included MW-3, found BTEX reductions to just above SCGs. The groundwater analytical data was also reviewed for inorganic SCG exceedences; including chromium. The groundwater analytical results indicate that the MPS is not a source of inorganic contamination to groundwater.

Historic low level VOC groundwater contamination slightly above SCGs from the ORB can also be found on the southwestern side of Republic Airport. The majority of this plume is TCE and has commingled with the plume of a much higher level of TCE from an unidentified upgradient source. It has been more than 15 years since Fairchild discharged into the recharge basin. More recent MPS RI data shows the ORB is no longer a source of VOC groundwater contamination.

Groundwater concentrations exceeded the standard for TCE in 68 of the 160 samples taken. The maximum RI TCE concentration was 1,659 ppb. For PCE the standard was exceeded in 39 of 160 samples taken. The maximum RI PCE concentration was 5,100 ppb. For vinyl chloride, the standard was exceeded in 26 of 160 samples. The maximum RI vinyl chloride concentration was 200 ppb. These groundwater concentrations were found downgradient of the MPS and represent a significant exceedence of SCGs in the glacial and Magothy aquifers. The NYS groundwater standard is 5 ppb for TCE, PCE and DCE and 2 ppb for vinyl chloride. (See Table 1.)

3.2: Interim Remedial Measures

Interim Remedial Measures (IRMs) are conducted at sites when a source of contamination or exposure pathway can be effectively addressed before completion of the RI/FS. Fairchild Republic has elected to implement two IRMs at the Main Plant Site. The first IRM consisted of two soil vapor extraction (SVE) systems in Building 17 of the MPS Site. The second IRM removed the chromium contaminated soils from the surface of the Main Plant Site.

One SVE system addressed the TCE associated with the vapor degreaser located in the southwest corner of Building 17. The second SVE system addressed the PCE associated with the PCE tank located adjacent to the southeast portion of Building 17. The SVE systems operated beneath the slab of Building 17 for more than one year. The SVE effluent prior to treatment approached non-detect after a period of turning on and turning off (pulsing) the system. Test results of the soils were compared to NYSDEC TAGM 4046 guidance values. These results demonstrated that VOCs were effectively removed from the soils beneath Building 17. Both SVE systems were decommissioned in March 1997.

The second IRM consisted of excavating and removing chromium contaminated soils from the Site. These soils were placed in the Old Recharge Basin with the restriction that they must be placed a minimum of 10 feet below ground surface and 5 feet above the water table. None of the chromium analytical results for these soils exceeded chromium concentrations that currently exist in the Old Recharge Basin. The completed soil vapor extraction system, the chromium soil IRM, and the RCRA closure have removed all source areas from the MPS soils.

3.3: Summary of Human Exposure Pathways

This section discusses the potential pathways of exposure for people living near the Fairchild Republic Site. An exposure pathway is how an individual may come in contact with a contaminant. The elements of an exposure pathway include; the source of contamination; the contaminated environmental media (i.e. soil, water and air) and the way the contaminant migrates from the source; the location where one may be exposed to the contamination; how the contaminant enters the body (i.e. inhalation, ingestion, and/or adsorption through the skin); and, the population exposed to the contamination.

The potential exposure pathway of concern at the MPS is ingestion of contaminated groundwater. During the RI, volatile organic compounds were detected in on-site and off-site groundwater monitoring wells at concentrations significantly above drinking water standards. There are three public drinking water supply wellfields located downgradient from the MPS. These include: the East Farmingdale Water District Route 109 Wellfield, and the Suffolk County Water Authority Albany Avenue and Tenety Avenue Wellfields. Two additional Suffolk County Water Authority Wellfields, North Fifth Street and Lambert Avenue are much further downgradient and should not be effected by the MPS plume. Public supply well locations are shown on Figure 6.

VOCs were detected in the shallow wells at the Albany Avenue Wellfield in 1977. The contaminated wells were taken out of service in early 1977 and remain off-line. Organic chemical contamination has never been detected in the three deep wells at Albany Avenue, or at the other downgradient wellfields.

At the request of the NYSDOH, a private well survey was conducted downgradient of the MPS between Route 110 and Great Neck Road, Wellwood Avenue and Sunrise Highway. Several private wells were identified during the survey, some of which were used as a drinking water source. The residents with homes supplied only by private drinking water wells identified during the survey were advised as appropriate on measures to reduce possible exposure to contaminants that may be in their drinking water. Many of these homes have since been connected to public water. In the future, all homes serviced by private drinking water wells located in and around Route 110 and Great Neck Road, Wellwood Avenue and Sunrise Highway will be connected to public water, if permitted by the homeowner, at no cost to the homeowner. Currently, exposure to site-related chemicals in the public water supply is unlikely since routine monitoring of the public drinking water supply wells has not detected contamination.

In order to evaluate the health risks associated with exposure to contaminated drinking water, Fairchild Republic prepared a Risk Assessment using a groundwater model to predict what the concentration of VOCs would be if contaminants migrated to downgradient public drinking water supply wells. Groundwater models, such as the one used by Fairchild, which attempt to predict contaminant levels after microbial decomposition and transport through a heterogenous media (soil), can be highly speculative and may significantly underestimate the health risks associated

with exposure to contaminated drinking water. Therefore, NYSDOH requested that Fairchild recalculate the health risks associated with exposure to contaminated drinking water using the actual VOC levels detected in groundwater during the RI. However, in order to proceed with the RI/FS process, the NYSDOH and NYSDEC allowed Fairchild to forego recalculation of the Risk Assessment as requested, provided that Fairchild agree to a remedial action objective for the groundwater contamination that will be protective of human health and the environment.

3.4: Summary of Environmental Exposure Pathways

This section summarizes the types of environmental exposures which may be presented by the Site. No impacts from the Main Plant Site to fish and wildlife resources were found.

No potential environmental exposure to natural habitats were found to exist based on the MPS data and no future impacts to surface water or fish and wildlife resources are expected. No wetlands or surface water bodies have been identified on or within a one-half mile downgradient radius of the Site. Surrounding land use is light industrial in all directions with the closest residential area over one-half mile to the west.

SECTION 4: ENFORCEMENT STATUS

Potentially Responsible Parties (PRPs) are those who may be legally liable for contamination at a site. This may include past or present owners and operators, waste generators, and haulers.

The Potentially Responsible Party (PRP) for this Site is Mairoll, Inc., which is a subsidiary of the Fairchild Holding Corporation. Fairchild implemented the RI/FS at the Site, as requested by the NYSDEC. After the remedy is selected, Fairchild will be requested to implement the remedial program. If an agreement cannot be reached with Fairchild, the NYSDEC will evaluate the site for further action under the State Superfund. The PRPs are subject to legal actions by the State for recovery of all response costs incurred by the State.

The following is the chronological enforcement history of this site:

Plans

1987-8 RCRA Closure Plan

Orders on Consent

Date	Index No.
03/20/92	No. W1-0461-90-02-MPS RI/FS Order
12/25/96	No. W1-0705-94-08-ORB Fill Order

SECTION 5: SUMMARY OF THE REMEDIATION GOALS

Goals for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375-1.10. The overall remedial goal is to meet all Standards, Criteria, and Guidance values (SCGs) and be protective of human health and the environment.

At a minimum, the remedy selected should eliminate or mitigate all significant threats to the public health and to the environment presented by the hazardous waste disposed at the site through the proper application of scientific and engineering principles.

The following are goals, or remedial action objectives (RAOs) selected for this site:

- Reduction, control, or elimination to the extent practicable of the contamination present within the soils on site.
- Eliminate the threat to surface waters by eliminating any future contaminated surface run-off from the contaminated soils on site.
- Eliminate the potential for direct human exposure with the contaminated groundwater from the site.
- Mitigate the impacts of contaminated groundwater to the environment.
- Provide for attainment of SCGs for groundwater quality to the extent practicable.
- To the extent practicable, restore the site to pre-disposal conditions.

SECTION 6: SUMMARY OF THE EVALUATION OF ALTERNATIVES

The selected remedy should be protective of human health and the environment, be cost effective, comply with other statutory laws, and utilize permanent solutions, alternative technologies or resource recovery technologies to the maximum extent practicable. Potential remedial alternatives for the Main Plant Site were identified, screened, and evaluated in a Feasibility Study. This evaluation is presented in the report entitled "Fairchild Industries, Inc., Main Plant Feasibility Study Report, dated September, 1997."

The RI/FS determined that it was not technically or economically feasible to restore the aquifer to groundwater quality standards. There are many areas around the MPS where groundwater VOC contamination exists above SCGs. Groundwater remedies which will intercept and treat groundwater under Republic Airport with 5 ppb of VOCs or greater, will still not guarantee that downgradient public supply wells, shown on Figure 6, will not be effected at some time in the

future. Therefore, those alternatives that addressed groundwater with 5 ppb or greater of VOCs were screened out and removed from further consideration.

6.1: Description of Remedial Alternatives

The MPS Feasibility Study Report contains four groundwater pump and treat remedies. The groundwater concentration isocontours used in Alternatives 2, 3, 4, and 5 of the MPS FS are based only on PCE RI data. Additional VOC concentrations from TCE due to the MPS vapor degreaser and other sources have increased total VOC concentrations in the areas downgradient of the MPS. Given the known rate of groundwater flow in the glacial and Upper Magothy aquifers in the area of Republic Airport, the NYSDEC has projected total VOC horizontal contours and revised all the alternatives of the FS accordingly. These modified alternatives are designed to intercept the total VOC plume downgradient of the MPS. Figure 7 shows the approximate location of the extraction wells for all of the groundwater alternatives.

Since the RI data used as the basis of the MPS Feasibility Study is almost five years old, a predesign study will be required in the areas where the extraction wells will be installed. The predesign study will delineate the total current horizontal and vertical VOC isocontour concentrations and the geological conditions in the area the extraction wells will be installed.

Since any remedy selected will result in hazardous waste remaining in the groundwater to be reduced by natural attenuation over a period of time, a long-term monitoring program will be instituted. This program will allow the effectiveness of the selected remedy to be monitored and will be a component of the operation and maintenance program for the site. It is a part of each alternative.

As used in the following text, the time to implement reflects only the time required to construct the remedy and does not include the time required to design the remedy, procure contracts for design and construction or to negotiate with the responsible party for implementation of the remedy.

The cost of each alternative is presented as the capital cost, annual operation and maintenance (O&M) cost, and the total present worth cost. Present worth is defined as the amount of money currently required (in 1998 dollars at 5 percent interest) to fund the capital cost and 30 years or the number of years required for the O&M cost.

Alternative 1: No Further Action

The no further action alternative is evaluated as a procedural requirement and as a basis for comparison. This alternative recognizes remediation of the site conducted under previously completed IRMs. Only continued monitoring is necessary to evaluate the effectiveness of the remediation completed under the IRMs. This alternative will leave the groundwater downgradient

of the site in its present condition and will not provide any additional protection to human health or the environment. It requires minimal long-term monitoring only to track plume migration and to evaluate the effectiveness of the remediation completed under the IRMs. Contamination concentrations will be reduced only by natural attenuation.

Present Worth:	$328,000
Capital Cost:	$ 87,000
Annual O&M Year 1:	$ 25,000
Annual O&M Year 2-30:	$ 15,000

Each of the next five alternatives contain appropriate long-term monitoring to verify the effectiveness of the remedy being implemented.

Alternative 2: Pump and Treat Groundwater approaching the 500 ppb total VOC Plume Boundary With Alternative 6 Contingency

This alternative consists of installing six groundwater recovery wells, each pumping approximately 300 gallons per minute (gpm) near the Southern State Parkway. This pumping will intercept the elevated portion of the total VOC plume. The zone of influence created by the extraction system will capture the width of the plume defined by the 500 ppb total VOC plume isocontour. Extracted groundwater will be treated to SCGs and recharged to groundwater. Contaminants in the remainder of the plume will be reduced by natural attenuation. The time to construct this remedy is six months to a year.

Present Worth:	$10,530,000
Capital Cost:	$1,767,000
Annual O&M Year 1:	$ 588,000
Annual O&M Year 2-30:	$ 569,000

Alternative 3: Pump and Treat Groundwater above 1,000 ppb total VOCs with Alternative 6 Contingency

This alternative consists of a minimum of two recovery wells pumping at least 250 gpm each with a projected location near the Breslau property. The need for additional wells will be determined in the design phase. Alternative 3 will only extract the highly contaminated groundwater approaching the 1,000 ppb most contaminated total VOC plume under Republic Airport. Extracted groundwater will be treated to SCGs and recharged to the aquifer. Contaminants in the remainder of the plume will be reduced by natural attenuation. The time to construct this remedy is six months to a year.

Present Worth:	$3,468,000
Capital Cost:	$ 738,000
Annual O&M Year 1:	$ 202,000
Annual O&M Year 2-30:	$ 176,000

Alternative 4: Pump and Treat Groundwater above 1,000 ppb total VOCs and at the 500 ppb total VOC Plume Boundary with Alternative 6 Contingency

This alternative consists of eight recovery wells, which is Alternatives 2 and 3 combined. Six extraction wells will be installed at the edge of the 500 ppb total VOC isocontour, each pumping approximately 300 gpm. The remaining two extraction wells will be installed near the Breslau property, pumping at least 250 gpm each. This should potentially reduce the time for operation. Extracted groundwater will be treated to SCGs and recharged to the aquifer. Contaminants in the remainder of the plume will be reduced by natural attenuation. The time to construct this remedy is six months to a year.

Present Worth:	$13,895,000
Capital Cost:	$ 2,398,000
Annual O&M Year 1:	$ 771,000
Annual O&M 2-30:	$ 743,000

Alternative 5: Pump and Treat Groundwater above 1,000 ppb total VOCs and Install Wellhead Treatment Now

This alternative consists of a minimum of two extraction wells pumping at least 250 gpm each and located near the Breslau property. Alternative 5 will only extract the highly contaminated groundwater above 1,000 ppb of the total VOC plume found on Republic Airport. Extracted groundwater will be treated to SCGs and recharged to the aquifer. Contaminants in the remainder of the plume will be reduced by natural attenuation. Wellhead treatment as described in Alternative 6 would be installed now. Outpost monitoring will not be needed. The time to construct this remedy is six months to a year.

Groundwater Remedy:

Present Worth:	$3,468,000
Capital Cost:	$ 738,000
Annual O&M Year 1:	$ 202,000
Annual O&M Year 2:	$ 176,000

Wellhead Treatment:

1. East Farmingdale
   Present Worth: $1,228,000

Capital Cost:	$ 876,000
Annual O&M:	$ 6,000
Carbon Replacement:	$ 40,000

2. SCWA Albany Avenue

Present Worth:	$1,004,000
Capital Cost:	$ 870,000
Annual O&M:	$ 6,000
Carbon Replacement:	$ 40,000

3. SCWA Tenety Avenue

Present Worth:	$ 984,000
Capital Cost:	$ 879,000
Annual O&M:	$ 6,000
Carbon Replacement:	$ 40,000

Total Present Worth:	$6,684,000
Total Capital Cost:	$3,363,000
Total Annual O&M (Year 1):	$ 340,000
Total Annual O&M (Year 2):	$ 314,000

Alternative 6: Wellhead Treatment Contingency:

A. Outpost Monitoring and;
Wellhead Treatment for:
B. East Farmingdale Water District Wells (S-66556 and S-79105);
C. Suffolk County Water Authority Wells at Albany Ave. (S-34595, S-47886 and S-6305); and
D. Suffolk County Water Authority Wells at Tenety Ave. (S-20460, S-37681).

None of Alternatives 2, 3, 4, or 5 will intercept all of the MPS contamination in the downgradient groundwater. In order to correct for this potential shortfall, Alternative 6, listed as a stand alone alternative in the FS, contains outpost monitoring and a wellhead treatment contingency. Outpost monitoring will indicate if treatment of a municipal water supply is needed to address MPS plume impacts. Since this will be a requirement to ensure protection of human health, a detailed analysis for Alternative 6 was not performed. Rather, Alternative 6 will supplement the inability of any other alternatives, except Alternative 5 with wellhead treatment now, to address all contamination above SCGs for protection of human health.

This alternative will monitor VOC concentrations in the groundwater and provide contingency to install wellhead treatment at public supply wells downgradient of the MPS, if necessary, to protect

public health. A wellhead treatment system will be designed, if outpost monitoring well data, as determined by the NYSDEC and State and County Health Departments, upgradient of one or more public supply wells indicates that treatment is necessary.

Outpost monitoring well clusters will be installed upgradient of the East Farmingdale Route 109 Wellfield, the SCWA Albany Avenue Wellfield, and the SCWA Tenety Avenue Wellfield. These wells are the closest downgradient to the MPS at 6,600 feet for East Farmingdale and 14,000 feet for the SCWA wells. It is not expected that the SCWA Lambart Avenue and North 5th Street wells, located almost four miles downgradient, will be effected by the MPS plume. Conceptual remedial designs and cost estimates have been developed for treatment systems at the East Farmingdale Route 109 and the SCWA Albany Avenue and Tenety Avenue public supply wells.

A. Outpost Monitoring:
East Farmingdale: 2 wells at 350 and 500 feet.
Albany Ave.: 3 wells at 100, 200 and 300 feet.
Tenety Ave.: 3 wells at 100, 200 and 300 feet.

Present Worth:	$ 277,000
Capital Cost:	$ 123,000
Annual O&M:	$ 10,000

Wellhead treatment:

B. East Farmingdale: Installed 10 years from now:

Present Worth:	$1,228,000
Capital Cost:	$ 876,000
Annual O&M:	$ 6,000
Carbon Replacement:	$ 40,000

C. SCWA Albany Avenue: Installed 20 years from now:

Present Worth:	$1,004,000
Capital Cost:	$ 870,000
Annual O&M:	$ 6,000
Carbon Replacement:	$ 40,000

D. SCWA Tenety Avenue: Installed 20 years from now:

Present Worth:	$ 984,000
Capital Cost:	$ 879,000
Annual O&M:	$ 6,000
Carbon Replacement:	$ 40,000

Total Present Worth:	$3,493,000

Total Capital Cost:	$2,748,000
Total Annual O&M:	$ 49,000

Carbon change out is estimated to be:
East Farmingdale: Every 364 Days
Albany Avenue: Every 308 Days
Tenety Avenue: Every 500 Days

6.2: Evaluation of Remedial Alternatives

Based on information presented in the MPS RI Report, it is not economically or technically feasible to contain and treat the entire contaminant plume migrating from the Fairchild Republic Main Plant Site, the full downgradient extent of which is not currently known. Nor is it feasible to define the low level VOC plume, greater than the NYS Drinking Water Standard of 5 ppb, but generally less than 50 ppb, downgradient of the Old Recharge Basin that has combined with a much higher concentration VOC plume from an unknown upgradient source. Public health must and will be protected with public water supply protection detailed in Alternative 6. Also, the connection to public water of any resident utilizing a private drinking water well, free of charge, that is within the area of concern downgradient from this site, will provide additional public health protection.

A summary of the detailed analysis follows. The criteria used to compare the potential remedial alternatives are defined in the regulation that directs the remediation of inactive hazardous waste disposal sites in New York State (6 NYCRR Part 375). For each of the criteria, a brief description is provided, followed by an evaluation of the alternatives against that criterion. A detailed discussion of the evaluation criteria and comparative analysis is contained in the Feasibility Study.

Threshold Criteria: The first two evaluation criteria must be satisfied in order for an alternative to be considered for selection.

1. **Protection of Human Health and the Environment.** This criterion is an overall and final evaluation of the health and environmental impacts to assess whether each alternative is protective. This evaluation is based upon a composite of factors assessed under other criteria, especially short/long term effectiveness and compliance with Standards, Criteria and Guidance values (SCGs).

Alternative 1 will not be protective of human health as the potential for exposure to contaminated groundwater will not be addressed. Alternatives 2 and 4 by themselves will be the most effective in protection of human health and the environment as more of the total VOC contamination will be addressed and will most likely reduce the need for implementation of well head treatment. Alternatives 3 and 5 will be slightly less effective for groundwater protection as a smaller portion

of the total VOC plume will be addressed. None of Alternatives 2, 3, 4, or 5 will intercept all of the total VOC contamination in the downgradient groundwater.

Alternative 1 is unacceptable as contaminated groundwater will remain in its present condition for an indeterminate amount of time. The environment will also remain unprotected. Since Alternative 1 offers no protection of human health or the environment and is not compliant with SCGs, it is eliminated from further consideration.

The wellhead treatment contingency listed in Alternative 6 will be a requirement for the protection of human health, and as such is added to Alternatives 2, 3 and 4. Alternative 6 will protect public supply wells by monitoring of outpost wells and a contingency to provide wellhead treatment, if necessary.

2. **Compliance with New York State Standards, Criteria, and Guidance Values.** Under this criterion, the issue of whether a remedy will meet all of the federal and State environmental laws and regulations is addressed. If these laws and regulations will not be met, then grounds for invoking a waiver must be provided.

The most significant SCGs are the New York State Water Quality Regulations. This includes 10 NYCRR Part 5 Drinking Water Standards and 6 NYCRR Part 700 Groundwater Standards. 6 NYCRR Part 200 Air Quality Regulations are relevant to the air discharges from each groundwater treatment system.

Alternatives 2, 3, 4 and 5 will be compliant with SCGs for the portion of the groundwater plume addressed by each alternative. The groundwater treatment systems will be designed to be compliant with the NYSDEC Part 200 Air Quality Regulations. Alternative 6 by itself does not address any of the groundwater standards.

The 5 ppb groundwater standard for primary organic compounds will not be met with respect to plume interception, although natural attenuation should reduce site related contaminant concentrations to below 5 ppb over time.

Primary Balancing Criteria: The next five "primary balancing criteria" are used to compare the positive and negative aspects of the various alternatives.

3. **Short-term Effectiveness.** Under this criterion, the potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and/or implementation were evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared against the other alternatives.

Alternatives 2, 3, 4 and 5 will all have the similar short-term impacts related to construction of the pump and treat system on or near Republic Airport and the State Highways. Alternatives 2 and 4 will have a potentially higher short term impact due to the increased amount of construction work required on the Airport property. Worker exposure to VOCs during construction will be controlled through a site-specific health and safety plan developed prior to implementation of any of the groundwater remedies.

4. **Long-term Effectiveness and Permanence.** This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes or treated residuals remain on site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks; 2) the adequacy of the controls intended to limit the risk, and 3) the reliability of these controls.

Alternative 4 has a higher long term effectiveness due to a larger contaminant mass removal from the groundwater. Alternative 2 will remove almost as much as Alternative 4 except for some potential dispersion between the middle and the end of the plume. Alternative 3 and Alterative 5 will remove less of the total VOC contamination than Alternatives 2 and 4, but will remove the highly contaminated portion of the total VOC plume.

Alternatives 2, 3, 4 and 5 will all contain air stripping technology. Air stripping with emission controls, if required, is a common, proven and reliable technology which will be operated over the long term to reduce the VOC groundwater contamination due to the MPS. None of the remedies will leave any residual contamination on site, however, none of the alternatives will completely remediate the plume.

Alternatives 3 and 5 will require a longer period of time to achieve the remedial action objectives. Alternatives 2 and 4 will require a slightly shorter period of time to meet the remedial action objectives. The time is based on the rate of travel of the contaminated groundwater downgradient of the MPS.

5. **Reduction of Toxicity, Mobility or Volume.** Preference is given to alternatives that permanently, and by treatment reduce the toxicity, mobility or volume of the wastes at the site.

By means of groundwater extraction at the center and southern end of Republic Airport, Alternatives 2 and 4 offer the highest reduction in volume of the effected groundwater. Alternatives 3 and 5 will offer less contamination reduction, but will intercept the most contaminated portion of the VOC plume and offer a substantial reduction in toxicity, mobility and volume of contamination. Alternative 6 with outpost monitoring and wellhead treatment, if necessary, will be included with any remedy, except Alternative 5, and will reduce the toxicity of the contamination to the public. Alternative 5 eliminates the need for outpost monitoring by

immediately putting wellhead treatment on the East Farmingdale Route 109, and SCWA Albany Avenue and Tenety Avenue Wellfields.

6. **Implementability.** Under this criterion, the technical and administrative feasibility of implementing each alternative are evaluated. Technical feasibility includes the difficulties associated with the construction and the ability to monitor the effectiveness of the remedy. For administrative feasibility, the availability of the necessary personnel and material is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, etc.

Alternatives 2, 3, 4, and 5 will all be implementable with respect to construction. Alternative 4 will be the most difficult to implement because it contains the most number of extraction wells and has the highest groundwater pumping rate. Alternatives 3 and 5 have slightly less construction requirements on airport property than Alternatives 2 and 4. The need for VOC emission air controls on an air stripper will be evaluated during the design phase.

7. **Cost.** Under this criterion, capital and operation and maintenance (O&M) costs are estimated for each alternative and compared on a present worth basis. Although cost is the last criterion evaluated, where two or more alternatives have met the requirements of the other criteria, cost effectiveness can be used as the basis for the final decision.

The costs for each alternative are presented in Section 6.1 and Table 2. The costs for Alternative 6, wellhead treatment, will be common to Alternatives 2, 3 and 4. Alternative 5 will not contain outpost monitoring. Alternative 6, with outpost monitoring and the wellhead treatment contingency to protect the public drinking water supply has a present worth of $277,000 for outpost monitoring and $3,216,000 for wellhead treatment, respectively.

Modifying Criterion: This final criterion is taken into account after evaluating those above. It is focused upon after public comments on this Proposed Remedial Action Plan (PRAP) have been received.

8. **Community Acceptance** - Under this criterion, concerns of the community regarding the RI/FS Report and the Proposed Remedial Action Plan are evaluated. The concerns of the community are presented along with the NYSDEC's responses to these concerns, in the Responsiveness Summary (Appendix A) to the Record of Decision.

SECTION 7: SUMMARY OF THE SELECTED ALTERNATIVE

Based upon the results of the RI/FS and the evaluation presented in Section 6 and the reasons presented below, the NYSDEC is selecting Alternative 3 which includes Alternative 6. Alternative 3 will be designed to intercept the 1,000 ppb total VOC plume south of the Main Plant Site. The

capture zone will intercept groundwater as depicted in Figure 7 and as determined by the predesign study. The groundwater remedy will begin at the water table and intercept all incoming contaminated groundwater along both a horizontal and vertical axis. Additionally, a wellhead treatment contingency will be in effect for the East Farmingdale Route 109 and SCWA Albany Avenue and Tenety Avenue Wellfields with outpost monitoring to determine if wellhead treatment is necessary.

The selected remedy, Alternative 3 with Alternative 6, was chosen based on the fact that it is not economically or technically feasible to contain and treat all the contaminated groundwater migrating from the Fairchild Republic Main Plant Site with concentrations greater than the New York State Drinking Water Standard of 5 ppb. The probability of impacts to the public water supply wells is low. These wells will be protected by the monitoring of outpost wells upgradient of the public water supply wells and with a contingency to provide wellhead treatment, if necessary. The preference to permanently and significantly reduce the toxicity, mobility or volume of VOCs in groundwater is satisfied in that this remedy will attempt to reduce the mass of VOCs in the groundwater by recovering, treating and discharging groundwater contaminated by the Fairchild Republic Main Plant Site plume with total VOCs greater than 1,000 ppb. The remedial goal to provide for attainment of the 5 ppb groundwater standard will be met in the treated aquifer segment, to the extent practicable.

Part of the remedy may address contamination that has not been conclusively attributable to Fairchild. As more data becomes available, other PRPs may be identified. In the same manner, not all of the contamination attributable to Fairchild will be addressed by the selected groundwater remedy.

The elements of the selected remedy are as follows:

1. A predesign investigation to determine the geology of and the optimum location for the groundwater extraction wells. This predesign investigation will derive the data necessary to determine the screen zone of each extraction well. In addition, the number of extraction wells will be substantiated and the potential need to cluster these wells will be determined. The predesign investigation and the long term monitoring will also include the development of a groundwater model of the aquifer, plume tracking, plume tracking updates and plume modeling periodic updates. The results will identify the fate and transport of the unremediated portion of the groundwater plume including whether the Suffolk County Water Authority Great Neck Road Wellfield is at risk due to the potential for increased pumping rates.

2. A remedial design program to verify the components of the design and provide the details necessary for the construction, operation and maintenance, and monitoring of the remedial program. Any uncertainties identified during the RI/FS, and due to the length of time between

the remedial investigation and the remedial design, will be resolved through the installation of monitoring wells and/or hydropunch data and sampling of existing monitoring wells, if necessary.

3. Groundwater extraction to address contamination above 1,000 ppb of the total VOC plume to the south of the MPS. The capture zone must be three dimensional from the water table to the depth of contamination to intercept the width and depth of the 1,000 ppb total VOC plume. The installation of at least 2 groundwater extraction wells, or comparable remedial technology, pumping a minimum total combined rate of 500 gpm, or a comparable remedial technology; with all necessary piping to install the wells and properly run the discharge to the groundwater treatment systems.

4. Construction of a groundwater recharge system, if necessary, that is outside the groundwater extraction zone, unless this can be demonstrated otherwise by design calculations.

5. The installation of the necessary air stripping systems or comparable remedial technology designed to remove VOCs in the extracted groundwater to meet the State Pollution Discharge Elimination System (SPDES) discharge limitations.

6. The installation of air emission controls, if required, to comply with the NYSDEC air regulations.

7. The long-term monitoring of the extraction well system by means of the installation and use of upgradient and downgradient groundwater shallow and deep monitoring wells. This will be done semi-annually the first year and annually thereafter to verify the system performance. Additionally, quarterly elevation monitoring will be done in the first year to determine the groundwater capture zone in different seasons and annually thereafter.

8. The required installation and quarterly monitoring for VOCs of outpost monitoring wells installed for the East Farmingdale Water District Wells S-66556 and S-79105; the Suffolk County Water Authority Albany Avenue Wells S-34595, S-47886 and S-6305; and the Suffolk County Water Authority Tenety Avenue Wells S-20460 and S-37681. If necessary, outpost monitoring will be added for the Suffolk County Water Authority North Fifth Street Well S-29491 and/or Lambert Avenue Well S-22351 and/or Great Neck Road Wells S-51214 and S-54568. The remedial design will evaluate and determine the best locations for these outpost wells.

9. Wellhead treatment contingency plan for the design, construction, operation and maintenance of wellhead treatment systems, if necessary. If the evaluation of the monitoring indicates that the outpost monitoring wells are contaminated with MPS contaminants, treatment at the public supply wells will be necessary to comply with 10 NYCRR Part 5 Drinking Water Standards.

An activated carbon or comparable treatment system to produce potable water will be designed and constructed. Alternatively, if Mairoll/Fairchild Corporation reaches a cash settlement with the SCWA and/or the East Farmingdale Water District, then each settling Water Authority and/or District will be responsible for its respective implementation of, as necessary, wellhead treatment.

10 Any detection of 1 ppb or more of MPS site related contamination in the outpost monitoring wells will "trigger" Fairchild to evaluate the rate of movement of the MPS contaminants towards the public supply wells. If VOC concentrations in the outpost well(s) exceed the respective standards, a minimum of one and a maximum of three confirmatory samples will be collected within 30 days and the results evaluated by the NYSDEC and the State and County Health Departments. If the NYSDEC's and the Health Departments' evaluation indicates that wellhead treatment is necessary to comply with drinking water standards, the design phase of the wellhead treatment system(s) will begin.

11 The East Farmingdale Route 109 and SCWA Tenety and Albany Avenue Wellfields will be sampled on a monthly basis for total volatile organic compounds.

12 A performance evaluation will be conducted at least once a year to determine whether the remedial goals have been or can be achieved, and whether the monitoring should continue.

13 Connection of any private drinking water wells within and around an area between Route 110 and Great Neck Road, Wellwood Avenue and Sunrise Highway.

14 A plan to properly close all monitoring wells associated with the Old Recharge Basin and the MPS no longer required as part of the remedial action or the long term operation and maintenance plan.

The selected remedy for any site should, at a minimum, eliminate or mitigate all significant threats to the public health or the environment presented by the hazardous waste present at the site. The State believes that the IRM remediations which have taken place, and the implementation of the selected remedy, which is described in this section, will accomplish this objective provided that it continues to be operated and maintained in a manner consistent with the design.

The estimated present worth to implement the groundwater portion of Alternative 3 is $3,468,000. The estimated cost to construct the groundwater portion is $738,000 and the estimated average annual operation and maintenance cost for the groundwater portion, which will be necessary for thirty years, is $202,000 for the first year and $176,000 for the remainder of thirty years. The present worth estimate for outpost monitoring implementation will be $277,000. The combined total present worth for wellhead treatment calculated for the East Farmingdale Route 109, and

SCWA Albany Avenue and Tenety Avenue Wellfields is $3,216,000. The total present worth of the proposed remedy is $6,961,000.

The source areas associated with the MPS have been removed. The Department will reclassify the site from a Class 2 to a Class 4 on the New York State Registry of Inactive Hazardous Waste Disposal Sites after the remedy has been installed and is operating. A Class 4 site is defined as a site that has been properly closed but requires continued operation, maintenance and monitoring.

SECTION 8: HIGHLIGHTS OF COMMUNITY PARTICIPATION

As part of the remedial investigation process, a number of Citizen Participation activities were undertaken in an effort to inform and educate the public about conditions at the site and the potential remedial alternatives. The following activities were conducted at the site:

- A Citizen Participation Plan was developed and repositories were established for site related documents. They are located at the Farmingdale Free Library on Merritts Road, the NYSDEC Region 1 SUNY Stony Brook office and the NYSDEC Central office at 50 Wolf Road in Albany.

- A public contact list was established which included nearby property owners, local elected officials, local media and other interested parties.

- Fact sheets were mailed to the contact list on several occasions to update interested parties on the site status.

- Public informational meetings were held in June 1992, December 1994, March 1996 and February 1998 to discuss this project and answer questions posed by the public.

- In January 1998 a public information sheet was mailed to the public contact list and a public meeting was held on February 10, 1998 to present the Fairchild Republic Main Plant Site Proposed Remedial Action Plan (PRAP). A 30 day public comment period was established for the receipt of written comments which closed on February 27, 1998.

- In March 1998 a Responsiveness Summary was prepared to address the comments and questions received during the public comment period for the PRAP. This was sent to the meeting attendees, placed in the document repositories and appended to the Record of Decision.

GLOSSARY OF TERMS

Alodine:	Refers to a process used to treat metals to make them corrosion resistant
ARAR:	Applicable or relevant and appropriate requirement
Capital Cost:	Refers to the cost of constructing a remedial alternative
CERCLA:	Comprehensive Environmental Response, and Comprehensive Liability Act (USEPA)
Chemical Milling:	A process using acids to etch specific areas of metal surfaces
Chromium:	An inorganic element used in various manufacturing processes at the MPS Site
ECL:	Environmental Conservation Law
FS:	Feasibility Study
Glacial:	Refers to the Glacial or shallow aquifer associated with Long Island
Groundwater Contours:	Equipotential lines of groundwater elevation
IRM:	Interim Remedial Measure
Magothy:	Refers to the section of the Long Island aquifer below the Glacial aquifer and above the Lloyd aquifer
Metal Hydroxides:	Refers to basic compounds consisting of an inorganic and a hydroxyl group capable of combining with a proton to form a new compound
MGD:	Million gallons per day, refers to daily rate of pumping groundwater
MPS:	The Main Plant Site, or the former Fairchild Republic Aircraft manufacturing facility
ND:	Non-detect or below the detection limit of the analytical equipment
NYCRR:	New York State Codes, Rules and Regulations

NYSDEC: New York State Department of Environmental Conservation

NYSDOH: New York State Department of Health

NYSDOT: New York State Department of Transportation

O&M: Operation and maintenance, refers to operation of remedial alternatives

ORB: Old Recharge Basin, located between Carmans Road and Route 110, south of Conklin Street

PCE: (Perchloroethylene or tetrachloroethlyne) A chlorinated, aliphatic organic solvent

Plume: Contaminant dispersion in the groundwater

POTW: Publicly owned treatment works or sewage treatment plant

ppb: Part per billion

ppm: Part per million

ppmv: Part per million volume

PRAP: Proposed Remedial Action Plan. This is a document listing the remedy(s) proposed to mitigate the threat of hazardous waste disposal to human health and the environment

RAOs: Remedial Action Objectives, or the goals established to remedy a site based on findings of the RI (CERCLA)

RCRA: Resource Conservation and Recovery Act

RI/FS: Remedial Investigation/Feasibility Study

ROD: Record of Decision

SCGs: Standards, Criteria and Guidance values

SCWA: Suffolk County Water Authority

TAGM: Technical and Administrative Guidance Memorandum. Used by the NYSDEC

TCA: (Trichloroethane) A chlorinated aliphatic organic solvent

TCE: (Trichloroethylene) A chlorinated, aliphatic organic solvent

TCLP: Toxicity Characteristic Leaching Procedure, is a test used to define a hazardous waste for disposal purposes

VOC: Volatile Organic Compound

TABLE 1
Nature and Extent of Contamination

MEDIA	CLASS	CONTAMINANT OF CONCERN	CONCENTRATION RANGE	FREQUENCY of SCG EXCEEDENCES	SCG
Groundwater	Volatile Organic Compounds (VOCs)	Trichloroethane	ND to 100 ppb	22 out of 160	5 ppb
		Tetrachloroethylene	ND to 5,100 ppb	39 out of 160	5 ppb
		Trichloroethylene	ND to 1,659 ppb	68 out of 160	5 ppb
		Dichloroethene	ND to 460 ppb	7 out of 160	5 ppb
		Dichloroethane	ND to 210 ppb	30 out of 160	5 ppb
		Vinyl Chloride	ND to 200 ppb	26 out of 160	2 ppb
		Benzene	ND to 163 ppb	33 out of 160	0.7 ppb
		Toluene	ND to 1,500 ppb	8 out of 160	5 ppb
		Ethyl benzene	ND to 1,200 ppb	13 out of 160	5 ppb
		Xylene	ND to 3,900 ppb	15 out of 160	5 ppb
		Chlorobenzene	ND to 670 ppb	8 out of 160	5 ppb
Groundwater	Inorganics	Lead	ND to 678 ppb	15 out of 86	25 ppb
		Iron	ND to 184,000 ppb	44 out of 86	300 ppb
		Mercury	ND to 3 ppb	1 out of 86	2 ppb
		Cadmium	ND to 107 ppb	7 out of 86	10 ppb
		Chromium	ND to 1,270 ppb	13 out of 86	50 ppb
		Manganese	ND to 10,500 ppb	58 out of 86	300 ppb
		Arsenic	ND to 104 ppb	7 out of 86	25 ppb
		Zinc	ND to 2,300 ppb	4 out of 86	300 ppb
Soils	Volatile Organic Compounds (VOCs)	Trichloroethene	ND to 4,000 ppb	5 out of 65	700 ppb
		Tetrachloroethene	ND to 4,100 ppb	1 out of 65	1,400 ppb
		Trichloroethane	ND to 370 ppb	0 of 65	800 ppb
		Dichloroethene	ND	0 of 65	300 ppb
		Chloroform	ND to 7,800 ppb	1 out of 65	300 ppb
		Toluene	ND to 610 ppb	0 out of 65	1,500 ppb

Soils	Inorganics	Lead	0.79 to 18.1 ppm	0 of 6	2-500 ppm
		Cadmium	ND to 0.12 ppm	0 of 6	1 ppm
		Chromium	6.6 to 791 ppm	21 of 31	10 ppm
		Arsenic	ND to 1.8 ppm	0 of 6	7.5 ppm
		Zinc	4.2 to 25.1 ppm	1 of 5	20 ppm

TABLE 2
Remedial Alternative Costs

Remedial Alternative	Capital Cost	Annual O&M YEAR 1	Annual O&M YEAR 2 PLUS	Total Present Worth
ALTERNATIVE 1:	$ 87,000	$25,000	$15,000	$328,000
ALTERNATIVE 2:*	$1,767,000	$588,000	$569,000	$10,530,000
ALTERNATIVE 3:*	$ 738,000	$202,000	$176,000	$3,468,000
ALTERNATIVE 4:*	$2,398,000	$771,000	$743,000	$13,895,000
ALTERNATIVE 5:**	$3,363,000	$340,000	$314,000	$6,684,000
ALTERNATIVE 6:***				
A. OUTPOST MONITORING:	$123,000	$10,000	$10,000	$277,000
	Capital Cost	**Annual O&M**	**GAC Replacement**	**Total Present Worth**
B. E. FARMINGDALE	$876,000	$6,000	$40,000	$1,228,000
C. ALBANY AVE.	$870,000	$6,000	$40,000	$1,004,000
D. TENETY AVE.	$879,000	$6,000	$40,000	$984,000

NOTES

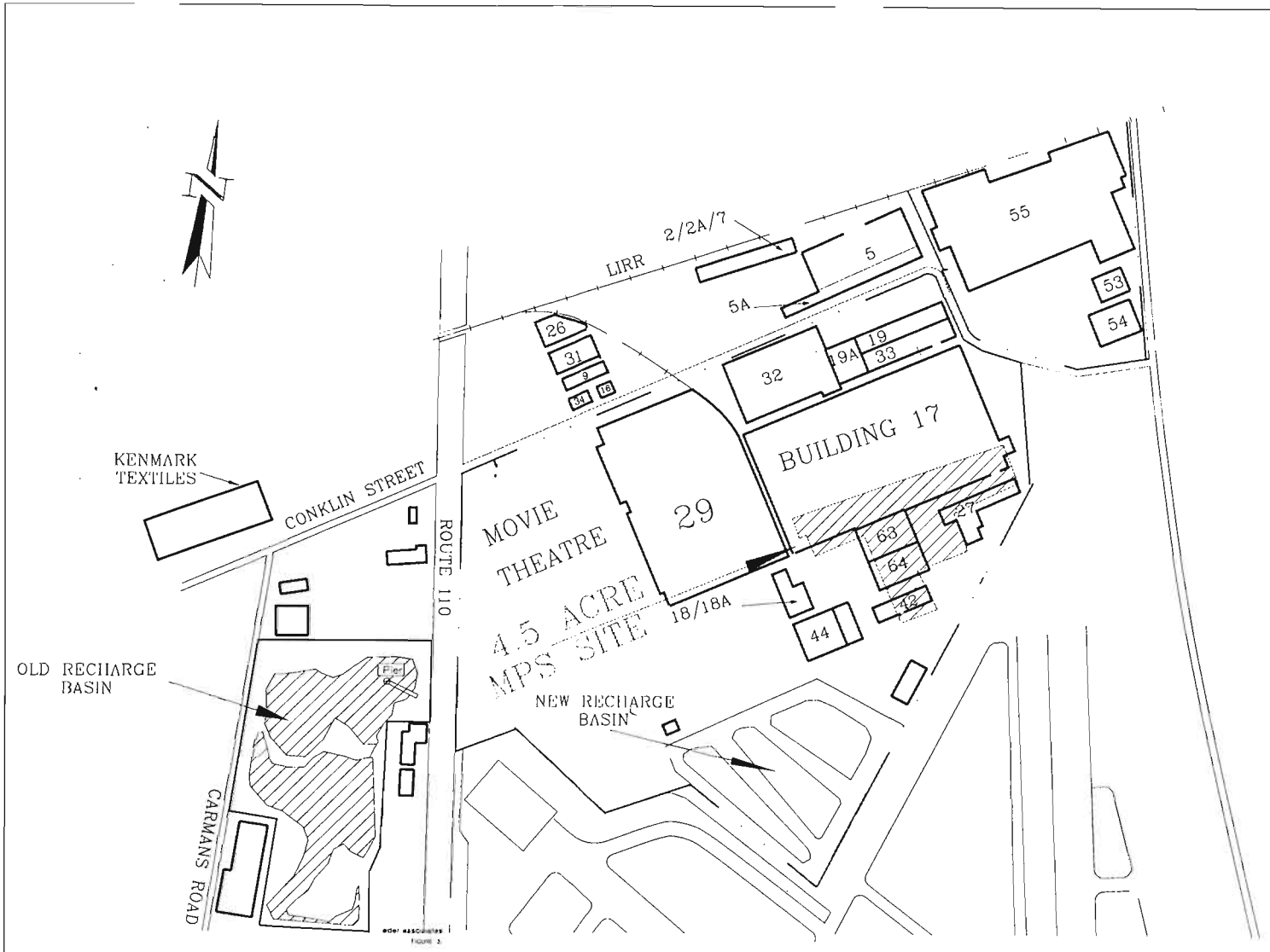
Present Worth is calculated by adding the capital cost to the present worth of the Operation and Maintenance (O&M) costs. These O&M costs computed for the expected duration of the operation of the remedy or 30 years, which ever is less.

*Alternatives 2, 3 and 4 must add Alternative 6 costs to get the cost for the entire remedy.

**Alternative 5 includes the cost of wellhead treatment but not outpost monitoring.

***ALTERNATIVE 6:

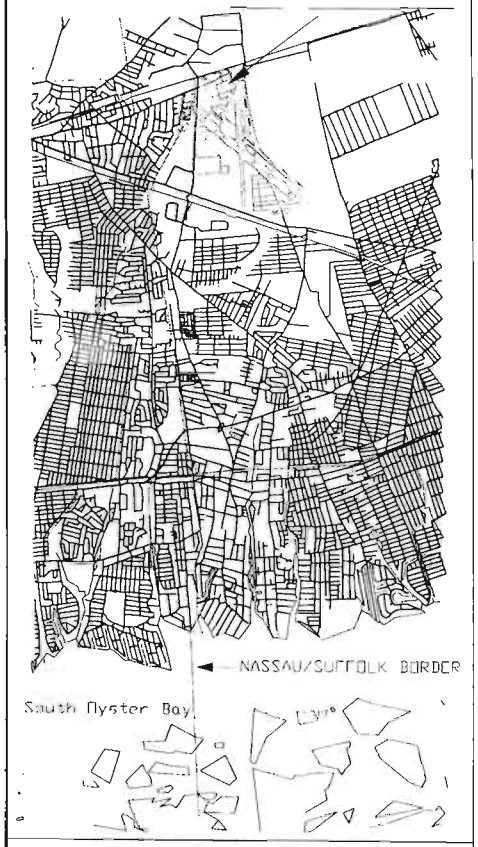
A. Outpost Monitoring
   Wellhead Treatment:
B. East Farmingdale Water District Wells (S-66556 and S-79105)
C. Suffolk County Water Authority, Albany Avenue Wells (S-34595, S-47886 and S-6305)
D. Suffolk County Water Authority, Tenety Avenue Wells (S-20460, S-37681)



0 200' 400'
SCALE

NOTES:

1. SCALE IS FOR ESTIMATING PURPOSES ONLY
2. BUILDINGS 17, 19, 19A, 27, 29, 32, 33, 42, 44, 53, 54, 55, 63 AND 64 NO LONGER EXIST
3. NOT ALL FORMER BUILDINGS ARE INCLUDED ON THIS FIGURE



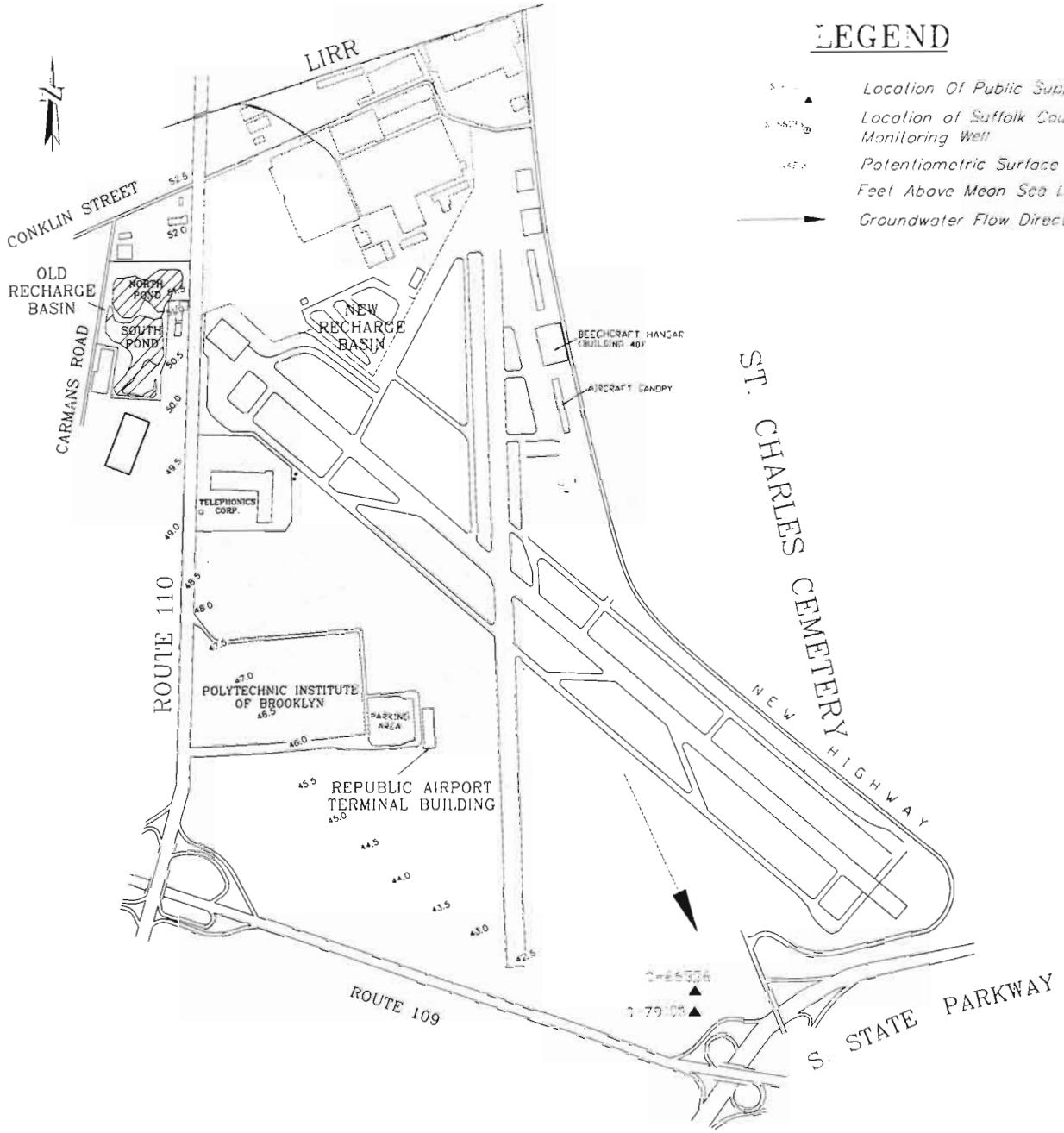
FAIRCHILD REPUBLIC AVIATION

SITE MAP

East Farmingdale, Suffolk County, New York
Site No. 1-52-130

New York State Department of Environmental Conservation

FILE: MNPT.DWG	DRAWING: DRAWN FROM EDER ASSOCIATES BASE MAP
MODIFIED BY: STEVEN M. SCHARF, P.E.	
DATE: 03/29/99	FIGURE 1



WATER TABLE CONTOUR MAP
(OCTOBER 27, 1993)

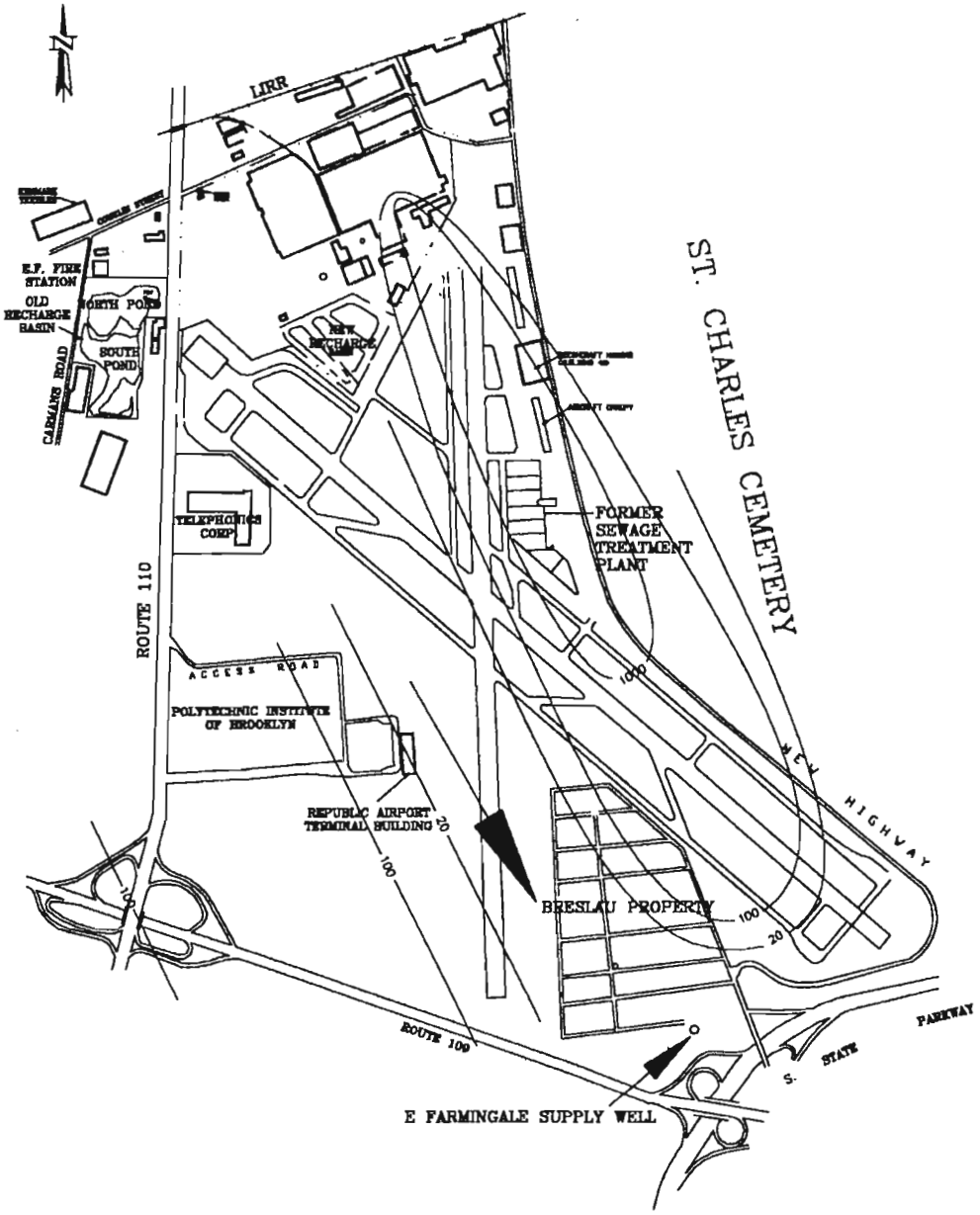
FAIRCHILD REPUBLIC MAIN PLANT SITE
EAST FARMINGDALE, NEW YORK

DIVISION OF ENVIRONMENTAL REMEDIATION

DATE REVISED:	FIGURE:	DRAWING: REVISED BY STEVEN M. SCHARF, P.E.
10/09/97	FR16.DWG	FROM EDER ASSOCIATES BASE MAP

WATER TABLE CONTOUR MAP
OCTOBER 1993

FIGURE 2



LEGEND

20 —— *Generalized PCE Isoconcentration Contour Line*

→ *Groundwater Flow Direction*

FAIRCHILD REPUBLIC SITE

EAST FARMINGDALE, SUFFOLK COUNTY, NEW YORK

Site No. 1-52-130

New York State Department of Environmental Conservation

DRAWN BY: Steven M. Scharf, P.E.

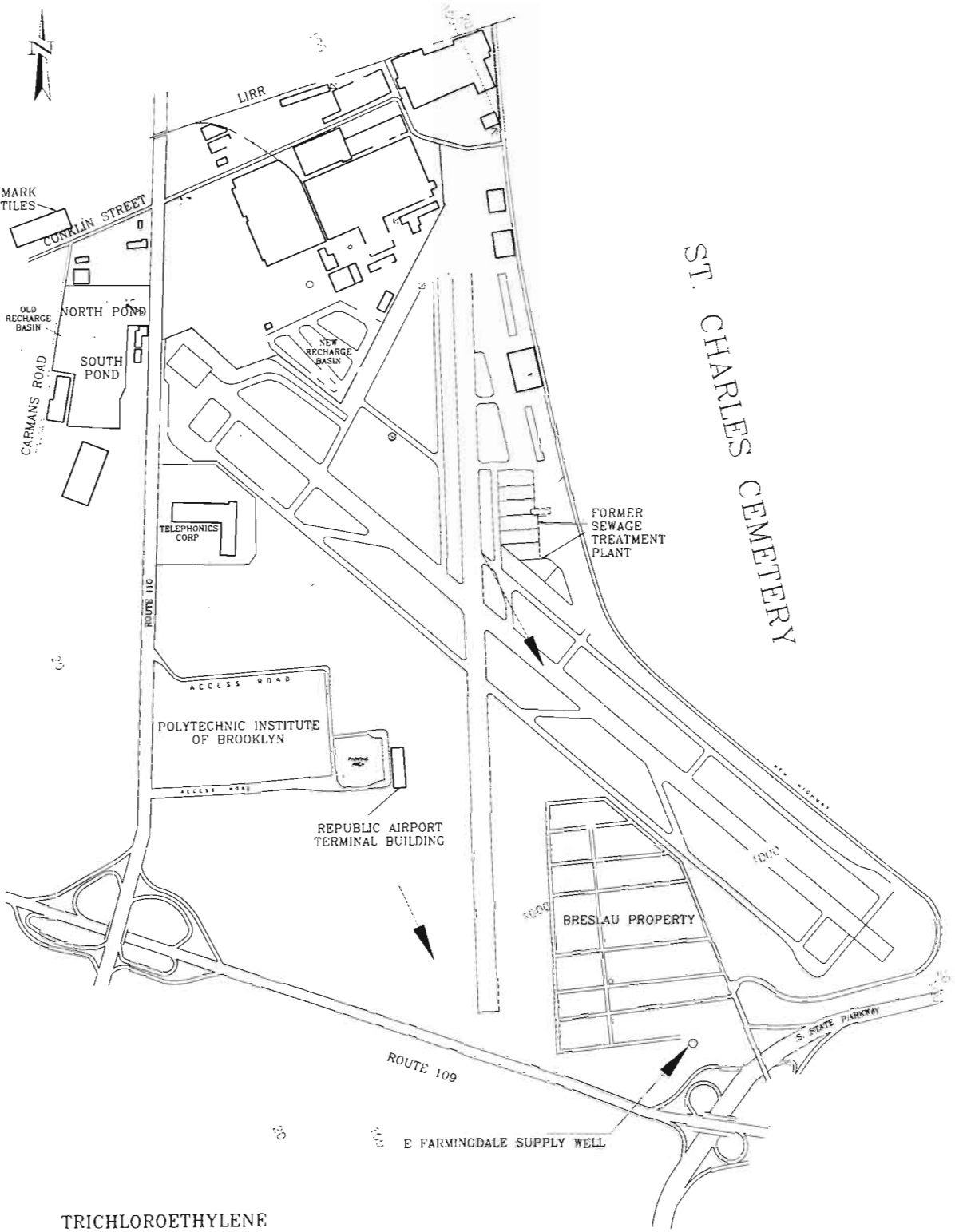
DRAWING: EDER ASSOCIATES BASE MAP

TETRACHLOROETHYLENE IN DOWNGRADIENT GROUNDWATER

(FR17.DWG)

DATE: 10/10/97

FIGURE 3



TRICHLOROETHYLENE
IN GROUNDWATER

Legend

20 — *Generalized TCE Isoconcentration Contour Line*

Groundwater Flow Direction

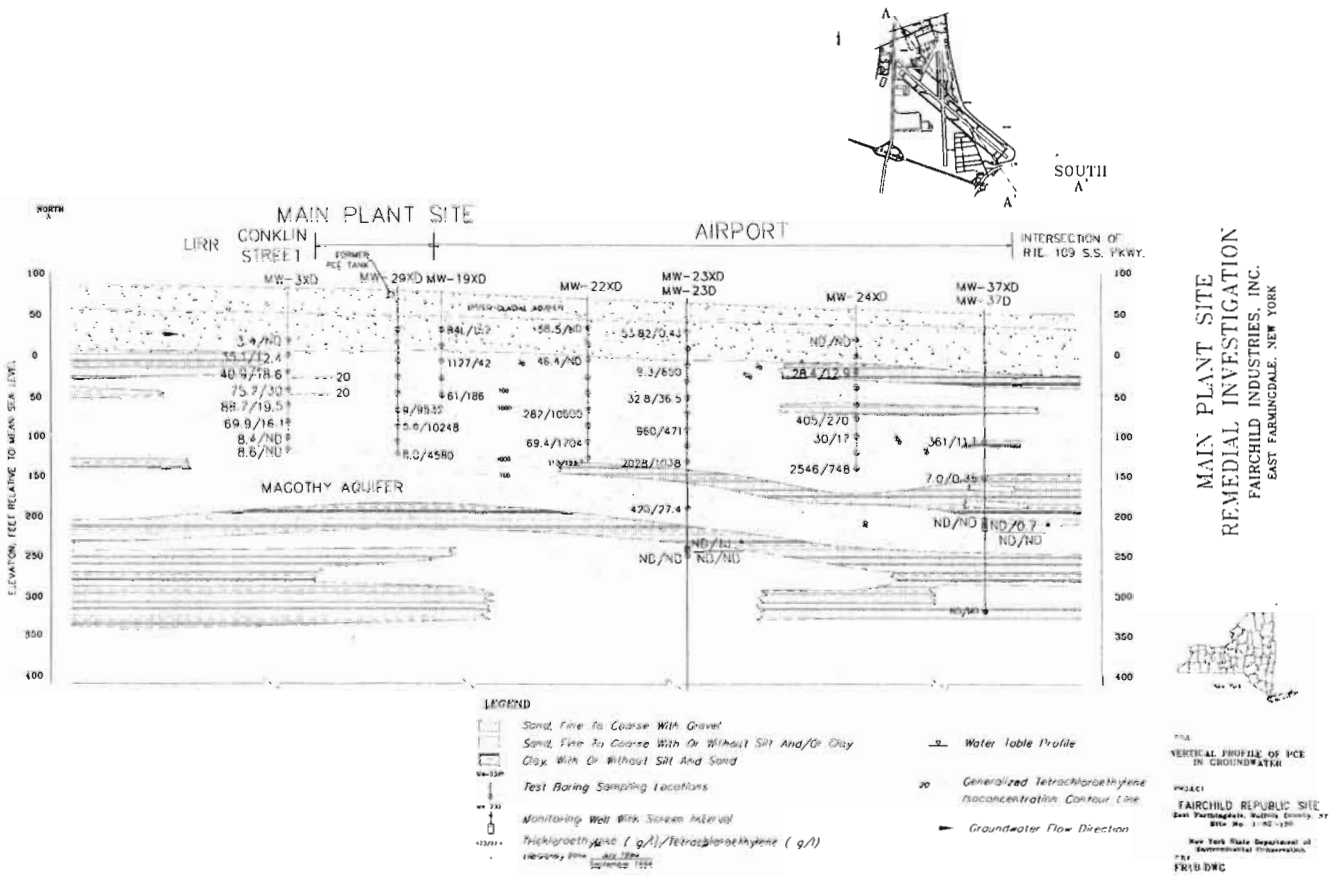
FAIRCHILD REPUBLIC SITE
EAST FARMINGDALE, SUFFOLK COUNTY, NEW YORK
Site No. 1-52-130

New York State Department of Environmental Conservation

MODIFIED BY: STEVEN M. SCHARF, P.E. | DRAWING: FROM EDER ASSOCIATES (FR20A.DWG) BASE MAP

TRICHLOROETHYLENE
IN GROUNDWATER

DATE: 12/01/97 | FIGURE 4



MAIN PLANT SITE
REMEDIAL INVESTIGATION
FAIRCHILD INDUSTRIES, INC.
EAST FARMINGDALE, NEW YORK

TITLE
VERTICAL PROFILE OF PCE IN GROUNDWATER

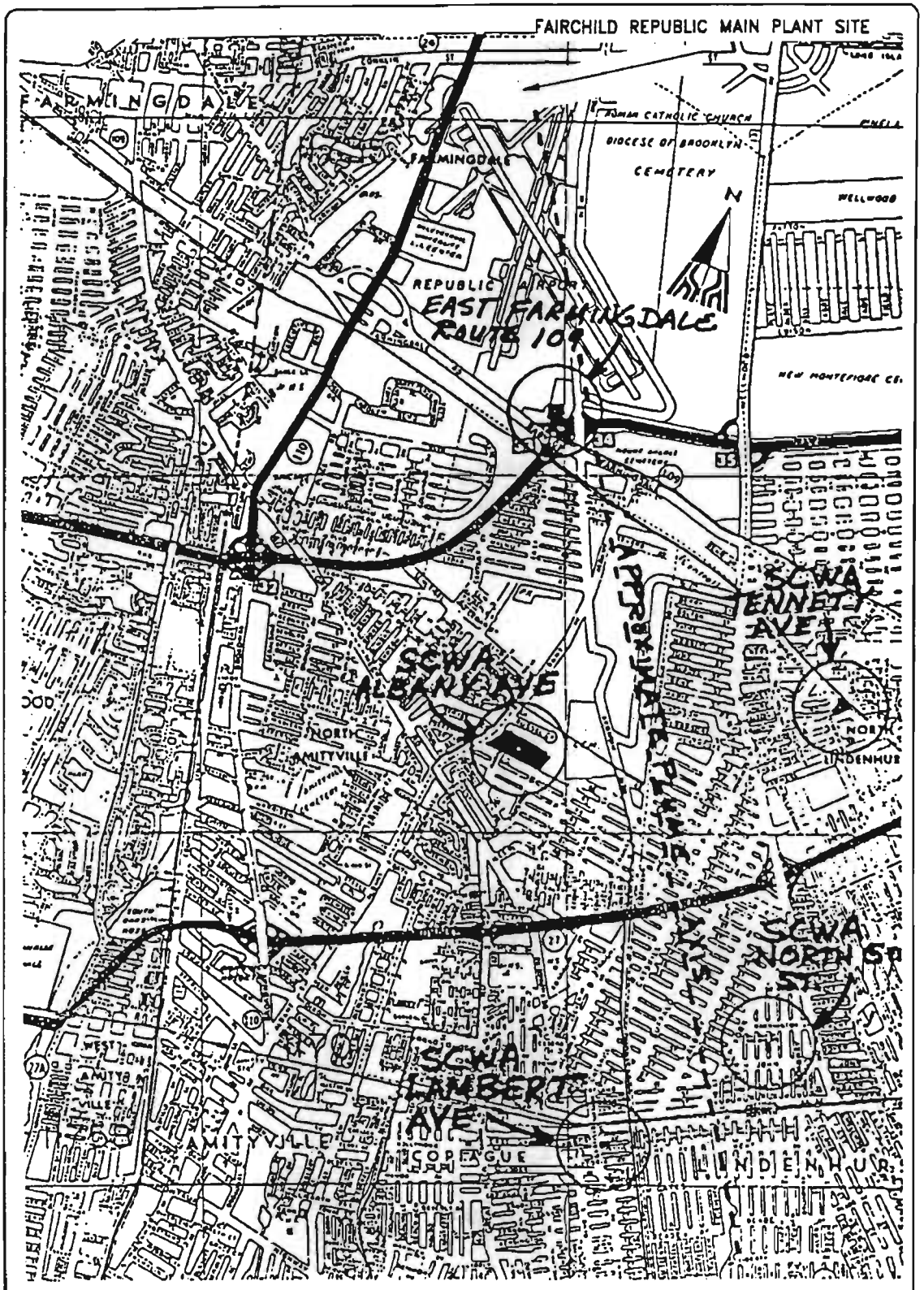
PROJECT
FAIRCHILD REPUBLIC SITE
East Farmingdale, Suffolk County, NY
Site No. 1-52-130

New York State Department of Environmental Preservation

FILE
FR10.DWG

DATE
02/08/90

FIGURE 5



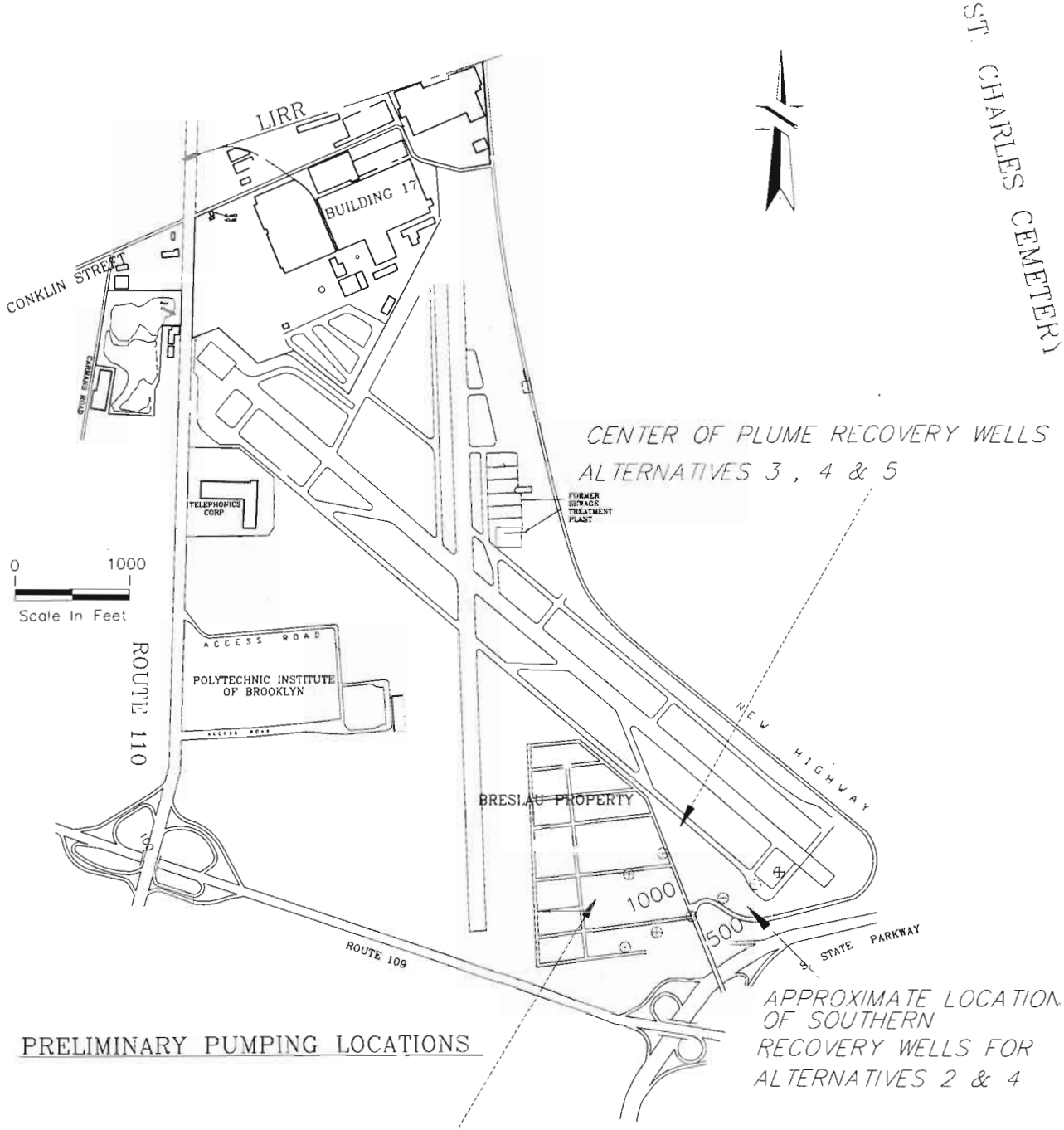
FAIRCHILD REPUBLIC MAIN PLANT SITE

Figure 6– Municipal Well Location

DIVISION OF HAZARDOUS WASTE REMEDIATION

REVISED: DATE: 11/26/97 | DRAWING: FRVBORD.DWG

East Farmingdale, Suffolk County Site No. 1-52-130



NOTES

1. 20 DENOTES APPROXIMATE LOCATION OF CAPTURE ZONES BASED ON TOTAL VOCS (ppb).

FAIRCHILD REPUBLIC MAIN PLANT SITE
FIGURE 7- APPROXIMATE LOCATIONS FOR VARIOUS RECOVERY WELLS

DIVISION OF HAZARDOUS WASTE REMEDIATION

REVISED:
DATE: 12/17/97 DRAWING: FSFIG7.DWG

East Farmingdale, Suffolk County Site No. 1-52-130

APPENDIX A
RESPONSIVENESS SUMMARY
PROPOSED REMEDIAL ACTION PLAN
FAIRCHILD REPUBLIC MAIN PLANT SITE
SITE NUMBER 152130

A public meeting was held on February 10, 1998 at the East Memorial Elementary School, located in East Farmingdale, Suffolk County. The purpose of the public meeting was two-fold. First, the New York State Department of Environmental Conservation (NYSDEC) presented the Proposed Remedial Action Plan (PRAP). The second purpose was to receive comments from the public on the PRAP for consideration during the final selection of a remedy.

The Responsiveness Summary has been broken into three sections; those public comments raised during the public meeting regarding the Main Plant Site, those raised during the public meeting regarding the Old Recharge Basin, and written comments submitted to the Department during the public comment period.

A. Main Plant Site

1. Question/Comment: Doesn't Comprehensive Environmental Response (CERCLA) Law require drinking water standards be attained?

The National Contingency Plan (NCP) is the framework regulation that includes procedures and standards for responding to environmental concerns under CERCLA. The NCP requires that remedial alternatives be screened for protection of human health and the environment and their respective ability to comply with Applicable or Relevant and Appropriate Regulations as the threshold criteria. In the case of the Main Plant Site, the proposed Alternative 3 with Alternative 6, is protective of human health and the environment. However, none of the alternatives screened can clean up the groundwater to drinking water standards based on the extent of the plume and the presence of background concentrations of total volatile organic compounds. Therefore, CERCLA, as detailed in the NCP, allows for a waiver of attaining groundwater standards and groundwater will be treated, to the extent practicable, to pre-disposal conditions for the area that is treated. The remainder of the plume will, over time, naturally attenuate. Though not expected, should any of this contamination ever effect a public supply well, the potentially highest concentrations that may ever reach the well would be much lower, and the Record of Decision would allow the water districts to utilize the best available technology to remove these contaminants from the water supply.

2. Question/Comment: Are the monitoring wells there to warn us when the plume arrives?

Yes. The outpost monitoring wells would be strategically placed to allow for advance warning of groundwater contamination heading toward one or more of the public supply wells.

3. Question/Comment: How does the wellhead contingency work?

Based on the known and to be determined flow paths of groundwater, and hydrogeologic conditions in the upper glacial and Magothy aquifers, outpost wells, will be placed in such a way as to allow a two year advance warning that contamination would affect a public supply well.

4. *Question/Comment: Can new wells be drilled instead of treatment? We had questioned why East Farmingdale had placed their wells where they did.*

The decision to drill new wells is entirely up to the Water District. Currently the East Farmingdale wells are unaffected by the Main Plant Site groundwater contamination. The overall quality of the water in the deeper wells drilled by East Farmingdale is excellent, which is why the deeper wells at Route 109 were drilled there. In the unlikely event that either the outpost monitoring wells or the East Farmingdale Water District wells indicate that wellhead treatment is required, the technology can be put in place to provide potable water without any exposure or risk to the consumer. However, the evaluation of and the ultimate decision regarding the fate of the East Farmingdale Water District wells would be up to the District.

5. *Question/Comment: Are the public wells contaminated? Will the drinking water be degraded or at least not protected by the proposed alternative?*

There are three public drinking water supply wellfields located downgradient from the MPS. These include: the East Farmingdale Water District Route 109 Wellfield, and the Suffolk County Water Authority Albany Avenue and Tenety Avenue Wellfields. Two additional Suffolk County Water Authority Wellfields, North Fifth Street and Lambert Avenue are much further downgradient and should not be affected by the Main Plant Site plume. VOCs, were detected in the shallow wells at the Albany Avenue Wellfield in 1977. The contaminated wells, were taken out of service in early 1977 and remain off-line. Organic chemical contamination has never been detected in the three deep wells at Albany Avenue, or any other downgradient wellfields.

In addition, as part of the remedy, Fairchild will be required to track and model the fate of the plume not intercepted by the groundwater recovery system. This is in addition to outpost monitoring and the long term monitoring associated with the remediation and will include actual analytical data points gathered on a routine basis combined with plume tracking/modeling and plume tracking/modeling updates to show that the residual plume is indeed attenuating and/or poses no threat to the public supply wells.

6. *Question/Comment: Is 1,000 parts per billion (ppb) the groundwater standard?*

No, the groundwater standard for trichloroethylene and tetrachloroethylene is 5 ppb each and the groundwater standard for total volatile organics compounds (VOCs) is 50 ppb.

7. *Question/Comment: What are total volatile organic compounds (VOCs) drinking water standards?*

The drinking water standards for total VOCs, or unspecified organic contaminants (VOCs) is 50 ppb.

8. *Question/Comment: We disagree with the remedy and want a clean up closer to groundwater standards.*

A remedy that is protective of human health and the environment, is technically feasible and is implementable is the basis of an acceptable remedy for the Main Plant Site. A groundwater remedy that approached groundwater standards was screened out as technically unfeasible due to the magnitude of groundwater that was contaminated. In order to allow the higher cleanup criteria for the Main Plant Site, the PRP will be required to track and model the portion of the contaminant plume left unremediated in the groundwater.

9. *Question/Comment: Is granular activated carbon (GAC) effective and how long has this technology been use?*

Granular activated carbon is a highly effective technology for removing the contaminants of concern from the groundwater supply. This carbon technology has been in use for more than ten years.

10. Question/Comment: Are the chromium results speciated in the groundwater samples? Cr +6 and Cr +3 makes a big difference. Is it all Cr +6?

The groundwater samples from the Main Plant Site were analyzed for total chromium only. These results indicated that the Main Plant was not a source of chromium contamination to groundwater. In addition, the specific soil areas with elevated chromium concentrations were subjected to the Toxicity Characteristic Leaching Procedure (TCLP). If chromium was leaching into groundwater or chromium was present at hazardous waste levels, the soils would fail the TCLP test; which they did not.

11. *Question/Comment: Who will pay for all this?*

Under CERCLA and New York State regulations promulgated under 6 NYCRR Part 375, Fairchild, the Potential Responsible Party (PRP) will be required to pay for the implementation of this remedy.

12. *Question/Comment: Can East Farmingdale wells become impacted?*

As covered in the Proposed Remedial Action Plan, the East Farmingdale Water District Wells have the *potential* to become impacted by the groundwater contamination from this Site. No one can say for certain that these wells will ever be effected by this groundwater contamination.

13. *Question/Comment: Are you aware that Long Island has an elevated cancer rate?*

The New York State Cancer Registry keeps track of all newly diagnosed cancer cases in New York State. For the period 1989-1993, the most recent period for which cancer incidence statistics are available, incidence rates for all types of cancer combined, among males in Nassau and Suffolk Counties, were comparable with the rate for the State as a whole, excluding New York City. (New York City is generally excluded from comparisons of this type due to its unique ethnic and racial composition.) Incidence rates among females in Nassau and Suffolk Counties were somewhat higher that the rate for the State, excluding New York City (see table below). In fact, while the overall incidence rate in Nassau County for males was slightly higher than the rate for New York State, excluding New York City, the overall incidence in Suffolk County for males was slightly lower than the rate for New York State, excluding New York City.

While the incidence rate of all types of cancers combined is a convenient number for comparing cancer rates in different areas or over time, it is not very meaningful when trying to understand the reasons for differences in rates, or in trying to plan cancer control strategies. Cancer is not a single disease, but a collection of different diseases, each with its own set of risk factors and, presumably, causes. What is more useful is to look at the incidence of individual types of cancer across areas.

The table below also compares the incidence of the most common types of cancer among males and females in New York State, exclusive of New York City, and Nassau and Suffolk Counties. From this it can be seen that while rates of colon and rectal cancers, and prostrate cancer in males is higher in Nassau County than New York State, excluding New York City, rates of lung cancer among Nassau County males are lower than in the remainder of the State, while lung cancer rates are comparable and colon and rectal cancer rates are somewhat elevated. Among females, breast cancer rates are higher in both Nassau and Suffolk Counties.

Average annual age-adjusted[1] cancer incidence rates per 100,000 people.

	New York State Excluding NYC		Nassau County		Suffolk County	
	Males	Females	Males	Females	Males	Females
Total Cancers	451.9	348.8	463.4	377.9	447.7	365.4
Colon and Rectal	60.2	42.4	66.6	46.0	65.1	44.9
Lung	84.8	45.3	74.4	46.3	87.5	50.4
Breast	----	105.7	----	117.1	----	110.6
Prostrate	109.4	----	115.2	----	88.5	----

14. *Question/Comment: Shouldn't we be most concerned about contamination and not cost?*

Yes. The primary concern is the potential exposure to human health and the environment from these site related contaminants in the groundwater. The selected remedy meets the criterion of protection of human health and the environment.

15. *Question/Comment: Who is overseeing the sampling at the public well samples?*

The East Farmingdale Water District and the Suffolk County Water Authority sample their respective wells for the contaminants of concern on a quarterly basis. In addition, Suffolk County Department of Health Services samples the municipal wells on an annual basis.

16. *Question/Comment: Can we see the results from the public supply wells?*

Yes. Analytical results from any and all sampling events at any of the public wells is public information. These results can be made available upon request from either the East Farmingdale Water District and/or the Suffolk County Water Authority.

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[1]Rates age-adjusted to the 1970 U.S. population. Source of data: New York State Cancer Registry.

17. *Question/Comment: It is unacceptable that the East Farmingdale Supply Well casing is in contact with contamination.*

The purpose of the wellhead treatment contingency is to protect the public from potential exposure to Main Plant Site related groundwater contamination. Based on information from the remedial investigation, the screens are separated by at least one low permeability clay layer and over five hundred feet of the Magothy aquifer. It is not expected that the East Farmingdale Water District Route 109 wells will ever be affected. However, if the water supply is compromised, the wellhead treatment contingency will be implemented to prevent any potential exposure.

18. *Question/Comment: What if the 1,000 part per billion plume is at the East Farmingdale well? Why not pump and treat over there?*

The information that is currently known about the location of the groundwater plume concentrations is based on data that is approximately 3 to 5 years old. Hence the need to require a predesign study to define the current contamination isoconcentration lines. The predesign study will determine the locations for the groundwater extraction and treatment system, which may be near the East Farmingdale supply wells.

19. *Question/Comment: How much clay is there between the East Farmingdale Wells and the plume?*

At the location of the East Farmingdale municipal wells, it is known that at least one clay layer approximately 25 feet thick exists between the horizontally moving contaminated groundwater and the underlying clean portion of the Magothy Aquifer. In addition, the screened interval of the East Farmingdale Water District wells is at least 500 feet deeper than the maximum known depth of the groundwater contamination.

20. *Question/Comment: As citizens, we disagree with the cleanup numbers.*

The cleanup criteria for this site was established by screening out remedial alternatives that were unable to attain groundwater standards and were therefore deemed unfeasible. Reducing the cleanup number would not reduce the possibility that one or all of the municipal wells may be effected in the future. However, Fairchild will be required to track and model the groundwater plume in order to show that the portion of the groundwater left unremediated will not affect public health or the environment.

21. *Question/Comment: Are my children at risk now and in the future?*

No one is currently at risk from the groundwater as there is no contamination in any of the public supply wells. In addition, the purpose of this remedy is to prevent any future risk from exposure to site related contaminants through the drinking water supply.

22. *Question/Comment: Are the SONY theaters involved in this site contamination? There are rumors in the neighborhood that the theater is not safe.*

The SONY movie theaters are safe and there is absolutely no exposure to any patrons or employees to Site contamination. The soils of the Main Plant Site have been remediated and the groundwater contamination migrating from the Main Plant Site is moving to the South away from the theaters, with the water table more than thirty feet deep. There are no surface or indoor air problems associated with the contaminated plume.

23. *Question/Comment: The Proposed Plan is the lowest cost option. You (NYSDEC) are "whipping boys" for the community, then you (NYSDEC) go home and select what you want.*

The proposed remedy is protective of public health and the environment. Cost is an evaluation criteria that comes into review only after public health, the environment and the other evaluation criteria have been considered. The purpose of the public meeting is to present the outcome of the evaluation criteria to the public in the form of the Proposed Remedial Action Plan.

24. *Question/Comment: What is the "best" remedy?*

The "best" remedy is one that is protective of human health and the environment, complies with standards, criteria and guidance, offers long term effectiveness and permanence, can reduce toxicity, mobility and volume of contamination, is implementable and is cost effective. Alternative 3 with Alternative 6 meets these criteria.

25. *Question/Comment: How wide is the plume?*

The Main Plant Site plume migrating beneath Republic Airport is approximately 1/4 mile wide.

26. *Question/Comment: Who is looking at Republic Airport runoff?*

Republic Airport is regulated by several different State and County Agencies. These agencies regulate the Airport with respect to runoff discharges.

27. *Question/Comment: How are the jet fuel spills handled at the Airport?*

If a jet fuel spill occurs at Republic Airport, the New York State Department of Transportation (NYSDOT) is required to notify the NYSDEC Division of Environmental Remediation Spill Response Unit. Either the onsite NYSDOT response team or an environmental contractor would be called to the scene immediately if some response action is required.

28. *Question/Comment: The documents in the library are too voluminous.*

Unfortunately, as is the case on many inactive hazardous waste disposal sites, the reporting requirements, amount of site data generated, and in this case the area covered by the investigation requires the Responsible Party to submit a substantial amount of information. Much of the information for the Main Plant Site is backup data to the main text in Volume 1 of the Remedial Investigation Report. It is suggested that you review just Volume 1 in conjunction with the Proposed Remedial Action Plan to gain a thorough understanding of the site.

29. *Question/Comment: What is the time line for this process?*

The public comment period closed on February 27, 1998 and the Department has prepared a Responsiveness Summary. The Record of Decision will be signed before March 31, 1998. After the Record of Decision is signed, the NYSDEC enforcement attorney will continue the ongoing negotiations with Fairchild to execute an Order on Consent to implement the remedy detailed in the Record of Decision. Any consent order prepared will contain a time line for the remedial design and the remedial construction.

30. *Question/Comment: Why were Main Plant Site soils used in filling in the basin?*

The Record of Decision for the Old Recharge Basin (ORB) called for fencing with signs posted to keep people out. One option for Fairchild was to elect to fill the Old Recharge Basin; an option that was enthusiastically embraced by many of the residents at the Old Recharge Basin Proposed Remedial Action Plan public meeting.

In order for Fairchild to generate enough material needed to fill in the Old Recharge Basin, the former Main Plant Site demolition material was considered. The DEC did not want to use 500,000 cubic yards of virgin soil because that is not the best use of a natural resource. Fairchild was required to sign an order, pay for a full time Environmental Monitor, and perform rigorous testing of demolition materials prior to placing in the ORB. This testing demonstrated to the NYSDEC satisfaction that the Main Plant Site demolition materials were acceptable to use in filling in the Old Recharge Basin. No hazardous wastes were placed in the ORB.

31. *Question/Comment: Why aren't the Water Districts here?*

A representative of the Suffolk County Water Authority was at the public meeting. Though they were invited, the East Farmingdale Water District did not attend the February 10, 1998 public meeting.

32. *Question/Comment: Why did New York State permit such environmental damage? Is New York State still letting companies pollute?*

Most of the contamination that is present in the groundwater that is attributable to Fairchild was disposed of prior to regulations that made these disposals illegal. However, CERCLA deals with this issue by making the generator responsible for past disposal practices. Under current regulations,

the State no longer allows companies to pollute in the manner that created many of these environmental problems in the first place.

33. *Question/Comment: What about iron in my water?*

Iron can be a problem in many of the public supply wells on Long Island. It is naturally occurring. This is not a contaminant of concern for the Main Plant Site and will not be addressed by the selected remedy for this site.

34. *Question/Comment: Can there be another public meeting prior to the implementation of the proposed remedy? There should be another meeting.*

Another public meeting will be held during the remedial design phase of this project. More meetings may be held during the remedial action phase of this project.

35. *Question/Comment: I live in East Farmingdale and didn't get a notice. Public Notice letters should have gone to all East Farmingdale Water District consumers. Can East Farmingdale send notices with their bill?*

Public notification for site meetings is conducted in a number of ways. The direct mailing for this site included more than 4,000 notices. This was the largest mailing for any site of this nature in the State of New York. For this specific site, this mailing was based on the geographic proximity, areas downgradient where residents may have private wells, local elected officials and the local media. The NYSDEC did not feel it was appropriate to notify all of the East Farmingdale Water District customers as they are not in proximity to the site. To require the Water District and/or the Authority to take on the task of sending out public notices is beyond their responsibility for this project.

36. *Question/Comment: Why wasn't the contact list larger?*

The NYSDEC has a mailing list for this Site that includes over 4,000 addresses. This is the largest mailing list by far for any remedial project anywhere in New York State. While no public contact list can reach everybody, the Department notifies the local media in the hope that an article or announcement is published to cover any residential area not covered by the mass mailing.

B. <u>OLD RECHARGE BASIN</u>

1. *Question/Comment: We had questioned the presence of the "Blue Lagoon". We are not happy about the "lack of clean up." (The "Blue Lagoon" refers to the Old Recharge Basin.)*

Fairchild has elected to fill in the Old Recharge Basin (ORB) in lieu of fencing and posting. The possibility of taking this action was well received by the residents at the Old Recharge Basin

Proposed Remedial Action Plan public meeting. Once the filling of the Old Recharge Basin is complete, the sediments will be encapsulated providing a permanent remedy.

2. *Question/Comment: We had complained for a long time about the Basin. It's a shame that we had to wait until now to get something done over there.*

There were a number of technical and legal issues that had to be resolved and/or approved before filling in the Old Recharge Basin could commence. According to the current project schedule, the Old Recharge Basin should be completely filled in by August of 1998.

3. *Question/Comment: There was soil contamination along East Carmans Road from flooding.*

Soil samples were collected from several locations along East Carmans Road, including two residential properties. This sampling demonstrated that East Carmans Road was not affected by any discharges to the Old Recharge Basin and contaminants related to the Old Recharge Basin were not detected in any of these samples.

4. *Question/Comment: The mud (sediments) from the Basin should have been removed and replaced with clean fill.*

Removing the sediments from the ORB was screened out as a remedial alternative during the Old Recharge Basin Feasibility Study. It was determined that sediment removal was not implementable or cost effective.

5. *Question/Comment: There is a surcharge into the Basin from the fill and concrete pushing the contaminants into the groundwater.*

The water in the Old Recharge Basin is at equilibrium with the groundwater table of the surrounding area. Filling in the Old Recharge Basin will not create any water surges since the fill is placed in slowly over time. Once the Old Recharge Basin is completely filled in, the sediments at the bottom of the Old Recharge Basin will be encapsulated.

6. Question/Comment: The concrete being placed in the basin is hazardous waste.

Any concrete going into the Old Recharge Basin must come from the Main Plant Site and have been demonstrated by Fairchild, to the satisfaction of the NYSDEC, that the material was acceptable for use as inert fill material. Concrete placed in the Old Recharge Basin must be five feet above the water table. There is also a size restriction of 18 inches for concrete debris. No hazardous waste has been or will be placed in the basin.

7. Question/Comment: What about the people along East Carmans Road near the Basin?

The possibility of exposure to contaminants in the Old Recharge Basin is significantly reduced since a fence around the Site prevents access, and the contaminants are in the sediment at the bottom of the basin, where the water is 20 to 40 feet deep. Once the basin is filled, the contaminants will be covered with clean soil greater than 10 feet deep and thus would be unavailable for human exposure.

8.Question/Comment: Are the soils along the bottom of the basin still a problem?

The soils and sediment at the bottom of the basin have now been encapsulated. The contaminants present in these sediments are not mobile, are more than 20 feet below grade and will remain in place forever now that Fairchild has elected to completely fill in the Old Recharge Basin.

9. Question/Comment: Are the soils going into the Basin being tested?

The soils going into the Old Recharge Basin have been tested to insure that only acceptable materials are being used as fill. Any soils not meeting DEC requirements are rejected and disposed of at a permitted facility.

10. Question/Comment: What about homes and yards? My home and others around the ORB have not been tested.

The homes and yards adjacent to the Old Recharge Basin that requested testing in 1996 were sampled. None of the sampling revealed contaminants from the Old Recharge Basin sediments in the yards of any of the homes.

11. Question/Comment: What about odors from the filling in of the Basin?

Odors from filling in the basin are from organic matter, such as decayed foliage, that may have been disturbed. As these problems arise, the contractor for Fairchild is notified by the onsite NYSDEC environmental monitor to correct the problem.

12. Question/Comment: Are contaminated soils from the Main Plant Site going into the Basin?

The soil source areas for volatile organic contamination on the Main Plant Site were remediated by the soil vapor extraction system. Fairchild submitted a soil sampling plan that was approved by the NYSDEC. The sampling plan required extensive testing of the Main Plant Site soils. All of the sampling efforts were overseen by NYSDEC personnel. The results indicated that all of the Main Plant Site soils were usable as fill for the Old Recharge Basin.

Discrete areas of near surface soils contained chromium contamination above guidance values for surface soils but were not a hazardous waste based on the Toxicity Characteristic Leaching Procedure (TCLP). None of the chromium soils samples exceeded the levels already found in some of the sediments of the Old Recharge Basin. These soils from the Main Plant Site with chromium

will be placed in the ORB and restricted to five feet above the water table and ten feet below grade in an area that will not be disturbed by future development.

C. RESPONSES TO COMMENT LETTERS RECEIVED ON THE PRAP

RESPONSES TO SUFFOLK COUNTY DEPARTMENT OF HEALTH SERVICES COMMENT LETTER OF FEBRUARY 20, 1998:

The NYSDEC agrees with Suffolk County Department of Health Services (SCDHS) that the plume downgradient of the Main Plant Site has never been fully delineated. This fact was acknowledged by all participants involved in this project when the Feasibility Study was being finalized. At that time, the question was whether there was enough information to screen remedial alternatives for the Main Plant Site Feasibility Study. The answer to this question was yes.

However, important concerns were raised about the fate and transport of the remaining groundwater contamination during the public comment period for the Main Plant Site Proposed Remedial Action Plan. Therefore, in response to these concerns, the NYSDEC is adding plume tracking and plume modeling to the scope of work for the selected remedial alternative in order to identify the fate and transport of the unremediated portion of the Fairchild plume. This is in addition to the long term monitoring in Alternative 3 and the outpost monitoring in Alternative 6.

Plume tracking will involve the sampling of existing groundwater monitoring wells, possible hydropunch data points and/or the installation of new monitoring wells. This information will then be used to track the plume and run a groundwater model. The results will identify the fate and transport of the unremediated portion of the groundwater plume.

The SCDHS also has raised the concern on behalf of, and in addition to, the Suffolk County Water Authority (SCWA) of assessing the need to outpost monitor the Suffolk County Water Authority (SCWA) Great Neck Road public supply wells. This specific issue will be addressed by the plume tracking and groundwater modeling effort. The Great Neck Road Wellfield was never raised as a water supply at potential risk for contamination from the Main Plant Site groundwater plume. These wells were always judged to be side gradient based on existing hydrogeological data. However, the SCWA has raised the concern of increased pumpage not evaluated previously with respect to potential impacts to the water supply. While it does not appear that the Great Neck Wellfield is at risk from the Main Plant Site groundwater plume, the plume tracking/groundwater modeling will be specifically tasked to determine, among other things:

1. whether the Great Neck Wellfield is at risk based on plume tracking and modeling results incorporating the increased pumping rates, and

2. whether outpost monitoring at the Great Neck Wellfield is warranted.

If it is determined that the Great Neck Road Wellfield could potentially be impacted by the Main Plant Site groundwater contamination, provisions will be made to include the Great Neck Road Wellfield in the outpost monitoring and wellhead treatment contingency through a modification to the Record of Decision.

COUNTY OF SUFFOLK

ROBERT J. GAFFNEY
SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF HEALTH SERVICES

CLARE B. BRADLEY, M.D., M.P.H.
ACTING COMMISSIONER

February 20, 1998

Steven M. Scharf, P.E.
Bureau of Eastern Remedial Action
Division of Environmental Remediation
N.Y.S. Dept. of Environmental Conservation
50 Wolf Road
Albany, New York 12233-7010

Dear Mr. Scharf:

RE: FAIRCHILD REPUBLIC MAIN PLANT (#152130)

On behalf of the Suffolk County Department of Health Services (SCDHS), I would like to offer the following comments on the Proposed Remedial Action Plan for the Fairchild Republic Main Plant, Farmingdale (Site #152130) dated January 22, 1998:

The preferred remedy, which includes intercepting the most-concentrated portion of the Fairchild plume, wellhead treatment contingencies for public supply wells, and the hookup of private wells to public water, should be protective of public health. However, the lack of a full delineation of groundwater contamination related to past Fairchild activities creates a number of potential difficulties, not least of which will be the design of an adequate outpost monitoring well network for downgradient public supply wells; the potential impact area for private wells also remains uncertain, and could extent beyond the area of responsibility defined in the PRAP.

The SCDHS therefore recommends that a detailed groundwater model be developed to aid in the outpost monitoring well design process, and that this model take into account all that is known about the history of site activities, and all the existing water quality data for the region downgradient of the site (including SCDHS test well data and Suffolk County Water Authority (SCWA) shallow production well data for the Albany Avenue wellfield). Potential impacts and the need for outpost wells for the SCWA's Great Neck Road wellfield should also be assessed, given the SCWA's plans to significantly increase pumpage at this wellfield. In addition, the area of Fairchild's responsibility for hookups to public water should be expanded to include the area surrounding the region specified in the PRAP.

DIVISION OF ENVIRONMENTAL QUALITY
OFFICE OF WATER RESOURCES ■ 225 RABRO DRIVE EAST, HAUPPAUGE, N.Y. 11788-4290 ■ TEL (516) 853-3076
FAX (516) 853-3075

If you wish to discuss this site further, contact me at (516) 853-3196.

Very truly yours,

Sy F. Robbins, C.P.G.
County Hydrogeologist

cc: B. Becherer, NYSDEC Region 1
J. Crua, NYSDOH
G. Proios, Off. Co. Exec.
E. Rosavitch, SCWA
G. Veilson, E. Farmingdale W.D.

RESPONSES TO SUFFOLK COUNTY WATER AUTHORITY COMMENT LETTER OF FEBRUARY 27, 1998:

Paragraph 1: The Department agrees with the Suffolk County Water Authority (SCWA) that Fairchild should come to an equitable settlement with the SCWA and the East Farmingdale Water District prior to the public supply well(s) becoming contaminated. This would allow them to take immediate action without the potential of burdening their customers with an undo expense in the process of providing potable water.

Paragraph 2: The NYSDEC agrees with the SCWA that an outpost monitoring system is valuable for a number of reasons. Accordingly, any agreement reached between the SCWA and the East Farmingdale Water District with Fairchild shall not include outpost monitoring and the NYSDEC will require that the outpost monitoring be implemented by Fairchild as part of the ROD.

Paragraph 3: The Great Neck Road Wellfield was never raised as a water supply at potential risk for contamination from the Main Plant Site groundwater plume. These wells were always judged to be side gradient based on existing hydrogeological data. However, the SCWA has raised an issue of increased pumpage not evaluated previously with respect to potential impacts to the water supply. While it does not appear that the Great Neck Wellfield is at risk from the Main Plant Site groundwater plume, the plume tracking/groundwater modeling will be specifically tasked to determine:

1. whether the Great Neck Wellfield is at risk based on plume tracking and modeling results incorporating the increased pumping rates, and

2. whether outpost monitoring at the Great Neck Wellfield is warranted.

If it is determined that the Great Neck Road Wellfield could potentially be impacted by the Main Plant Site groundwater contamination, provisions will be made to include the Great Neck Road Wellfield in the outpost monitoring and wellhead treatment contingency through a modification to the Record of Decision.

SUFFOLK COUNTY WATER AUTHORITY

Herman J. Miller
Deputy CEO for Operations

Administrative Offices: 4060 Sunrise Highway, Oakdale, NY 11769-0901
(516) 589-5200
Fax No. (516) 563-0358

February 27, 1998

Steven M. Scharf, P.E.
Bureau of Eastern Remedial Action
Division of Environmental Remediation
N.Y.S. Department of Environmental Conservation
50 Wolf Road
Albany, New York 12233

Re: Proposed Remedial Action Plan
Fairchild Republic Main Plant, Farmingdale

Dear Mr. Scharf:

I have reviewed the Proposed Remedial Action Plan (PRAP) for the Fairchild Republic Main Plant in Farmingdale, Site #152130. I would like to offer the following comments on that plan.

The preferred remedy as referred to in the PRAP appears to be the most logical action. It should be sufficient to protect the residents down gradient of the contamination plume. I would recommend that the Mairoll/Fairchild Corporation be directed to reach an upfront settlement with the Suffolk County Water Authority and East Farmingdale Water District to provide for the increased monitoring and potential treatment system costs. This approach would insure that the customers of those water systems would not be saddled with the burden of those high costs. There would not be the same level of assurance if these costs were to be provided to water supplier after a certain contaminant threshold has been reached in a monitoring well.

While the outpost monitoring well system is valuable for a variety of reasons , it does not offer much benefit to the Authority. The only value to the Authority would be a little earlier notice that the contamination would be reaching our facility. Since the treatment systems used by the Authority are a standard design that we have used at a large number of stations, we would have no problem in installing the systems in a very short time. Therefore, the cost of the monitoring system should not impact the funding for the treatment systems and O & M costs for the water suppliers..

The plan offers no mention of the Authority's Great Neck Road Well Field which is located a short distance to the west of the Albany Avenue site. The Authority has recently installed an iron removal system at the Great Neck Road location. Due to that installation, there will be greatly increased pumpage from those wells. The plan should require a review of the hydrogeological data to see if the increased pumpage will draw the contamination to that property. If it appears that would be a likely scenario, then the treatment system and increased monitoring costs should be included for that location as well.

The Engineering staff at the Authority has estimated the cost to construct the treatment systems. The costs are different than what you have in your plan. Our estimated costs are as follows:

Albany Avenue	$1,089,000.00
Tenedy Avenue	$794,500.00
Great Neck Road	$1,089,000.00

We have not calculated for the O & M costs as of this time. I will forward them to you if they should be significantly different than that shown in the plan.

Having been through a number of situations like this one, I believe the modification I have suggested would offer the most acceptable approach for resolution of this problem as far as the community would be concerned.

If you have any questions, please feel free to contact me.

Very truly yours,

Herman J. Miller, P.E.
Deputy CEO for Operations

HJM/cc

SCWA

RESPONSES TO MAIROLL INC./FAIRCHILD CORPORATION COMMENT LETTER OF FEBRUARY 26, 1998:

Comment No. 1& 2: Review of the Old Recharge Basin Remedial Investigation "Nature and Extent of Contamination" identifies the surface water of the Old Recharge Basin to contain perchloroethylene (PCE) and dichloethylene (1,1-DCE) above New York State surface water standards. Therefore, even if at the time of the Old Recharge Basin Remedial Investigation Report writing, there were potential impending upgradient sources of contamination, the Old Recharge Basin was determined by the Old Recharge Basin Remedial Investigation Report to be a low level source of groundwater contamination.

Further review of the Old Recharge Basin data tables shows trichloroethylene at higher concentrations in downgradient monitoring well 9S in comparison to monitoring well 11S. This clearly indicates that the Old Recharge Basin was historically a low level source of trichloroethylene to the groundwater. Years of unmonitored wastewater discharges contaminated with chlorinated organics, which was the largest inflow to the Old Recharge Basin, is the obvious source. Therefore, the discussion in the Record of Decision must remain as is; that the the Old Recharge Basin was historically a low level source of groundwater contamination.

Comment No. 3: The NYSDEC agrees with Fairchild that the connection of private wells to the municipal water was not an Interim Remedial Measure (IRM). The connection of the private homes will instead be added to the Site History Section of the Record of Decision. The Site History discussion will state that the previous connections were made through the Town of Babylon and that Fairchild agreed to fund this operation. However, by doing so, the Fairchild Corporation was not confirming that the contamination in these wells was from Fairchild, nor were these connections made in response to any water quality problems necessarily attributable to Fairchild.

The summary of the selected remedy will extend the program to connect any private well to municipal water. The same condition will apply that Fairchild is not confirming that the contamination in these wells was from Fairchild, nor would these connections be made in response to any water quality problems necessarily attributable to Fairchild.

Comment No. 4: The Fairchild comment states that the PCE tank contamination could not have started before 1975 due to the fact that the Main Plant Site did not start using PCE until that date. The NYSDEC agrees with Fairchild on this point. However, as documented by the tank removals during the excavation of site soils during February 1998, two old abandoned underground 550 gallon storage tanks were found within the boundaries of the inactive hazardous waste disposal site.

One of the recently discovered tanks was next to the vapor degreaser. Based on the results from sludge samples, the leaking tank was used to store trichloroethene. The tank location was within the zone of influence of the soil vapor extraction system. No one will ever know what quantities were stored, how long this tank was used for this purpose before it was abandoned, or how much

of a TCE source to the groundwater this tank was. But overall, the end result is that the Main Plant Site was a source of trichloroethylene contamination to the groundwater.

The second 550 gallon tank uncovered during the Main Plant excavation also contained a sludge material. The analysis showed the contents to be waste paint.

The remedial investigation for the Main Plant Site did not specifically address whether the Main Plant Site was responsible for any of the chlorinated organic contamination in the Albany Avenue Wellfields. The time rate of travel argument presented by Fairchild applies to the perchloroethylene but not so for trichloroethylene. However, a more conservative estimate of groundwater flow rate in the Upper Glacial Aquifer in the region of Fairchild is 1.5 feet per day.

Based on the hydrogeology present south of the Main Plant Site and Republic Airport, a majority of the contaminated groundwater would be expected to migrate south beneath the Gardiners Clay and into the Upper Magothy Aquifer. However, by diffusion some less amount of contamination would also be expected to make its way into the Upper Glacial Aquifer. However, no data currently exists to say whether at some point historically any of the Main Plant Site contamination made its way to the Upper Glacial Aquifer south of the Southern State Parkway. The plume tracking and plume modeling should resolve this question.

Comment No. 5: One of the major problems with the Fairchild initial model was that Fairchild would not consider the Main Plant as a source of trichloroethylene groundwater contamination. The extrapolated end of the groundwater plume had never been determined and therefore fell short of actual site conditions. Now that the Main Plant has been determined to be a source of trichloroethylene as well as perchloroethylene, coupled with plume tracking and real time data to be used in future modeling, a more realistic picture of the fate and transport of the Main Plant Site plume is possible.

It is the NYSDOH and NYSDEC position that the actual contaminated groundwater concentrations be used to calculate health risks rather than the modeled results used by Fairchild. What was being termed speculative wasn't necessarily the model but rather using the modeled concentrations to determine the health risks. However, the NYSDOH and NYSDEC allowed Fairchild to forego revising the risk assessment as long as Fairchild agreed to establishing remedial action objectives for groundwater that would be protective of human health and the environment.

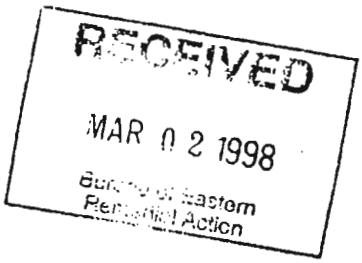
Comment No. 6: The Main Plant Site plume, based on the RI data, is more than 200 feet deep at the southern end of Republic Airport. The Main Plant Site plume is poised to go beneath the Gardiners Clay that begins at the southern end of the Airport. This is one of the main reasons that all the participants involved in this project agreed that the three downgradient public supply wells can be potentially impacted by the Main Plant Site groundwater plume within the next thirty years.

The Main Plant Site Remedial Investigation Report discusses other groundwater plumes, and the NYSDEC PRAP acknowledges that the western portion of the plume under Republic Airport has

commingled with a plume from another unknown upgradient source. However, Fairchild is the major contributor to contamination in this region.

The NYSDEC, in conjunction with the Suffolk County Department of Health Services, will continue to identify, investigate and remediate other upgradient and side gradient plumes as these sites are identified. However, under CERCLA, there is joint and several liability. Fairchild is only going to address the highly contaminated portion of the groundwater plume attributable to Main Plant Site.

Mairoll, Inc.
300 West Service Road
P.O. Box 10803
Chantilly, Virginia 22021
703/478-5800



February 26, 1998

By Facsimile (518-457-4198) and Regular Mail

Mr. Steven M. Scharf, P.E.
Project Engineer
New York State Department of
Environmental Conservation
50 Wolf Road, Room 242
Albany, New York 12233-7010

Re: *Proposed Remedial Action Plan*
Fairchild Republic Main Plant Site
East Farmingdale, Suffolk County, New York
Site No. 1-52-130

Dear Steven:

Please find enclosed the comments of Mairoll, Inc. on the Proposed Remedial Action Plan for the Fairchild Republic Main Plant Site submitted by Mairoll.

We look forward to working with you towards completion of an appropriate Record of Decision for this site.

Sincerely,

B. Michael Hodge
Asst. General Counsel

Enclosure

cc: Susan D. McCormick
James Rigano, Esq.
Michael McEachern

Fairchild

Comments of Mairoll, Inc.
on the NYSDEC PRAP
Fairchild Republic Main Plant Site

Comment #1- Page 3 Paragraph 7

NYSDEC stated, "The Old Recharge Basin historically introduced low level volatile organic compound (VOC) contamination to the groundwater beneath Republic Airport." Fairchild has maintained that there are no groundwater data supporting the above statement, nor are there any data that would indicate that the surface water in the basin contained VOCs at sufficient concentration to have caused measurable groundwater contamination. The VOC concentrations measured in wastewater are not representative of the eventual basin surface water or downgradient groundwater concentrations because the wastewater was being diluted by non-contact cooling water and stormwater. Moreover, methylene chloride was principal VOC found in the wastewater, and this compound was not found in groundwater beneath the airport, downgradient of the ORB.

Fairchild agrees that there is an unknown, upgradient source of groundwater contamination that has affected groundwater beneath the airport and that the Old Recharge Basin is not a current source of groundwater contamination.

Please note that this comment similarly applies to page 6, paragraph 8.

Comment #3 - Page 7 Paragraph 2

Section 4.2 : Interim Remedial Measures (IRMs) discusses the connection of private homes using private wells to the public water supply. Fairchild voluntarily funded two private water connections when such a request was made by NYSDEC and the Suffolk County Health Department, even though the available data have not implicated Fairchild in VOC contamination found in these private wells. Fairchild agreed to this in the interest of public health and because, reportedly, no public funds were available to make the connections.

Fairchild strongly objects to characterizing the water connections as an IRM because these connections were not made in response to any water quality problems attributable to the Main Plant Site or other Fairchild property. Briefly, the private wells tap a shallow portion of the Upper Glacial Aquifer that is not contaminated downgradient of Fairchild on the Republic Airport and the shallow groundwater contamination affecting the private wells comes from a source or sources south of the airport. One such source, National Heatset, a New York State Inactive Hazardous Waste Site is caused shallow aquifer contamination with VOCs, including PCE and is upgradient of a number of the affected wells. The Suffolk County Department of Health Services (SCDHS) found shallow aquifer VOC contamination

in the area of the affected wells in the "Miller Avenue Study" but did not investigate potential industrial sources along Route 109.

Fairchild may voluntarily agree to provide funds for public water connections to homes using private wells without prejudice, or admission with respect to the source of any contamination that may be affecting these wells. The Company may also decline to fund such work and defer the connection responsibility to the State, the County or the Town of Babylon. The private well testing results clearly reveal that the wells are affected by a variety of organic and inorganic contaminants, including septage and gasoline. While Fairchild has, in the past, connected private citizens to the public water system, the future responsibility for rectifying such problems belongs to the community.

Comment #4- Page 8 Paragraph 2

The PRAP indicated that the Suffolk County Water Authority shut down the shallow wells at the Albany Avenue wellfield in 1977 because of VOC contamination and that this contamination could have come from Fairchild. The available data do not implicate the MPS because, like the private wells, the shallow public supply wells would have been affected by a shallow VOC plume. The MPS plume is deeper than these wells at the present southern plume extent and it would be still deeper by the time it would reach the wellfield. Furthermore, the wells were closed in 1977 and the MPS plume would have been much farther north in 1977 than it is today.

The particular VOCs that were found in the shallow SCWA wells at Albany Avenue were not mentioned in the PRAP and a chemical "fingerprint" was not presented. It must be pointed out that the former PCE tank at the MPS could not be the source of these VOCs because no halogenated solvents, including PCE, were stored in the tank before 1975. Even if the PCE tank began leaking in 1975, it would be impossible for any contamination to have travelled to the Albany Avenue wellfield, over 2.5 miles away, in two years.

The groundwater flow rate in the Upper Glacial Aquifer in the MPS vicinity is approximately 1 foot per day, based on the U.S. Geological Survey published data cited in the RI/FS. The MPS is about 14,000 feet upgradient of the Albany Avenue wellfield and it would therefore take over 38 years for groundwater to travel from the MPS to the wellfield. This means that a hypothetical release of VOCs on the MPS would have had to have taken place in the 1930s, at the latest, to have caused the shallow wells at Albany Avenue to become contaminated in 1977. There are no data that would support such a hypothesis and the

former vapor degreaser that was cited in the PRAP as a TCE source, was not constructed until at least 1942.

The closure of these shallow public supply wells is more logically explained by a shallow source or sources south of Route 109. Industrial development along and south of Route 109, including the former Zahn's Airport would be the likely area to look for such a source. One such source has been identified upgradient of the Albany Avenue wellfield, National Heatset, a State Superfund site and other sites are suspected given the wide area of low level VOC contamination south of Route 109.

Comment #5- Page 8 Paragraph 4

The PRAP states that the groundwater model used by Fairchild to predict the likelihood and degree of future public supply well impact was not acceptable to the Department because such models tend to be "highly speculative and may underestimate the health risks associated with exposure to contaminated drinking water". Fairchild would like to point out that despite several iterations of the model, using various conservative assumptions, results indicated that the public supply wells would not be at risk from the MPS plume. The model results also showed that even in the case of an assumed impact to the public supply wells, there would be ample time to track the plume and take action before the plume could be intercepted by the wells. Furthermore, the exposure scenario of the public being exposed to contaminated public drinking water would not arise, since the public wells are routinely monitored and are shut down if contamination is found above or even close to the drinking water standard.

Comment #6- Page 12 Paragraph 2 <u>Alternative 6: Wellhead Treatment Contingency</u>

The PRAP includes Alternative 6 as a backup contingency measure, recognizing that it may not be technically feasible to capture all of the VOC contamination attributable to the MPS. Fairchild would like to point out that there is another more compelling reason to adopt a public supply wellhead treatment contingency; the MPS groundwater plume is virtually surrounded by contaminant plumes that would threaten the public supply wells even if the MPS plume did not exist. Similarly, if Fairchild were able to remediate all VOC contamination in the MPS plume, the remediated groundwater would be replaced by contaminated groundwater from upgradient and sidegradient plumes.

The wellhead treatment technology, especially with granular activated carbon (GAC) is a readily available and easily implementable option that SCWA has been using extensively (over 60 stations to date). The GAC system does not have special engineering or permitting requirements that would delay implementation. While Fairchild believes that this is a desirable, "fail safe" contingency, the responsibility for funding or for providing surety of treatment if it is ever needed, should be shared by the various PRPs that have contributed to the regional VOC contamination and/or by the State through Superfund remediation of "orphaned" or unidentified PRP sites.

RESPONSES TO TOWN OF BABYLON COMMENT LETTER OF FEBRUARY 26, 1998:

Comment No. 1: The NYSDEC agrees with the Town of Babylon that the southernmost extent of the Fairchild plume has never been established. However, Fairchild Republic has installed monitoring wells and temporary hydropunch groundwater samples more than one mile downgradient of the Main Plant Site. There was also the ongoing disagreement between Fairchild and the NYSDEC as to what constituted the end of the Fairchild plume. Rather than continue with this disagreement and the investigation phase of this project, it was agreed by all involved with the project that there was enough information collected from the remedial investigation to be able to screen applicable remedial alternatives.

The NYSDEC and the NYSDOH are concerned about the toxicity of the Main Plant Site plume. Therefore, unlike the Record of Decision for Operable Unit 2 of the Babylon Landfill, a wellhead treatment alternative was added to the Feasibility Study and the wellhead treatment contingency alternative was part of the Proposed Remedial Action Plan of the Main Plant Site. In order to determine the fate and transport of the remaining groundwater contamination, the NYSDEC is adding plume tracking and plume modeling to the scope of work for the selected remedial alternative. Plume tracking will involve taking actual data points and/or the installation of actual monitoring wells to identify the real time position of the groundwater contamination.

The NYSDEC and the NYSDOH are fully aware of the potential toxicity of the contaminants in the Fairchild plume. The production of vinyl chloride from the breakdown of PCE, TCE and DCE is always a concern. There is always the potential with tetrachloroethylene, trichloroethylene and dichloroethylene that vinyl chloride, depending on the anaerobic conditions and hydro-geochemistry, can be produced in the groundwater. Vinyl chloride has been detected sporadically in monitoring wells installed by the remedial investigation; generally at low levels not consistent with concentrations that would be expected with elevated levels of tetrachloroethylene and trichloroethylene that favor vinyl chloride production. Therefore, vinyl chloride production, while expected to be low due to unfavorable conditions, must be monitored by the plume tracking, modeling, and long term monitoring of the selected remedial alternative and the outpost monitoring of the public supply wells.

Comment No. 2: Additional homes with private wells have been identified that are in or around the area of concern. Steps are being taken to have these homes connected to public water.

Comment No. 3: The concentrations of chromium in specific areas of the Main Plant Site are above guidance levels for surface soils, but below Toxicity Characteristic Leaching Procedure (TCLP) levels which is one way to characterize a hazardous waste. Therefore, rather than leave these soils at the surface in an uncontrolled condition, these soils are being placed in such a way as to prevent any human contact. The soils from the Main Plant Site that contain chromium are being placed 10 feet below grade and 5 feet above the water table in the Old Recharge Basin within an area that will

not be developed other than for parking. None of the chromium results for soils exceeded the 907 ppm concentrations that already exist in the sediments of the Old Recharge Basin.

Comment No. 4: The basis for the cleanup number is to remediate the hotspot of the total volatile organic compound plume yet give a definitive number that must be addressed by the remediation. The NYSDEC and NYSDOH are confident that the total VOC plume will be attenuated over time; the goal is to reduce concentrations below the drinking water standards. One reason for adding the groundwater modeling and plume tracking is to confirm the success of the remedial effort. See the response to Comment No. 2 with respect to the toxicity of vinyl chloride.

Comment No. 5: Currently, the NYSDEC is evaluating the applicability of the Natural Resource Damage claim to this project. A Natural Resource Damage claim is not tied to a selected remedy for any site. NRD is a claim made for irreversible damage to a natural resource regardless of the level of proposed remediation. The claim is not used for remedial purposes, but for protection of currently undamaged natural resources.

RICHARD H. SCHAFFER, Supervisor

Town of Babylon

281 Phelps Lane, North Babylon, New York 11703-4006

February 26, 1998

Mr. Steven M. Scharf, P.E.
New York State Dept. of Environmental Conservation
Central Office
50 Wolf Road, Room 242
Albany, N.Y. 12233-7010

RE: COMMENTS - PROPOSED REMEDIAL ACTION PLAN (PRAP) FOR FAIRCHILD REPUBLIC MAIN PLANT

Dear Mr. Scharf:

The Town of Babylon has reviewed the PRAP for the Fairchild Main Plant Site and offers the following comments:

- Comprehensive sampling has never been implemented south of the Southern State Parkway. As such, the southern extent of the plume has never been established. The Town of Babylon has reservations with respect to this lack of information. Without this information it is not possible to conclusively determine whether significant contamination exists further south of the parkway. The Town Landfill plume that is comprised of compounds far less toxic than the Fairchild plume was required to be fully delineated. Both plumes originated at approximately the same time.

  This concern was raised and your agency indicated it does not share this concern. This was based on the NYSDEC's position that the difference in geology between the two sites would cause the Fairchild plume to migrate slower but deeper than the Landfill plume. This department still remains concerned with regard to this lack of information. The "older segment" of the plume has the potential to be more toxic than the delineated portion of the plume. This is due to the fact that the breakdown product of the compound that comprises this plume is vinyl chloride.

- Fairchild has connected homes within the area of concern with private wells to public water at no cost to the homeowner. This offer is being extended into the future. It may be possible that contaminated private wells are still being utilized in this area.

- Chromium contaminated soils are to be removed from the Main Plant Site and placed in the Old Recharge Basin. It is likely that this site will be developed in the future, whereby this soil will be disturbed during construction and be handled and/or removed from the site by the construction company. Unsuspecting workers could then be exposed to this soil.

  At the public meeting, the NYSDEC justified this practice stating that the soils being placed in the ORB are not classified as hazardous. The issues then become:

  1. What is the concentration of the chromium in the soil and at what level would it be considered hazardous?

  2. If the soils are not hazardous, why relocate the soil to the ORB?

- Alternative 3 was selected as the preferred remedy. This would leave the 500 ppb section of the plume untreated. This contamination is two orders of magnitude greater than the NYS drinking water standard. Is there any scientific analysis involved in the choice to treat the 1,000+ ppb section of the plume? This department remains concerned that significant contamination at levels likely to be categorized as hazardous will remain untreated. PCE is toxic; however, this compound breaks down into vinyl chloride which is even more toxic. The opinion of the NYSDEC is that natural attenuation combined with Alternative 6 will protect human health and the environment.

  While it is acknowledged that attenuation of the plume will continue to occur for a considerable period of time, has the NYSDEC established a target value for VOC contamination once attenuation has occurred over a set number of years? Such a forecast could be used to evaluate the success of the remedial effort.

- At the public meeting, it was mentioned that a Natural Resources Damages Claim was being evaluated for a more thorough cleanup. If the current cleanup is acceptable, why is this claim being evaluated? More information on this matter is requested.

Thank you for this opportunity to comment.

Sincerely yours,

Ronald C. Kluesener
Commissioner

RCK:rm

cc: Town Board

RESPONSES TO NEW YORK STATE DEPARTMENT OF TRANSPORTATION COMMENT LETTER OF FEBRUARY 20, 1998:

Comment No. 1: The final location of the extraction wells will be determined by the predesign study. However, in all likelihood, the extraction wells, some of the outpost wells, any recharge or infiltration basins, and/or any injection wells would be located somewhere on Republic Airport property. Any work done on Republic Airport property must be done with the review and approval of the New York State Department of Transportation. If negotiations with the Fairchild Corporation fail to reach a consent order, the remediation would be done by the New York State Department of Environmental Conservation State Superfund program. Republic Airport would not be liable for expenses of the remedial activities detailed in the Record of Decision.

Comment No. 2: The Record of Decision will allow the evaluation of any comparable remedial technology to groundwater extraction and recharge. One such technology is in-situ air stripping. This technology treats groundwater within a specially adapted well casing, directly recharging the groundwater without the need for recharge basin(s).

Comment No. 3: The New York State Department of Environmental Conservation will not require the New York State Department of Transportation to clean up contamination in groundwater from upgradient sources that is flowing beneath Republic Airport and/or other adjacent New York State Department of Transportation property.

NEW YORK STATE
DEPARTMENT OF TRANSPORTATION

7150 Republic Airport, Room 216
East Farmingdale, New York 11735-1580
(516) 752-7707 • FAX (516) 293-1429

February 20, 1998

Mr. Steven M. Scharf, P.E.
Project Engineer
Bureau of Eastern Remedial Action
Division of Environmental Remediation
New York State Dept. of Environmental Conservation
50 Wolf Road
Albany, New York 12233-7010

Dear Mr. Scharf:

Thank you for providing me with a copy of the Proposed Remedial Action Plan for the Fairchild Republic Main Plant Site (1-52-130). It was reviewed by NYSDOT's Environmental Analysis Bureau and they see no problems for Republic Airport or the Department of Transportation with the plan.

We do, however, need further clarification:

- there is no mention as to whether the alternatives involve placing extraction wells or ground water monitoring wells on Republic Airport property. It is possible outpost monitoring wells could be installed at the Airport. The report gives no indication that Republic airport would be liable for any of the remedial activities.

- If the proposed remediation requires a pump and treat system on the Airport, Fairchild and/or NYSDEC will need to drill additional groundwater monitoring wells on the Airport to establish the extent of the contamination plume. In addition to the extraction wells the remedial action plan calls for a recharge basin. There is no information provided as to required size or location of the recharge basin. Obviously, the Airport urges the use of an alternative treatment process which would allow direct injection into the groundwater to avoid the potential impact on the development of the Breslau area.

- Since the DEC is requiring Fairchild to clean up the groundwater to 1000 ppb of total voc's, the Airport needs to obtain assurances from NYSDEC that in the event that groundwater standards are changed in the future, the Airport will not be required to assume any clean up responsibility.

Thank you for the opportunity to comment on the Remediation Plan. I understand that Ms. Susan McCormack of NYSDEC was very supportive of the Airport's efforts at the February 10th public meeting in allowing for monitoring wells and borings on the Airport. We appreciate her efforts.

Very truly yours,

Hugh D. Jones
Airport Director

HDJ/baf

cc: M. Corrado
T. Gilchrist
G. McVoy

APPENDIX B
FAIRCHILD REPUBLIC SITE ADMINISTRATIVE RECORD

1. Contingency Plan and Emergency Procedures Manual, November 1986, Fairchild Republic Company.

2. Phase II Investigation Work Plan, Fairchild Republic Company, February 1, 1987, Geraghty and Miller.

3. Phase II Hydrogeological Investigation, Volumes I and II, April 1988, Geraghty and Miller.

4. Main Plant Site Closure Plan Final report, June 1989, Eder Associates.

5. Summary of Environmental Investigations at the Main Plant, January 1992, Geraghty and Miller.

6. Work Plan for the RI/FS Study at the Fairchild Republic Main Plant Site, April 1992, Geraghty and Miller.

7. Main Plant Remedial Investigation Groundwater Plume Definition, Volumes I, II and III, March 1994, Eder Associates.

8. Main Plant Suspected Source Area Investigation, Volumes I, II, III, IV, V, VI, VII and VIII May, 1994, Eder Associates.

9. Petition for Delisting/Segmentation (Redefinition of Boundaries), Fairchild Republic Aircraft, July 1994, The Fairchild Corporation.

10. Preliminary Generic Environmental Impact Statement, Airport Plaza, Fairchild Republic Site, July 1994, Saccardi and Schiff, Inc.

11. Proposed Scope of Work for a Human health and Ecological Risk Assessment of the Chlorinated solvent plumes at the Fairchild Republic Company Site, April; 1995.

12. Soil Vapor Extraction Pilot Test Work Plan, August 1994, Eder Associates.

13. Final Generic Environmental Impact Statement, Airport Plaza, Fairchild Republic Site, September 1994, Saccardi and Schaff, Inc.

14. Response to the August 29, 1994 meeting, October 1994, Eder Associates.

15. Soil Vapor Extraction Pilot Study Report, Fairchild Main Plant, November 1994, Eder Associates.

16. Interim Remedial Measures Design, Operation and Maintenance Program, March 1995, Eder

Associates.

17. Baseline Human Health Risk Assessment and Ecological Risk Assessment of the Fairchild Industries Site, April 1995, Eder Associates.

18. Fairchild Republic Main Plant Site Sampling Plan, November 1996, MAC Consultants.

19. Split Sampling for Site Sampling Plan, H2M Labs, Inc., November 1996.

20. Fairchild Republic Main Plant Site Remedial Investigation Report, May 1997.

21. Fairchild Republic Main Plant Site Feasibility Study Report, June 1997.

22. Main Plant Site Additional Sampling Report, October 1997, MAC Consultants.

23. Analytical Data from the two, Area Five underground Storages Tanks, February 1998.

24. Correspondence File that consists of the following:

    a. To Fairchild From NYSDEC listing the MPS Site as Class 2, September 13, 1989.

    b. To Fairchild from NYSDEC approving of RI/FS Work Plan, April 23, 1992.

    c. To Fairchild from NYSDEC approving Site boundary changes, November 23, 1994.

    d. To Fairchild from NYSDEC approving Additional Sampling Plan, Nov. 6, 1996.

    e. To Fairchild from NYSDEC establishing Remedial Action Objectives for the MPS Site, January 27, 1997.

    f. To Fairchild from NYSDEC approving Additional Sampling Plan Addendum, January 31, 1997.

    g. To Fairchild from NYSDEC approving closure of the SVE System, May 6, 1997.

    h. To Fairchild from NYSDEC approving Remedial Investigation Report, June 6, 1997.

    i. To Fairchild from NYSDEC approving Feasibility Study Report, July 17, 1997.

    j. To Fairchild from NYSDEC approving the Site Investigation Summmary Report, December 24, 1997.

25. Legal File that consists of the following:

    Fairchild Republic Main Plant Site RI/FS Order on Consent, March 1992

New York State Department of Environmental Conservation
Division of Environmental Remediation
Bureau of Eastern Remedial Action
625 Broadway, 11th Floor
Albany, New York 12233-7015
Phone: (518) 402-9625 • Fax: (518) 402-9022
Website: www.dec.state.ny.us

Erin M. Crotty
Commissioner

June 11, 2003

Dan St. Germain
Malcolm Pirnie Inc.
17-17 Route 208 North
Fairlawn, NJ 07410

RE: Fairchild republic Main Plant Site, Town of Babylon, Suffolk County Site No. 1-523-130.

Dear Mr. Germain:

This letter is a follow-up to our June 3, 2003 meeting and our June 4, 2003 conference calls. MAC Inc., on behalf of Mairoll, Inc. presented the Fairchild Republic Main Plant Site (MPS) hydrogeologic and groundwater modeling reports as part of the Preliminary Design Investigation. Based on the information presented these reports, and confirmed by the modeling performed by Malcolm Pirnie Inc., the New York State Department of Environmental Conservation (NYSDEC) has determined that a much higher degree of contaminant removal can be achieved by increasing the pumping rate of the two well extraction systems described the draft 35 percent design package.

The contaminant removal criteria outlined in the MPS Record of Decision (ROD), was based on information presented by Eder Associates (Gannett Fleming), on behalf of Mairoll Inc., in the MPS feasibility study. The actual hydrogeologic and groundwater contaminant conditions defined by the Preliminary Design Investigation identified that a much higher degree of contaminant removal could be achieved and still be in the ROD specified operational range of the groundwater extraction and treatment system. Malcolm Pirnie, Inc. confirmed that the existing air stripper groundwater treatment system, used for the pump test, can be modified to operate at 400 gallons per minute (gpm). In addition, there is adequate room to install appropriate infiltration galleries. Based on the more sophisticated groundwater flow modeling conducted by Malcolm Pirnie, Inc., this pumping rate would, at a minimum, capture groundwater containing Volatile Organic Compounds (VOCs) at the 200 ug/L.

Therefore, 200 ug/L will be the minimum design criterion for the design and operation of the groundwater remedy in lieu of the ROD remedial action objective of 1,000 ug/l. This is the most practical remedial design given:

a. that a remediation system that achieves a much higher degree of contaminant removal than outlined in the 35 percent design is feasible and,

b. the site and system constraints, which includes the limited ability to recharge much more than 400 gpm, and,

c. the post Remedial Investigation (RI) and Record of Decision (ROD) refined hydrogeologic conditions that exist at the site.

Malcolm Pirnie, Inc. is reviewing the net present worth cost-estimate for changing the remedial action objective. This will be compared to the net present worth cost-estimate for the selected remedial alternative outlined in the ROD, where the cost estimate in the ROD must be adjusted for inflation. In turn the cost figure comparison will be used by the NYSDEC to determine whether this change is a minor or significant in nature with respect to the selected remedy. In either case, Malcolm Pirnie will confirm that the changes outlined in this letter are acceptable and proceed with the preparation of the 90 percent design package accordingly.

The NYSDEC is also in receipt of your letter proposing changes for the long term monitoring program. This letter has been distributed for review and once comments. Any comments, if any, will be forwarded under separate cover.

In the meantime, if I can be of further assistance, or if you have any questions, please contact me at (518)402-9620.

Sincerely,

Steven M. Scharf, P.E.
Bureau of Eastern Remedial Action
Division of Environmental Remediation

C: M. Hodge, Mairoll (Via e-mail)
R. Rusinko (Via e-mail)
G. Rosser, SCDHS

New York State Department of Environmental Conservation
Division of Environmental Remediation
Bureau of Eastern Remedial Action
625 Broadway, Albany, New York 12233-7015
Phone: (518) 402-9620 FAX: (518) 402-9022

April 3, 2002

Michael McEachern
MAC Consultants, Inc.
222 Middle Country Road, Suite 209
Smithtown, New York 11787

RE: Mairoll Fairchild Republic Main Plant Site, East Farmingdale, Suffolk County Site No. 1-52-130.

Dear Mr. McEachern:

MAC Consultants Inc. (MAC), on behalf of Mairoll Inc., has submitted the 35 Percent Design Report package for the Mairoll Fairchild Republic Main Plant Site. These documents were reviewed by the New York State Department of Environmental Conservation (NYSDEC), the New York State Department of Health (NYSDOH) and the Suffolk County Department of Health Services (SCDHS). This letter transmits comments on the 35 percent design package and also serves to update the overall status of the Fairchild Republic Main Plant Site remedial design.

The 35 percent design package contains the following reports:

A. Preliminary Remedial Design Report.
B. Draft Operation, Maintenance And Monitoring Report.
C. Preliminary Plan Drawings 1 through 14.
D. Groundwater Pump And Treat System Preliminary Technical Specifications.
5. Groundwater Pump And Treat System Preliminary Technical Specification Outline.
6. State Pollution Elimination Discharge System (SPDES) Application.
7. NYSDEC Air Permit Application.
8. Preliminary Site Restoration Plan.

Additional Site Related documents:
1. February 13, 2002 MAC response letter to NYSDEC comments on the Aquifer Test Report.

A. PRELIMINARY REMEDIAL DESIGN SUBMITTAL REPORT

1. Section 3.1.3 and 3.2.2.2: Discharge Pump: All pumps associated with the 250 g.p.m. flow rate should be variable speed pumps that can be increased in capacity should ongoing analytical data indicate the need to do so.

2. Section 3.2.2.3, Water level alarms: Water level alarms need to be installed inside the treatment systems and at key locations inside the barn that will shut the remedial system down when flooding occurs.

3. Section 3.2.3.3, Emissions Estimates: The 19 foot stack height calculations indicate that emission rates would be unacceptable for at a minimum, vinyl chloride, 1,1, dichloroethane and trichlorethene. Given the

height constraints for the air stripper location south of Republic Airport runway, the taller track heights would not be recommended. The nineteen foot stack would be a more appropriate sizing of an emission point for the storage building proposed for this project given the desire for low profile structures in the area.

Therefore, raising the stack height to get the emission rates to acceptable levels is not an appropriate procedure for this project. In the end, the influent groundwater concentrations are likely to rise in the short term, creating an even greater potential for unacceptable emission rate. Therefore, the design will include vapor phase treatment.

4. Section 3.2.3.4, Emissions Summary, Bullet 7: The air emission rate calculations actually indicate that NYSDEC ambient air guide One concentration limits will be exceeded for all three stack heights. Therefore, air pollution control equipment will be required in the remedial design.

B. OPERATION, MAINTENANCE AND MONITORING PLAN:

1. Page 3, Site History, Bullet 1: The 250 g.p.m. is a revised flowrate based on the Aquifer Test Report and localized hydrogeology. The text must state in the site history that the ROD calls for 500 g.p.m. with two recovery wells. The changes approved for current operating conditions, came from the NYSDEC approved Aquifer Test Report results.

2. Page 7, Section 4.1.1: Lambert Avenue and North Fifth Street wells must be added as supply wells where outpost wells may be required in the future. Also, Route 209 should read Route 109.

3. Section 5.1.1- System Description: All pumps and blowers should be variable speed motors.

4. Page 12, Section 5.2.3:

a. The air discharges from the air stripper blower will require treatment and must be changed throughout the design report.

b. The air discharges should be sampled routinely to check against breakthrough.

5. Table 1 and Drawing 1 of the February 2002 draft detailing monitoring well depths and locations respectively needs to be included in this plan and all future monitoring submittal reports. Also, Table 1 is missing some information, such as well depths, screened intervals and if it is an outpost well.

B.1. Appendix A Outpost Monitoring Well Program

a. Outpost Well Locations: Since MODFLOW is being used .1 feet per day may be too conservative. Use MODFLOW to back track 2 years to confirm the placement of outpost wells.

a. Page 4, Section 3.1: Monitoring well S-66535 should be S-67535. Also based on information generated as part of this project, the NYSDEC may request additional outpost wells will be established for the additional municipal wells.

b. Page 5, Section 3.2: To date, the National Heatset plume has been identified only in the Upper Glacial aquifer above the Gardiner Clay. Please correct the text accordingly.

c. Page 5, Section 3.3: Given the MW 47 location, while appropriate for a monitoring well, it's use as an outpost well for the Suffolk County Water Authority (SCWA) Tenety Avenue wellfield appears to be too far to the east. Mairoll needs to evaluate the need for and then propose a new outpost well location.

d. Page 6: If not already in place, all the municipal wells must be sampled monthly.

B.2. Appendix B: Remediation Phase Monitoring Plan

The NYSDEC and the NYSDOH concur with the MAC proposal to continue sampling the groundwater monitoring wells on a quarterly basis.

a. Section 1, First Paragraph: The introduction must clearly state the remediation goals for this project. The more elevated concentrations of groundwater contamination at 1 ppm total VOCs will be intercepted and treated. This system will then continue to operate NYS Drinking water standards, or maximum contaminant levels (MCLs), until, to the extent practicable, have been achieved; not the one ppm TVOC concentration. The text must be changed accordingly.

b. Section 2.1, MPS Monitoring Wells: Add the new wells 37 I and 50 I into the groundwater monitoring program.

c. Section 2.3, Western Plume Detection Wells First Paragraph: Add text to state that the western plume detection wells also monitor the low level Old Recharge Basin contamination.

d. Section 2.3 Page 6: Wells S-66133, S-66157 and MW 46D should be included in the monitoring program.

e. Section 2.4, Page 7: Pursuant to the ongoing implementation of bullet one of the ROD, a work plan needs to be submitted that will continue the plume tracking process. At a minimum, plume tracking will determine the lateral extent of the Fairchild plume. For example, some of the down gradient impacts of the plume have already been clearly defined, such as the location of the groundwater recovery well at Route 109 and the Southern State Parkway; but information on the plumes leading edge still needs to be identified.

f. Section 3.4.1, Quality Control: The CLP Tier Certified lab that is going to be used is not identified.

g. Section 3.4.1, Quality Control: The identification of the person who will be preparing the DUSRs should be given and a resume including data validation experience should be provided.

h. Section 3.6.2 and Section 4.2: Groundwater elevation data should be taken continuously.

i. Section 5, First Bullet: Change one year to 6 months.

j. Page 17, First Bullet: Remove 1,000 ppb as the remediation objective and replace it with maximum contaminant levels (MCLs), to the extent practicable.

k. Page A-A-1: The flow rate of the sample pump needs to be lowered. Also specify how the sample is to be collected; i.e. bailer or pump.

B.3. Appendix C, Post Remediation Phase Groundwater Monitoring Plan:

a . Page 1, Introduction. The Post Remediation Phase Groundwater Monitoring Plan will be implemented only at the approval of the NYSDEC and NYSDOH. The text should be changed accordingly. Also, add downgradient to line 6 of paragraph 1.

b. Page 1, Introduction: The language that the remediation system will be shut down at 1ppm must be removed from this OM & M plan and in all other site related documents. When this project is at the point Mairoll is requesting to have the groundwater extraction and treatment system turned off, an application will be

made to the NYSDEC. This can occur when it has been determined that, to the extent practicable, MCLs cannot be met.

c. Page 2, Second Sentence: Add "behaved in a predictable manner."

d. Page 2, Section 2.1: Add "the final decision to discontinue the pump and treat system will be made by the NYSDEC."

e. Page 3, Section 2.2.1: Wells selected for the post-remediation monitoring should not be limited to exceeding 1ppm TVOC.

C. PRELIMINARY DRAWINGS 1 THROUGH 14:

1. Plan sheet 4 and plan sheets 9 through 14 are missing from the 35 percent design package.

2. Plan 5:

a. Plan view: The site building needs running water and a containment area to wash trays during maintenance operations such as removing iron scale.

b. B-B: The piping system lacks a thrust blocks at key elbow locations.

c. The location of the system sample ports are missing from this figure.

d. The air stripper and key piping locations inside the building need to be contained or sloped towards the center with cutoff switch(s) in key locations to prevent water from filling the stripper building.

e. A hose bib or a treated water storage holding tank should be included for any required site cleanup activities.

f. The proposed building should have enough room to add any additional equipment as necessary.

3. Plan 6: All pumps should be variable speed pumps so that rates can easily be changed.

D. GROUNDWATER PUMP AND TREAT SYSTEM PRELIMINARY TECHNICAL SPECIFICATIONS

The plans and specifications need a sediment and erosion control plan.

F. STATE POLLUTION DISCHARGE ELIMINATION SYSTEM PERMIT

The analytical results from the 72 hour pump test were used to establish SPDES discharge limits for the recharge system. Since Mairoll Fairchild Republic site is on the NYS registry as Class 2 Inactive Hazardous Waste Disposal Sites, a SPDES permit is not required at this time. However, the substantive permit requirements must be met, and the discharge limits established for this site are enclosed with this letter.

G. NYSDEC AIR PERMIT APPLICATION: See comment A.3 above.

H: PRELIMINARY SITE RESTORATION:

This plan needs to include, within reason, a section about maintaining the aesthetics of the site.

I. MAC Response Letter: The February 13, 2002 MAC response to the NYSDEC letter on the Aquifer Test Report has been reviewed and is acceptable.

Thank you for the opportunity to comment on the 35 percent design package. Please keep me informed of the status of access discussions with the Town of Babylon. It is my understanding that the draft

final design package should be ready by the end of May 2002. If you have any questions prior to submitting the draft final design package for review, please call me at (518) 402-9620.

Sincerely,

Steven M. Scharf, P.E.
Project Engineer
Bureau of Eastern Remedial Action
Division of Environmental Remediation
(Design35.wpd)

Enclosure
c/w/enc: W. Gilday, NYSDOH
G. Rosser, SCDHS
M. Hodge, Mairoll/Fairchild

MALCOLM PIRNIE

APPENDIX C

MALCOLM PIRNIE, INC., PROCESS FLOWS CALCULATION AND BACKUP DOCUMENTATION DATED JULY 15, 2003

MALCOLM PIRNIE

CALCULATION COVER SHEET

Client: Fairchild Republic Main Plant Site Project No.: **4724-002**

Project Name: Groundwater Pump and Treat System

Project Description: 90% and Final Design of a 400-gpm groundwater pump, treat, and recharge system to remove VOC contamination.

Total Number of Pages (including cover sheet): _____

Total Number of Computer Runs: N/A

Prepared by: David M. Patton, P.E. DMP Date: July 15, 2003

Checked by: _____ Date: _____

Description and Purpose:

1. To determine the required minimum treatment efficiencies of the proposed air stripper, the capacity/loading of the vapor-phase granular activated carbon treatment units, the capacity/loading and liquid-phase granular activated carbon treatment units, and the maximum loading rates of the leaching pools/chambers.
2. To verify/confirm the proposed treatment system's process flows, contaminant concentrations, and capacities for the purpose of determining proper equipment sizing, capacities, and electrical loads.

Design Basis/References/Assumptions:

- The treatment system is to pump, treat, and recharge the groundwater contaminated with VOCs at a flow rate of 400-gpm, and provide effluent water with a total VOC concentration of less than 5.0 ppb.
- The "basis of design" was taken from the Preliminary Remedial Design Report, (35 Percent Completion) submittal, which was prepared and submitted to the NYSDEC, by MAC Consultants. Attached are copies of report pages containing the pertinent study results and design values (i.e. flows, concentrations, capacities, loading rates, etc.), used to calculate the process flows. The following are taken from the report:
  1. PW-1 maximum/peak total VOC concentration = 1,390 ppb.
  2. PW-1 total VOC concentration range = 877 – 1,255 ppb.
  3. PW-1 "design" total VOC concentration = 1,170 ppb.
  4. Leaching Pool Loading Rate (revised test value) = 900 gal/ft^2-day.
- The MAC design report was tested and completed at a treatment flow rate of 250-gpm. The process/theory of linear extrapolation was used to determine the design values at the treatment flow rate of 400-gpm.
- The treatment flow rate has been determined to be 400-gpm, from two recovery wells approximately 500 feet apart. The two recovery/groundwater wells are proposed for the treatment system, one well (PW-1) will have a maximum flow rate of 250-gpm, while PW-2 will have a maximum flow rate of 150-gpm, with both wells totaling 400-gpm. The specific flow rates have been determined by MPI (NNJ office) and approved by the NYSDEC previously.
- The proposed groundwater recovery well (PW-2) has been assumed to contain the same total VOC concentration as PW-1. The design (average) VOC concentration used in these calculations is 1,170 ppb, as taken from PW-1 laboratory results (attached Table 2).
- North East Environmental Products Inc. (NEEP) provided the necessary performance projections, efficiencies, and required equipment modifications and cut sheets (attached) for use

in the design of the air stripper treatment system. The projections were completed at: a treatment flow of 400-gpm; a total VOC concentration of 1,500 ppb; 2,400 CFM air flow; water temperature of 50 °F; and air temperature of 40 °F. The following values were utilized from the projections:

1. Air Stripper total VOC removal = 99.6511%

- Barnebey & Sutcliffe Corporation provided projections, efficiencies, carbon usage/consumptions, and recommended equipment cut sheets, for both the vapor-phase and liquid-phase treatment systems, for use in the design of each specific treatment system. The projections were completed at: a treatment flow of 400-gpm; a total VOC influent concentration of 1,170 ppb; 2,400 CFM air flow; water temperature of 50 °F; and air temperature of 70 °F with relative humidity of 50%. The following values were utilized from the projections:

1. Vapor-Phase GAC usage/consumption = 0.05683 lb_{VOC}/lb_{GAC}
2. Liquid-Phase GAC usage/consumption = 0.00163 lb_{VOC}/lb_{GAC}

Remarks/Conclusions/Results:

- See attached excel spreadsheet for the calculated process flows, concentrations, and capacities of the treatment and recharge systems.

AIR STRIPPER:

- The existing air stripper will require modifications to be capable of treating the 400-gpm flow rate. The modifications will include: the additional of one (1) stripper tray, upgrading of the blower to provide 2,400 CFM air flow through the air stripper and vapor-phase GAC treatment units.
- The completed modifications will enable the existing air stripper to achieve a removal of approximately 99.6511% of the peak influent VOC concentration of 1,170 ppb, which will result in an effluent water quality/concentration (4.10 ppb) of total VOC less than the NYSDEC MCL limit of 5.0 ppb.

VAPOR-PHASE GRANULAR ACTIVATED CARBON (GAC_{vapor}) ABSORBER:

- The proposed GAC treatment system will include three (3) 8,000 lbs units Arranged in series, with two (2) units on-line and one (1) unit as a stand-by.
- The projected GAC consumption rate, at a removal efficiency of 96%, has been given as 0.0582 lb_{VOC}/lb_{GAC}, by NEEP representatives. The GAC consumption rate equates to a projected run-time (between carbon change outs) of approximately 83 days, for the treatment flow rate of 400-gpm (24 hrs/day) at an influent total VOC concentration of 1,170 ppb.
- The GAC units are to be connected in series, via 12" diameter flexible hosing, to facilitate the carbon change outs and GAC unit switchovers. The final effluent off-gas will be connected to ceiling ductwork and continue through a roof stack to the atmosphere.

LIQUID-PHASE GRANULAR ACTIVATED CARBON (GAC_{liquid}) ABSORBER:

- The proposed GAC_{liquid} treatment system will include two (2) 10,000 lbs units, which will be configured to operate as stand-alone units or simultaneously in parallel.
- The projected GAC_{liquid} consumption rate, at a removal efficiency of 99.9%, has been given as 0.00.00163 lb_{VOC}/lb_{GAC}, by Barnebey & Sutcliffe Corp. representatives. The GAC_{liquid} consumption rates:
  1. For polishing/secondary treatment, the consumption rate equates to a projected run-time (between carbon change outs) of approximately 485 days, for the treatment flow rate of 400-gpm (24 hrs/day) at an influent total VOC concentration of 7.0 ppb.
  2. For emergency full treatment (i.e. air stripper off-line), the consumption rate equates to a projected run-time, between carbon change out, of approximately 6 days, for the treatment flow rate of 400-gpm (24 hrs/day) at an influent total VOC concentration of 1,170 ppb.

LEACHING CHAMBERS/POOLS:

- Upon review of MAC's Preliminary Design Report (35%Completion) an error was discovered in the calculation of the leaching pools/chamber system, specifically the total square feet of available leaching area for each of the 8' OD x 8' H precast chambers. The report stated that each precast chamber had a total available leaching area of 500 ft^2, whereas the correct value is only 200 ft^2, as shown on the attached manufacturer's cut sheets. This error was carried through the calculations that determined the number of leaching chambers required for the treatment rate of 250-gpm and loading of 200 GDP/ft^2. The report stated that only three (3) chambers/pools, at 500 ft^2 each, would be required for the required flow of 250-gpm, whereas the correct number of chambers required increases to a total of nine (9) chambers, at 200 ft^2 each, for the same 250-gpm flow rate.
- It has been determined, by MPI (NNJ office), to use a recharge/leaching pool loading rate of 365 GPD/ft^2, in lieu of the 200 GPD/ft^2 rate suggested by MAC. At the 365 GPD/ft^2 loading rate the system requires a total of 1,578 ft^2 of available leaching area.
- It has been determined to use two (2) sets of five (5) 10' O.D. x 10' H precast concrete leaching chambers, each with 315 ft^2 of available leaching area. The five chambers, located in series, will provide a total of 1,575 ft^2 of available leaching area, capable of treating up to 400-gpm.

Calculation Approved by: _____

Project Manager/Date

FIGURE 1

FAIRCHILD REPUBLIC MAIN PLANT SITE
GROUNDWATER PUMP, TREAT, AND RECHARGE SYSTEM
PROCESS FLOW DIAGRAM

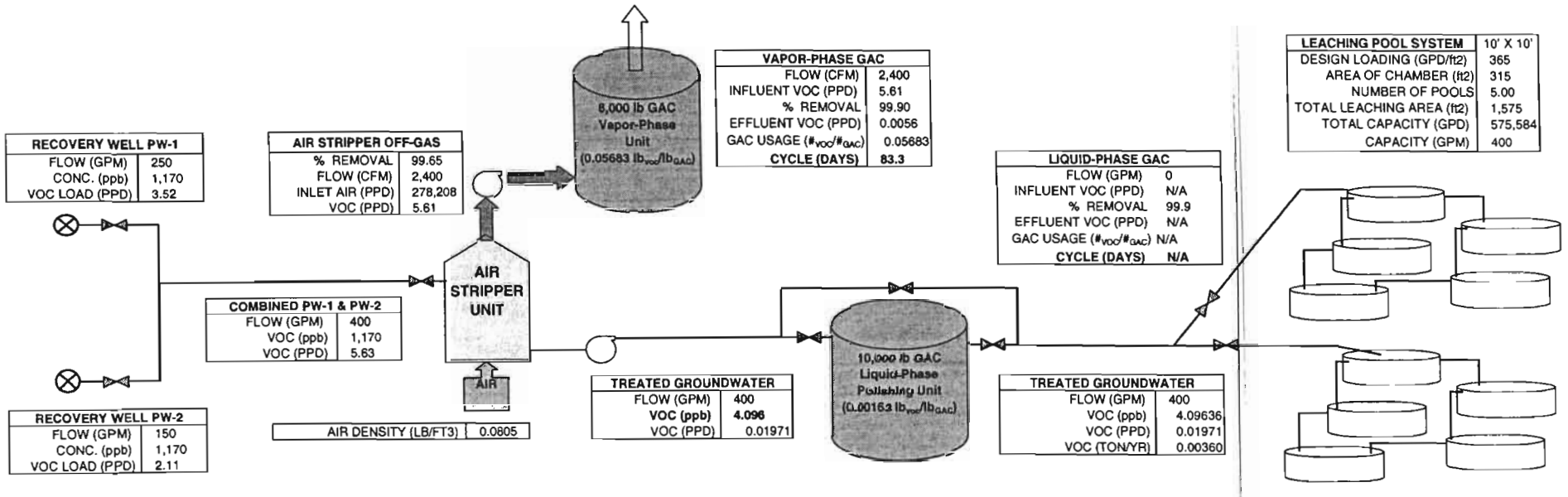
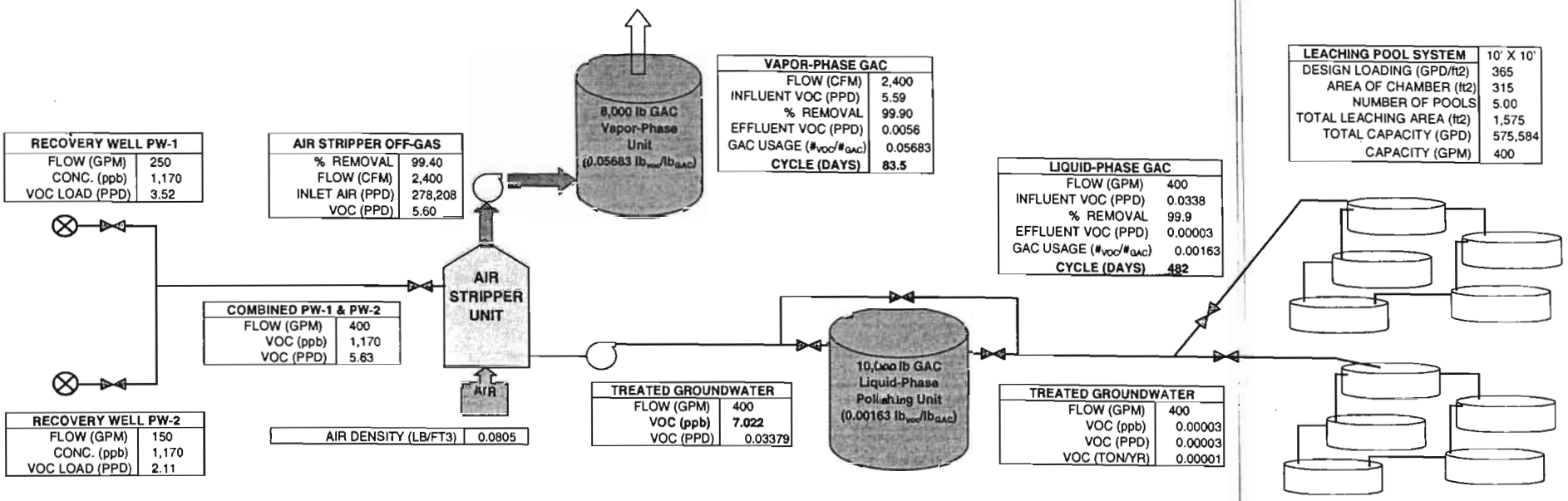


FIGURE 1

FAIRCHILD REPUBLIC MAIN PLANT SITE
GROUNDWATER PUMP, TREAT, AND RECHARGE SYSTEM
PROCESS FLOW DIAGRAM



RECOVERY WELL PW-1	
FLOW (GPM)	250
CONC. (ppb)	1,170
VOC LOAD (PPD)	3.52

RECOVERY WELL PW-2	
FLOW (GPM)	150
CONC. (ppb)	1,170
VOC LOAD (PPD)	2.11

AIR STRIPPER OFF-GAS	
% REMOVAL	99.40
FLOW (CFM)	2,400
INLET AIR (PPD)	278,208
VOC (PPD)	5.60

COMBINED PW-1 & PW-2	
FLOW (GPM)	400
VOC (ppb)	1,170
VOC (PPD)	5.63

AIR DENSITY (LB/FT3)	0.0805

VAPOR-PHASE GAC	
FLOW (CFM)	2,400
INFLUENT VOC (PPD)	5.59
% REMOVAL	99.90
EFFLUENT VOC (PPD)	0.0056
GAC USAGE ($\#_{VOC}/\#_{GAC}$)	0.05683
CYCLE (DAYS)	**83.5**

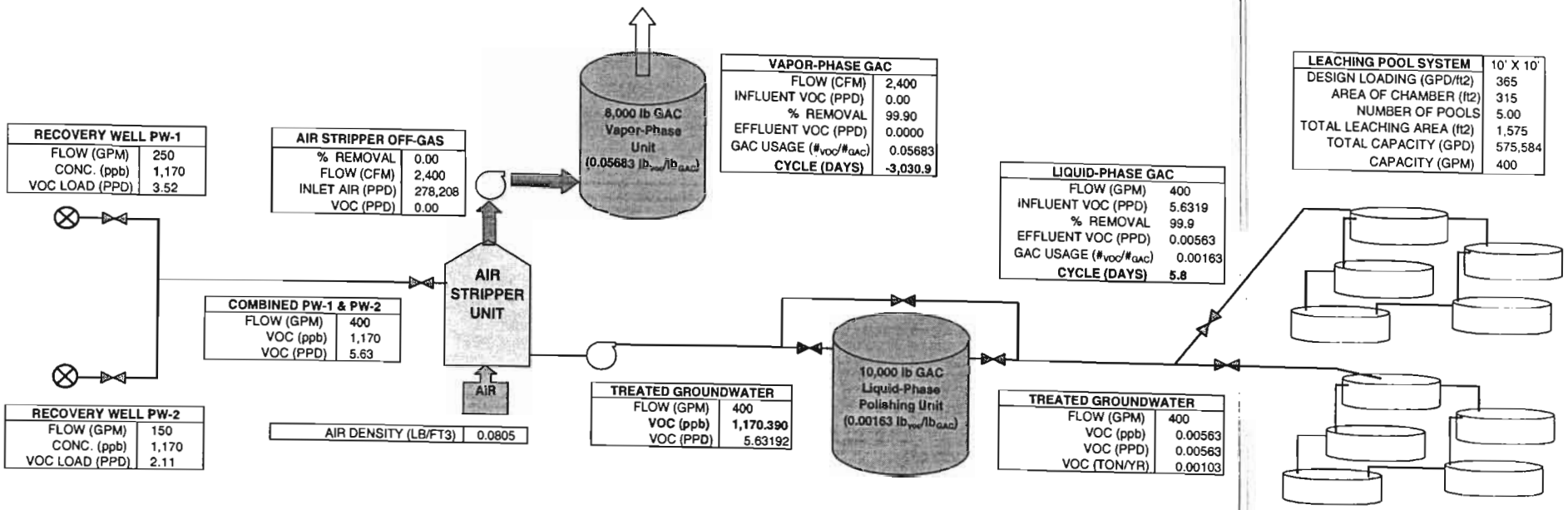
TREATED GROUNDWATER	
FLOW (GPM)	400
VOC (ppb)	**7.022**
VOC (PPD)	0.03379

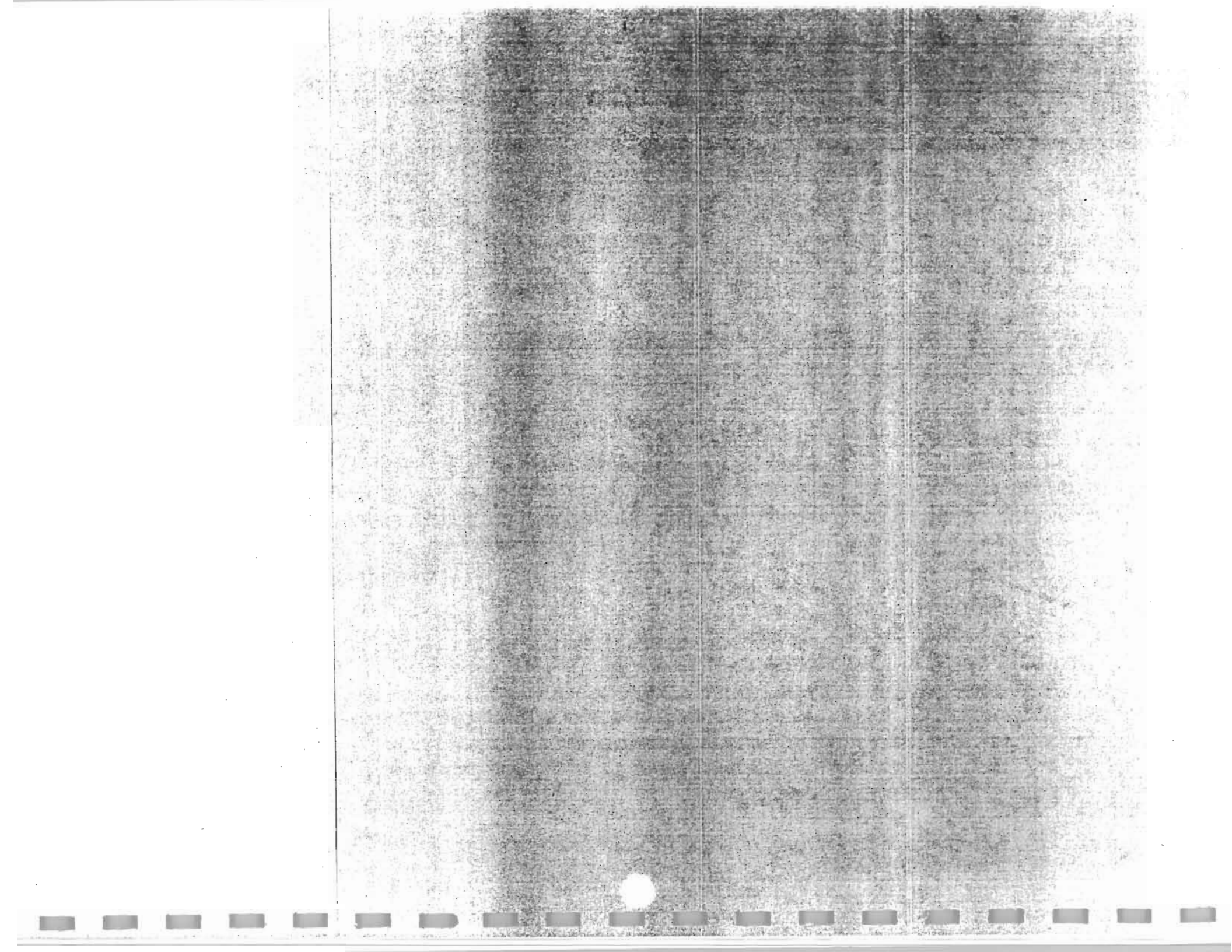
LIQUID-PHASE GAC	
FLOW (GPM)	400
INFLUENT VOC (PPD)	0.0338
% REMOVAL	99.9
EFFLUENT VOC (PPD)	0.00003
GAC USAGE ($\#_{VOC}/\#_{GAC}$)	0.00163
CYCLE (DAYS)	**482**

TREATED GROUNDWATER	
FLOW (GPM)	400
VOC (ppb)	0.00003
VOC (PPD)	0.00003
VOC (TON/YR)	0.00001

LEACHING POOL SYSTEM	10' X 10'
DESIGN LOADING (GPD/ft2)	365
AREA OF CHAMBER (ft2)	315
NUMBER OF POOLS	5.00
TOTAL LEACHING AREA (ft2)	1,575
TOTAL CAPACITY (GPD)	575,584
CAPACITY (GPM)	400

FIGURE 1
FAIRCHILD REPUBLIC MAIN PLANT SITE
GROUNDWATER PUMP, TREAT, AND RECHARGE SYSTEM
PROCESS FLOW DIAGRAM





North East Environmental Products Incorporated
17 Technology Drive West Lebanon, New Hampshire 03784
Phone: 603-298-7061 Fax: 603-298-7063

Friday, 11 April 2003

To: Ben Girard
Malcolm Pirnie Incorporated **Ph: 716-667-6645**
40 Centre Drive **Fax: 716-667-0279**
Orchard Park, New York 14127

From: Don Shearouse, P.E. ***don_shearouse@neepsystems.com***

Subject: ShallowTray #41241-5601: Tray Addition Upgrade

To follow-up your request, the following budgetary pricing to provide an additional tray and upgraded blower and control panel as well as offgas vapor-phase granular activated carbon (VGAC) for the existing ShallowTray. Attached modeling provides the offgas mass loadings from the upgraded model 41251 air stripper exhaust at 2400 scfm and increased influent concentration at 400 gpm.

One (1) series 41200 stripper tray, 304L SS fabrication; with gasket, latches, weirs, downcomer, & sealpot; US$ each $8,100.00

Induced draft ductwork, 18"Ø, from stripper exhaust to blower inlet, total US$, each $2,000.00

Blower, American Fan model RB 354-24.5 to deliver 2400 scfm at 38" w.c. (26" w.c. for stripper, 12" w.c. for VGAC and piping losses), complete with 50 HP 3Ø 460 volt 60 Hz TEFC motor, total: $10,000.00

Discharge ducting, 12"Ø flexible hose with clamps, for connecting blower discharge to VGAC vessels, interconnection between vessels, and connection to owner provided discharge stack (18" minimum diameter), total: $2,000.00

Three (3) [two online in series, one offline standby] VF-10000 vapor phase carbon adsorber vessels, each 7'8"H x 8'W x 10'L, requiring 5" w.c. each at 2400 scfm, each with 10,000 pounds of reactivated VGAC, each: $19,500.00

One (1) control panel, NEMA 4, 24" x 24" x12", for 125 amp 460 volt 3Ø service; factory built, tested, and UL certified, complete with 200 amp main disconnect, fuses, starter, overload, run light, and H-O-A switch for 50 HP blower motor and 7.5 HP pump motor, alarm lights, intermittent operation circuitry, and control power transformer: price US$, each: $3,288.00

Total Upgrade Package Selling Price, US$: $83,888.00

Shipping, unloading, electrical conduit and wiring, and mechanical installation is not included.

Please don't hesitate to phone or fax if we can assist with any questions, comments, or concerns you may have.

Kindest Regards,

D. Shearone

Total number of pages INCLUDING this cover page: THREE

Visit our website at www.neepsystems.com

ShallowTray low profile air strippers

ShallowTray®
low profile air strippers

HIGH FLOW

System Performance Estimate
Client and Proposal Information:

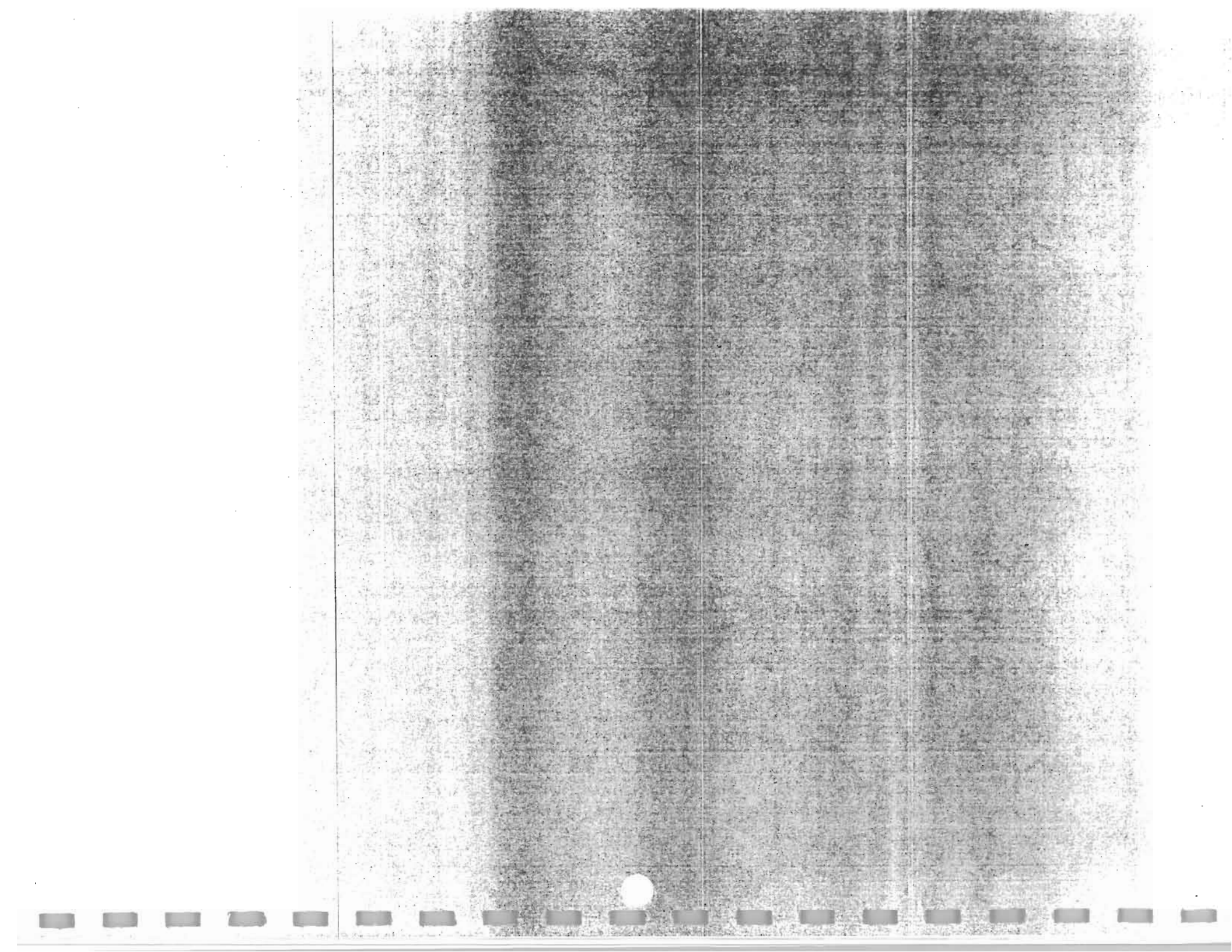
Malcolm Pirnie: Ben Girard
fax#: 716-667-0279
Fairchild Republic, Farmingdale, NY
#41241-04-5601 add a tray

Series chosen:	41200	
Water Flow Rate:	400.0 gpm	90.9 m3/hr
Air Flow Rate:	2400 scfm	4080 m3/hr
Water Temp:	50 °F	10 °C
Air Temp:	40 °F	4 °C
A/W Ratio:	45	45
Safety Factor:	None	

Contaminant	Untreated Influent / Effluent Target	Model 41211 Effluent lbs/hr PPMv %removal	Model 41221 Effluent lbs/hr PPMv %removal	Model 41231 Effluent lbs/hr PPMv %removal	Model 41241 Effluent lbs/hr PPMv %removal	Model 41251 Effluent lbs/hr PPMv %removal
Trichloroethylene	1500 ppb	484 ppb	156 ppb	50 ppb	16 ppb	5 ppb
Solubility 1100 ppm	ppb	0.20 4.1	0.27 5.4	0.29 5.8	0.30 6.0	0.30 6.0
Mwt 131.5		67.7487%	89.5986%	96.6454%	98.9181%	99.6511%

This report has been generated by ShallowTray Modeler software version Ev2.2. This software is designed to assist a skilled operator in predicting the performance of a ShallowTray air stripping system. North East Environmental Products, Inc. (NEEP) is not responsible for incidental or consequential damages resulting from the improper operation of either the software or the air stripping equipment.

Report Generated: 4/11/03 Modeler Ev2.3 ppmv



BARNEBEY SUTCLIFFE
A WATERLINK COMPANY

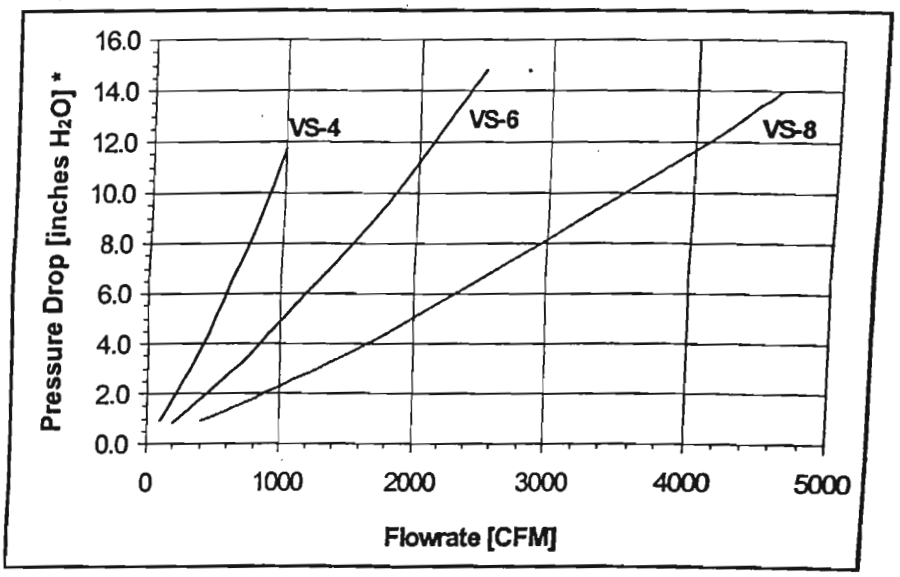
Powerful Solutions for a New Tomorrow

Protect VS Series

The Protect VS series vessels are portable, low pressure vapor adsorbers that are easily put into service. These vessels are designed to operate at a maximum pressure of 5 psi, maximum vacuum of 5" of mercury, operating temperature up to 150 °F, and hold from 2,000 to 8,000 pounds of activated carbon.

Important Features:

- Durable carbon steel construction
- Upper & lower open-air plenum area for efficient carbon usage
- Rust-prohibitive exterior epoxy urethane coating
- 16" Round inspection manway
- Condensate drain plug
- Forklift guides
- Lifting lugs to facilitate moving
- Fitting for sample port or Protect saturation indicator
- All models available to rent



* Estimated pressure drop based on 4x10 mesh carbon.

Model #	GAC		Recommended Maximum Flow Rate, cfm	Weight, lbs. (Empty / Operating)
	ft.^{3}	lbs.**		
VS-4	72	2,000	1,100	1,760 / 3,760
VS-6	180	5,000	2,500	3,340 / 8,340
VS-8	265	8,000	4,500	4,900 / 12,900

** Weight estimated based on vessel volume.

Corporate Capabilities:

Barnebey Sutcliffe has been manufacturing and servicing adsorption equipment for over 80 years. Some of our other products and services include:

- Wide variety of coal & coconut shell carbons
- Broad range of filtration media
- National network of service centers
- Carbon reactivation (hazardous & non-hazardous)
- Vessel rental
- Spent media exchange
- Technical support
- Custom-engineered systems
- ASME Code certified fabrication facility

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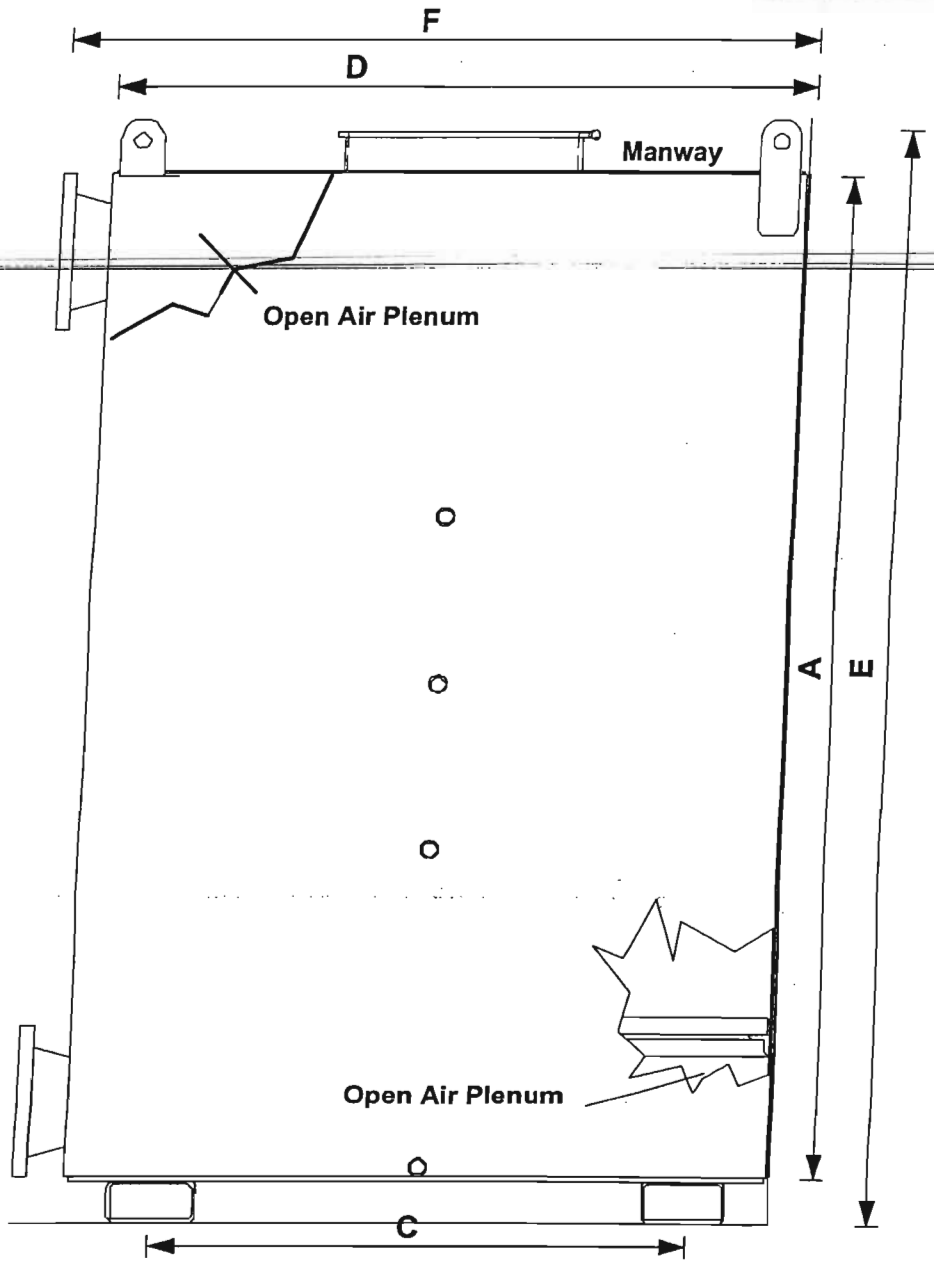

Available Options:

- Internal linings
- Camloc quick connectors
- Higher operating pressures / vacuum
- Stainless steel construction
- Pressure relief valves
- Butterfly isolation valves
- Carbon saturation indicators

To discuss your application needs, call us at one of our regional offices or at

1-800-866-2272

www.bscarbons.com

Model	Cross-Sectional Area, ft^2	Side Shell A	Inlet / Outlet B	Forklift Guides C	Overall Width D	Overall Height E	Overall Length F
VS-4	16	72"	6" 150# flg	36"	49" ±	79" ±	52" ±
VS-6	36	96"	8" 150# flg	48"	73" ±	103" ±	77" ±
VS-8	64	96"	12" 150# flg	48"	97" ±	103" ±	101" ±

Due to the ongoing improvement of our products, we reserve the right to change system specifications and performance criteria without notification. Warning: Some compounds and/or high concentrations can lead to heat buildup in GAC and potential bed fire. Contact BSC for information.

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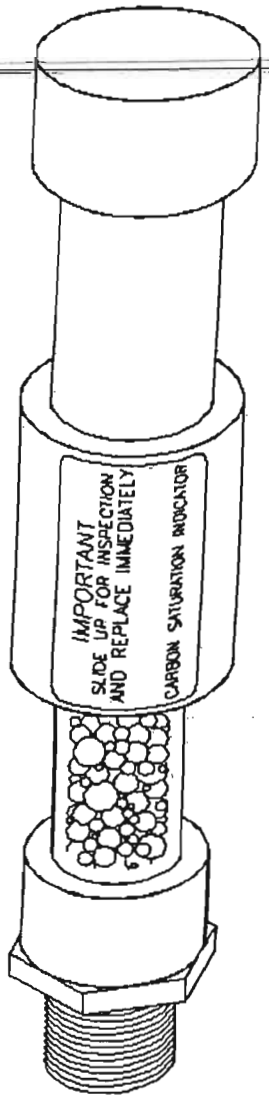
Carbon Saturation Indicator

Barnebey Sutcliffe has developed the unique Protect Carbon Saturation Indicator as a monitoring device to compliment vapor phase adsorbers operating in positive pressure applications. This indicator provides a simple and inexpensive method of determining when a carbon bed needs to be replaced.

The device works similarly to a litmus test, indicating when volatile organics have saturated the activated carbon and breakthrough has begun. When the carbon can no longer adsorb the organics, media in the indicator changes color from purple to brown.

The exterior cover houses the clear internal cylinder which contains the media, and protects it from ultraviolet light and



Installation on a Protect vapor phase adsorber:

- Remove the threaded cap from the bottom of the indicator
- Remove the threaded plug from the 3/4" adsorber port and thread indicator into the opening
- Remove the green sealing tape from the top and bottom of the indicator.
- Lift the protective cover for inspection and replace. Leave the protective cover down in between inspections.

When the bright purple color of the media changes to a dull brown, it is time to replace the activated carbon and the Carbon Saturation Indicator.

To discuss your application needs, call us at one of our regional offices or at

1-800-866-2272

www.bscarbons.com

Barnebey Sutcliffe is continually improving carbon capacity and system performance. Due to the ongoing improvement of our products, we reserve the right to change system specifications and performance criteria without notification.

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- Vessel rental
- Spent media exchange
- Technical support
- Custom-engineered systems
- ASME Code certified fabrication facility

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Capacity for Vapor Phase Contaminants

Factors Which Influence Adsorption

Various factors affect carbon's ability to adsorb contaminants. In vapor phase applications, the most important influences are molecular structure of the contaminant, concentration, competitive adsorption, relative humidity, pressure, and temperature.

Contaminant Structure and Concentration

Capacity generally increases for materials with a higher boiling point and higher molecular weight. As concentration of a compound increases, the capacity for that compound also increases.

Competitive Adsorption

Because chemicals adsorb to different degrees, the relative concentrations of chemicals plays a large part in adsorption efficiency. For example, even though waste stream may contain a large amount of a poorly adsorbed compound like butane and only a small amount of benzene, as the carbon comes into contact with fresh portions of the stream, benzene will displace the adsorbed butane.

Pressure and Temperature

Adsorption occurs when the energy exerted by the pore walls overcomes the energy of a contaminant molecule present in the operating environment. The molecules held to the pore walls more closely resemble a liquid than a gas. For this reason, anything which helps the contaminant substance to condense or become more liquid-like, will increase adsorption. Two ways of doing this are lowing temperature and increasing pressure. Increasing pressure forces the molecules closer together. A temperature decrease causes molecules lose energy, making it easier for them to be trapped by the force exerted by pore walls.

Relative Humidity

The effect of humidity depends on the type of contaminant. At higher humidity (relative humidity >50%), capacity is higher for water soluble compounds like acetone and methanol, but is lower for immiscible or partially immiscible solvents such as toluene, benzene, and chlorinated solvents.

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Trends for Vapor Phase Adsorption

Operating Condition	Change in Operating Condition	Resulting Change in Adsorption
Pressure	↑	↑
Concentration	↑	↑
Temperature	↑	↓
Relative Humidity	↑	↑ For water soluble ↓ For water insoluble

Relative Adsorption Capacity Table

The following table shows the relative capacity of a standard coconut shell carbon for removing selected chemical compounds from vapor under typical conditions.

Average index values are shown. Standard activated carbon has limited effectiveness for certain chemically reactive gases like ammonia, hydrogen sulfide and formaldehyde. Special impregnated carbons, however, have been formulated for many reactive gases, and can be recommended for the substances noted with an asterisk (*). Because carbon capacity depends heavily process conditions, please contact Barnebey Sutcliffe to review your specific application. This is by not a complete list of contaminants that can be treated by activated carbon.

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Key : 0 - 5 5 is highest adsorptive capacity, 0 is no capacity under normal conditions

Substance	Index	Substance	Index	Substance	Index
Acetaldehyde	*	Chlorine	3*	Ethane	0
Acetic acid	4	Chlorobenzene	5	Ether	3
Acetic anhydrite	4	Chlorobutadiene	4	Ethyl acetate	4
Acetone	3	Chloroform	4	Ethyl acrylate	4
Acetylene	0	Chloronitropropane	4	Ethyl alcohol	3
Acid gas	*	Chloronitropropane	4	Ethyl amine	*
Acrolein	3	Chloropicrin	4	Ethyl benzene	5
Acrylic acid	4	Cigarette smoke odor	4	Ethyl bromide	3
Acrylonitrile	4	Citrus and other fruits	4	Ethyl chloride	3
Adhesives	4	Cleaning compounds	4		
Amines	*	Cooking odors	4	Ethyl ether	3
Ammonia	*	Corrosive gases	*	Ethyl formate	3
Amyl acetate	4	Creosote	5	Ethyl mercaptan	3
Amyl alcohol	4	Cresol	5	Ethyl silicate	4
Amyl ether	4	Crotonaldehyde	4	Ethylene	0
Animal odors	3	Cyclohexane	5	Ethylene chlorohydrin	3
Anesthetics	3	Cyclohexanol	4	Ethylene oxide	*
Aniline	5	Cyclohexanone	5	Essential oils	5
Asphalt	4	Cyclohexene	5	Eucalyptole	4
Benzene	5	Decane	5	Fertilizer	4
Bleaching solutions	*	Deodorants	4	Film Processing Odors	3
Bromine	*	Detergents	4	Floral scents	4
Butadiene	3	Dibromethane	3	Fluorotrichloromethane	3
Butane	2	Dichlorobenzene	5	Food aromas	4
Butanone	4	Dichlorodifluoromethane	3	Formaldehyde	*
Butyl acetate	4	Dichloroethane	3	Formic acid	*
Butyl alcohol	4	Dichloroethylene	3		
Butyl cellosolve	4	Dichloroethyl ether	4	Gasoline	5
Butyl chloride	4	Dichloromonofluormethane	3		
Butyl ether	4	Dichloronitroethane	4	Heptane	5
Butylene	2	Dichloropropane	4	Heptylene	5
Butyne	2	Dichlorotetrafluorethane	4	Hexane	4
Butyraldehyde	3	Diesel fumes	4	Hexylene	4
Butyric acid	4	Diethylamine	*	Hexyne	4
		Diethyl ketone	4	Hospital odors	4
Caprylic acid	4	Dimethylaniline	5	Household smells	4
Carbolic acid	4	Dimethylsulfide	3	Hydrogen	0
Carbon disulfide	2	Dioxane	4	Hydrogen bromide	*
Carbon dioxide	1	Dipropyl ketone	4	Hydrogen chloride	*
Carbon monoxide	0			Hydrogen cyanide	*
Carbon tetrachloride	4	Epoxy	4	Hydrogen fluoride	*

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Key : 0 - 5 5 is highest adsorptive capacity, 0 is no capacity under normal conditions

Substance	Index	Substance	Index	Substance	Index
Hydrogen iodide	*	Naphtha	5	Propyl mercaptan	4
Hydrogen selenide	*	Naphthalene	5	Propylene	1
Hydrogen	*	Nicotine	4	Propyne	1
		Nitric acid	*	Putrescine	4
Ink Odors	3	Nitro benzenes	5	Pyridine	4
Iodine	4	Nitroethane	4		
Isophorone	4	Nitrogen dioxide	*		
Isoprene	3	Nitroglycerine	4	Radiation products	*
Isopropyl acetate	4	Nitromethane	2	Radioactive iodide	*
Isopropyl alcohol	4	Nitropropane	4	Resins	4
Isopropyl ether	4	Nitrotoluene	5	Ripening fruits	4
		Nonane	5	Rubber	4
Kerosene	5	Noxious gases	*		
Kitchen odors	4			Sewer odors	*
		Octalene	5	Styrene monomer	5
Liquid fuels	5	Octane	5	Sulfur dioxide	*
Lubricating oils	5	Odorants	*	Sulfur trioxide	*
		Ozone	5	Sulfuric acid	*
Medicinal odors	4				
Menthol	4	Paint odors	4	Tetrachloroethane	5
Mercaptans	*	Palmitic acid	4	Tetrachloroethylene	5
Mercury	*	p-dichlorbenzene	5	Toluene	5
Mesityl oxide	4	Paste	4	Toluidine	5
Methane	0	Pentane	3	Trichlorethylene	4
Methyl acetate	2	Pentanone	4	Trichloroethane	4
Methyl acrylate	3	Pentylene	3	Turpentine	5
Methyl alcohol	1	Pentyne	3		
Methyl bromide	2	Perchloroethylene	4	Urea	4
Methyl butyl ketone	4	Perfumes	4	Uric acid	4
Methyl cellosolve acetate	4	Pet odors	3		
Methyl chloride	2	Phenol	5	Valeric acid	4
Methyl chloroform	4	Phosgene	3	Valericaldehyde	4
Methyl ether	3	Pitch	5	Varnish fumes	4
Methyl ethyl ketone	3	Plastics	4	Vinegar	4
Methyl formate	2	Poison gases	*	Vinyl chloride	1
Methyl iodine	*	Propane	1		
Methyl isobutyl ketone	4	Propionaldehyde	3	Xylene	5
Methylcyclohexane	5	Propionic acid	4		
Methylcyclohexanol	5	Propyl acetate	4	War gases	*
Methylcyclohexanone	5	Propyl alcohol	3		
Methylene chloride	3	Propyl chloride	4		
Monochlorobenzene	5	Propyl ether	4		

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Gulf Coast Office •Sulphur, LA •337-527-0084 • Fax 337-527-0087 / Northeast Regional Office • Downingtown, PA • 610- 870-3070 • Fax 610-870-3072

Patton, David

From: Elwood V. Reinhart [wreinhart@waterlink.com]
Sent: Tuesday, August 12, 2003 1:37 PM
To: Patton, David
Subject: FWD: RFQ Fairchild Republic, Farmingdale, LI, NY


Malcom Pirnie-2(2).xls


Malcom Pirnie(2).xls


Malcom Pirnie - 99% RH(3).xls

David, good afternoon!

Attached are the revised carbon usage calculations for the vapor stream for Fairchild Republic project, based on 400 gpm, not 250 gpm. You will see that the carbon usage rate increases from 81 lbs./day to only 97 lbs./day. Therefore, the life for an 8,000 lb. carbon adsorber at equalibrium is approx. 82 days.

I am proceeding to get you information on the electric heater for hating the air stream and reduce RH to below 70%. Will get back to you shortly on this.

Best regards,

Woody Reinhart
Regional Sales Manager
Barnebey Sutcliffe Corporation
835 North Cassady Avenue
Columbus, OH 43219-2203 USA
one: (614) 258-9501 x223
ax: (614) 258-3464
E-mail: wreinhart@waterlink.com

---------- Forwarded Message ----------

FROM: Mark Stouffer <mstouffer@waterlink.com>
TO: "Woody Reinhart (SMTP)" <wreinhart@waterlink.com>
DATE: Tue, 12 Aug 2003 11:45:31 -0400

RE:

Mark R. Stouffer
Technical Director
Barnebey Sutcliffe Corporation
835 North Cassady Avenue
Columbus, OH 43219
614-258-9501 (Voice)
614-258-3464 (Fax)
Email: mstouffer@waterlink.com

Barnebey & Sutcliffe Corp.

Vapor Phase Adsorption Model - Activated Carbon Consumption Calculation

12/08/02

System Conditions	
System Temperature (oF)	70
Flow Rate (acfm)	2,400
System Pressure (mmHg)	760
System Operation (hrs/day)	24
Humidity , %	50

GAC SYSTEM USAGE ($\#_{VOC}/\#_{GAC}$)	0.05683

Component	Inlet Concentration	Inlet Concentration	Activated Carbon Type AC		Activated Carbon Type 207A	
			Capacity	Usage	Capacity	Usage
	ppm	lb/day	% (w/w)	lb/day	% (w/w)	lb/day
ACETALDEHYDE	0.0000	0.00	0.00	0.00	0.00	0.00
ACETONE	0.0000	0.00	0.00	0.00	0.00	0.00
ACETIC ACID	0.0000	0.00	0.00	0.00	0.00	0.00
ACRYLONITRILE	0.0000	0.00	0.00	0.00	0.00	0.00
ALLYLCHLORIDE	0.0000	0.00	0.00	0.00	0.00	0.00
ANILINE	0.0000	0.00	0.00	0.00	0.00	0.00
BENZENE	0.0134	0.01	4.02	0.23	0.50	1.89
BUTANE-n	0.0000	0.00	0.00	0.00	0.00	0.00
BUTANOL-n	0.0000	0.00	0.00	0.00	0.00	0.00
BUTOXY ETHANOL-2	0.0000	0.00	0.00	0.00	0.00	0.00
BUTYL ACETATE-n	0.0000	0.00	0.00	0.00	0.00	0.00
CARBON TETRACHLORIDE	0.0130	0.02	7.00	0.25	0.84	2.12
CHLOROBENZENE	0.0000	0.00	0.00	0.00	0.00	0.00
CHLOROFORM	0.0050	0.01	1.29	0.41	0.04	12.44
CUMENE	0.0000	0.00	0.00	0.00	0.00	0.00
CYCLOHEXANE	0.0000	0.00	0.00	0.00	0.00	0.00
DICHLOROBENZENE-m	0.0000	0.00	0.00	0.00	0.00	0.00
DICHLOROETHANE-1,2	0.0496	0.04	3.99	1.10	0.37	11.86
DICHLOROETHYLENE-1,1 (EDC)	1.3120	1.14	7.69	14.77	1.31	86.63
DICHLOROMETHANE	0.0000	0.00	0.00	0.00	0.00	0.00
DIETHYLENE GLYCOL MONOBUTYL ETHER	0.0000	0.00	0.00	0.00	0.00	0.00
DIETHYL ANILINE	0.0000	0.00	0.00	0.00	0.00	0.00
DIMETHYLPENTANE-2,2	0.0000	0.00	0.00	0.00	0.00	0.00
ETHANOL	0.0000	0.00	0.00	0.00	0.00	0.00
ETHYL ACETATE	0.0000	0.00	0.00	0.00	0.00	0.00
ETHYLBENZENE	0.0000	0.00	0.00	0.00	0.00	0.00
ETHYL CHLORIDE	0.0000	0.00	0.00	0.00	0.00	0.00
ETHYLENE GLYCOL MONOPROPYL ETHER	0.0000	0.00	0.00	0.00	0.00	0.00
HEPTANE-n	0.0000	0.00	0.00	0.00	0.00	0.00
HEXANE-n	0.0000	0.00	0.00	0.00	0.00	0.00
ISOPRENE	0.0000	0.00	0.00	0.00	0.00	0.00
ISOPROPANOL	0.0000	0.00	0.00	0.00	0.00	0.00
ISOPROPYL ACETATE	0.0000	0.00	0.00	0.00	0.00	0.00
ISOPENTYL ACETATE	0.0000	0.00	0.00	0.00	0.00	0.00
METHANOL	0.0000	0.00	0.00	0.00	0.00	0.00
METHYL-2-PYROLIDONE	0.0000	0.00	0.00	0.00	0.00	0.00
METHYL ACRYLATE	0.0000	0.00	0.00	0.00	0.00	0.00
METHYL CHLORIDE	0.0000	0.00	0.00	0.00	0.00	0.00
METHYL ETHYL KETONE	0.0000	0.00	0.00	0.00	0.00	0.00
METHYL ISOBUTYL KETONE	0.0000	0.00	0.00	0.00	0.00	0.00
METHYL METHACRYLATE	0.0000	0.00	0.00	0.00	0.00	0.00
METHYL TERT BUTYL ETHER	0.0000	0.00	0.00	0.00	0.00	0.00
METHYLENE CHLORIDE	0.0000	0.00	0.00	0.00	0.00	0.00
OCTANE-n	0.0000	0.00	0.00	0.00	0.00	0.00
PENTANE-n	0.0000	0.00	0.00	0.00	0.00	0.00
PHENOL	0.0000	0.00	0.00	0.00	0.00	0.00
PROPANE	0.0000	0.00	0.00	0.00	0.00	0.00
PROPANOL	0.0000	0.00	0.00	0.00	0.00	0.00
PROPYLENE GLYCOL-1,2	0.0000	0.00	0.00	0.00	0.00	0.00
STYRENE	0.0000	0.00	0.00	0.00	0.00	0.00
TETRACHLOROETHYLENE	0.2464	0.36	32.37	1.13	12.90	2.83
TETRACHLOROETHANE	0.0000	0.00	0.00	0.00	0.00	0.00
TETRAHYDROFURAN	0.0000	0.00	0.00	0.00	0.00	0.00
TOLUENE	0.0000	0.00	0.00	0.00	0.00	0.00
TRI-O-CRESYL PHOSPHATE	0.0000	0.00	0.00	0.00	0.00	0.00
TRICHLOROETHANE-1,1,1	0.0302	0.04	7.12	0.51	0.99	3.62
TRICHLOROETHYLENE	3.2560	3.82	26.67	14.32	9.88	38.65
TRICHLOROTRIFLUOROETHANE-1,1,2	0.0173	0.03	5.11	0.57	0.48	6.00
TRIMETHYLAMINE	0.0000	0.00	0.00	0.00	0.00	0.00
VINYLCHLORIDE	0.0518	0.03	0.05	63.31	0.00	18399.78
XYLENE-m	0.0000	0.00	0.00	0.00	0.00	0.00
Total Usage	4.99473	5.49	95.30	96.59		18565.82
Average Adsorption Capacity (% w/w)			6%		0%	

The Adsorption Capacity Is Estimated Using The Polanyi Adsorption Theory And Toluene

AIR STRIPPER MASS BALANCE CALCULATION

Assumes 100% Efficiency

LIQUID STREAM

GAS STREAM

Water flow, gpm	Component	MW	Concentration, mg/l	lbmol/min	Flow, scfm	ppm
400	Benzene	78	0.002	8.53948E-08	2400	0.013485259
400	Vinyl Chloride	62.5	0.00617	3.28777E-07	2400	0.051919327
400	DCE	96.9	0.01085	3.72908E-07	2400	0.058888415
400	DCE, cis	96.9	0.2333	8.01838E-06	2400	1.266236617
400	chloroform	119	0.0018	5.03757E-08	2400	0.00795517
400	TCE	131.5	0.814	2.06155E-05	2400	3.255536423
400	PCE	165	0.0775	1.56428E-06	2400	0.247025431
400	DCA	98.96	0.00933	3.13992E-07	2400	0.049584491
400	TCA	133	0.00767	1.92061E-07	2400	0.030329666
400	F 113	187	0.00617	1.09885E-07	2400	0.017352716
400	Dichlorodifluor	121	0.003	8.25718E-08	2400	0.013039466

	K	L	M	N	O	P	Q	R	T	U	V	W	X	Y	Z	AA	AB	AC	AD
10								Vapor Pressure Eqn (Vp)												
11								Log(Vp) = A+B/T+C*log(T)+D*T+E*T^2												
12								Units: T [=] oK , Vp [=] mm Hg												
13 Component	Structure	Inlet Concentration ppm	Check Inlet Con. ppm	Boiling Point oK	Liquid Density gm/cc	Molecular Weight g/g mol	Refractive Index	A	B	C	D	E	Vp (atm) at Tem. mmHg	Polarization	Affinity 1	Affinity 2	Affinity Avg	Affinity Coef.	Carbon Capacity AC g/g	Carbon Capacity 207E4 g/g
14 ACETALDEHYDE	C2H4O	0	0	293.55	0.77	44.05	1.3316	87.3702	-3682.20	-31.5480	2.011E-02	5.534E-13	779.84	11.668	0.544	0.376	0.460	0.544	0.0000	0.0000
15 ACETONE	C3H6O	0	0	329.44	0.79	58.08	1.3590	28.5884	-2469.00	-7.3510	2.803E-10	2.736E-06	193.71	16.276	0.698	0.524	0.611	0.698	0.0000	0.0000
16 ACETIC ACID	C2H4O2	0	0	391.05	1.043	60.05	1.3715	28.378	-2973.40	-7.032	-1.51E-09	2.18E-06	12.58	13.070	0.593	0.421	0.507	0.593	0.0000	0.0000
17 ACRYLONITRILE	C3H3N	0	0	350.50	0.80	53.06	1.3910	35.9210	-2776.30	-10.1010	-3.155E-10	4.730E-06	91.01	15.737	0.681	0.507	0.594	0.681	0.0000	0.0000
18 ALLYLCHLORIDE	C3H5Cl	0	0	318.11	0.93	76.53	1.4135	8.6085	-1751.20	0.6079	-7.168E-03	5.223E-06	317.13	20.523	0.831	0.661	0.746	0.831	0.0000	0.0000
19 ANILINE	C6H7N	0	0	457.60	1.02	93.13	1.5863	124.3764	-7167.60	-42.7630	1.734E-02	5.714E-15	0.35	30.722	1.125	0.990	1.057	1.125	0.0000	0.0000
20 BENZENE	C6H6	0.01344	0.01344	353.24	0.87	78.11	1.5010	31.7718	-2725.40	-8.4443	-5.353E-09	2.719E-06	79.19	26.364	1.003	0.849	0.926	1.003	0.0402	0.0050
21 n-BUTANE	C4H10	0	0	272.65	0.57	58.12	1.3540	27.0441	-1904.90	-7.1805	-6.685E-11	4.219E-06	1,618.76	22.054	0.877	0.710	0.794	0.877	0.0000	0.0000
22 n-BUTANOL	C4H10O	0	0	390.81	0.81	74.12	1.3990	39.6673	-4001.70	-10.2950	-3.257E-10	8.667E-07	5.34	22.240	0.883	0.716	0.800	0.883	0.0000	0.0000
23 BUTOXY ETHANOL-2	C6H14O2	0	0	444.47	0.90	118.18	1.4176	-39.3735	-3005.80	25.6960	-5.734E-02	3.271E-05	0.64	33.197	1.192	1.069	1.131	1.192	0.0000	0.0000
24 n-BUTYL ACETATE	C6H12O2	0	0	399.15	0.88	116.16	1.3940	4.3830	-2713.40	3.9835	-1.658E-02	9.725E-06	9.14	31.707	1.152	1.021	1.087	1.152	0.0000	0.0000
25 CARBON TETRACHLORIDE	CCl4	0.01296	0.01296	349.79	1.58	153.82	1.4595	31.9407	-2661.40	-8.5763	-6.714E-10	2.973E-06	95.76	26.583	1.009	0.856	0.933	1.009	0.0700	0.0084
26 monoCHLOROBENZENE	C6H5Cl	0	0	404.87	1.11	112.56	1.5240	19.4340	-2580.10	-3.9391	-4.400E-11	4.960E-07	9.64	31.111	1.136	1.002	1.069	1.136	0.0000	0.0000
27 CHLOROFORM	CHCl3	0.00497	0.00497	334.33	1.48	119.38	1.4460	56.6178	-3246.20	-18.7000	9.515E-03	1.155E-12	166.22	21.510	0.861	0.693	0.777	0.861	0.0129	0.0004
28 CUMENE	C9H12	0	0	425.56	0.86	120.19	1.4910	-0.9234	-2955.80	7.1685	-2.537E-02	1.486E-05	3.55	40.488	1.384	1.304	1.344	1.384	0.0000	0.0000
29 CYCLOHEXANE	C6H12	0	0	353.87	0.77	84.16	1.4260	48.5529	-3087.40	-15.5210	7.383E-03	6.356E-12	82.45	27.893	1.046	0.898	0.972	1.046	0.0000	0.0000
30 m-DICHLOROBENZENE	C6H4Cl2	0	0	446.23	1.28	147.00	1.5460	3.2904	-2583.90	3.2893	-9.540E-03	4.640E-06	1.68	36.267	1.274	1.168	1.221	1.274	0.0000	0.0000
31 1,2-DICHLOROETHANE	C2H4Cl2	0.0496	0.0496	356.59	1.25	98.96	1.4438	48.4226	-3180.30	-15.3700	7.294E-03	2.684E-14	65.56	21.094	0.848	0.679	0.764	0.848	0.0399	0.0037
32 1,1-DICHLOROETHYLENE	C2H2Cl2	1.312	1.312	304.71	1.12	96.94	1.4456	-16.5419	-1665.50	13.9230	-4.096E-02	3.000E-05	519.08	23.133	0.909	0.745	0.827	0.909	0.0769	0.0131
33 DICHLOROMETHANE	CH2Cl2	0	0	312.90	1.32	84.93	1.4240	32.5609	-2516.60	-8.8015	1.293E-10	3.319E-06	369.41	16.440	0.704	0.530	0.617	0.704	0.0000	0.0000
34 DIETHYLENE GLYCOL MONOBUTYL ETHER	C8H18O3	0	0	504.15	0.95	162.23	1.4299	-46.2629	-4453.00	31.6710	-7.527E-02	4.065E-05	0.01	44.013	1.473	1.418	1.445	1.473	0.0000	0.0000
35 DIETHYL ANILINE	C10H15N	0	0	489.42	0.93	149.24	1.5418	34.505	-4189.40	-8.669	-7.26E-11	8.89E-07	0.10	50.457	1.632	1.625	1.629	1.632	0.0000	0.0000
36 2,2-DIMETHYLPENTANE	C7H16	0	0	352.34	0.67	100.20	1.3820	6.2875	-2168.20	2.6936	-1.553E-02	1.092E-05	88.29	34.650	1.231	1.116	1.174	1.231	0.0000	0.0000
37 ETHANOL	C2H6O	0	0	351.44	0.79	46.07	1.3600	23.8442	-2864.20	-5.0474	3.745E-11	2.736E-07	47.17	12.914	0.587	0.416	0.502	0.587	0.0000	0.0000
38 ETHYL ACETATE	C4H8O2	0	0	350.21	0.89	88.11	1.3720	0.6955	-2249.80	5.4643	-1.945E-02	1.236E-05	77.01	22.409	0.888	0.722	0.805	0.888	0.0000	0.0000
39 ETHYLBENZENE	C8H10	0	0	409.35	0.87	106.17	1.4950	36.1998	-3340.20	-9.7970	-1.147E-11	2.576E-06	7.68	35.776	1.261	1.152	1.207	1.261	0.0000	0.0000
40 ETHYL CHLORIDE	C2H5CL	0	0	285.00	0.89	64.00	1.3652	28.3450	-2078.80	-7.5390	-1.640E-11	4.060E-06	1,047.86	16.076	0.692	0.518	0.605	0.692	0.0000	0.0000
41 ETHYLENE GLYCOL MONOPROPYL ETHER	C5H12O2	0	0	424.50	0.91	104.15	1.4122	-19.0128	-2532.40	14.6290	-3.355E-02	2.029E-05	2.41	28.617	1.067	0.922	0.994	1.067	0.0000	0.0000
42 n-HEPTANE	C7H16	0	0	371.58	0.68	100.20	1.3871	65.0257	-3818.80	-21.6840	1.039E-02	1.021E-14	37.38	34.620	1.230	1.115	1.173	1.230	0.0000	0.0000
43 n-HEXANE	C6H14	0	0	341.88	0.66	86.18	1.3722	69.7378	-3627.80	-23.9270	1.281E-02	-1.684E-13	128.65	29.857	1.101	0.962	1.031	1.101	0.0000	0.0000
44 ISOPRENE	C5H8	0	0	307.21	0.68	68.12	1.4220	32.4693	-2275.50	-9.4314	4.163E-03	-3.064E-14	476.09	25.608	0.981	0.825	0.903	0.981	0.0000	0.0000
45 ISOPROPANOL	C3H8O	0	0	355.41	0.78	60.10	1.3777	38.2363	-3551.30	-10.0310	-3.474E-10	1.737E-06	35.83	17.690	0.744	0.570	0.657	0.744	0.0000	0.0000
46 ISOPROPYL ACETATE	C5H10O2	0	0	361.65	0.87	102.13	1.3770	22.2064	-2498.90	-4.8975	-2.785E-10	8.339E-07	49.64	26.966	1.020	0.869	0.944	1.020	0.0000	0.0000
47 ISOPENTYL ACETATE	C7H14O2	0	0	422.15	0.87	130.19	1.3980	7.8850	-3069.60	2.7090	-1.520E-02	8.710E-06	2.65	36.034	1.268	1.161	1.214	1.268	0.0000	0.0000
48 METHANOL	CH4O	0	0	337.85	0.79	32.04	1.3290	45.6171	-3244.70	-13.9880	6.637E-03	-1.051E-13	102.50	8.281	0.421	0.267	0.344	0.421	0.0000	0.0000
49 METHYL-2-PYROLIDONE	C5H9NO	0	0	475.15	1.03	99.13	1.4690	-0.8097	-3078.80	5.8572	-1.492E-02	6.997E-06	0.25	26.930	1.019	0.867	0.943	1.019	0.0000	0.0000
50 METHYL ACRYLATE	C4H6O2	0	0	353.35	0.95	86.09	1.4020	47.0416	-3121.80	-14.8600	7.165E-03	3.455E-14	71.70	22.088	0.878	0.711	0.795	0.878	0.0000	0.0000
51 METHYL CHLORIDE	CH3CL	0	0	248.90	0.91	50.49	1.3362	25.7260	-1750.30	-6.7150	-1.300E-09	4.430E-06	3,836.47	11.474	0.537	0.370	0.454	0.537	0.0000	0.0000
52 METHYL ETHYL KETONE	C4H8O	0	0	352.79	0.80	72.11	1.3790	47.7060	-3096.50	-15.1840	7.485E-03	-1.708E-13	79.47	20.846	0.841	0.671	0.756	0.841	0.0000	0.0000
53 METHYL ISOBUTYL KETONE	C6H12O	0	0	389.65	0.80	100.16	1.3960	64.1919	-4357.70	-19.7660	-4.000E-10	7.102E-06	15.88	30.218	1.111	0.973	1.042	1.111	0.0000	0.0000
54 METHYL METHACRYLATE	C5H8O2	0	0	373.45	0.94	100.12	1.4140	106.8960	-5274.10	-37.6540	1.862E-02	-3.651E-13	31.21	26.695	1.012	0.860	0.936	1.012	0.0000	0.0000
55 METHYL TERT BUTYL ETHER	C5H12O	0	0	328.00	0.74	88.00	1.3690	4.7410	-1949.30	3.0770	-1.450E-02	1.000E-05	205.12	27.015	1.021	0.870	0.946	1.021	0.0000	0.0000
56 METHYLENE CHLORIDE	CH2Cl2	0	0	312.90	1.32	84.93	1.4240	32.5609	-2516.60	-8.8015	1.293E-10	3.319E-06	369.41	16.443	0.704	0.530	0.617	0.704	0.0000	0.0000
57 n-OCTANE	C8H18	0	0	398.83	0.70	114.23	1.3980	29.0948	-3011.40	-7.2653	-2.270E-11	1.468E-06	11.27	39.462	1.357	1.271	1.314	1.357	0.0000	0.0000
58 n-PENTANE	C5H12	0	0	309.22	0.62	72.15	1.3540	33.3239	-2422.70	-9.2354	9.020E-11	4.105E-06	443.05	25.245	0.971	0.813	0.892	0.971	0.0000	0.0000
59 PHENOL	C6H6O	0	0	454.99	1.06	94.11	1.5496	23.5332	-3496.10	-4.8990	1.216E-04	9.654E-13	0.39	28.294	1.057	0.911	0.984	1.057	0.0000	0.0000
60 PROPANE	C3H8	0	0	231.11	0.49	44.10	1.2860	21.4469	-1462.70	-5.2610	3.282E-11	3.735E-06	6,479.54	15.996	0.689	0.515	0.602	0.689	0.0000	0.0000
61 PROPANOL	C3H8O	0	0	8.66	0.78	60.10	1.3752	38.236	-3551.30	-10.031	-3.47E-10	1.74E-06	35.83	17.579	0.740	0.566	0.653	0.740	0.0000	0.0000
62 PROPYLENE GLYCOL-1,2	C3H8O2	0	0	460.75	1.03	76.10	1.4316	90.2930	-6696.80	-28.1090	-1.333E-10	9.365E-06	0.09	19.099	0.788	0.615	0.701	0.788	0.0000	0.0000
63 STYRENE	C8H8	0	0	418.31	0.90	104.15	1.5470	55.8621	-4024.00	-17.6090	6.684E-03	1.944E-13	4.81	36.697	1.285	1.182	1.234	1.285	0.0000	0.0000
64 TETRACHLOROETHYLENE	C2Cl4	0.2464	0.2464	394.40	1.61	165.83	1.5056	23.3960	-2688.80	-5.3312	-1.144E-10	9.237E-07	15.04	30.524	1.119	0.983	1.051	1.119	0.3237	0.1290
65 TETRACHLOROETHANE	C2Cl6	0	0	458.00	1.61	165.83	1.5056	23.3960	-2688.80	-5.3312	-1.144E-10	9.237E-07	15.04	30.524	1.119	0.983	1.051	1.119	0.0000	0.0000
66 TETRAHYDROFURAN	C4H8O	0	0	338.00	0.88	72.11	1.4670	34.8700	-2752.30	-9.5958	1.988E-10	3.547E-06	136.26	22.736	0.898	0.732	0.815	0.898	0.0000	0.0000
67 TOLUENE	C7H8	0	0	383.78	0.86	92.14	1.4960	34.0775	-3037.90	-9.1635	1.029E-11	2.704E-06	23.20	31.127	1.136	1.003	1.069	1.136	0.0000	0.0000
68 TRI-O-CRESYL PHOSPHATE	C21H21O4P	0	0		1.16	368.37	1.5553	21.1624	-5275.60	-3.3565	8.666E-06	-2.920E-09	0.00	101.708	2.761	3.276	3.018	2.761	0.0000	0.0000
69 1,1,1-TRICHLOROETHANE	C2H3Cl3	0.03024	0.03024	347.23	1.33	133.40	1.4366	36.5468	-2842.10	-10.2050	-2.637E-09	3.708E-06	103.75	26.251	1.000	0.846	0.923	1.000	0.0712	0.0099
70 TRICHLOROETHYLENE	C2HCl3	3.256	3.256	360.10	1.46	131.39	1.4640	23.6735	-2376.30	-5.8275	1.959E-03	2.888E-14	61.35	24.871	0.960	0.801	0.881	0.960	0.2667	0.0988
71 1,1,2-TRICHLOROTRIFLUOROETHANE	C2Cl3F3	0.01728	0.01728	320.75	1.56	187.38	1.3578	33.7192	-2532.30	-9.3175	1.455E-08	3.941E-06	283.43	26.292	1.001	0.847	0.924	1.001	0.0511	0.0048
72 TRIMETHYLAMINE	C6H15N	0	0	361.92	0.72	101.19	1.3980	8.8604	-2248.20	1.2692	-1.102E-02	7.440E-06	56.86	33.710	1.206	1.088	1.146	1.206	0.0000	0.0000
73 VINYLCHLORIDE	C2H3CL	0.05184	0.05184	259.78	0.90	62.50	1.3700	52.9650	-2501.6	-17.9140	1.080E-02	-4.530E-14	2,611.24	15.655	0.678	0.504	0.591	0.678	0.0005	0.0000
74 m-XYLENE	C8H10	0	0	412.27	0.86	106.17	1.5050	34.6803	-3298.10	-9.2570	-4.356E-10	2.410E-06	6.73	36.585	1.282	1.178	1.230	1.282	0.0000	0.0000

Barnebey & Sutcliffe Corp.

Vapor Phase Adsorption Model - Activated Carbon Consumption Calculation

System Conditions	
System Temperature (oF)	70
Relative Humidity	60
Flow Rate (acfm)	2,400
System Pressure (mmHg)	760
System Operation (hrs/day)	24

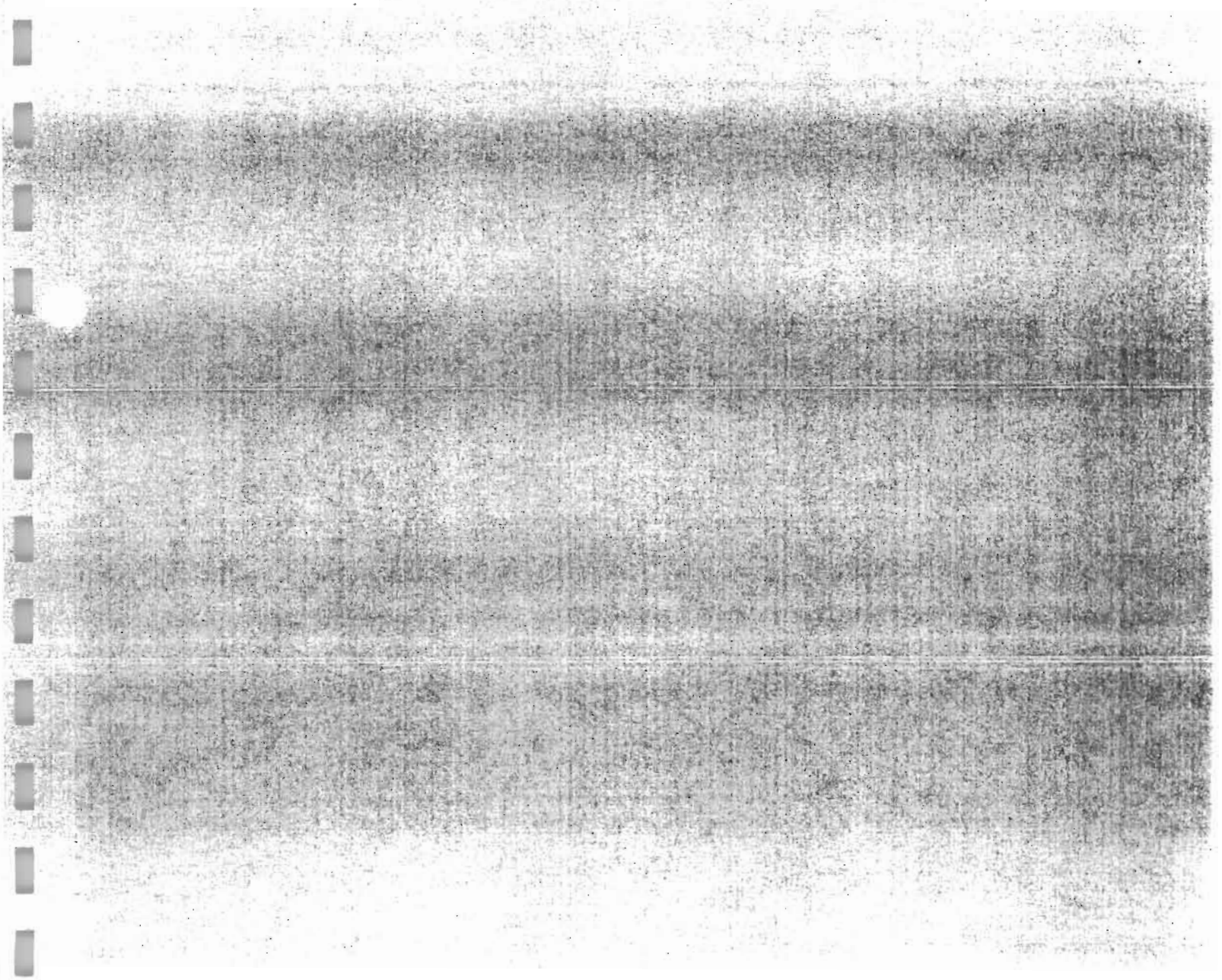
Project:

Rev 13

18-Aug-03

Component	Inlet Concentration	Inlet Concentration	Activated Carbon Type AC		Activated Carbon Type 207E4	
			Capacity	Usage	Capacity	Usage
	ppm	lb/day	% (w/w)	lb/day	% (w/w)	lb/day
ACETALDEHYDE	0.0000	0.00	0.00	0.00	0.00	0.00
ACETONE	0.0000	0.00	0.00	0.00	0.00	0.00
ACETIC ACID	0.0000	0.00	0.00	0.00	0.00	0.00
ACRYLONITRILE	0.0000	0.00	0.00	0.00	0.00	0.00
ALLYLCHLORIDE	0.0000	0.00	0.00	0.00	0.00	0.00
ANILINE	0.0000	0.00	0.00	0.00	0.00	0.00
BENZENE	0.0135	0.01	0.12	7.80	0.00	1020.74
BUTANE-n	0.0000	0.00	0.00	0.00	0.00	0.00
BUTANOL-n	0.0000	0.00	0.00	0.00	0.00	0.00
BUTOXY ETHANOL-2	0.0000	0.00	0.00	0.00	0.00	0.00
BUTYL ACETATE-n	0.0000	0.00	0.00	0.00	0.00	0.00
CARBON TETRACHLORIDE	0.0128	0.02	0.22	7.84	0.00	1005.33
CHLOROBENZENE	0.0000	0.00	0.00	0.00	0.00	0.00
CHLOROFORM	0.0080	0.01	0.00	224.75	0.00	698255.98
CUMENE	0.0000	0.00	0.00	0.00	0.00	0.00
CYCLOHEXANE	0.0000	0.00	0.00	0.00	0.00	0.00
DICHLOROBENZENE-m	0.0000	0.00	0.00	0.00	0.00	0.00
DICHLOROETHANE-1,2	0.0496	0.04	0.07	64.10	0.00	17469.02
DICHLOROETHYLENE-1,1 (EDC)	1.3120	1.14	0.53	213.92	0.01	10491.56
DICHLOROMETHANE	0.0000	0.00	0.00	0.00	0.00	0.00
DIETHYLENE GLYCOL MONOBUTYL ETHER	0.0000	0.00	0.00	0.00	0.00	0.00
DIETHYL ANILINE	0.0000	0.00	0.00	0.00	0.00	0.00
DIMETHYLPENTANE-2,2	0.0000	0.00	0.00	0.00	0.00	0.00
ETHANOL	0.0000	0.00	0.00	0.00	0.00	0.00
ETHYL ACETATE	0.0000	0.00	0.00	0.00	0.00	0.00
ETHYLBENZENE	0.0000	0.00	0.00	0.00	0.00	0.00
ETHYL CHLORIDE	0.0000	0.00	0.00	0.00	0.00	0.00
ETHYLENE GLYCOL MONOPROPYL ETHER	0.0000	0.00	0.00	0.00	0.00	0.00
HEPTANE-n	0.0000	0.00	0.00	0.00	0.00	0.00
HEXANE-n	0.0000	0.00	0.00	0.00	0.00	0.00
ISOPRENE	0.0000	0.00	0.00	0.00	0.00	0.00
ISOPROPANOL	0.0000	0.00	0.00	0.00	0.00	0.00
ISOPROPYL ACETATE	0.0000	0.00	0.00	0.00	0.00	0.00
ISOPENTYL ACETATE	0.0000	0.00	0.00	0.00	0.00	0.00
METHANOL	0.0000	0.00	0.00	0.00	0.00	0.00
METHYL-2-PYROLIDONE	0.0000	0.00	0.00	0.00	0.00	0.00
METHYL ACRYLATE	0.0000	0.00	0.00	0.00	0.00	0.00
METHYL CHLORIDE	0.0000	0.00	0.00	0.00	0.00	0.00
METHYL ETHYL KETONE	0.0000	0.00	0.00	0.00	0.00	0.00
METHYL ISOBUTYL KETONE	0.0000	0.00	0.00	0.00	0.00	0.00
METHYL METHACRYLATE	0.0000	0.00	0.00	0.00	0.00	0.00
METHYL TERT BUTYL ETHER	0.0000	0.00	0.00	0.00	0.00	0.00
METHYLENE CHLORIDE	0.0000	0.00	0.00	0.00	0.00	0.00
OCTANE-n	0.0000	0.00	0.00	0.00	0.00	0.00
PENTANE-n	0.0000	0.00	0.00	0.00	0.00	0.00
PHENOL	0.0000	0.00	0.00	0.00	0.00	0.00
PROPANE	0.0000	0.00	0.00	0.00	0.00	0.00
PROPANOL	0.0000	0.00	0.00	0.00	0.00	0.00
PROPYLENE GLYCOL-1,2	0.0000	0.00	0.00	0.00	0.00	0.00
STYRENE	0.0000	0.00	0.00	0.00	0.00	0.00
TETRACHLOROETHYLENE	0.2464	0.36	12.20	2.99	2.24	16.28
TETRACHLOROETHANE	0.0304	0.05	4.24	1.06	0.34	13.39
TETRAHYDROFURAN	0.0000	0.00	0.00	0.00	0.00	0.00
TOLUENE	0.0000	0.00	0.00	0.00	0.00	0.00
TRI-O-CRESYL PHOSPHATE	0.0000	0.00	0.00	0.00	0.00	0.00
TRICHLOROETHANE-1,1,1	0.0302	0.04	0.35	10.28	0.00	806.34
TRICHLOROETHYLENE	3.2560	3.82	8.96	42.64	1.39	273.88
TRICHLOROTRIFLUOROETHANE-1,1,2	0.0173	0.03	0.16	17.76	0.00	2910.77
TRIMETHYLAMINE	0.0000	0.00	0.00	0.00	0.00	0.00
VINYLCHLORIDE	0.0000	0.00	0.00	0.00	0.00	0.00
XYLENE-m	0.0000	0.00	0.00	0.00	0.00	0.00
Total Usage	4.976208	5.51	26.85	593.15		732263.28
Average Adsorption Capacity (% w/w)			1%		0%	

The Adsorption Capacity Is Estimated Using The Polanyi Adsorption Theory And Toluene



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BARNEBEY SUTCLIFFE
A WATERLINK COMPANY

Powerful Solutions for a New Tomorrow

Activated Carbon 207A-12

Coal Based Activated Carbon

207A-12 is manufactured from specific grades of bituminous coal by high-temperature steam activation under rigidly controlled conditions. The carbon is versatile for use in a range of liquid-phase purification applications, including potable water treatment, wastewater treatment and industrial processes.

Specifications

Iodine Number [BSC 90-032]	1000 mg/g Minimum
Moisture Content [ASTM D-2867]	5 % w/w Maximum
Particle Size [ASTM D-2862]	12x40 US Mesh
On 12	15 % w/w
Through 40	5 % w/w

Typical Properties

Ball Pan Hardness [ASTM D-3802]	90
Ash Content [ASTM D-2866]	15% w/w
Bulk Density [ASTM D-2854]	0.50 g/cm^3
Backwashed and Drained Density	0.48 g/cm^3

Packaging Options

50 Pound bags	Bulk tanker	15 Gallon drum
55 Gallon drum	1,000 Pound bulk sacks	

Unless otherwise specified, particle size distribution will be 5% maximum on the top screen and 5% maximum through the bottom screen. An MSDS is available for all BSC activated carbon products. If the moisture exceeds the referenced value, BSC weight adjusts to the referenced value.

835 N. Cassady Ave.• Columbus, OH •43219• 1-800-886-2272 • 614-258-9501• Fax 614-258-3464 • E-mail: activated_carbon@waterlink.com• www.bscarbons.com
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Product Bulletin

"DD"

WATERLINK®
Barnebey Sutcliffe

PROTECT™ LS SERIES

Large Capacity Liquid Adsorbers

Barnebey Sutcliffe Corporation offers a complete line of large capacity code design liquid phase adsorbers. The **PROTECT™ LS Series** is designed as a high flow, high pressure adsorber that can easily be put into service.

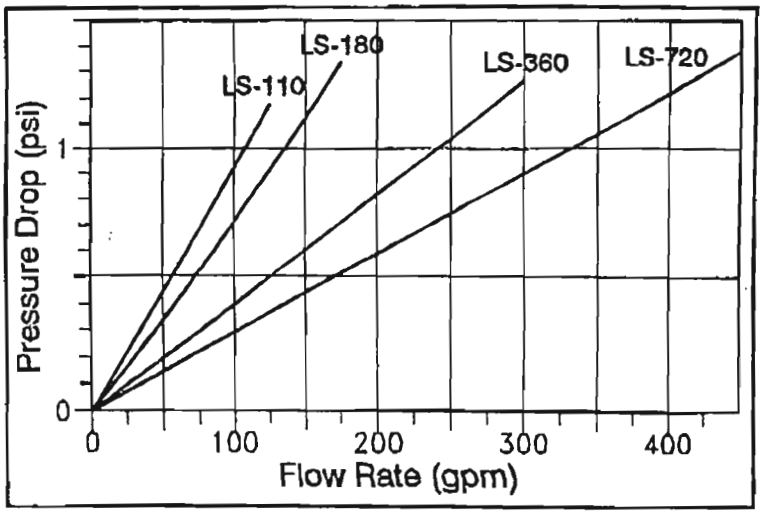
The **PROTECT™ LS Series** adsorbers are designed for a operating pressure of 100-psi, maximum temperature of 140°F, and are designed to hold from 3,200 to 20,000-lbs. of activated carbon or 110 to 720-ft³ of other granular media.

Model #	GAC ft³/lbs	Recommended Maximum Flow Rate	Estimated Weight (Empty/Operating)
LS-110	110/3,200	110-gpm	4,015/17,525
LS-180	180/5,000	160-gpm	4,225/24,480
LS-360	360/10,000	275-gpm	8,545/53,365
LS-720	720/20,000	430-gpm	16,700/101,965

For smaller sizes and flow rates see Product Information Bulletin # CD1.

Important Features

- Durable carbon steel construction.
- ASME Section VIII Div. 1 Code design for 100-psi.
- Lifting lugs to facilitate moving and placement.
- Lower carbon steel header with PVC contoured laterals positioned for superior distribution and eliminates the need for a GAC support bed.
- Upper carbon steel header with PVC laterals allow for backwashing and/or upflow operation.
- Flanged influent/effluent connections.
- Elliptical manways on top head and lower side shell for easy access.
- Pressure relief, vent and utility connections.
- Heavy duty chemical resistant internal epoxy lining.
- Exterior protected with a rust-inhibitive epoxy urethane for a durable finish.
- Can be filled with any of Barnebey's reactivated or virgin activated carbons or other granular media.
- All models available for rent.



For More Information and Pricing Call
1-800-886-2272
and Talk to One of Our Knowledgeable Technical Support Personnel
or Visit Our Web Site at
http://www.bscarbons.com

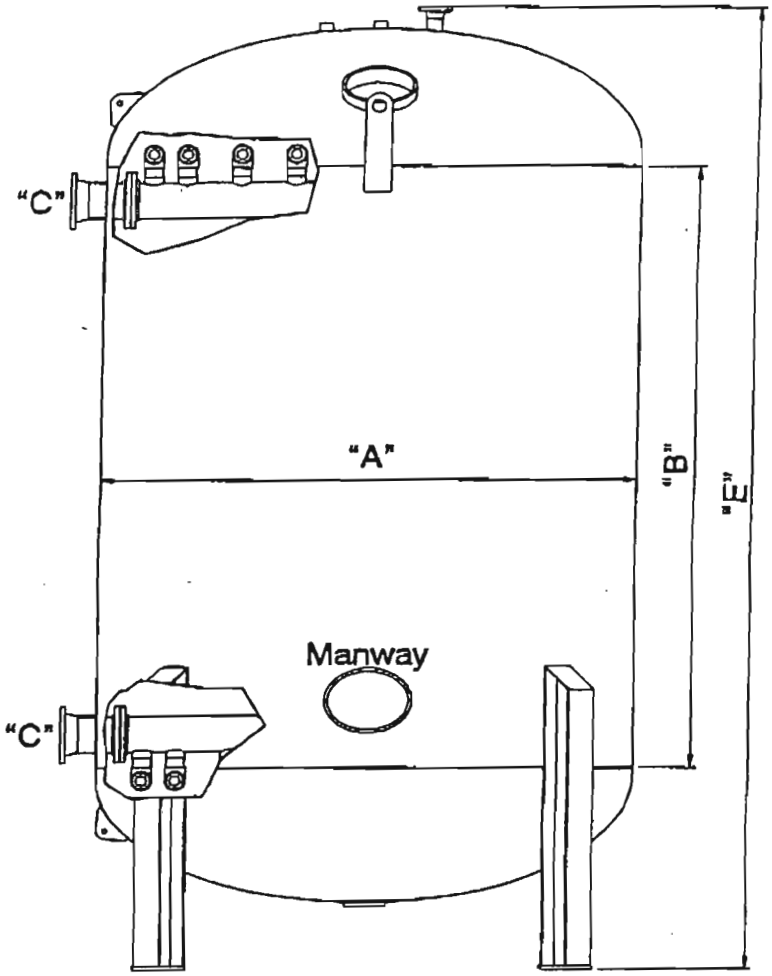
Volume and weight based on liquid phase bituminous carbon @ 28-lbs/ft³.

Estimated pressure drop based on virgin 8x30 carbon.

Design and specifications subject to change without notice.

"DD"

Description	Type	Orientation	Location
Inlet/Outlet	150# RF Spool	180°	Side Shell
Pressure Relief	150# RF Nozzle	90°	Top Head
Vent	2" Full Clpg	225°	Top Head
Drain/Media Transfer	150# RF Pad Flg	Center	Bottom Head
Utility	2" Full Clpg	Center	Top Head
Manway #1	14"x18" Elliptical	270°	Side Shell
Manway #2	14"x18" Elliptical	315°	Top Head



Available Options:

- ◊ FDA & NSF Approved Linings
- ◊ ASME Code Stamp
- ◊ Custom Linings
- ◊ Custom Colors
- ◊ Higher Operating Temperatures
- ◊ Stainless Steel Construction
- ◊ Stainless Steel Internals
- ◊ Media Fill Piping
- ◊ Vent Piping
- ◊ Large Round Manway
- ◊ PRV
- ◊ Air Release Valves
- ◊ Prepiped Dual Systems
- ◊ Skid Mounted Multi Vessel Systems
- ◊ Call for Your Custom Configuration

Barnebey Sutcliffe Corp.
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Drawings not to scale.
Design and specifications subject to change without notice.

Model #	Diameter "A"	Can Length "B"	Inlet/Outlet "C"	Overall Hgt. "E"	Pressure Relief	Drain/Media Transfer
LS-110	60"	96"	4"	146"±	2"	2"
LS-180	72"	96"	4"	151"±	2"	2"
LS-360	96"	120"	6"	190"±	3"	3"
LS-720	120"	144"	8"	230"±	3"	4"

P.O. Box 2526 • Columbus, OH 43216 • 1-800-886-2272 • 614-258-9501 • Fax 614-258-3464 • E-Mail: activated_carbon@waterlink.com
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Gulf Coast Regional Office • 337-527-0084 • Fax 337-527-0087

Product Bulletin

"EE"

WATERLINK
Barnebey Sutcliffe

PROTECT™ LD SERIES

Dual Vessel Liquid Adsorption Systems

Barnebey Sutcliffe Corporation offers a complete line of code design liquid phase adsorbers. The **PROTECT™ LD Series** consists of a pair of code design high pressure adsorbers, skid mounted with lead/lag piping.

The **PROTECT™ LD Series** adsorbers are designed for a maximum pressure of 100-psi, maximum temperature of 140°F, and are designed to hold a from 6,400 to 40,000-lbs. of activated carbon or 220 to 1,440-ft³ of other granular media.

Model #	GAC ft³/lbs	Recommended Maximum Flow Rate*	Estimated Weight** (Empty/Operating)
LD-110	220/6,400	220-gpm	10,635/37,655
LD-180	360/10,000	320-gpm	10,035/51,550
LD-360	720/20,000	550-gpm	22,620/112,260
LD-720	1,440/40,000	860-gpm	44,040/214,570

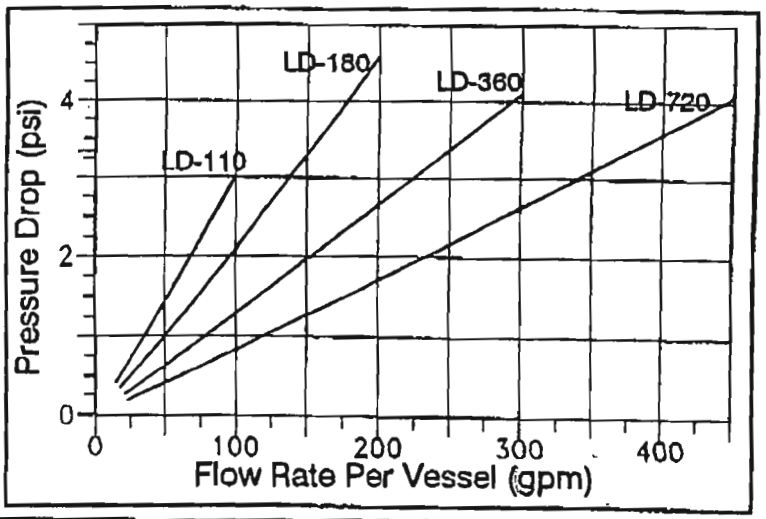
* This maximum flow rate can only be attained if the two vessels are operated in parallel. If units are operated in series, the maximum flow rate will be half of the number shown above.

** Operating weight based on system loaded with GAC and filled with water.

Note: Pressure drop chart reflects series operation.

Important Features

- Durable carbon steel construction.
- ASME Section VIII Div. 1 Code design for 100 psi.
- Lifting lugs, horizontal and vertical, for individual vessel moving and placement.
- Lower carbon steel header with PVC contoured laterals positioned for superior distribution and eliminates the need for a GAC support bed.
- Upper carbon steel header with PVC laterals allow for backwash and/or upflow operation.
- Piping header allows vessels to operate in lead/lag, parallel, or single configurations.
- Graphite rupture disk protects against over pressure and allows for easy replacement.
- Heavy duty chemical resistant internal lining.
- Exterior protected with a rust-inhibitive epoxy urethane for a durable finish.
- Can be filled with any of Barnebey's reactivated or virgin activated carbons or other granular medias.
- All models available for rent.



For More Information and Pricing Call
1-800-886-2272
and Talk to One of Our Knowledgeable Technical Support Personnel
or Visit Our Web Site at
http://www.bscarbons.com

Volume and weight based on liquid phase bituminous carbon @ 28-lbs/ft³.

stimated pressure drop based on virgin 8x30 carbon.

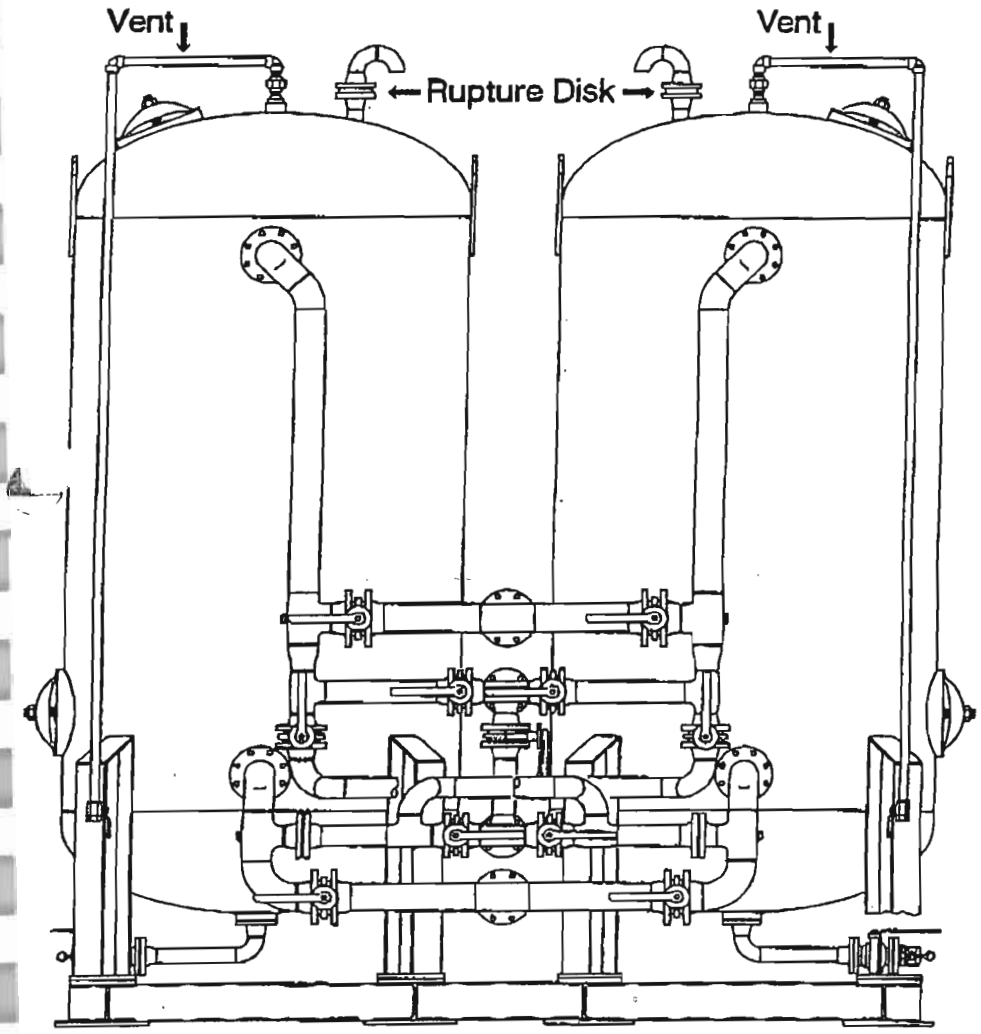
Design and specifications subject to change without notice.

"EE"

Model #	Service	Backwash	Vent	Rupture	GAC	Screen
LD-110	3"	4"	1"	2"	2"	1"
LD-180	3"	4"	1"	2"	2"	1"
LD-360	4"	6"	1"	3"	3"	1"
LD-720	6"	8"	1"	3"	4"	1"

Available Options:

- ◊ FDA & NSF Approved Linings
- ◊ Custom Linings
- ◊ Custom Colors
- ◊ Higher Operating Temperatures
- ◊ ASME Code Stamp
- ◊ Stainless Steel Construction
- ◊ Stainless Steel Internals
- ◊ GAC Fill Line
- ◊ PRVs
- ◊ Air Release Valves
- ◊ Call for Your Custom Configuration



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Drawings not to scale.
Design and specifications subject to change without notice.

Model #	Vessel Diameter	Can Length	Overall Length	Overall Width	Overall Hgt.
LD-110	60"	96"	11'-4"±	6'-11"±	13'-5"±
LD-180	72"	96"	13'-6"±	7'-11"±	14'-0"±
LD-360	96"	120"	17'-5"±	10'-3"±	17'-7"±
LD-720	120"	144"	22'-4"±	12'-11"±	20'-11"±

BARNEBEY SUTCLIFFE
A WATERLINK COMPANY

BARNEBEY SUTCLIFFE CORP.
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Fax

TO: **David M. Patton, P.E.**

FROM: Elwood V. Reinhart

COMPANY: **Malcolm Pirnie, Inc. (Buffalo)**

DATE: August 11, 2003

FAX NO.: **1-716-667-0279**

TIME: 1:51 PM

SUBJECT: **QUOTATION FOR GROUNDWATER PUMP & TREAT PROJECT**
Fairchild Republic Airport
Farmingdale, Long Island, NY
LIQUID PHASE GAC TREATMENT
(polishing air stripper H2O effluent)

Page #1 of 11 page(s)

Dear David, good afternoon!

I am faxing you the information and budget pricing for the "Liquid Phase GAC Treatment System" to polish the water effluent from the existing Neep air stripper system. The attached Exhibits AA through EE are for your review and our further discussion upon your receipt.

Exhibit AA: The **Neep ShallowTray Air Stripper, System Performance Estimate** is attached. We re-calculated performance for 400 gpm water flow rate in lieu of the original 250 gpm. Based on upgrading the existing 412241 to a 41251 by adding a 5th tray and changing the fan to meet the new requirements, you have a new effluent calculation for water polishing.

Mark Stouffer is due back tomorrow and I will have him early tomorrow **re-calculate the Mass Balance Calculation at 400 gpm** of the various constituents. I can then insert the new ppm numbers into the charts and fax them to you for carbon consumption based on 100% efficiency.

Exhibit BB: The three pages are the **carbon consumption based on "no" air stripper on-line.** This means that based on the water influent concentrations, the usage would be approx. 3429 lbs. of carbon per day based on 400 gpm flow rate. The carbon beds would be estimated to last about 5 days on an emergency basis if the air stripper is off-line. As a polisher of the water effluent from the air stripper, the carbon beds would last a long time. At the low concentrations of the constituents (7 ppb total VOC's) it's difficult to predict how long the beds will last.

Exhibit CC: This is the Product Information Sheet for our **Type 207A-12 12x40 mesh** virgin activated GAC carbon that is recommended for the liquid phase carbon adsorbers.

Carbon Replacement Cost is estimated at $0.72/lb. FOB Columbus, OH, supplied in super sacks.

Exhibit DD: This exhibit shows the LS Series and I have selected **two LS-360 adsorbers** without any external face piping. Two adsorbers would be required for the 400 gpm flow rate. Each adsorber has 10,000 lbs. of carbon. Carbon to be installed in the field by others.

Budget Price: Two LS-360 adsorbers with carbon but without external piping and valves is $57,800.00 FOB Sulfur, LA, fabricated at our own tank fabrication facility.

Exhibit EE: I have also quoted on a **duplex LD-360** as shown in this exhibit in case you wish to include face piping for service, back washing and rinsing of the carbon beds if required. As a polisher of the water effluent, this will depend on the turbidity of the water effluent. It's always good anyway to fluff the carbon beds to prevent a "packed bed" that does not allow for back washing that reclassifies the bed and prevents short circuit of the bed and removes turbidity. Carbon to be installed in the field by others.

Budget Price: One LD-360 adsorber duplex system with carbon and external piping and valves is $70,020.00 FOB Sulfur, LA, fabricated at our own tank fabrication facility.

Carbon Service Change-Out: We estimate $26,724.00 for the Vac & Rebed of 20,000 lbs. of carbon per dual bed change-out. This budget price includes labor and equipment to remove and replace the carbon bed, transportation costs for the service crew, super sacks for the disposal of the spent carbon, transportation of virgin carbon to the site and disposal of the spent carbon & TCLP testing by BSC. 20,000 lbs. of virgin carbon is included in this price. Price does not include a forklift operator, which is to be provided by the end user as required. Service prices are based on non-hazardous media as determined by the TCLP testing. Spent Carbon Profile Application will be required with the TCLP test results. If carbon proves to be hazardous per the TCLP test result, the adder for the hazardous service is approximately $4,000.00 for each 20,000 lbs. carbon service change-out.

If the 20,000 lbs. of carbon (10,000 lbs. per adsorber) is to be installed by the Adsorber/Carbon supplier, during system start-up, the estimated service price is $4,100.00 to be added to the total price. Deduct $900.00 for travel of service crew if this installation can be accomplished at the same time as BSC Service Crew installs carbon in the vapor phase adsorbers.

David, again thank you for the opportunity to work with you on the Fairchild Republic Pump & Treat Remediation Site in Farmingdale, Long Island, NY. Will call you shortly on this project.

Sincerely,

BARNEBEY SUTCLIFFE CORPORTION

Woody Steinhart

Regional Sales Manager
Carbon & Service Division

Enclosures
CC: D. Ivey

ShallowTray®
low profile air strippers

ER 8/11/03

System Performance Estimate

Client and Proposal Information:

Barnebey Sutcliffe Corp
Republic Airport
Farmington, NY

Liquid Phase

HIGH FLOW

		Upgrade
Series chosen:	41300	
Water Flow Rate:	400 gpm	90.9 m3/hr
Air Flow Rate:	2400 scfm	4080 m3/hr
Water Temp:	60 °F	10 °C
Air Temp:	60 °F	10 °C
A/W Ratio:	45 :1	
Safety Factor:	5%	

Contaminant	Untreated Influent / Effluent Target	SELECTED MODEL Model 41211 Effluent lbs/hr	ppmv	%removal	Model 41221 Effluent lbs/hr	ppmv	%removal	Model 41231 Effluent lbs/hr	ppmv	%removal	EXISTING Model 41241 Effluent lbs/hr	ppmv	%removal	Model 41251 Effluent lbs/hr	ppmv	%removal
Benzene Solubility 1,780 ppm Mwt 78.12	2 ppb ppb	<1 ppb 0.00	0.01	66.72%	<1 ppb 0.00	0.01	80.21%	<1 ppb 0.00	0.01	86.94%	<1 ppb 0.00	0.01	90.04%	<1 ppb 0.00	0.01	90.70%
Vinyl Chloride Solubility 1100 ppm Mwt 62.5	6.17 ppb ppb	<1 ppb 0.00	0.04	84.91%	<1 ppb 0.00	0.05	97.72%	<1 ppb 0.00	0.05	98.66%	<1 ppb 0.00	0.05	98.85%	<1 ppb 0.00	0.05	98.96%
1,1-Dichloroethylene Solubility 500 ppm Mwt 96.94	18.85 ppb ppb	2 ppb 0.00	0.05	83.41%	<1 ppb 0.00	0.06	97.25%	<1 ppb 0.00	0.06	98.84%	<1 ppb 0.00	0.06	98.92%	<1 ppb 0.00	0.06	99.09%
1,1-Dichloroethylene Solubility 500 ppm Mwt 96.94	9.67 ppb ppb	<1 ppb 0.00	0.00	83.41%	<1 ppb 0.00	0.00	97.25%	<1 ppb 0.00	0.00	98.54%	<1 ppb 0.00	0.00	98.92%	<1 ppb 0.00	0.00	99.09%
cis-1,2-DCE Solubility 6,800 ppm Mwt 96.94	233.33 ppb ppb	99 ppb 0.63	0.73	57.50%	42 ppb 0.04	1.04	81.94%	12 ppb 0.04	1.17	92.32%	8 ppb 0.05	1.23	96.74%	3 ppb 0.05	1.25	98.91%
Chloroform Solubility 8,000 ppm MW 119.38	1.83 ppb ppb	<1 ppb 0.00	0.00	58.83%	<1 ppb 0.00	0.01	83.89%	<1 ppb 0.00	0.01	93.52%	<1 ppb 0.00	0.01	97.48%	<1 ppb 0.00	0.01	98.95%
Trichloroethylene Solubility 1100 ppm Mwt 131.5	813.93 ppb ppb	279 ppb 0.11	2.17	86.21%	83 ppb 0.14	2.80	96.58%	31 ppb 0.16	3.14	98.14%	11 ppb 0.18	3.23	98.79%	4 ppb 0.18	3.26	98.96%
Tetrachloroethylene Solubility 150 ppm Mwt 165.83	77.5 ppb ppb	23 ppb 0.01	0.17	70.41%	7 ppb 0.01	0.23	91.24%	2 ppb 0.02	0.24	97.41%	<1 ppb 0.02	0.25	98.23%	<1 ppb 0.02	0.25	98.77%
1,1- Dichloroethane Solubility 5,500 ppm Mwt 98.96	9.33 ppb ppb	3 ppb 0.00	0.03	64.37%	1 ppb 0.00	0.04	87.31%	<1 ppb 0.00	0.05	95.48%	<1 ppb 0.00	0.05	96.39%	<1 ppb 0.00	0.05	98.43%
1,1,1-Trichloroethane Solubility 4,400 ppm Mwt 133.41	7.67 ppb ppb	2 ppb 0.00	0.02	78.02%	<1 ppb 0.00	0.03	95.60%	<1 ppb 0.00	0.03	98.08%	<1 ppb 0.00	0.03	98.81%	<1 ppb 0.00	0.03	98.98%
1,2-Trichlorotrifluoroethane (F113) Solubility 200ppm Mwt 187	6.17 ppb ppb	<1 ppb 0.00	0.02	91.49%	<1 ppb 0.00	0.02	98.28%	<1 ppb 0.00	0.02	98.94%	<1 ppb 0.00	0.02	99.09%	<1 ppb 0.00	0.02	100.00%
Based on theoretical data only, CONSULT NEEP REPRESENTATIVE FOR WARRANTY																
Dichlorodifluoromethane Solubility 280 ppm Mwt 121	3 ppb ppb	<1 ppb 0.00	0.01	84.83%	<1 ppb 0.00	0.01	98.73%	<1 ppb 0.00	0.01	99.09%	<1 ppb 0.00	0.01	100.00%	<1 ppb 0.00	0.01	100.00%
Based on theoretical data only, CONSULT NEEP REPRESENTATIVE FOR WARRANTY																
Total ppb	1172 ppb	407 ppb			144 ppb			52 ppb			19 ppb			7 ppb		
Total VOC lbs/hr - ppmv		0.15	3.27		0.21	4.40		0.22	4.69		0.23	4.85		0.23	5.00	
Total				85.29%			97.88%			98.56%			98.37%			98.40%

Upgrade with 5th tray & upgrade fan

This report has been generated by ShallowTray Modeler software version 6.12e. This software is designed to assist a skilled operator in predicting the performance of a ShallowTray air stripping system. North East Environmental Products, Inc. (NEEP Systems) is not responsible for incidental or consequential damages resulting from the improper operation of either the software or the air stripping equipment. This software is © Copyright North East Environmental Products, Inc., 2001.

Report Generated: 8/11/2003 Modeler V6.12e 5/24/2001

"BB"

Barnebey & Sutcliffe Corp.
Technical Department
Liquid Phase Consumption Calculation
Activated Carbon Type 207A

WATER FLOW RATE (gpm): 400

Rev 2
08/07/03

Compound	Inlet Concentration	Adsorption Capacity	Carbon Usage (lb GAC/ 1000 gal H20)	Carbon Usage Corrected For TOC (lb GAC/ 1000 gal H20)	Carbon Usage Rate (lb gac /24 hrs	Range
	(ugm/l)	% (w/w)				
ACENAPHTHENE	0.000	0.000	0.0000	0.000	0.000	
ACENAPHTHYLENE	0.000	0.000	0.0000	0.000	0.000	
ACETALDEHYDE	0.000	0.000	0.0000	0.000	0.000	
ACETIC ACID	0.000	0.000	0.0000	0.000	0.000	
ACETONE	0.000	0.000	0.0000	0.000	0.000	
ACETONITRILE	0.000	0.000	0.0000	0.000	0.000	
ACETOPHENONE	0.000	0.000	0.0000	0.000	0.000	
ACETYLAMINOFLUORENE-2	0.000	0.000	0.0000	0.000	0.000	
ACRIDINE ORANGE	0.000	0.000	0.0000	0.000	0.000	
ACRIDINE YELLOW	0.000	0.000	0.0000	0.000	0.000	
ACROLEIN	0.000	0.000	0.0000	0.000	0.000	
ACRYLAMIDE	0.000	0.000	0.0000	0.000	0.000	
ACRYLONITRILE	0.000	0.000	0.0000	0.000	0.000	
ADENINE	0.000	0.000	0.0000	0.000	0.000	
ADIPIC ACID	0.000	0.000	0.0000	0.000	0.000	
ALDRIN	0.000	0.000	0.0000	0.000	0.000	
ALPHA-BHC	0.000	0.000	0.0000	0.000	0.000	
ALPHA-CHLOROTOLUENE	0.000	0.000	0.0000	0.000	0.000	
ALPHA-ENDOSULFAN	0.000	0.000	0.0000	0.000	0.000	
ALPHA-NAPHOL	0.000	0.000	0.0000	0.000	0.000	
ALPHA-NAPHTHYLAMINE	0.000	0.000	0.0000	0.000	0.000	
AMINOBIPHENYL-4	0.000	0.000	0.0000	0.000	0.000	
ANDRIN	0.000	0.000	0.0000	0.000	0.000	
ANETHOLE	0.000	0.000	0.0000	0.000	0.000	
ANILINE	0.000	0.000	0.0000	0.000	0.000	
ANISIDINE	0.000	0.000	0.0000	0.000	0.000	
ANTHRACENE	0.000	0.000	0.0000	0.000	0.000	
ATRAZINE	0.000	0.000	0.0000	0.000	0.000	
ARACLOR 1254	0.000	0.000	0.0000	0.000	0.000	
BENZENE	2.000	0.131	0.0129	0.138	79.582	IR
BENZIDINE DIHYDROCHLORIDE	0.000	0.000	0.0000	0.000	0.000	
BENZO(A)PYRENE	0.000	0.000	0.0000	0.000	0.000	
BENZO(GHI)PERYLENE	0.000	0.000	0.0000	0.000	0.000	
BENZO(K)FLUORANTHENE	0.000	0.000	0.0000	0.000	0.000	
BENZOFLUORANTHENE-3,4	0.000	0.000	0.0000	0.000	0.000	
BENZOIC ACID	0.000	0.000	0.0000	0.000	0.000	
BENZOTHIAZOLE	0.000	0.000	0.0000	0.000	0.000	
BENZYL ALCOHOL	0.000	0.000	0.0000	0.000	0.000	
BETA-BHC	0.000	0.000	0.0000	0.000	0.000	
BETA-ENDOSULFAN	0.000	0.000	0.0000	0.000	0.000	
BETA-NAPHTHOL	0.000	0.000	0.0000	0.000	0.000	
BETA-NAPHTHYLAMINE	0.000	0.000	0.0000	0.000	0.000	
BIPHENOL-O-O	0.000	0.000	0.0000	0.000	0.000	
2-2'BIPYRIDINE	0.000	0.000	0.0000	0.000	0.000	
BIS(CHLOROETHOXY-2)METHANE	0.000	0.000	0.0000	0.000	0.000	
BIS(CHLOROETHYL-2)ETHER	0.000	0.000	0.0000	0.000	0.000	
BIS(CHLORDISOPROPYL-2)ETHER	0.000	0.000	0.0000	0.000	0.000	
BIS(ETHYLHEXYL-2) PHTHLATE	0.000	0.000	0.0000	0.000	0.000	
BROMODICHLOROMETHANE	0.000	0.000	0.0000	0.000	0.000	
BROMOFORM	0.000	0.000	0.0000	0.000	0.000	
BROMOPHENOL	0.000	0.000	0.0000	0.000	0.000	
BROMOPHENYL-4 PHENYL ETHER	0.000	0.000	0.0000	0.000	0.000	
BROMOURACIL-5	0.000	0.000	0.0000	0.000	0.000	
BUTANOL-1	0.000	0.000	0.0000	0.000	0.000	
BUTYL-N PHTHALATE	0.000	0.000	0.0000	0.000	0.000	
BUTYLBENZYL PHTHALATE	0.000	0.000	0.0000	0.000	0.000	
CARBON TETRACHLORIDE	0.000	0.000	0.0000	0.000	0.000	
CHLORDANE	0.000	0.000	0.0000	0.000	0.000	
CHLOROACETONE	0.000	0.000	0.0000	0.000	0.000	
CHLOROBENZENE	0.000	0.000	0.0000	0.000	0.000	
CHLOROETHANE	0.000	0.000	0.0000	0.000	0.000	
CHLORO-1 NITROBENZENE-2	0.000	0.000	0.0000	0.000	0.000	
CHLOROETHYL-2 VINYL ETHER	0.000	0.000	0.0000	0.000	0.000	
CHLOROFORM	1.830	0.012	0.1304	0.403	232.348	IR
CHLORONAPHTHALENE-2	0.000	0.000	0.0000	0.000	0.000	
CHLOROPHENOL O	0.000	0.000	0.0000	0.000	0.000	
CHLOROPHENOL-2	0.000	0.000	0.0000	0.000	0.000	
CHLOROPHENYL-4 PHENYL ETHER	0.000	0.000	0.0000	0.000	0.000	
1-CHLOROPROPANE	0.000	0.000	0.0000	0.000	0.000	
CHLOROURACIL-5	0.000	0.000	0.0000	0.000	0.000	
CHRYSENE	0.000	0.000	0.0000	0.000	0.000	
COUMARIN	0.000	0.000	0.0000	0.000	0.000	
CRESOL	0.000	0.000	0.0000	0.000	0.000	

"BB"

CYCLOHEXANE	0.000	0.000	0.0000	0.000	0.000	
CYCLOHEXANONE	0.000	0.000	0.0000	0.000	0.000	
DDD	0.000	0.000	0.0000	0.000	0.000	
DDE	0.000	0.000	0.0000	0.000	0.000	
DDT	0.000	0.000	0.0000	0.000	0.000	
DIBENZO(A,H)ANTHRACENE	0.000	0.000	0.0000	0.000	0.000	
DIBROMO-1,2,3-CHLOROPROPANE	0.000	0.000	0.0000	0.000	0.000	
DIBROMOCHLOROMETHANE	0.000	0.000	0.0000	0.000	0.000	
1,2-DIBROMOCHLOROPROPANE (DBCP)	0.000	0.000	0.0000	0.000	0.000	
DIBUTYL PHTHALATE-N	0.000	0.000	0.0000	0.000	0.000	
DICHLOROBENZENE-1,2	0.000	0.000	0.0000	0.000	0.000	
DICHLOROBENZENE-1,3	0.000	0.000	0.0000	0.000	0.000	
DICHLOROBENZENE-1,4	0.000	0.000	0.0000	0.000	0.000	
DICHLOROBENZIDINE-3,3	0.000	0.000	0.0000	0.000	0.000	
DICHLOROBROMOMETHANE	0.000	0.000	0.0000	0.000	0.000	
2,4-DICHLOROCRESOL	0.000	0.000	0.0000	0.000	0.000	
DICHLOROETHANE-1,1	0.000	0.000	0.0000	0.000	0.000	
DICHLOROETHANE-1,2	9.330	0.032	0.2504	0.646	314.473	IR
DICHLOROETHENE-1,1	11.520	0.072	0.1365	0.412	237.279	IR
DICHLOROETHENE-TRANS	233.330	0.378	0.5252	0.770	443.456	IR
DICHLOROMETHANE	0.000	0.000	0.0000	0.000	0.000	
DICHLOROPHENOL-2,4	0.000	0.000	0.0000	0.000	0.000	
2,4-DICHLOROPHENOXY ACETIC ACID	0.000	0.000	0.0000	0.000	0.000	
DICHLOROPROPANE-1,2	0.000	0.000	0.0000	0.000	0.000	
DICHLOROPROPENE-1,2	0.000	0.000	0.0000	0.000	0.000	
DIELDRIN	0.000	0.000	0.0000	0.000	0.000	
DIETHYL ETHER	0.000	0.000	0.0000	0.000	0.000	
DIETHYL KETONE	0.000	0.000	0.0000	0.000	0.000	
DIETHYL PHTHALATE	0.000	0.000	0.0000	0.000	0.000	
DIETHYLENE GLYCOL	0.000	0.000	0.0000	0.000	0.000	
DIETHYLFORMAMIDE	0.000	0.000	0.0000	0.000	0.000	
DIMETHYL MALONIC ACID	0.000	0.000	0.0000	0.000	0.000	
DIMETHYL PHENOL-2,6	0.000	0.000	0.0000	0.000	0.000	
DIMETHYL PHTHALATE	0.000	0.000	0.0000	0.000	0.000	
DIMETHYLAMINOZOBENZENE-4	0.000	0.000	0.0000	0.000	0.000	
DIMETHYLPHENOL-2,4	0.000	0.000	0.0000	0.000	0.000	
DIMETHYLPHENYLCARBINOL	0.000	0.000	0.0000	0.000	0.000	
DINITRO-O-CRESOL-4,6	0.000	0.000	0.0000	0.000	0.000	
DINITROPHENOL-2,4	0.000	0.000	0.0000	0.000	0.000	
DINITROTOLUENE-2,4	0.000	0.000	0.0000	0.000	0.000	
DINITROTOLUENE-2,6	0.000	0.000	0.0000	0.000	0.000	
1,4-DIOXANE	0.000	0.000	0.0000	0.000	0.000	
DIPHENYLAMINE	0.000	0.000	0.0000	0.000	0.000	
DIPHENYLHYDRAZINE-1,1	0.000	0.000	0.0000	0.000	0.000	
EDTA	0.000	0.000	0.0000	0.000	0.000	
ENDOSULFAN SULFATE	0.000	0.000	0.0000	0.000	0.000	
ENDRIN	0.000	0.000	0.0000	0.000	0.000	
ETHANOL	0.000	0.000	0.0000	0.000	0.000	
ETHYL BUTYL KETONE	0.000	0.000	0.0000	0.000	0.000	
ETHYL ACETATE	0.000	0.000	0.0000	0.000	0.000	
ETHYLBENZENE	0.000	0.000	0.0000	0.000	0.000	
ETHYLBUTANOL-2	0.000	0.000	0.0000	0.000	0.000	
ETHYLENE DIBROMIDE	0.000	0.000	0.0000	0.000	0.000	
ETHYL ETHER (DIETHYL ETHER)	0.000	0.000	0.0000	0.000	0.000	
FLUORANTHENE	0.000	0.000	0.0000	0.000	0.000	
FLUORENE	0.000	0.000	0.0000	0.000	0.000	
FLUOROURACIL-5	0.000	0.000	0.0000	0.000	0.000	
FREON 11	0.000	0.000	0.0000	0.000	0.000	
FREON 113	0.000	0.000	0.0000	0.000	0.000	
FREON 12	0.000	0.000	0.0000	0.000	0.000	
GAMMA-BHC	0.000	0.000	0.0000	0.000	0.000	
GLUCOSE	0.000	0.000	0.0000	0.000	0.000	
GUANINE	0.000	0.000	0.0000	0.000	0.000	
HEPTACHLOR	0.000	0.000	0.0000	0.000	0.000	
HEPTACHLOR EPOXIDE	0.000	0.000	0.0000	0.000	0.000	
HEPTANOIC ACID	0.000	0.000	0.0000	0.000	0.000	
HEXACHLOETHANE	0.000	0.000	0.0000	0.000	0.000	
HEXACHLOROBENZENE	0.000	0.000	0.0000	0.000	0.000	
HEXACHLOROBUTADIENE	0.000	0.000	0.0000	0.000	0.000	
HEXACHLOROCYCLOPENTADIENE	0.000	0.000	0.0000	0.000	0.000	
2-HEXANONE	0.000	0.000	0.0000	0.000	0.000	
HEXANOL-1	0.000	0.000	0.0000	0.000	0.000	
HYDROQUINONE	0.000	0.000	0.0000	0.000	0.000	
ISOOCTANE	0.000	0.000	0.0000	0.000	0.000	
ISOPHORONE	0.000	0.000	0.0000	0.000	0.000	
ISOPROPYL ALCOHOL	0.000	0.000	0.0000	0.000	0.000	
ISOPROPYL ETHER	0.000	0.000	0.0000	0.000	0.000	
ISOPROPYLACETATE	0.000	0.000	0.0000	0.000	0.000	
LINDANE	0.000	0.000	0.0000	0.000	0.000	
MALATHION	0.000	0.000	0.0000	0.000	0.000	
METHIONINE	0.000	0.000	0.0000	0.000	0.000	
2-METHYLBENZENEAMINE	0.000	0.000	0.0000	0.000	0.000	
2-METHYLBUTANE	0.000	0.000	0.0000	0.000	0.000	
METHYL ETHYL KETONE	0.000	0.000	0.0000	0.000	0.000	
METHYL ISOBUTYL KETONE	0.000	0.000	0.0000	0.000	0.000	
METHYL PARATHAION	0.000	0.000	0.0000	0.000	0.000	

"BB"

METHYL-2-PROPANOL-1	0.000	0.000	0.0000	0.000	0.000	
METHYLENE BLUE	0.000	0.000	0.0000	0.000	0.000	
METHYL CHLORIDE	0.000	0.000	0.0000	0.000	0.000	
METHYLENE CHLORIDE	0.000	0.000	0.0000	0.000	0.000	
METHYLENE-BIS-4,4(CHLOROA	0.000	0.000	0.0000	0.000	0.000	
METHYL NAPTHALENE	0.000	0.000	0.0000	0.000	0.000	
MTBE	0.000	0.000	0.0000	0.000	0.000	
N-NITROSODI-N-PROPYLAMINE	0.000	0.000	0.0000	0.000	0.000	
NAPHTHALENE	0.000	0.000	0.0000	0.000	0.000	
NITROBENZENE	0.000	0.000	0.0000	0.000	0.000	
NITROBIPHENYL-4	0.000	0.000	0.0000	0.000	0.000	
NITROPHENOL-2	0.000	0.000	0.0000	0.000	0.000	
NITROPHENOL-4	0.000	0.000	0.0000	0.000	0.000	
NITROSODIPHENYLAMINE N	0.000	0.000	0.0000	0.000	0.000	
O-CRESOL	0.000	0.000	0.0000	0.000	0.000	
P-CRESOL	0.000	0.000	0.0000	0.000	0.000	
P-NITROANILINE	0.000	0.000	0.0000	0.000	0.000	
P-NONYLPHENOL	0.000	0.000	0.0000	0.000	0.000	
PARACHLOROMETA CRESOL	0.000	0.000	0.0000	0.000	0.000	
PARATHION	0.000	0.000	0.0000	0.000	0.000	
PCB 1221	0.000	0.000	0.0000	0.000	0.000	
PCB 1260	0.000	0.000	0.0000	0.000	0.000	
PCB-1232	0.000	0.000	0.0000	0.000	0.000	
PCE	0.000	0.000	0.0000	0.000	0.000	
PEG 1000	0.000	0.000	0.0000	0.000	0.000	
PEG 400	0.000	0.000	0.0000	0.000	0.000	
PENTACHLOROPHENOL	0.000	0.000	0.0000	0.000	0.000	
PENTANOL-1	0.000	0.000	0.0000	0.000	0.000	
PHENANTHRENE	0.000	0.000	0.0000	0.000	0.000	
PHENOL	0.000	0.000	0.0000	0.000	0.000	
PHENYLACTIC ACID	0.000	0.000	0.0000	0.000	0.000	
PHENYLMERCURIC ACETATE	0.000	0.000	0.0000	0.000	0.000	
PHTHALIC ACID	0.000	0.000	0.0000	0.000	0.000	
PROPAZINE	0.000	0.000	0.0000	0.000	0.000	
PROPANOL-1	0.000	0.000	0.0000	0.000	0.000	
PROPIONITRILE	0.000	0.000	0.0000	0.000	0.000	
PROPENAOLDEHYDE	0.000	0.000	0.0000	0.000	0.000	
PROPYL ACETATE	0.000	0.000	0.0000	0.000	0.000	
PROPYL AMINE	0.000	0.000	0.0000	0.000	0.000	
PROPYLENE GLYCOL	0.000	0.000	0.0000	0.000	0.000	
PROPYLENE GLYCOL ETHYL AMINE	0.000	0.000	0.0000	0.000	0.000	
PYRIDINE	0.000	0.000	0.0000	0.000	0.000	
PYRENE	0.000	0.000	0.0000	0.000	0.000	
RESORCINOL	0.000	0.000	0.0000	0.000	0.000	
SILVEX	0.000	0.000	0.0000	0.000	0.000	
SIMAZINE	0.000	0.000	0.0000	0.000	0.000	
STYRENE	0.000	0.000	0.0000	0.000	0.000	
TETRACHLOROETHANE-1,1,2,2	0.000	0.000	0.0000	0.000	0.000	
TETRACHLOROETHENE (PERC)	77.500	1.958	0.0335	0.215	123.727	IR
TETRAHYDROFURAN	0.000	0.000	0.0000	0.000	0.000	
TETRAHYDRONAPHTHALENE-1,2,3,4	0.000	0.000	0.0000	0.000	0.000	
THIOUREA	0.000	0.000	0.0000	0.000	0.000	
THYMINE	0.000	0.000	0.0000	0.000	0.000	
TOLUENE	0.000	0.000	0.0000	0.000	0.000	
TRANS-1,2-DICHLOROETHENE	0.000	0.000	0.0000	0.000	0.000	
TRIBROMOMETHANE	0.000	0.000	0.0000	0.000	0.000	
TRICHLOROBENZENE-1,2,4	0.000	0.000	0.0000	0.000	0.000	
TRICHLOROETHANE-1,1,1	7.670	0.058	0.1084	0.372	214.195	IR
TRICHLOROETHANE-1,1,2	0.000	0.000	0.0000	0.000	0.000	
TRICHLOROETHENE	813.930	1.842	0.3550	0.842	389.772	IR
TRICHLOROFLUOROMETHANE	9.170	0.182	0.0428	0.240	138.512	BR
TRICHLOROMETHANE	0.000	0.000	0.0000	0.000	0.000	
TRICHLOROPHENOL-2,4,6	0.000	0.000	0.0000	0.000	0.000	
TRIMETHYLBENZENE	0.000	0.000	0.0000	0.000	0.000	
UREA	0.000	0.000	0.0000	0.000	0.000	
VALERIC ACID	0.000	0.000	0.0000	0.000	0.000	
VALINE	0.000	0.000	0.0000	0.000	0.000	
VINYL ACETATE	0.000	0.000	0.0000	0.000	0.000	
VINYL CHLORIDE	6.170	0.002	2.2183	2.215	1275.997	IR
XYLENE P	0.000	0.000	0.0000	0.000	0.000	
XYLENOL	0.000	0.000	0.0000	0.000	0.000	
Total GAC Usage	*1172.450*		*3.8115*	*5.9537*	*3,429.32*	
Carbon Usage	*2193.407*	*lb/day without TOC Background*				
	3429.323	*lb/day with TOC Background*				
Average Adsorption Capacity	*0.28%*	*w/w without TOC Background*				
	0.19%	*w/w with TOC Background*				

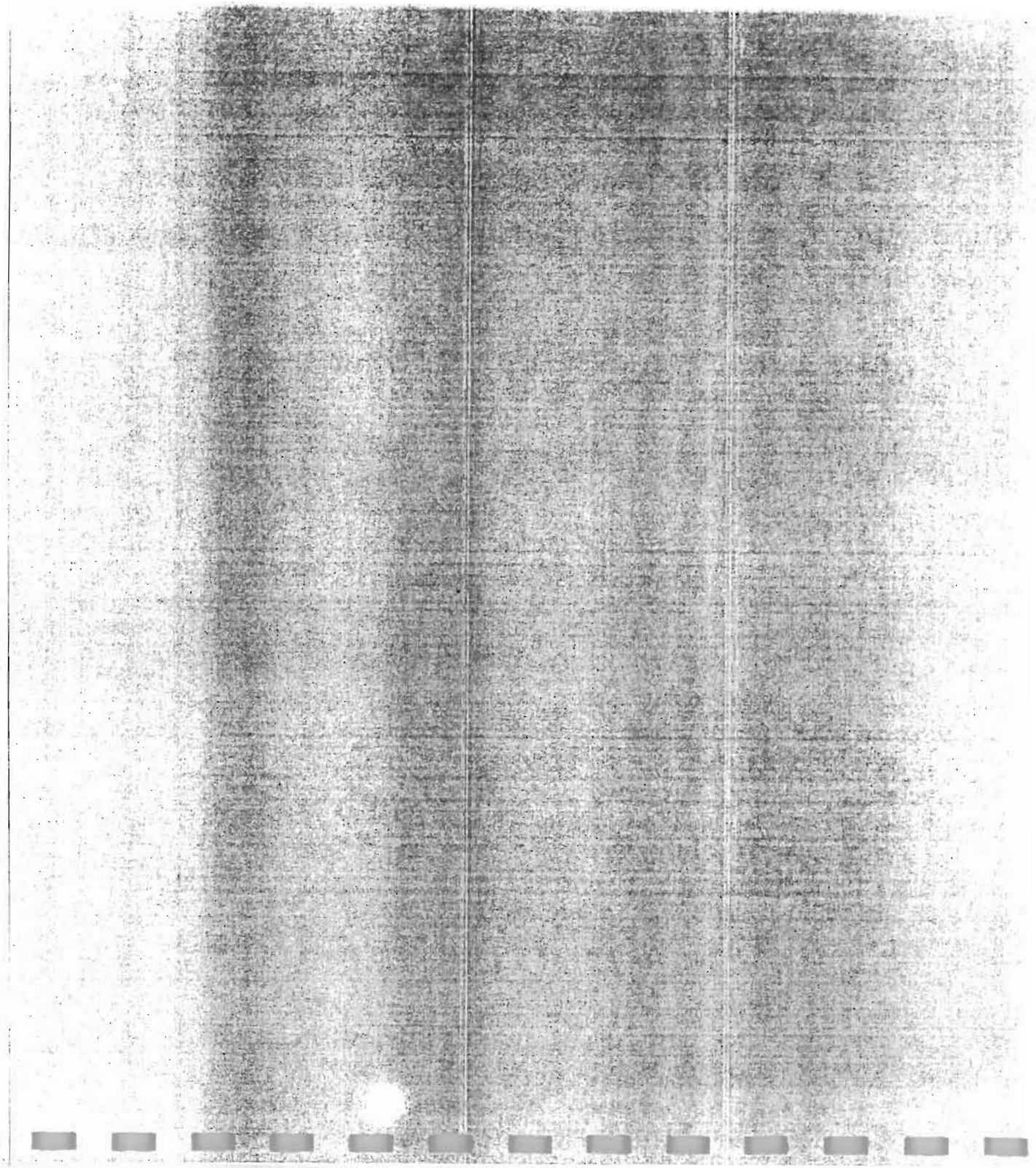
2@
20,000 lb units

5.6 #voc/day / 3,429 #GAC/day ⇒ 0.00163 #voc/#GAC

OR 612 #GAC/#voc

7ppb = 0.034 #voc/day

0.00163(20,000) #voc ⇒ 941 days



Sampling and analyses conducted for the pump test also confirmed the stripper performance and capability to meet the design requirements based on actual VOC concentrations found in the well pumpage. Influent and effluent samples at the stripper were collected and analyzed for VOCs at regular intervals during the pump test. Samples were taken twice per day for VOCs (8260) and SVOCs (8270) and samples were taken once per day for priority pollutant metals, iron, manganese, pH, total dissolved solids (TDS), total suspended solids (TSS) and total hardness. The influent effluent analytical results of the pilot test are presented in Table 2.

The influent total VOC concentrations were 884 micrograms per liter (ug/l), 23.5 hours after the pumping test began, and the concentrations peaked at 1,390 ug/l, 34.5 hours into the test. The influent concentration of total VOCs was 1,263 ug/l, 1.5 hours before shutdown. All effluent concentrations were non-detect, except for cis-1,2-DCE and TCE, at 3 and 2 ug/l, respectively. All effluent concentrations were less than the New York State SPDES discharge limits.

The laboratory results indicate that the stripper will remove VOCs to the limits required to meet New York State Groundwater Standards. The results also confirmed that the concentrations of inorganic parameters were less than New York State Groundwater Standards. Based on the pilot test results, the Shallow Tray Model 41241 low profile air stripper will meet the remedial design objectives and will be used in the groundwater remediation system.

3.2.2 Air Stripper Design

The Shallow Tray Model 41241 air stripper is designed to remove VOCs from the liquid phase. The unit is a low profile model, with four stripper trays to facilitate mass transfer of VOCs from the liquid to the vapor phase. The unit is a countercurrent flow model with the water containing VOCs applied at the top tray of the unit. Water flows through the full length of each baffled tray, and falls into the tray below as fresh air is forced up through 5 mm diameter holes in each stripper tray. The air forms a froth of bubbles approximately six inches deep on the stripper tray, generating a large mass transfer surface area where the organics are volatilized. The necessary contact or residence time to reach

Table 2
Aquifer Test (Influent and Effluent) Sampling Analyses and Effluent Limitations
Volatile Organic Compounds Analysis (ug/l): USEPA Method 8260

PARAMETER - ug/l	NYSDEC Groundwater Effluent Limitations	PW-1-1 Influent 10/30/01	PW-1-1 Effluent 10/30/01	PW-1-2 Influent 10/30/01	PW-1-2 Effluent 10/30/01	PW-1-3 Influent 10/30/01	PW-1-3 Effluent 10/30/01	PW-1-4 Influent 10/30/01	PW-1-4 Effluent 10/30/01	PW-1-5 Influent 10/31/01	PW-1-5 Effluent 10/31/01	PW-1-6 Influent 11/1/01	PW-1-6 Effluent 11/1/01
Dichlorodiflouromethane	5.0[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	*[3]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	2.0	5	ND	6	ND	7	ND	6	ND	6	ND	7	ND
Bromomethane	5.0[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	5.0[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroflouromethane	5.0[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	5.0[2]	9	ND	11	ND	12	ND	10	ND	11	ND	12	ND
Methylene Chloride	5.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
t-1,2-Dichloroethene	5.0[2]	ND	ND	1	ND	1	ND	ND	ND	1	ND	1	ND
1,1-Dichloroethane	5.0[2]	8	ND	9	ND	10	ND	9	ND	9	ND	11	ND
2,2-Dichloropropane	5.0[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
c-1,2-Dichloroethene	5.0[2]	210	3	240	3	270	2	200	2	230	2	250	2
Bromochloromethane	5.0[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	7.0	1	ND	2	ND	2	ND	2	ND	2	ND	2	ND
1,1,1-Trichloroethane	5.0[2]	4	ND	5	ND	6	ND	5	ND	5	ND	6	ND
Carbon Tetrachloride	5.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloropropene	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	1.0	2	ND	2	ND	2	ND	2	ND	2	ND	2	ND
1,2-Dichloroethane	0.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethelene	5.0	590	2	850	2	980	1	740	2	850	2	870	1
1,2-Dichloropropane	1.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromomethane	5.0[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
c-1,3-Dichloropropene	0.4[4]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	5.0[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
t-1,3-Dichloropropene	0.4[4]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	1.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	5.0[2]	55	ND	81	ND	86	ND	78	ND	77	ND	88	ND
1,3-Dichloropropane	5.0[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorodibromomethane	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromoethane	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	5.0[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethyl Benzene	5.0[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

PARAMETER - ug/l	NYSDEC Groundwater Effluent Limitations	PW-1 Influent 10/30/01	PW Effluent 10/30/01	PW Influent 10/30/01	PW Effluent 10/30/01	PW-1-3 luent 10/30/01	PW-1-3 Effluent 10/30/01	PW-1-4 Influent 10/30/01	PW-1-4 Effluent 10/30/01	PW-1-5 Influent 10/30/01	PW-1-5 Effluent 10/31/01	PW Influent 11/1/01	PW-1-6 Effluent 11/1/01
1,1,1,2-Tetrachloroethane	5.0[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
m+p Xylene	5.0[5]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
o Xylene	5.0[5]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	930	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	5.0[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromobenzene	5.0[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	5.0[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichloropropane	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Propylbenzene	5.0[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chlorotoluene	5.0[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	5.0[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Chlorotoluene	5.0[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butylbenzene	5.0[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	5.0[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
sec-Butylbenzene	5.0[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-Isopropyltoluene	5.0[5]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	3.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	3.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Butylbenzene	5.0[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	3.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloropropane	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	5.0[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	0.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	10.0[5]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichlorobenzene	5.0[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ter. ButylMethylEther	10.0[5]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-Ethyltoluene	*	ND	ND	ND	ND	ND	1	ND	ND	ND	2	ND	ND
Freon 113	5.0[5]	ND	ND	7	ND	8	ND	7	ND	7	ND	8	ND
1,2,4,5-Tetramethylbenzene	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	50.0[5]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl Ethyl Ketone	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylisobutylketone	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorodiflouromethane	*	ND	ND	3	ND	3	ND	3	ND	3	ND	3	ND
P-Diethylbenzene	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

1. ND = Not Detected
2. (POC) = Principal Organic Contaminant
3. * = No Groundwater Standard For This Compound
4. Applies to the Sum of cis- and trans-1,3-dichloropropene
5. TAGM Applicable but no Groundwater Standard

877 1212 1382 1058 1198 1255

Fairchild Republic Main Plant Site
Site Number 1-52-130
Farmingdale, New York

Table 2 (continued)
Aquifer Test (Influent and Effluent) Sampling Analyses and Effluent Limitations
Semi Volatile Organic Compounds Analyses (ug/l): USEPA Method 8270

PARAMETER - ug/L	NYSDEC Groundwater Effluent Limitations	PW-1-1 Influent 10/30/01	PW-1-1 Effluent 10/30/01	PW-1-2 Influent 10/30/01	PW-1-2 Effluent 10/30/01	PW-1-3 Influent 10/30/01	PW-1-3 Effluent 10/30/01	PW-1-4 Influent 10/30/01	PW-1-4 Effluent 10/30/01	PW-1-5 Influent 10/31/01	PW-1-5 Effluent 10/31/01	PW-1-6 Influent 11/1/01	PW-1-6 Effluent 11/1/01
N-Nitrosodimethylamine	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-chloroethyl)ether	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3 Dichlorobenzene	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4 Dichlorobenzene	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2 Dichlorobenzene	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-chloroisopropyl)ether	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodi-n-propylamine	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachloroethane	5[1]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nitrobenzene	0.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isophorone	50[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-chloroethoxy)methane	5[1]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	5[1]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	10[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	0.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorocylcopentadiene	5[1]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloronaphthalene	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dimethyl Phalate	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthylene	20[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	5[1]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthalene	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	5[1]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Diethyl Phalate	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluorene	50[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Chlorophenyl phenyl ether	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Diphenylhydrazine	Not Detectable	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Bromophenyl phenyl ether	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

PARAMETER - ug/L	NYSDEC Groundwater Effluent Limitations	PW-1-1 Influent 10/30/01	PW-1-1 Effluent 10/30/01	PW-1-2 Influent 10/30/01	PW-1-2 Effluent 10/30/01	PW-1-3 Influent 10/30/01	PW-1-3 Effluent 10/30/01	PW-1-4 Influent 10/30/01	PW-1-4 Effluent 10/30/01	PW-1-5 Influent 10/31/01	PW-1-5 Effluent 10/31/01	PW-1-6 Influent 11/1/01	PW-1-6 Effluent 11/1/01
Hexachlorobenzene	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	50[2]	ND	ND	ND	1	ND	ND	ND	ND	ND	ND	ND	ND
Anthracene	50[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Di-n-Butyl Phthalate	50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	50[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzidine	5[1]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pyrene	50[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BenzylButylPhthalate	50[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	0.002[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3,3'-Dichlorobenzidine	5[1]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chrysene	0.002[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-ethylhexyl)phthalate	5	ND	ND	ND	ND	ND	ND	ND	ND	1	ND	ND	ND
Di-n-octyl Phthalate	50[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	0.002[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	0.002[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(a)pyrene	Not Detectable	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	0.002[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzo(a,h)anthracene	50[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(ghi)perylene	5[2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

* = No Groundwater Standard For This Compound

1. (POC) = Principal Organic Contaminant
2. TAGM Applicable but no Groundwater Standard

Fairchild Republic Main Plant Site
Site Number 1-52-130
Farmingdale, New York

Table 4
Water Level Measurements: Aquifer Test Recharge System Piezometers

Date	Time	RP-1 (LEACHING POOL) (ft)	RP-2 (LEACHING POOL) (ft)	RP-3 (ft)	RP-4 (ft)	RP-5 (ft)
10/29/2001	9:30	17.66 T&C	17.42 T&C	17.85 T&C	17.20 T&C	17.11 T&C
10/29/2001	11:15	13.24 T&C	12.47* T&C	16.63 T&C	16.92 T&C	16.60 T&C
10/29/2001	14:30	11.70 T&C	12.59* T&C	15.88 T&C	16.60 T&C	16.04 T&C
10/30/2001	9:15	11.98	15.12	15.45	16.36	15.76
10/31/2001	9:40	12.10	15.32	15.37	16.30	15.72
11/1/2001	9:10	12.38	15.42	15.36	15.31	15.73
11/1/2001	13:10	17.18	16.00	17.42	16.80	16.69

NOTES:
T&C = Tape and Chalk Measurement, Other readings by M-scope
* = Possible error due to water cascading in the leaching pool piezometer

The water level increased approximately 6 feet in the first leaching pool and approximately 2 feet in the second leaching pool within the first five hours of operation. Water levels in the first and second pools were relatively stable after the fifth hour of operation. Water levels measured in the recharge area piezometers approximately 15 feet away from the first leaching pool showed one to two feet of mounding. Water level measurements collected from the recharge area peizometers are shown on Table 4. Water levels in the recharge leaching pools and piezometers stabilized before the end of the 72 hour test and water table mounding does not appear to be a limiting factor at the 250 gpm recharge rate.

2 CHAMBERS @ 201 ft² EACH, SEE ATTACHED MANUFACTURER CUT-SHE

The total leaching surface area available during the aquifer test was ~~500~~ 402 ft². The calculated leaching rate based on the recharge test flow rate of 250 gpm or 360,000 gpd is ~~720~~ 900 GPD/ft² LEACHING AREA gal/ft²-day.

As a result of the aquifer test recharge system, leaching pools are the selected water recharge option for the remediation system. The water level data from the recharge area piezometers indicated that the system could be easily enlarged forming a permanent system to accept groundwater recharge for long term remediation.

3.3.2 Recharge System Design

Based on the leaching rate of the aquifer test recharge system, the design of the recharge system will be based on a reduced leaching rate of 200 gal/ft²-day to account for fouling of the leaching surfaces by hardness and biological growth. At a design leaching rate of 200 gal/ft²-day and a 250 gpm (360,000 gpd) flow rate, the total required leaching surface area is 1,800 ft².

The recharge system will consist of three sets of three pre-cast leaching pools constructed approximately 1,875 feet east of the pumping well (PW-1)outside the capture zone of the well. Each set of leaching pools will consist of three leaching structures. The top of the leaching pools will have a precast concrete cover with a 2 foot diameter opening and will be finished flush with grade with access manholes.

NOT CORRECT

Each leaching pool will be 8 feet diameter with a total of 8 feet of sidewall height. The total leaching surface area for each pool is ~~500~~ 201 ft^2 (SEE ATTACHED CUT SHEETS). Three pools in each set will provide ~~1,500~~ 603 ft^2. The entire recharge system will provide ~~4,500~~ 1809 ft^2 of leaching surface area. During routine operation one or two set of three pools will be in service, and the service of the standby pools will be rotated to ensure long term reliability of the recharge system and minimize downtime. Butterfly valves will be installed in the force main to divert treated effluent to any of the three sets of leaching pools. High level alarm probes will be installed in each set of pools and will be interlocked to the well pump (PW-1) and the stripper to prevent the blower and well pump from operating during high level alarm conditions. The location and configuration of the proposed recharge system is shown in the 35 percent complete plans.

3.3.3 Recharge System Piezometers

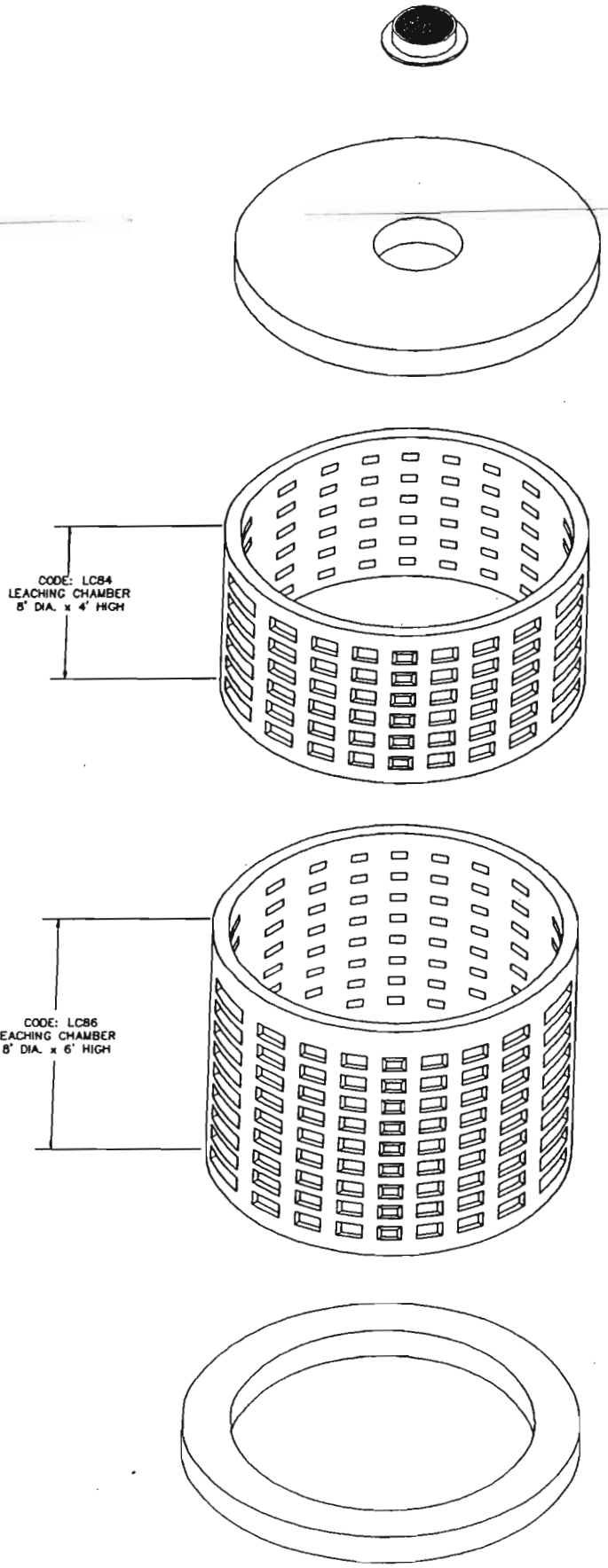
The recharge effects on the water table will be observed with piezometers dedicated to the recharge site. The depth to the water table at the proposed recharge test site is approximately 20 feet below grade. These piezometers are to be used for water level measurements only and will be constructed out of 2 inch diameter PVC plastic.

Four piezometers will be installed around the perimeter of the recharge site. Each piezometer will be constructed of SCH. 40 PVC (casing and 20-slot well screen), with WG #1 grain size filter pack, completed flush to grade. The piezometers will be screened approximately 0.5 to 3' below the water table.

3.4 Treatment System and Pumping Well Enclosure

A treatment system mechanical storage building will be constructed to house and protect the electrical service panel, stripper and controls, flow monitoring and flow control equipment. The approximate dimensions of the building are 20 feet by 30 feet. The building dimensions are based on the clearances recommended by the air stripper manufacturer and the dimensions of the equipment to be installed

KISTNER CONCRETE PRODUCTS INC. 8713 READ ROAD E. PEMBROKE, N.Y. 14056 (716) 894-2267	PRODUCT DESIGNATION	DWG. NO
	8'-0" DIA. DRYWELL/LEACHING CHAMBER	LC-8MID-



KISTNER CONCRETE PRODUCTS INC.
8713 READ ROAD
E. PEMBROKE, N.Y.
14056
(716) 894-2267

PRODUCT DESIGNATION

8'-0" DIA.
DRYWELL/LEACHING CHAMBER

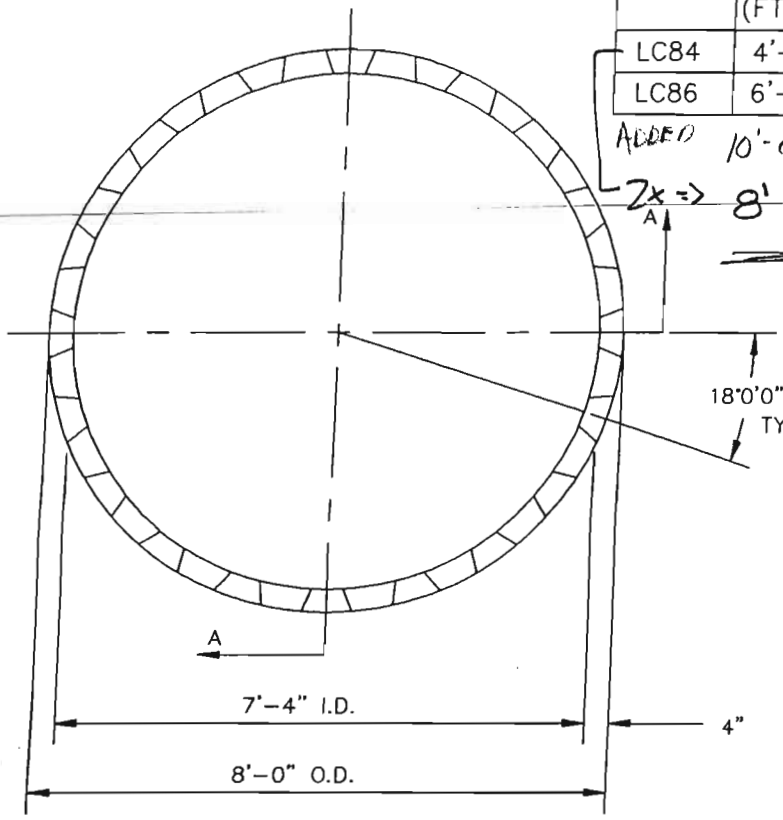
DWG. NO.

LC-8-MID

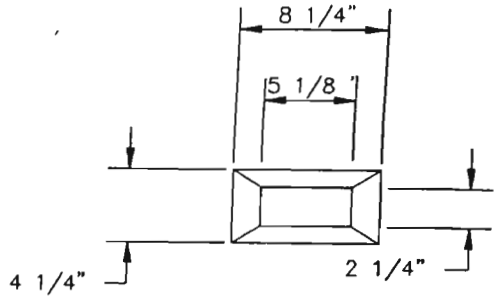
©

SPECIFICATIONS

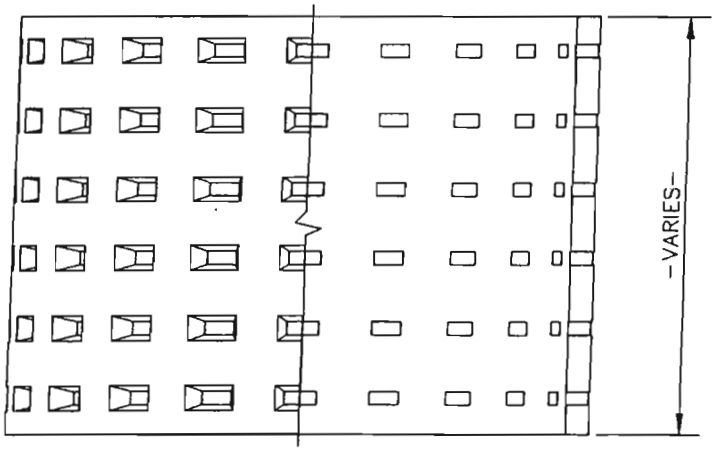
CODE:	BARREL HEIGHT (FT.)	LEACHING AREA (SQ. FT.)	VOLUME INSIDE (CU. FT.)	VOLUME (GALLONS)	APPROX. WEIGHT (LBS.)
LC84	4'-0"	100.48 SF	168.16	1257.9	3600
LC86	6'-0"	150.6	262.2	1961	5800
ADDED	10'-0"	251 SF			7200#
2x A =>	8' H	201 SF			



TOP VIEW



TYP. SLOT DET.



ELEVATION

SECTION A-A

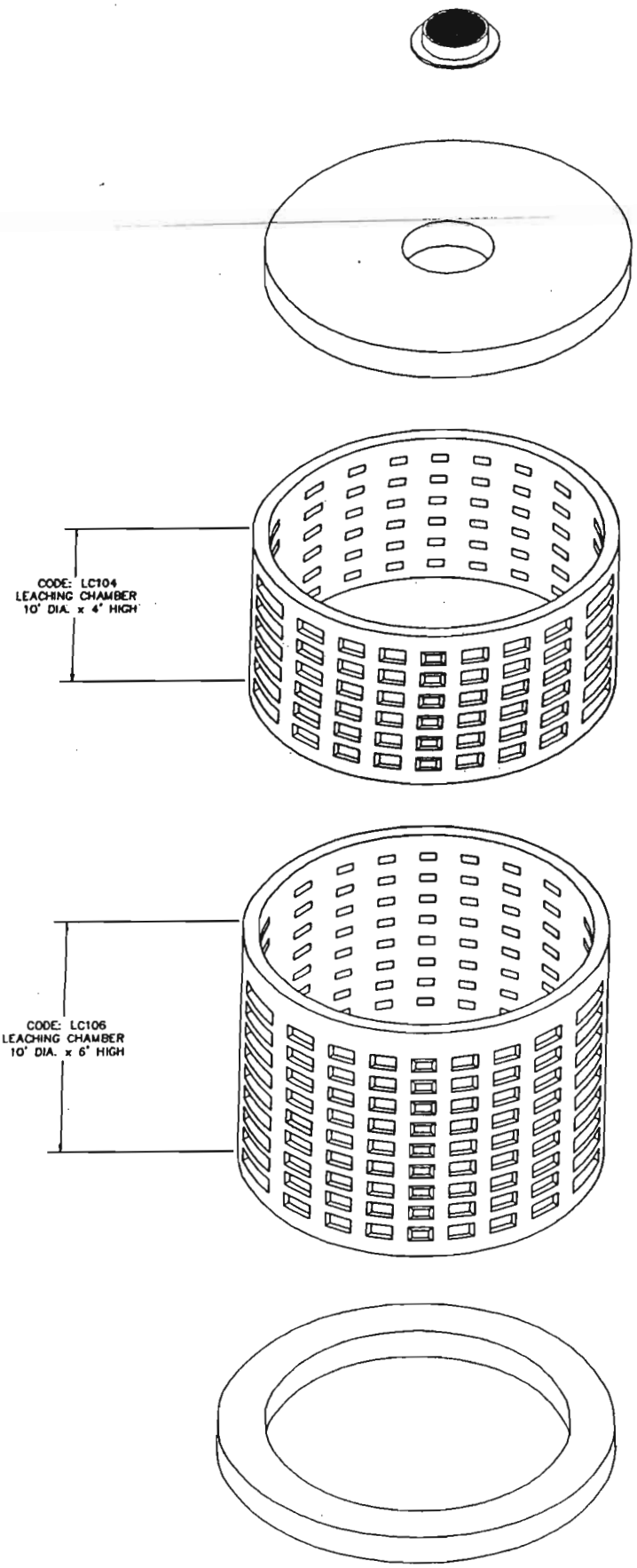
☐ SPECIFICATIONS:

CONCRETE:	4,000 P.S.I. @ 28 DAYS.
ENTRAINED AIR:	5% - 9%.
STEEL:	A.S.T.M. A496-A615 GRADE 60-60 KSI.
DESIGN LOADING:	A-0.3/300PSF/WALKWAYS. FLOATATION FORCES NOT ACCOUNTED FOR.

☐ SPECIFICATIONS:

CONCRETE:	4000 P.S.I. @ 28 DAYS.
ENTRAINED AIR:	5% - 9%.
STEEL:	A.S.T.M. A496-A615 GRADE 60-60 KSI.
DESIGN LOADING:	A.A.S.H.T.O. HS-20-44 WITH 30% IMPACT AND EQUIVALENT SOIL PRESSURE OF 130 (PSF). FLOATATION FORCES NOT ACCOUNTED FOR.

KISTNER CONCRETE PRODUCTS INC. 8713 READ ROAD E. PEMBROKE, N.Y. 14056 (716) 894-2267	PRODUCT DESIGNATION	DWG. NO.
	10'-0" DIA. DRYWELL/LEACHING CHAMBER	LC-10MID-1



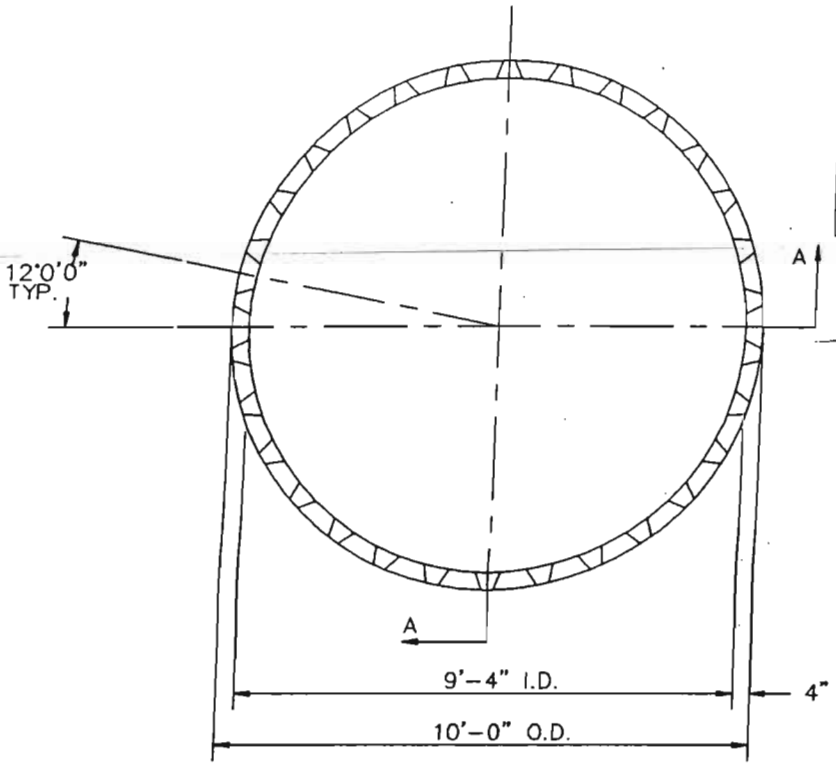
KISTNER CONCRETE PRODUCTS INC.
8713 READ ROAD
E. PEMBROKE, N.Y.
14056
(716) 894-2267

PRODUCT DESIGNATION	DWG. NO.
10'-0" DIA. DRYWELL/LEACHING CHAMBER	LC-10-MID ©

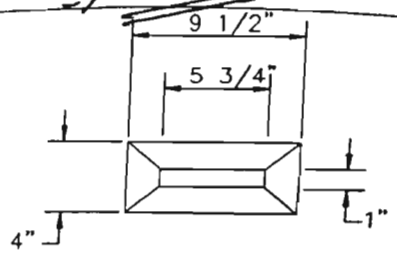
SPECIFICATIONS

CODE:	BARREL HEIGHT (FT.)	LEACHING AREA (SQ. FT.)	VOLUME INSIDE (CU. FT.)	VOLUME (GALLONS)	APPROX. WEIGHT (LBS.)
LC104	4'-0"	125.7	273.6	204.6	4800
LC106	6'-0"	188.6	409.6	3072	7200

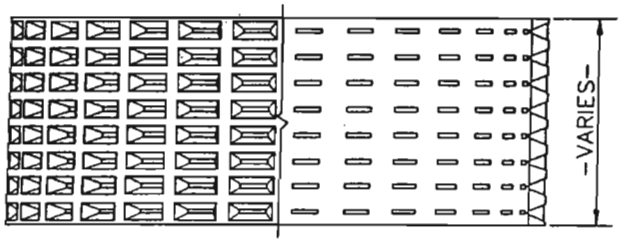
10'00 x 10'H => 315 ft² 12,000 lb



TOP VIEW



TYP. SLOT DET.



ELEVATION SECTION A-A

☐ SPECIFICATIONS:

CONCRETE:	4,000 P.S.I. @ 28 DAYS.
ENTRAINED AIR:	5% - 9%
STEEL:	A.S.T.M. A496-A615 GRADE 60-60 KSI.
DESIGN LOADING:	A-0.3/300PSF/WALKWAYS. FLOATATION FORCES NOT ACCOUNTED FOR.

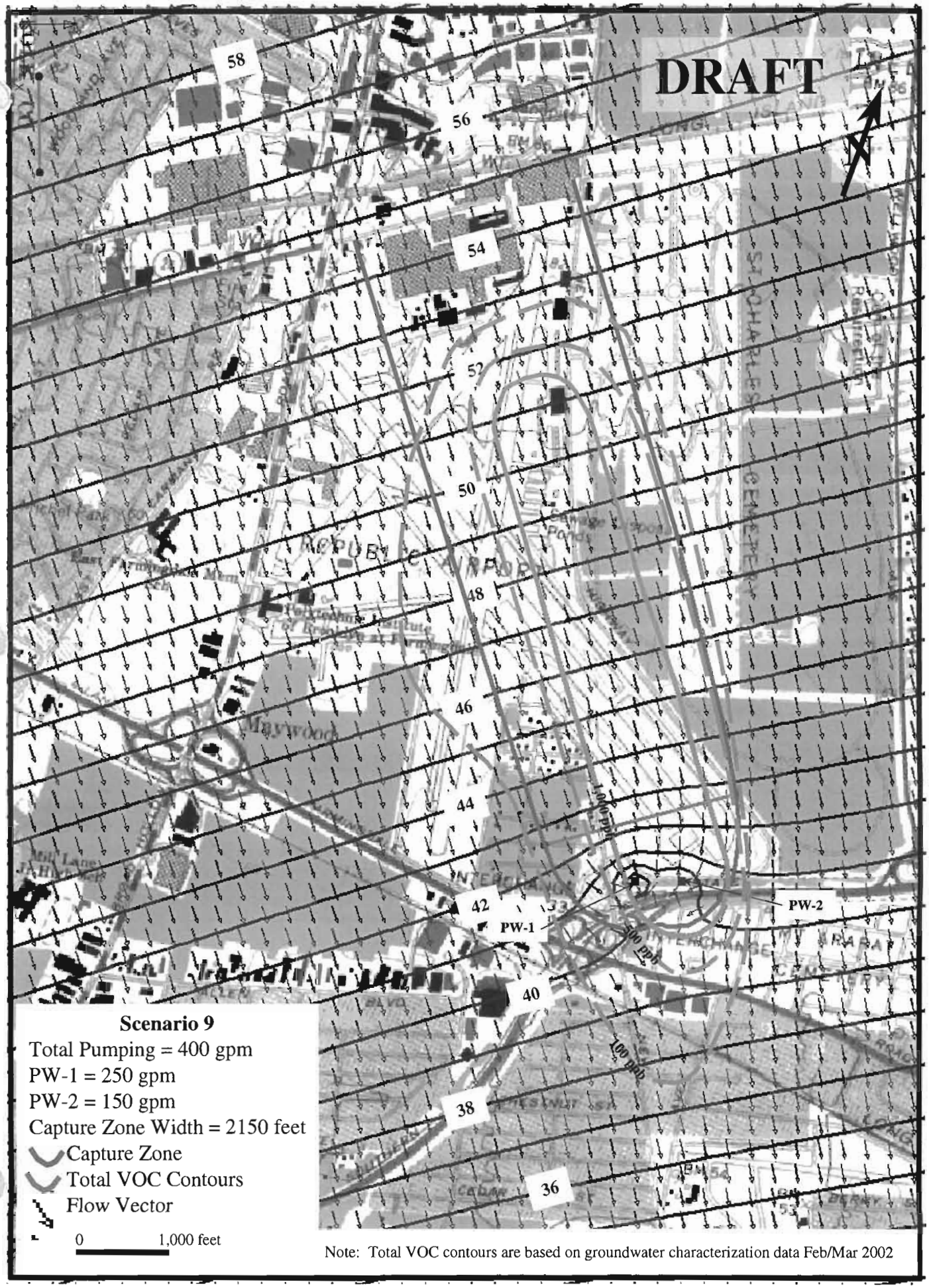
☐ SPECIFICATIONS:

CONCRETE:	4,000 P.S.I. @ 28 DAYS.
ENTRAINED AIR:	5% - 9%.
STEEL:	A.S.I.M. A496-A615 GRADE 60-60 KSI.
DESIGN LOADING:	A.A.S.H.T.O. HS-20-44 WITH 30% IMPACT AND EQUIVALENT SOIL PRESSURE OF 130 (PSF). FLOATATION FORCES NOT ACCOUNTED FOR.

MALCOLM PIRNIE

APPENDIX D

MALCOLM PIRNIE, INC., SCENARIO 9 – GROUNDWATER CONTAMINATION CAPTURE ZONE MAPPING



Note: Total VOC contours are based on groundwater characterization data Feb/Mar 2002

MALCOLM PIRNIE

APPENDIX E

MALCOLM PIRNIE, INC., PUMP AND PIPING SIZING CALCULATIONS AND BACKUP DOCUMENTATION DATED JULY 20, 2003

MALCOLM PIRNIE

CALCULATION COVER SHEET

Client: Fairchild Republic Main Plant Site Project No.: **4724-002**

Project Name: Groundwater Pump and Treat System

Project Description: 90% and Final Design of a 400-gpm groundwater pump, treat, and recharge system to remove VOC contamination from previous spills.

Total Number of Pages (including cover sheet): _____

Total Number of Computer Runs: N/A

Prepared by: David M. Patton, P.E. Date: July 20, 2003

Checked by: _____ Date: _____

Description and Purpose:

To determine the system's pipe sizes, pump capacity, pump required total dynamic head (TDH), and system head curves for each of the two groundwater recovery wells, raw water transmission piping, the air stripper discharge pump and piping.

Design Basis/References/Assumptions:

- The proposed wellfield includes two groundwater recovery wells (PW-1 and PW-2), along with associated transmission main piping to convey flows from each well to the treatment system. The system curves are determined for each piping section starting at each well and following through to the 6-inch diameter inlet header/manifold of the air stripper system. The two piping sections/alignments are as follows:
  1. Well No PW-1 is located approximately 25 linear feet from the air stripper inlet manifold, and is designed at a maximum flow of 250-gpm.
  2. Well No PW-2 is located approximately 500 linear feet from the air stripper inlet manifold, and is designed at a maximum flow of 150 gpm.
- The specified elevations have been calculated using the given well depth as a basis/datum. Elevations are not based on USGS vertical/horizontal datum.
- The static groundwater level, of the both recovery wells, is given in the report as 35-feet below ground surface.
- The well specific capacity (or feet of drawldown in well water level per gallon per minute pumped) has been taken from the MAC 35% report as 0.044 $FT_{drawldown}$/gpm.
- The proposed air stripper discharge pump and piping to the recharge system/leaching pools will include the necessary capacities to provide the required flows and head for the backwashing of the proposed GAC liquid phase treatment units with treated groundwater.

Remarks/Conclusions/Results:

Recovery Well PW-1:

- Pump requirement: Submersible type, minimum of 300-gpm flow at a total dynamic head (TDH) of 90-ft, with a minimum efficiency of 79%. Pump to fit an 8-5/8" I.D. well casing.
- Pipe size requirement: minimum 4-inch diameter piping, at a maximum velocity of 5.23 ft/sec.
- Typical pump:
  1. Fairbanks Morse Pump size 6G, 2-stages, 7.5 HP, max speed 3,500 rpm.
  2. Fairbanks Morse Pump size 7B, 5-stages, 7.5 HP, max speed 1,800 rpm.
  3. Goulds pump, model 7CL.

Recovery Well PW-2:

- Pump requirement: Submersible type, minimum of 200-gpm flow at a total dynamic head (TDH) of 85-ft, with a minimum efficiency of 79%. Pump to fit an 8-5/8" I.D. well casing.
- Pipe size requirement: minimum 4-inch diameter piping, at a maximum velocity of 3.14 ft/sec.
- Typical pump:
    1. Fairbanks Morse Pump size 6D, 2-stages, 5.5 HP, max speed 3,500 rpm.
    2. Fairbanks Morse Pump size 7A, 4-stages, 4.0 HP, max speed 1,800 rpm.
    3. Goulds Pump, model 7-WAH.

Air Stripper/Discharge Pump:

- Pump requirement: Centrifugal/End Suction type, minimum of 550-gpm flow at a total dynamic head (TDH) of 130-ft, which includes the necessary capacity for backwashing the GAC_{liquid} treatment units.
- Pipe size requirement: minimum 6-inch diameter piping, at a maximum velocity of 5.07 ft/sec.
- Typical pump:
    1. Goulds Pump Model 3298 (3 x 4 – 7), 25 HP motor at a maximum speed of 3,550 rpm.

Calculation Approved by: _____

Project Manager/Date

Methodology:

The calculations were performed on excel spreadsheets (attached) using the following:

A. STEPS:

1. Determine the headloss at various flows with the following steps:
   a. Static headloss calculations from the low well water level to the outlet.
   b. Minor headloss calculations in each pipe diameter.
   c. Frictional headloss calculations in each pipe diameter.
2. Plot the total head loss as a function of flow.
3. Estimate the design operation point (total dynamic head) at the required/specified design flow.
4. Determine which pipe diameter is most appropriate, while maintaining a pipe velocity between 4.0 - 6.0 ft/sec.

B. FORMULAS:

1. Total headloss (H_{tot}): $H_{tot} = H_s + H_m + H_f$.
2. Static headloss (H_s): H_s = Elevation of downstream point - elevation of upstream point.
3. Minor losses, valves and fittings (H_m): $H_m = (K_m * V^2)/2g$.
4. Friction losses (H_f): $H_f = 0.002083 * L * (100 / C)^{1.85} * Q^{1.85} / D^{4.865}$.
5. Pipe area (A): $A = (\Pi * D^2)/4$.
6. Velocity (V): $V = Q/A$.

C. ABBREVIATIONS/SYMBOLS:

1. A = Area (ft^2)
2. C = Hazen Williams coefficient (unitless), C = 120, for PVC piping.
3. cfs = Cubic feet per second
4. D = Pipe inner diameter (inches or ft)
5. ft/s = Feet per second
6. ft/s^2 = Feet per second squared
7. g = Acceleration due to gravity (32.2 ft/s^2)
8. gpm = Gallons per minute
9. H_f = Headloss due to friction (feet)
10. H_m = Minor losses due to bends and fittings (feet)
11. H_s = Static headloss (feet)
12. H_{tot} = Total system headloss (feet)
13. in = Inches
14. K_m = Resistance coefficient for bends and fittings (unitless)
15. L = Pipe length (feet)
16. Π = 3.14 (unitless)
17. Q = Flow Rate (gpm or cfs)
18. V = Velocity (feet per second)

D. REFERENCES:

1. Heald, C.C., Cameron Hydraulic Data, Ingersoll-Dresser Pumps, Liberty Corner. NJ: 18th ed.
2. Lindeburg, Michael R. Civil Engineering Reference Manual, Professional Publications, Inc., Belmont, CA: 6th ed.
3. Benefield, L.D., Judkins, J.F., Parr, A.D. Treatment Plant Hydraulics for Environmental Engineers, Prentice Hall, Englewood Cliffs, NJ.

MALCOLM PIRNIE

FAIRCHILD REPUBLIC MAIN PLANT SITE
PUMP, TREAT, AND RECHARGE SYSTEM
PROJECT No. 4724-002

WELL NO. PW-1

A. INDIVIDUAL WELL HEAD LOSS, from 4" well pump suction, column piping, and transmission main, up to the Air Stripper inlet/manifold.

Fitting	No.	Inlet Dia.	Outlet Dia.	Length ft	C	K	Head Loss, ft. @ Flow (gpm) & Velocity (ft/sec) 0 / 0.00	25 / 0.52	50 / 1.05	75 / 1.57	100 / 2.09	125 / 2.61	150 / 3.14	175 / 3.66	200 / 4.18	225 / 4.70	250 / 5.23	275 / 5.75	300 / 6.27
Entrance conditions	1	-	4	-	-	0.78	0.00	0.00	0.02	0.04	0.08	0.12	0.18	0.24	0.32	0.40	0.49	0.60	0.71
Well Foot Valve w/ Strainer	1	-	4	-	-	7.10	0.00	0.04	0.18	0.40	0.72	1.12	1.62	2.20	2.87	3.64	4.49	5.44	6.47
Column Piping Friction	-	-	4	100	120	-	0.00	0.07	0.24	0.52	0.88	1.33	1.87	2.48	3.18	3.96	4.81	5.73	6.73
90 deg. elbow	1	-	4	-	-	0.51	0.00	0.00	0.01	0.03	0.05	0.08	0.12	0.16	0.21	0.26	0.32	0.39	0.46
Swing Type Check Valve	1	-	4	-	-	1.70	0.00	0.01	0.04	0.10	0.17	0.27	0.39	0.53	0.69	0.87	1.08	1.30	1.55
Flow Control Valve (GATE style)	1	-	4	% OPEN ->	100	0.14	0.00	0.00	0.00	0.01	0.01	0.02	0.03	0.04	0.06	0.07	0.09	0.11	0.13
Turbine Type Flow Meter	1	-	4	-	-	5.00	0.00	0.03	0.13	0.28	0.51	0.79	1.14	1.55	2.02	2.56	3.16	3.83	4.56
Piping to Air Stripper Manifold	-	-	4.42	25	120	-	0.00	0.01	0.04	0.08	0.14	0.20	0.29	0.38	0.49	0.61	0.74	0.88	1.04
Increaser	1	4	6	-	-	0.31	0.00	0.00	0.01	0.01	0.03	0.04	0.06	0.08	0.10	0.13	0.16	0.19	0.23
Subtotal:							**0.00**	**0.18**	**0.67**	**1.48**	**2.58**	**3.99**	**5.68**	**7.67**	**9.94**	**12.50**	**15.34**	**18.46**	**21.87**

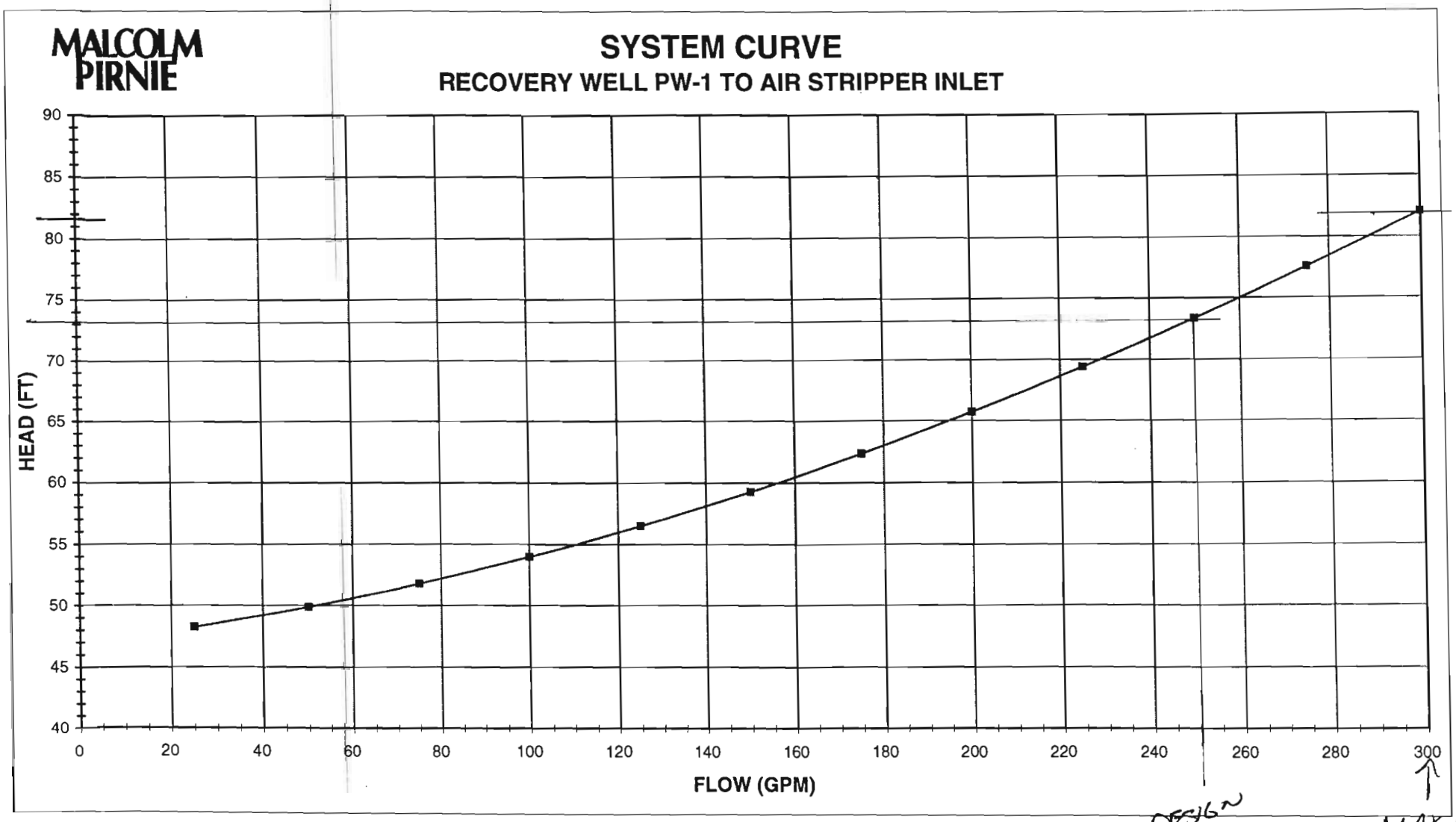
B. STATIC HEAD DIFFERENCES

		0	25	50	75	100	125	150	175	200	225	250	275	300
WELL PW-1														
GROUND/SURFACE ELV.	460 (calculated/assumed using well depth of 230')													
AIR STRIPPER INLET ELV.	472 (given in report, as 12-ft above ground surface)													
PUMP INLET ELV.	360 (given in report, as 100' above well bottom)													
WELL BOTTOM ELV.	230 (given in report)													
TOTAL WELL DEPTH	230 (given in report)													
STATIC WATER LEVEL ELV.	*425* (given in report, as a max. of 35 feet below ground level)													
SPECIFIC ($FT_{drawdown}$/GPM)	0.044 (given in report, calculatd as = 11 ft / 250 gpm)													
	PUMPING WELL WATER LEVEL AT FLOW ->	**425.0**	**423.9**	**422.8**	**421.7**	**420.6**	**419.5**	**418.4**	**417.3**	**416.2**	**415.1**	**414.0**	**412.9**	**411.8**
	AIR STRIPPER INLET ELEVATION ->	**472.0**	**472.0**	**472.0**	**472.0**	**472.0**	**472.0**	**472.0**	**472.0**	**472.0**	**472.0**	**472.0**	**472.0**	**472.0**
MAXIMUM STATIC HEAD DIFFERENCE		47.00	48.10	49.20	50.30	51.40	52.50	53.60	54.70	55.80	56.90	58.00	59.10	60.20
DYNAMIC HEAD LOSS		0.00	0.18	0.67	1.48	2.58	3.99	5.68	7.67	9.94	12.50	15.34	18.46	21.87
TOTAL LOSS IN HEAD (INCLUDES STATIC AND DYANAMIC LOSSES)		**47.00**	**48.28**	**49.87**	**51.78**	**53.98**	**56.49**	**59.28**	**62.37**	**65.74**	**69.40**	**73.34**	**77.56**	**82.07**

MALCOLM PIRNIE

SYSTEM CURVE

RECOVERY WELL PW-1 TO AIR STRIPPER INLET



MALCOLM PIRNIE

FAIRCHILD REPUBLIC MAIN PLANT SITE
PUMP, TREAT, AND RECHARGE SYSTEM
PROJECT No. 4724-002

WELL NO. PW-2

A. INDIVIDUAL WELL HEAD LOSS, from 4" well pump suction, column piping, and transmission main, up to the Air Stripper inlet/manifold.

Fitting	No.	Inlet Dia.	Outlet Dia,	Length ft	C	K	Head Loss, ft. @ Flow (gpm) & Velocity (ft/sec) 0 / 0.00	25 / 0.52	50 / 1.05	75 / 1.57	100 / 2.09	125 / 2.61	150 / 3.14	175 / 3.66	200 / 4.18	225 / 4.70	250 / 5.23
Entrance conditions	1	-	4	-	-	0.78	0.00	0.00	0.02	0.04	0.08	0.12	0.18	0.24	0.32	0.40	0.49
Well Foot Valve w/ Strainer	1	-	4	-	-	7.10	0.00	0.04	0.18	0.40	0.72	1.12	1.62	2.20	2.87	3.64	4.49
Column Piping Friction	-	-	4	100	120	-	0.00	0.07	0.24	0.52	0.88	1.33	1.87	2.48	3.18	3.96	4.81
90 deg. elbow	1	-	4	-	-	0.51	0.00	0.00	0.01	0.03	0.05	0.08	0.12	0.16	0.21	0.26	0.32
Swing Type Check Valve	1	-	4	-	-	1.70	0.00	0.01	0.04	0.10	0.17	0.27	0.39	0.53	0.69	0.87	1.08
Flow Control Valve (GATE style)	1	-	4	% OPEN ->	100	0.14	0.00	0.00	0.00	0.01	0.01	0.02	0.03	0.04	0.06	0.07	0.09
Turbine Type Flow Meter	1	-	4	-	-	5.00	0.00	0.03	0.13	0.28	0.51	0.79	1.14	1.55	2.02	2.56	3.16
Piping to Air Stripper Manifold	-	-	4.42	500	120	-	0.00	0.21	0.75	1.59	2.71	4.10	5.74	7.64	9.78	12.16	14.78
Increaser	1	4	6	-	-	0.31	0.00	0.00	0.01	0.01	0.03	0.04	0.06	0.08	0.10	0.13	0.16
Subtotal:							**0.00**	**0.37**	**1.39**	**2.99**	**5.16**	**7.88**	**11.14**	**14.92**	**19.23**	**24.05**	**29.38**

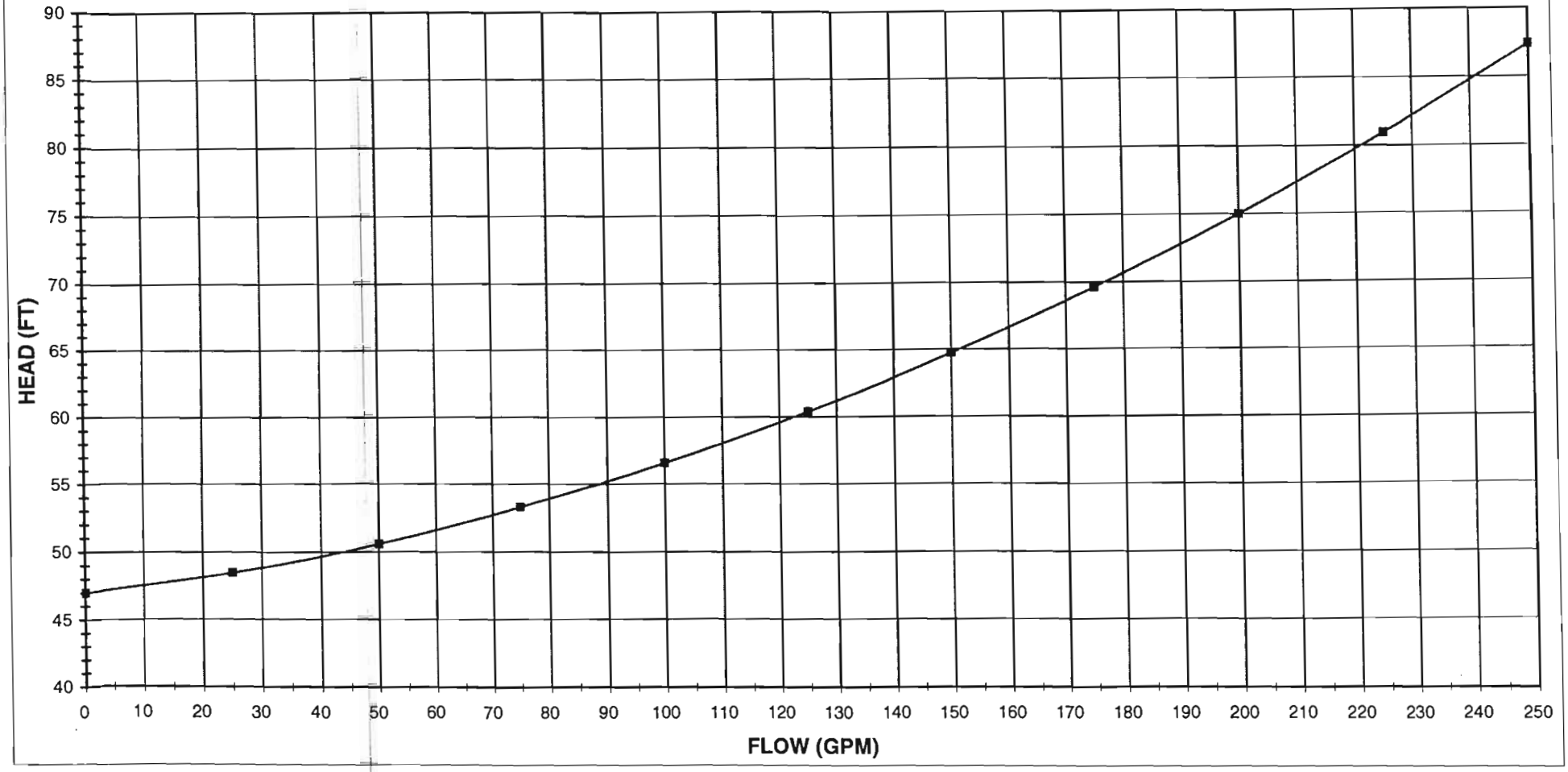
B. STATIC HEAD DIFFERENCES

	0	25	50	75	100	125	150	175	200	225	250
WELL PW-2											
GROUND/SURFACE ELV. 460 (calculated/assumed using well depth of 230')											
AIR STRIPPER INLET ELV. 472 (given in report, as 12-ft above ground surface)											
PUMP INLET ELV. 360 (given in report, as 100' above well bottom)											
WELL BOTTOM ELV. 230 (given in report)											
TOTAL WELL DEPTH 230 (given in report)											
STATIC WATER LEVEL ELV. *425* (given in report, as a max. of 35 feet below ground level)											
SPECIFIC ($FT_{drawdown}$/GPM) 0.044 (given in report, calculatd as = 11 ft / 250 gpm)											
PUMPING WELL WATER LEVEL AT FLOW, USING SPECIFIC FLUX OF WELL	**425.0**	**423.9**	**422.8**	**421.7**	**420.6**	**419.5**	**418.4**	**417.3**	**416.2**	**415.1**	**414.0**
ELEVATION OF INTERSECTION WITH RWM HEADER (APPROX. 5 FT BGL)	**472.0**	**472.0**	**472.0**	**472.0**	**472.0**	**472.0**	**472.0**	**472.0**	**472.0**	**472.0**	**472.0**
MAXIMUM STATIC HEAD DIFFERENCE	47.00	48.10	49.20	50.30	51.40	52.50	53.60	54.70	55.80	56.90	58.00
DYNAMIC HEAD LOSS	0.00	0.37	1.39	2.99	5.16	7.88	11.14	14.92	19.23	24.05	29.38
TOTAL LOSS IN HEAD (INCLUDES STATIC AND DYANAMIC LOSSES)	**47.00**	**48.47**	**50.59**	**53.29**	**56.56**	**60.38**	**64.74**	**69.62**	**75.03**	**80.95**	**87.38**

MALCOLM PIRNIE

SYSTEM CURVE

RECOVERY WELL PW-2 TO AIR STRIPPER INLET



MALCOLM PIRNIE

FAIRCHILD REPUBLIC MAIN PLANT SITE
PUMP, TREAT, AND RECHARGE SYSTEM
PROJECT No. 4724-002

6-INCH TREATED WATER MAIN

A. INDIVIDUAL HEAD LOSS, from Air Stripper discharge pump to Leaching Pools.

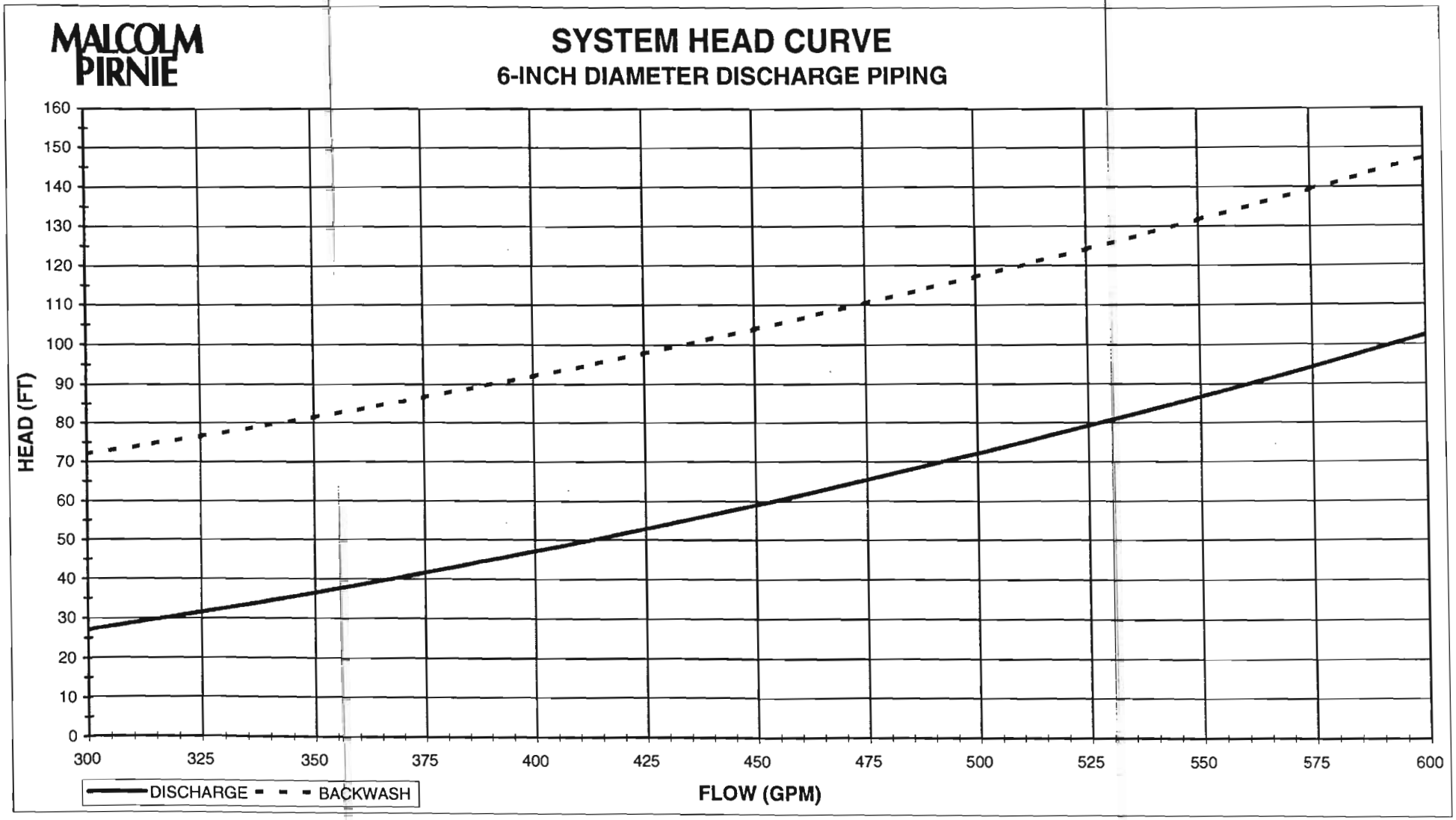
Fitting	No.	Inlet Dia.	Outlet Dia,	Length ft	C	K	Head Loss, ft. @ Flow (gpm) & Velocity (ft/sec) 0 0.00	25 0.25	50 0.51	75 0.76	100 1.01	125 1.27	150 1.52	175 1.77	200 2.03	225 2.28	250 2.53
Entrance conditions	1	-	6	-	-	0.78	0.00	0.00	0.00	0.01	0.02	0.02	0.04	0.05	0.06	0.08	0.10
Exit conditions	1	-	6	-	-	1.00	0.00	0.00	0.00	0.01	0.02	0.03	0.04	0.06	0.08	0.10	0.12
GAC vessel (manufacturer: 10'/400 gpm, 15'/500 gpm)	1	-	6	-	-	30.00	0.00	0.04	0.15	0.34	0.60	0.94	1.35	1.84	2.40	3.04	3.75
90 deg. elbow	6	-	6	-	-	0.45	0.00	0.00	0.01	0.03	0.05	0.08	0.12	0.17	0.22	0.27	0.34
45 deg. elbow	6	-	6	-	-	0.24	0.00	0.00	0.01	0.02	0.03	0.04	0.06	0.09	0.12	0.15	0.18
Increaser	2	4	6	-	-	0.31	0.00	0.00	0.01	0.03	0.05	0.08	0.11	0.15	0.20	0.25	0.31
Flow Meter	1		4			5.00	0.00	0.03	0.13	0.28	0.51	0.79	1.14	1.55	2.02	2.56	3.16
Flow Control Valve (GATE style)	1	-	6	% OPEN ->	100	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01
Piping to Leaching Pools	-	-	6.35	2200	120	-	0.00	0.16	0.57	1.20	2.04	3.09	4.33	5.76	7.37	9.17	11.14
Butterfly/Isolation Valve	1	-	6	-	-	0.24	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.03
Subtotal:							**0.00**	**0.24**	**0.89**	**1.92**	**3.33**	**5.09**	**7.21**	**9.68**	**12.50**	**15.65**	**19.15**

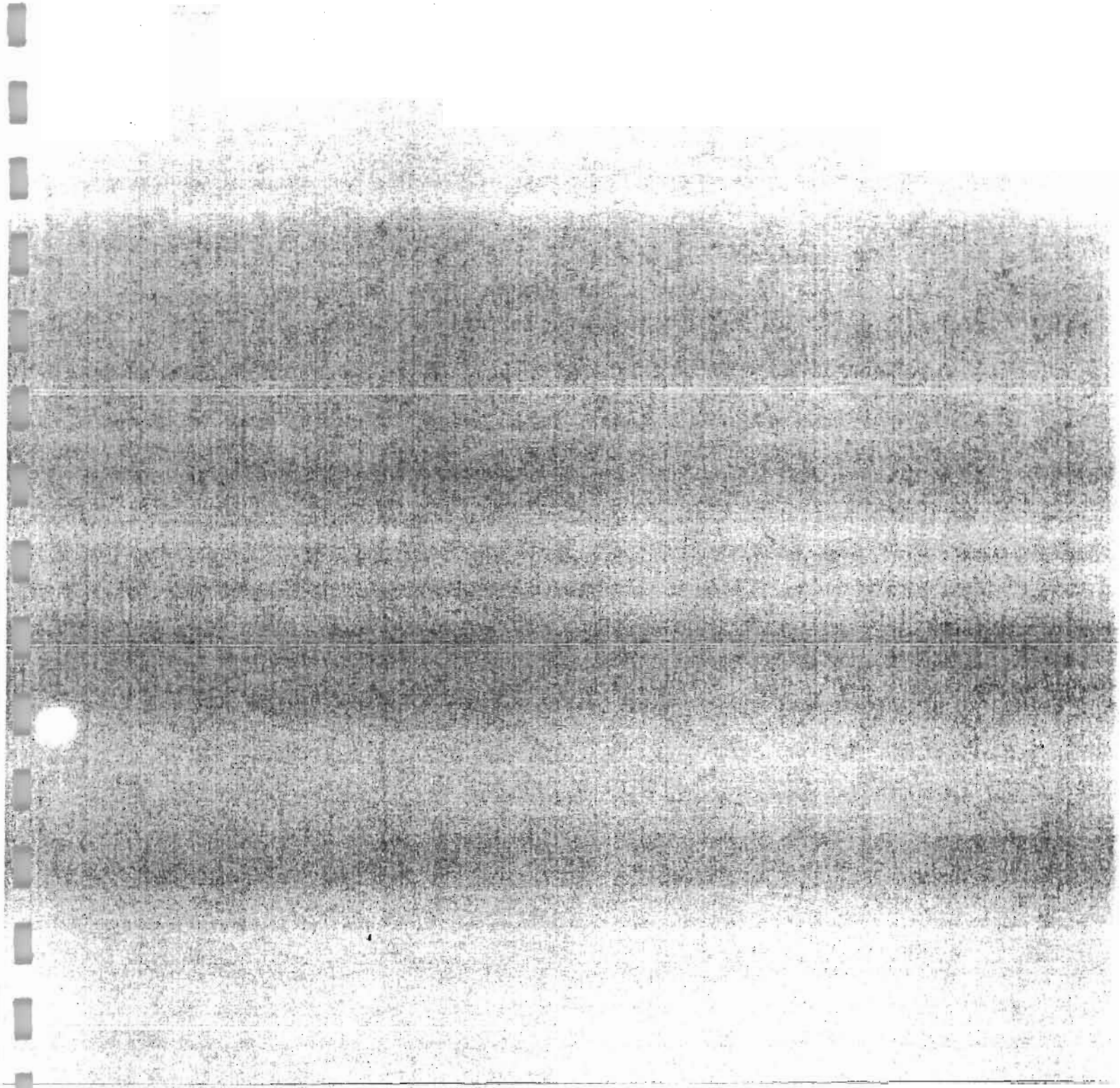
Fitting	No.	Inlet Dia.	Outlet Dia,	Length ft	C	K	Head Loss, ft. @ Flow (gpm) & Velocity (ft/sec) 275 2.79	300 3.04	325 3.29	350 3.55	375 3.80	400 4.05	425 4.31	450 4.56	475 4.81	500 5.07
Entrance conditions	1	-	6	-	-	0.78	0.12	0.14	0.16	0.19	0.22	0.25	0.28	0.32	0.35	0.39
Exit conditions	1	-	6	-	-	1	0.15	0.18	0.21	0.24	0.28	0.32	0.36	0.40	0.45	0.50
90 deg. elbow	6	-	6	-	-	0.45	0.41	0.49	0.57	0.66	0.76	0.86	0.98	1.09	1.22	1.35
45 deg. elbow	6	-	6	-	-	0.24	0.22	0.26	0.30	0.35	0.40	0.46	0.52	0.58	0.65	0.72
Increaser	2	4	6	-	-	0.31	0.38	0.45	0.53	0.61	0.71	0.80	0.91	1.02	1.13	1.25
Flow Meter	1	0	4	0	0	5	3.83	4.56	5.35	6.20	7.12	8.10	9.14	10.25	11.42	12.65
Flow Control Valve (GATE style)	1	-	6	% OPEN ->	100	0.12	0.02	0.02	0.03	0.03	0.03	0.04	0.04	0.05	0.05	0.06
Piping to Leaching Pools	-	-	6	2200	120	-	13.29	15.61	18.10	20.76	23.58	26.57	29.73	33.04	36.52	40.15
Butterfly/Isolation Valve	1	-	6	-	-	0.24	0.04	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.11	0.12
Subtotal:							**22.98**	**27.14**	**31.63**	**36.46**	**41.61**	**47.08**	**52.88**	**59.00**	**65.44**	**72.20**

MALCOLM PIRNIE

SYSTEM HEAD CURVE

6-INCH DIAMETER DISCHARGE PIPING





MAIROLL, INC.

FAIRCHILD REPUBLIC MAIN PLANT SITE
FARMINGDALE, NEW YORK

SITE #1-52-130

PRELIMINARY REMEDIAL DESIGN REPORT
35 PERCENT COMPLETION

February 2002

Prepared By: Nicholas A. Andrianas, P.E.
For:
MAC CONSULTANTS, INC.
222 Middle Country Road, Suite 209
Smithtown, New York 11787
tel 631-265-7700
fax 631-265-9073

well PW-1.

The groundwater capture zone of the test well PW-1 pumping at 250 gpm and the MPS VOC plume map overlay, demonstrate the ability of the test well to capture the plume as required by the ROD. The groundwater capture zone of the test well PW-1 pumping at 250 gpm and the MPS VOC plume map overlay are shown on Drawing 11 of the Field Investigation and Aquifer Test Report.

3.1.1 Recovery Well Construction

The pumping well was installed by the direct rotary drilling method. The well was bored to an initial diameter of 12 inches and later bored to a final diameter of 16 inches using Roller Cone drilling bits and a combination of Revert and Gel-X drilling fluids. A natural-gamma geophysical log was performed and screen section lengths and depths were selected. Soil samples were collected at the MW-49 well cluster every five feet from 100 feet to 200 feet below grade and analyzed by Cook Screen Technologies, Inc. for grain size to determine the screen slot size and the gravel pack surrounding the screen. The geophysical log and the sieve analysis are provided in Appendix C.

The pumping well was constructed with a WG #2 grain size filter pack, three sections of 30 slot wire wrapped stainless steel screen, 8-5/8 inch steel well casing and screen, bentonite /sand seal and bentonite grout. The pumping well screen was set in three sections; one 15 foot section at a depth of 125 feet to 140 feet, one 12 foot section at a depth of 157 feet to 172 feet and a 50 foot section set 180 feet to 230 feet below grade, because of the presence of clay layers encountered during geophysical logging of the borehole. The well construction log for pumping well PW-1 is shown on Figure 1.

3.1.2 Recovery Well Development

The pumping well was developed by air-lift methods, utilizing an eductor pipe system to periodically pump the well to remove sediment from the screen and borehole. The pumped effluent was stored

The results of the predesign investigation suggest that the MPS plume that exceeds 1000 ppb of total VOCs is approximately 800 feet wide and 5000 feet long. The MPS plume is approximately 150 feet thick in the vicinity of test well PW-1. The segment of the plume with 1000 ppb of total VOCs is approximately 50 feet thick, based on aquifer profiling data.

3.1.1.2 Pumping Test

A controlled 72 hour pumping test was performed on test well PW-1 at 250 gpm to determine if the well would meet the remedial design objectives. The maximum drawdown (water level decline due to pumping) in PW-1 was approximately 11 feet at the end of the test. The well would be capable of pumping at a much higher rate. 11/250 => 0.044 ft/gpm

Drawdown was measured during the test at selected monitoring wells and piezometers. Water levels were measured using manually operated electric water level meters ("M-scopes") and/or automatic transducer water level recording probes. Measurement increments were pre-determined in the May 2000 Aquifer Testing and Analysis Specifications report and recorded accordingly. Water level measurements collected during the pumping test are provided in the January 2002, Field Investigation and Aquifer Test Report.

Once the test started, water table measurements were made at given intervals and the change in water table elevation was recorded. Maximum drawdown in the observation wells was 3.2 feet in piezometer PZ-D (105 feet from PW-1) to 0.47 feet in well MW-42I (2175 feet from PW-1). There was no discernable drawdown in the water table observation wells, such as MW-49S.

Water levels were also measured in certain wells that were not used for the aquifer test analysis, such as well MW-37D, so that pumpage effects above and below the aquifer pumping zone could be documented. Well MW-37D had approximately one foot of drawdown near the end of the 72 hour pumping test, thus confirming that pumping influence extended below the zone in which the test well was screened. The drawdown measurements were used to estimate groundwater capture of the test

7.0 Groundwater Flow

7.1 Water Table Elevations

← WORST CASE WATER LEVEL

The water table is approximately 35 feet below grade at Conklin Street to the north, about 20 feet at the test well site, and about 15 feet in the southern portion of the study area near New Highway and Albany Avenue. The water table is the top of the groundwater system, and it is in direct contact with the atmosphere in the unsaturated soil zone, which is part of the Upper Glacial Deposits.

Natural recharge to the aquifer system occurs through rain and snowmelt water percolating through the soil, and through man-made structures such as leaching pools and stormwater recharge basins. The natural recharge rate on Long Island has been estimated at about 1 million gallons per day per square mile (mgd) by the U. S. Geological Survey.

The water table slopes to the south-southeast at a gradient of about 0.0015 Ft./Ft.. Water table elevations were drawn for 2001 as shown on Drawing #3. Vertical gradients in the water table aquifer were measured during the RI and were not found to be significant based on comparing water levels in adjacent shallow and intermediate monitoring wells indicating predominantly horizontal flow in the water table aquifer. The horizontal groundwater velocity at the water table is estimated at about 1 foot per day by the U.S. Geological Survey. The groundwater velocity decreases with depth and is estimated to be approximately 0.1 feet per day at the Upper Glacial - Magothy contact.

7.2 Water Levels in the Upper Magothy Deposits

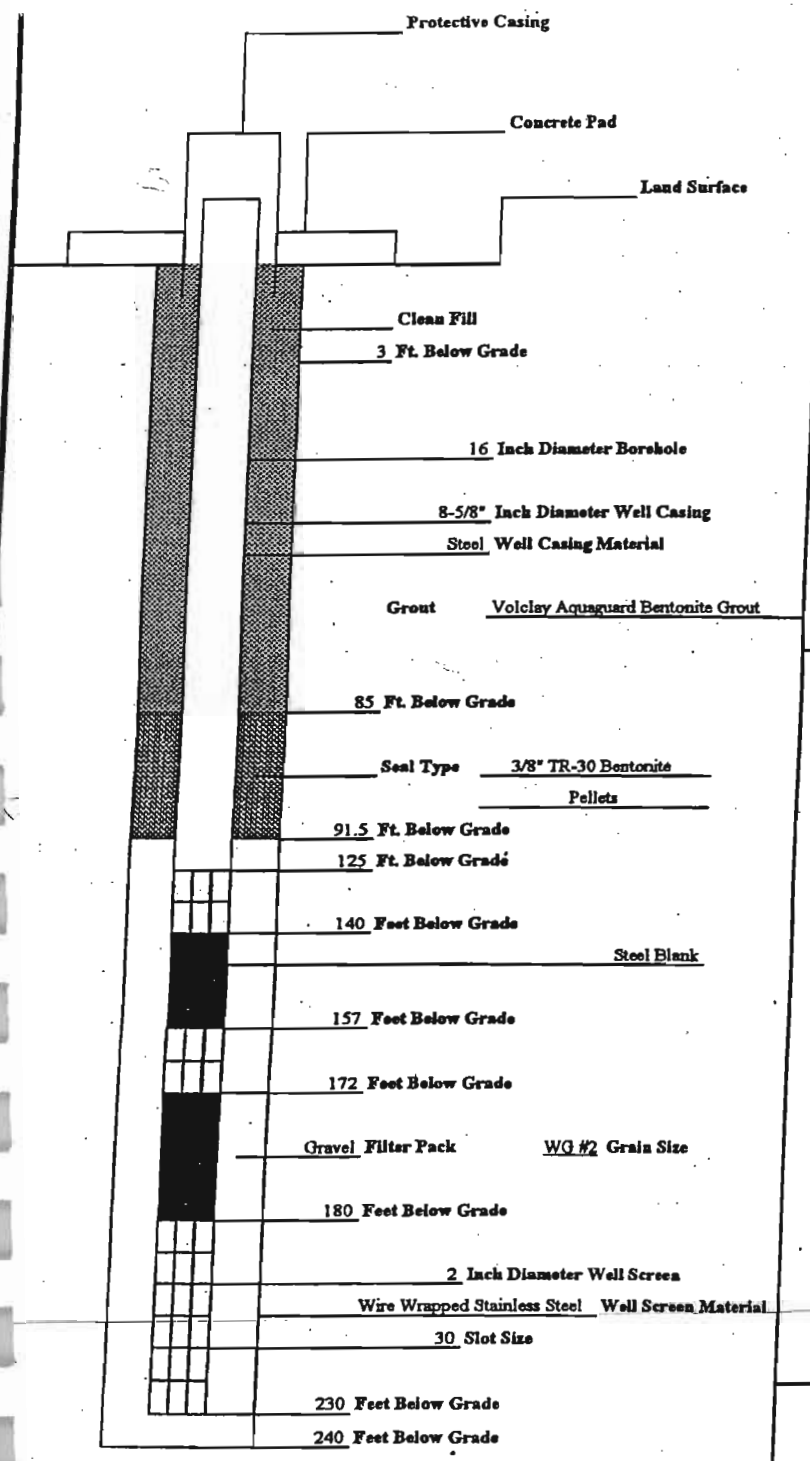
The Upper Magothy Deposits occur at about 100 feet below grade in the study area, and slope to the south-southeast. The Cretaceous Magothy deposits directly contact the Upper Glacial deposits in the study area, and recharge to the Magothy Aquifer occurs through the Upper Glacial Aquifer. The Magothy consists of deltaic deposits that differ from the Upper Glacial outwash deposits in the added frequency and extent of clay and silt deposits that create a confined or semi-confined condition in the Magothy aquifer.

Groundwater flow in the Magothy is south-southeast, similar to the Upper Glacial Aquifer. The gradient is approximately 0.0019 feet per mile in the study area. The groundwater velocity in the Upper Magothy has been estimated at approximately 0.1 feet per day by the U. S. Geological Survey.

Water levels in the Upper Magothy for 2001 are shown on Drawing #3. These water levels are called piezometric head levels because they represent semi-confined aquifer conditions and are not in direct contact with the atmosphere as with the water table.

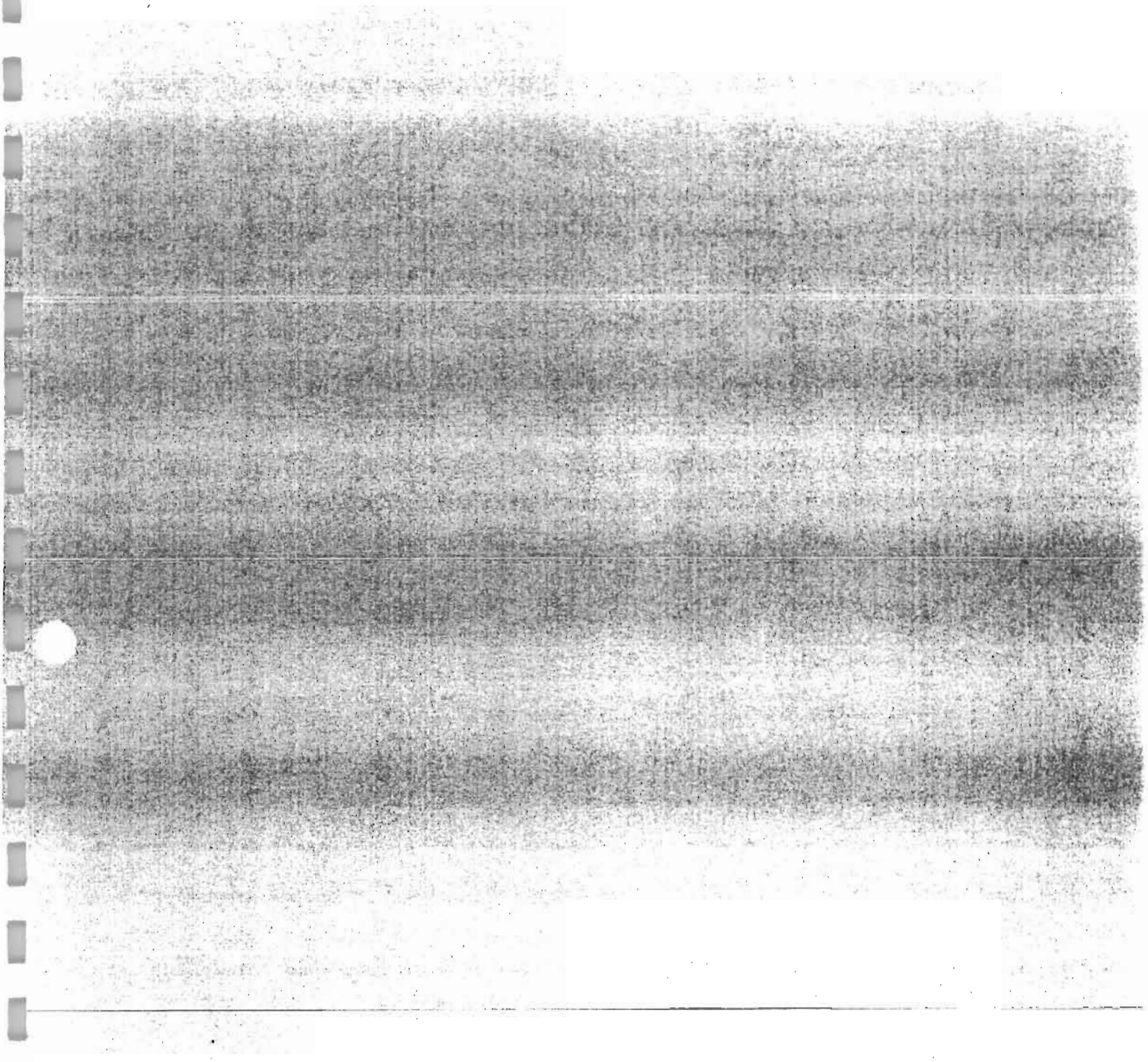
FIGURE 1:

PUMPING WELL (PW-1) CONSTRUCTION LOG

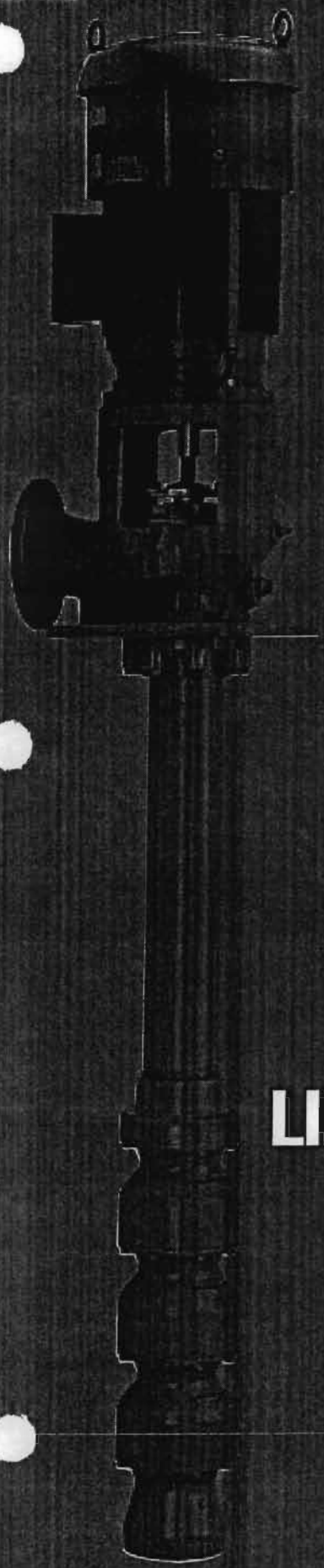


Notes:

Well No.	PW-1
Client	Mairoll, Inc.
Project	Fairchild Republic Main Plant Site (MPS)
Surveyor	N/A — Survey Date
Measuring Point Elevation	Not Surveyed
Installation Date	February 28, 2001
Drilling Contractor	Delta Well & Pump Co., Inc.
Drilling Method	Direct (Mud) Rotary
Drilling Fluid	Cetco Super Gel-X Xtra High Yield Drilling Fluid
Fluid Loss During Drilling (gals.)	20 (estimated)
Development Technique(s)	Air Lift
Date(s) of Development	May 22 - 23, 2001
Water Removed During Development (gals)	64,000
Depth to Water (ft. below M.P.)	19.7 feet
Pumping Depth to Water (ft. below M.P.)	37.0 feet
Pumping Duration	14 hours
Yield (gpm)	N/A
pH	6.8
Turbidity (NTU)	28.61 NTU
Temperature (deg. F)	62
Total Dissolved Solids	150 ppm
Well Purpose	Pumping Well
Hydrogeologist	Mike Bluight
Company	MAC CONSULTANTS, INC.



GOULDS PUMPS



GOULDS TURBINE PUMPS

LINESHAFT

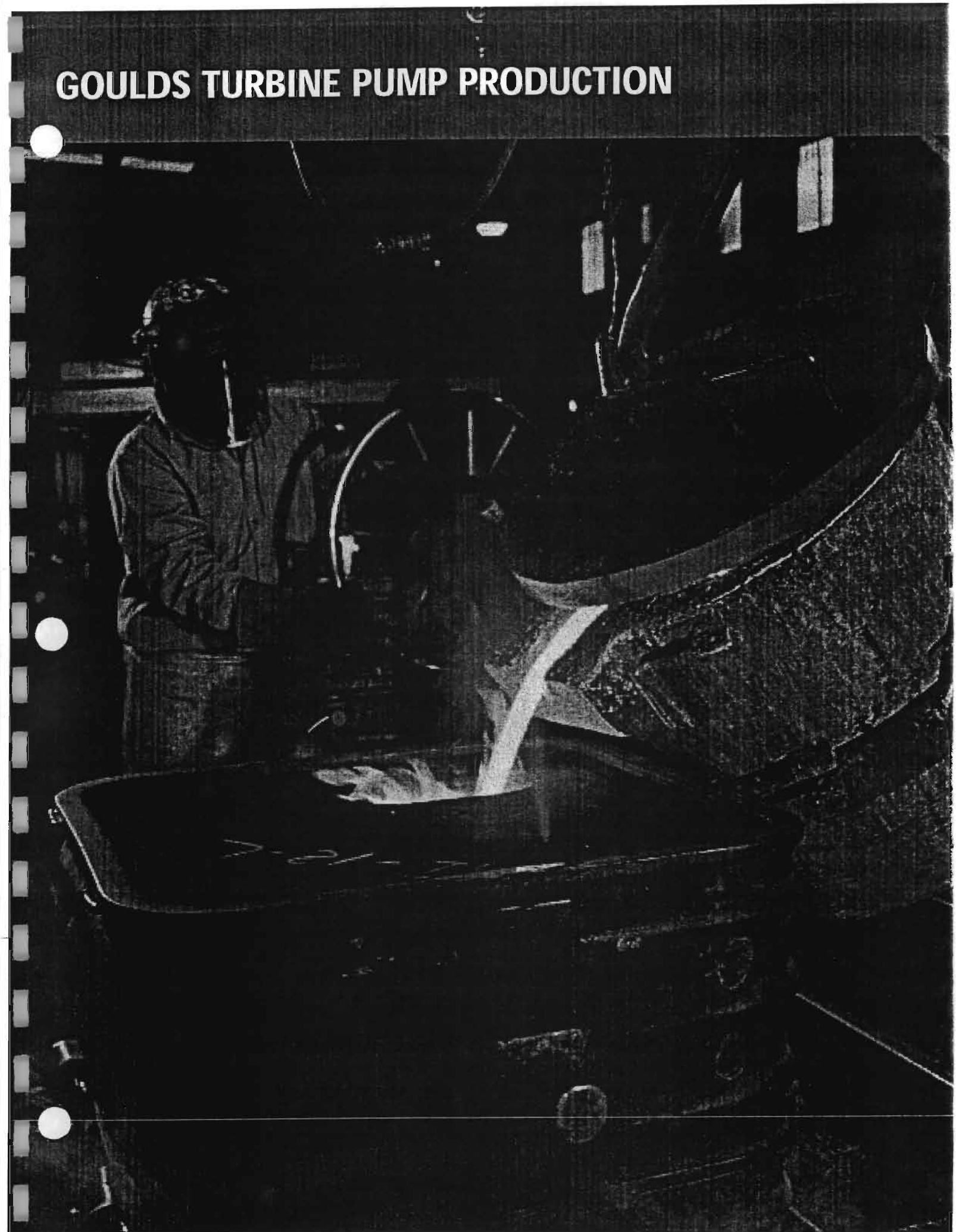
SUBMERSIBLE

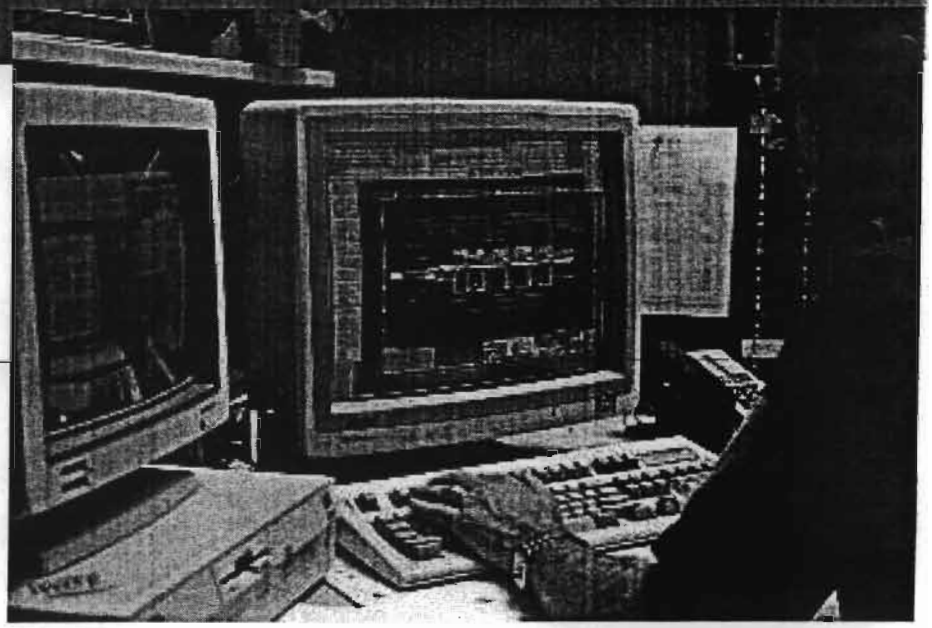
Goulds Pumps

ITT Industries

WATER TECHNOLOGY GROUP - TURBINE DIVISION

GOULDS TURBINE PUMP PRODUCTION

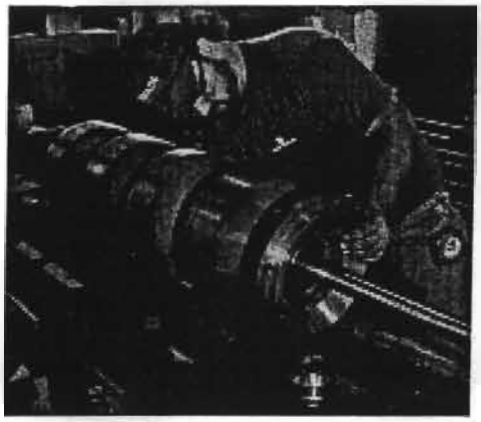




You not only get the latest in pump design and technology from Goulds Pumps, you get more than 100 years of pump manufacturing know-how that includes most of the major innovations in pump engineering and materials. All our products reflect the engineering design advances for top efficiency and head generation.

Our engineers are specialists, using computer assisted design and extensive test and research facilities. They develop the specifications that guide our in-house pattern shop technicians in the development of precision turbine pattern equipment. The result is consistent casting accuracy, close tolerances and the quality needed to maintain water passage shape and pump efficiencies.

Goulds Pumps further controls the quality of its products in its own foundries. Here the molding, core work and Vitra-Glass enameling are closely supervised for tight quality standards.



Our modern manufacturing facilities assure dimensionally consistent, high quality, fully machined parts, produced on a volume basis to bring down costs. Every impeller is precision balanced on a micro processor balance analyzer. Goulds Pumps is one of the largest manufacturers in the turbine industry.

From design to pattern shop to foundry to manufacturing to warehousing — Goulds Pumps is a completely integrated producer. Our network of turbine warehouses brings pumps and same day service to you. We offer full service on new units. Rebowling, rebuilding and repair on turbine pumps and submersible and centrifugal pumps.

We are committed to service. We offer ready availability of complete pumps, repair parts and service. We are continually improving and expanding our turbine products warehouse network with locations in key areas.

SUBMERSIBLE

Applications

Goulds Pumps combines the hydraulic engineering of turbine pumps matched to the hi-tech design of electric submersible motors.

Features

1 Discharge Pipe
Properly sized for optimum watervelocities to insure peak hydraulic performance.

2 Discharge Bowl
Several discharge sizes available for NPT or flanged pipe.

3 Discharge Bearing
Extra long top protected bronze bearing insures positive shaft alignment and stabilization for extended life.

4 Intermediate Bowl
Close grained Class 30 cast iron. Water passage glassed for maximum efficiency and abrasion resistance.

5 Impellers
Designed for maximum efficiency with wide range hydraulic coverage. Precision balanced for smooth operation.

6 Upthrust Collar
Designed for extra margin of safety against possible momentary upthrust occurring at startup.

7 Intermediate Bowl Bearings
Reliable long life bronze or rubber bearing.

8 Lock Collets
Accurately machined to insure positive locking of impeller to pump shaft.

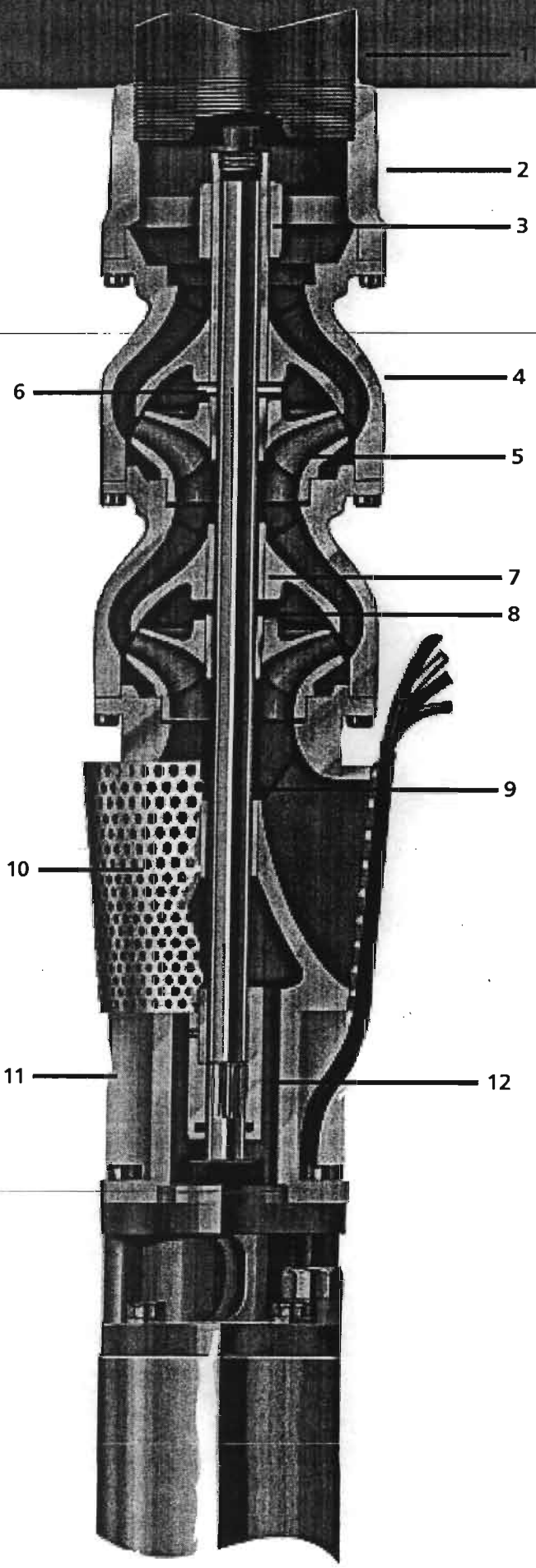
9 Pump Shaft
100,000 PSI high tensile stainless steel provides strength and excellent corrosion resistance. Ground and polished for smooth bearing surface.

10 Suction Inlet
Contoured for smooth flow entrance. Protected by an oversized stainless steel strainer to prevent entrance of damaging solids.

11 Suction Adapter
Ductile iron provides for increased strength and positive motor alignment. Open area permits easy access to pump/motor coupling.

12 Pump/Motor Coupling
Large stainless steel coupling accurately machined for perfect alignment, balance and power transmission.

Submersible pumps and motors provide an extensive list of options versus other deep well pumping equipment systems. Advanced engineering designs and experience now assure units for long term pumping service. Water well applications provide the perfect opportunity to evaluate features and benefits of submersible equipment.



Hermetically Sealed Type

A Hermetically Sealed Type motor utilizes windings of standard construction and insulation thickness. The windings are encased and Hermetically Sealed within the external shell casing on the outside and an internal tube or liner inside the bore. The Hermetically Sealed enclosure eliminates the possibility of water leakage into the winding the liquid medium circulates between the rotor and stator liner providing lubrication and cooling to the bearings.

Submersible Options

Goulds Pumps can provide several options in pump and motor combinations to meet the exacting conditions of your applications:

- High temperature wells
- High horsepower, limited well diameters
- Motor sensing devices
- Water level indicators
- Special materials
- Special voltage motors

Consult Goulds Turbine Customer Service Dept. for details.

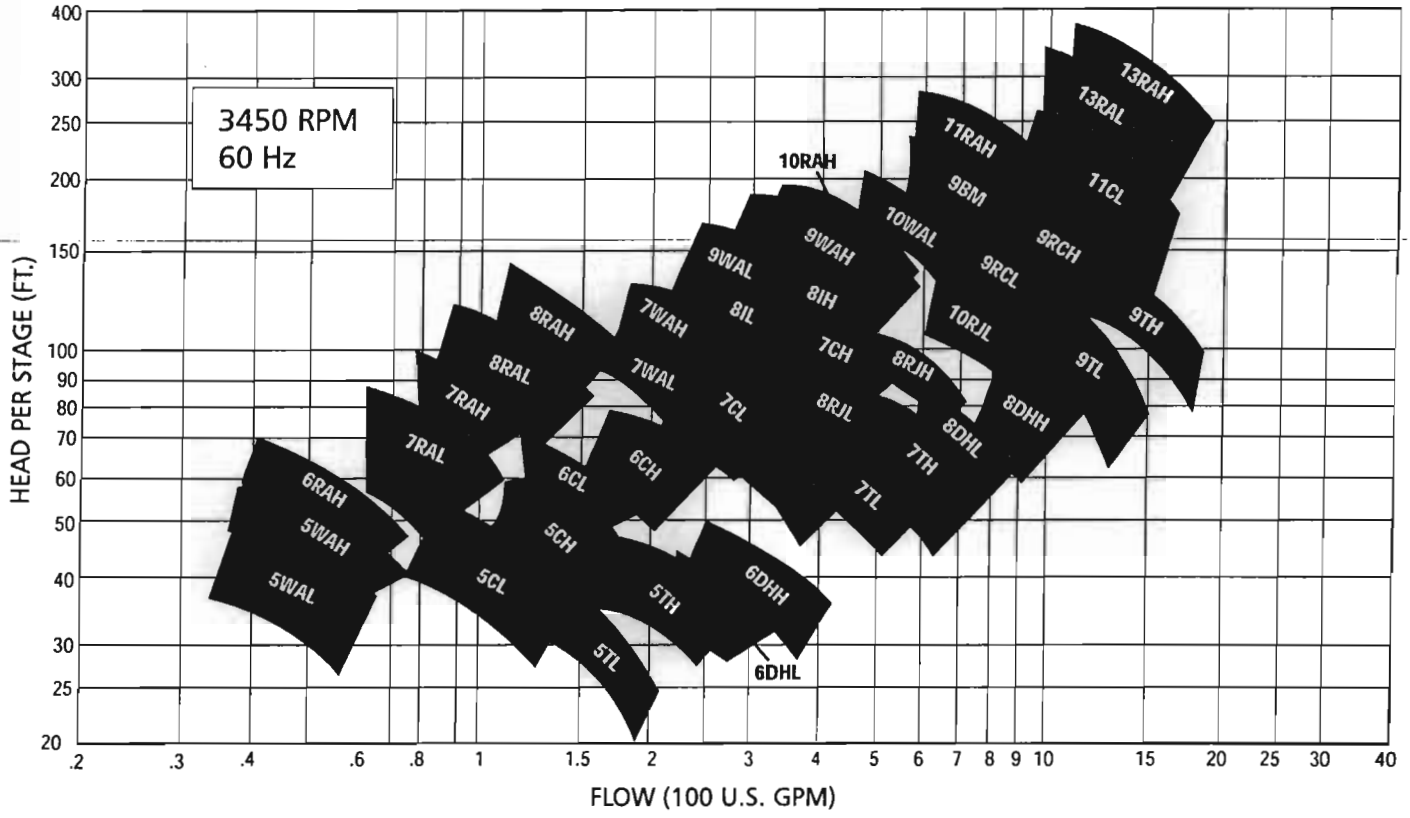
Wet Winding Type

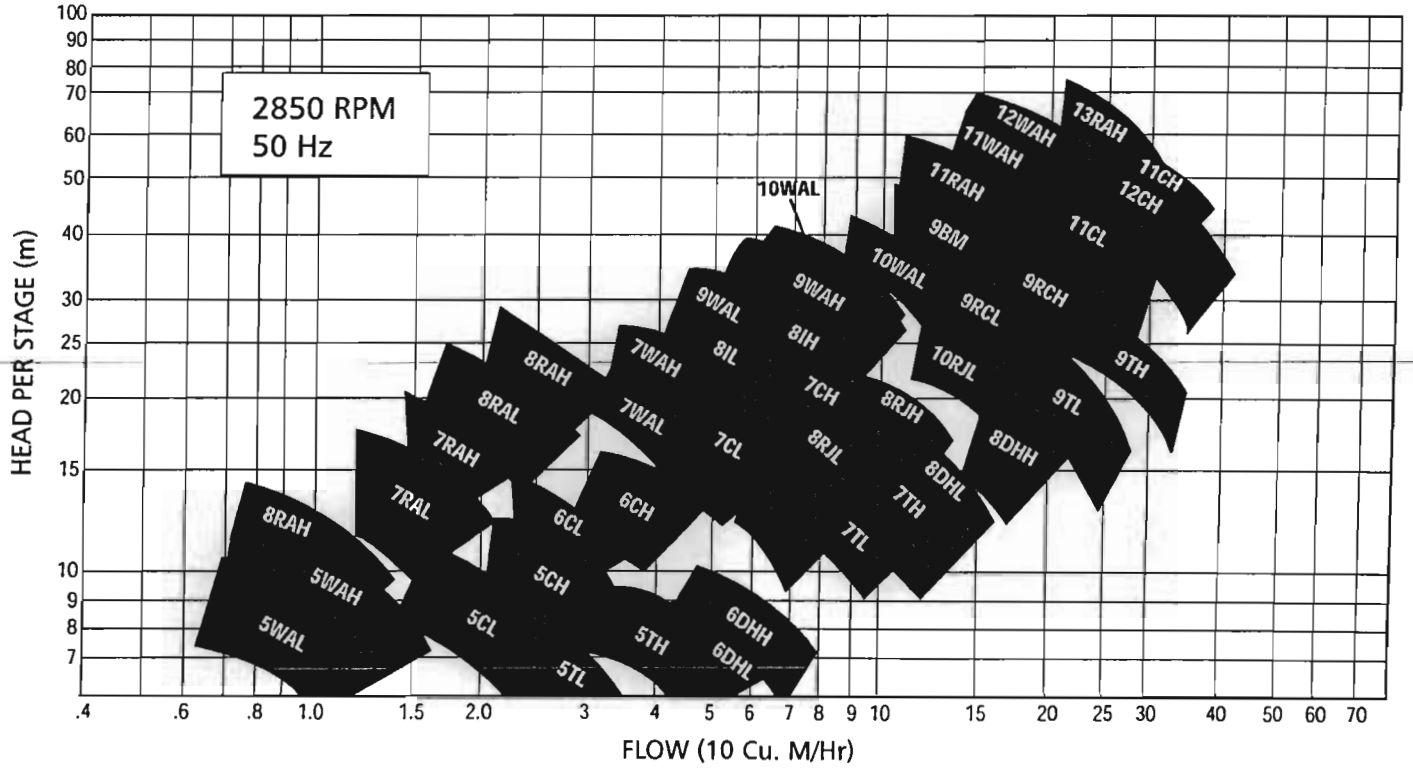
A Wet Winding Type motor is one in which the motor windings are in direct contact with a liquid medium. The medium is clean, clear water. A pressure balancing system prevents exchange of the motor liquid medium and well water due to thermal expansion and contraction when the motor is operating. The liquid medium fills the inside of the motor and surrounds both the stator windings and the rotor. A completely water proof insulation is used on the magnet wire used for the stator windings. The liquid medium inside the motor air gap and coils acts as a heat transfer device by circulating through the windings and transferring heat to the external casing. Dissipation of this heat occurs as the well water flows at a required velocity over the external case. As is the case in all submersible type motors, the internal liquid medium is also used for bearing lubrication.

Submersible Accessories:

- Valves
  - — Check Valves
  - — Flow Control
  - — Gate Valves
  - — Ball Valves
- Electrical Panels
  - — F.E. Subtrol
  - — Furnas Panels
  - — V.F.D. Drivers
- Pitless Adapters
- Wire
  - — 12 to 0000
- Heat Shrinks
- Splice Kits
- Tanks
- Well Heads
  - — Submersible Discharge Head
- Torque Arrestors
- Gauges
- Motor Shrouds

SUBMERSIBLE



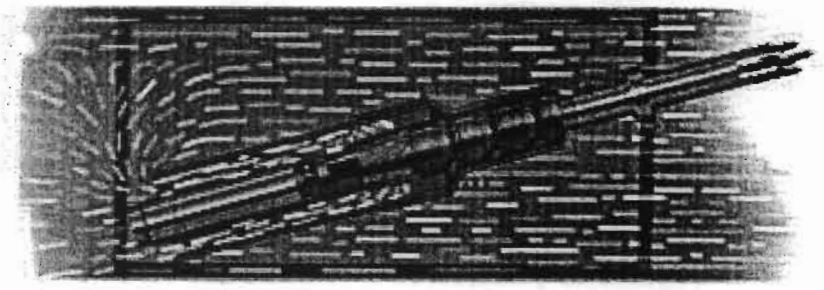


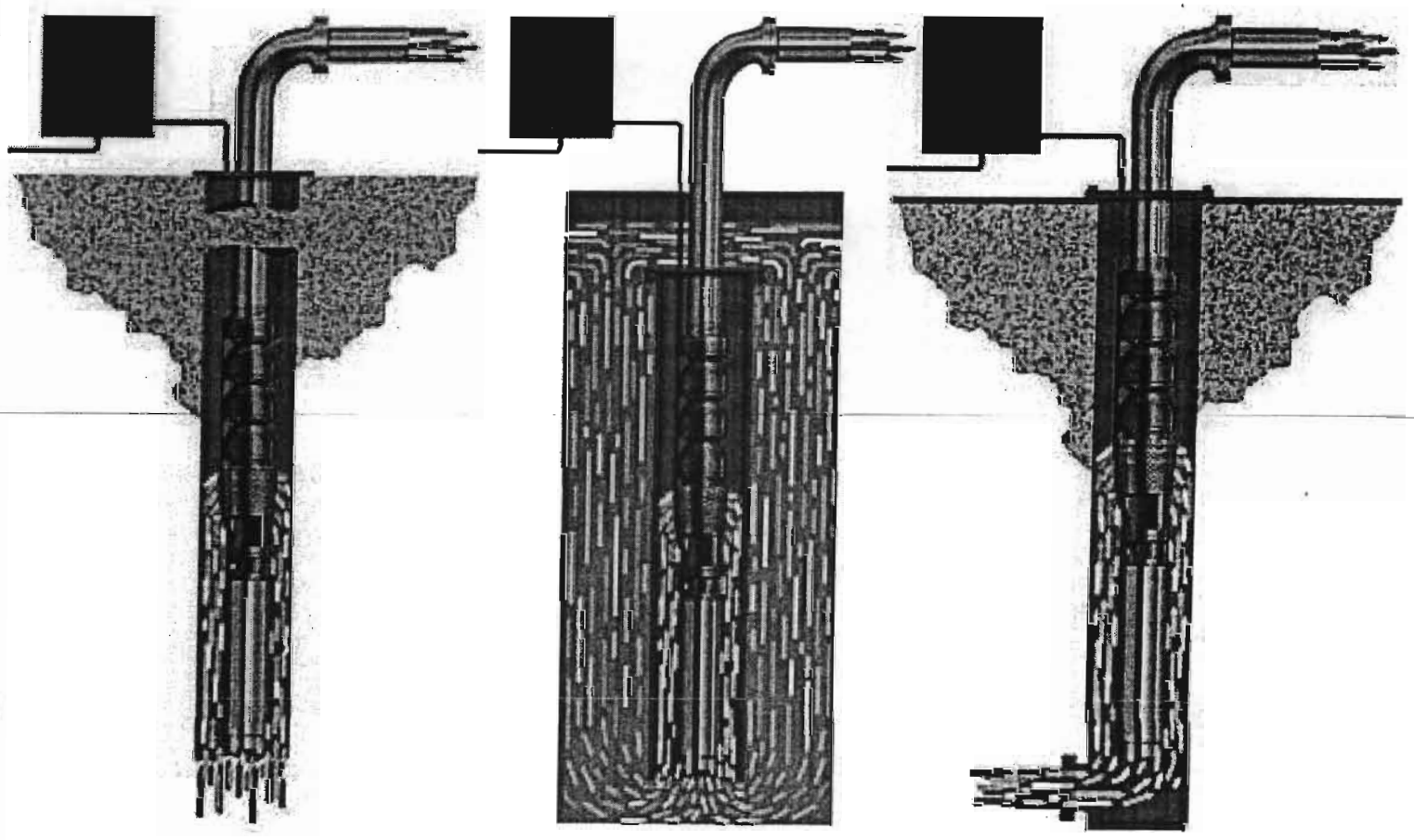
Hydraulic Performance

The system requirements can be met with a choice of pump sizes and selections for the best hydraulic performance. The choice of pump and motor diameters, voltage and speecs for varying well conditions provides additional opportunity to match the unit to all the requirements of the system.

The availability of accessory items, cable and controls enables you to rely on Goulds Pumps for units that provide top service.

Submersibles for 1800 RPM through 16' are also available.





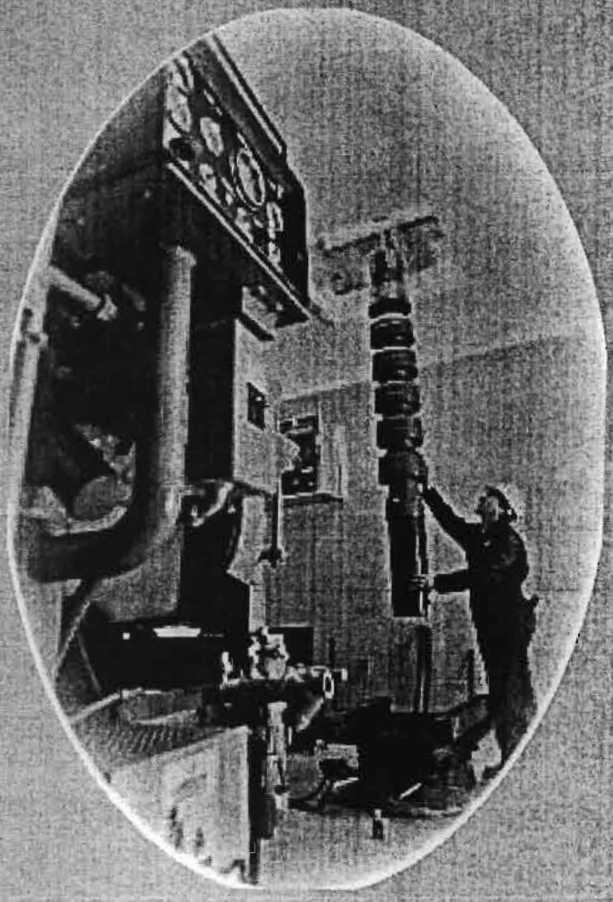
Lineshaft/Submersibles

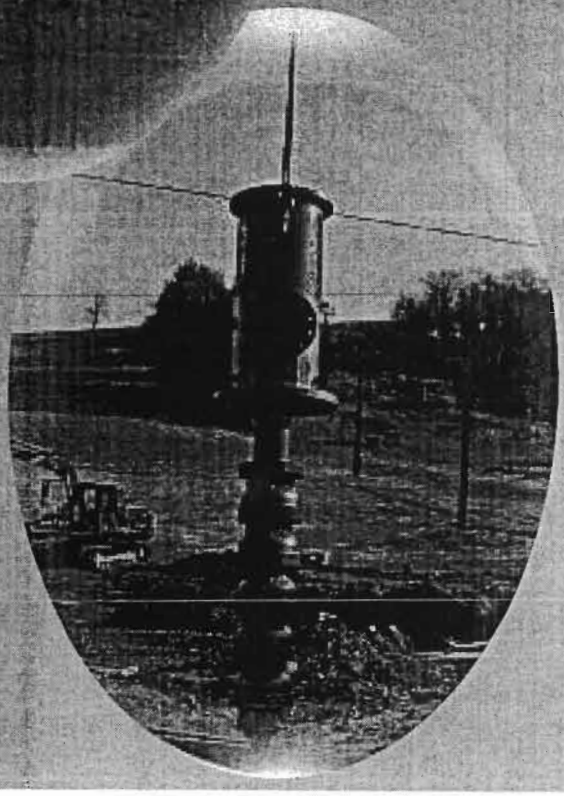
Parts List Standard Materials of Construction

No.	Description		Material	
			Goulds No.	Description
1	Discharge Head		1003	C.I. ASTM A48,CL 30B
2	Head Shaft	Water Lube	2227	Stainless — ASTM A582, Type 416
		Oil Lube	2205	Steel — AISI C1045
3	Adjusting Nut		2130	Brass ASTM B16M C360
4	Gib Key		2242	Mild Steel — ASTM A108, Gr. 1018
5	Tension Nut	Oil Lube Only	1187	Brass ASTM B584 C844
6	Tension Plate	Oil Lube Only	1003	Cast Iron — ASTM A48, CL 30B
7	Oiler Body	Oil Lube Only	1425	Aluminum — SAE 329 or Steel
8	Stuffing Box	Water Lube	1003	Cast Iron — ASTM A48, CL 30B
9	Stuffing Box Busing	Water Lube	1109	Bronze — ASTM B584 C89835 Federalloy III
10	Stuffing Box Stud	Water Lube	2229	Stainless — ASTM A276 Type 316
11	Stuffing Box Stud Nut	Water Lube	2229	Stainless — ASTM A276 Type 316
12	Stuffing Box Gasket	Water Lube	5136	Garlock Brand Blue Guard
13	Stuffing Box Split Gland	Water Lube	1193	Aluminum Bronze — ASTM B148HT
14	Stuffing Box Slinger	Water Lube	5121	Rubber
15	Packing		5026	Graphited Acrylic Yarn
16	Column Nipple		6501	Pipe — ASTM A53
17	Lock Ring		1018	Ductile — ASTM A536, Gr. 65-45-12
18	Reducer-Bushing		1003	Cast Iron — ASTM A48, CL 30B
19	Companion Flange		1003	Cast Iron — ASTM A48, CL 30B
20	Companion Flange Gasket		5136	Garlock Brand Blue Guard
21	Nameplate		3211	Stainless — ASTM A240, Type 316
22	Sole Plate		3201	Steel Plate — ASTM A36
23	Column Pipe		6501	Pipe — ASTM A53
24	Column Coupling		6501	Pipe — ASTM A53
25	Tube Nipple		6518	Pipe — Steel SCH80 ASTM A120 Gr. B
26	Enclosing Tube	Bronze Construction	6518	Steel — SCH80, ASTM A120, Gr. B
		Wood-Lined Construction	6518	Steel — SCH80, ASTM A120, Gr. B
27	Oil Tube Coupling	Wood-Lined Only	6518	Steel — SCH80, ASTM A120, Gr. B
'8	Lineshaft Bearing	Bronze Construction	1109	Bronze — ASTM B584 C903
		Wood-Lined Construction		Clear Heart Redwood — Grade A
29	Lineshaft	W/L — Sleeved	2205	Steel — AISI C1045 with Type 304SS Sleeve
		W/L — Stainless	2227	Stainless — ASTM A582, Type 416
		Oil Lube	2205	Steel — AISI C1045
30	Lineshaft Coupling	Water Lube	2242	Mild Steel — ASTM A108, Gr. 1018
		Stainless	2218	Stainless — ASTM A582, Type 416
31	Water Lube Retainer	Retainer	1102	Silicon Bronze — ASTM B584 C876
		Insert	5121	Rubber
32	Tube Centering Spider		5121	Rubber
33	Discharge Bowl		1003	Cast Iron — ASTM A48, CL 30B
34	Discharge Bushing	Water Lube	1109	Bronze — ASTM B584 C89835 Federalloy III
35	Throttle Bushing	Oil Lube	1109	Bronze — ASTM B584 C89835 Federalloy III
36	Intermediate Bowl		6911	Cast Iron — ASTM A48, CL 30B, Enameled
37	Top Inter Bowl		6911	Cast Iron — ASTM A48, CL 30B, Enameled
38	Inter Bowl Bushing	Bronze	1109	Bronze — ASTM B584 C89835 Federalloy III
		Rubber	5121	Rubber
39	Wear Rings — Optional	Inter Bowl	1117	AL Bronze ASTM B148 C954
		Impeller	1117	AL Bronze ASTM B148 C954
40	Impeller		1102	Silicon Bronze — ASTM B584 C876
41	Taper Lock		2242	Mild Steel — ASTM A108, Gr. 1018
42	Suction Bowl		1003	Cast Iron — ASTM A48, CL 30B
43	Suction Bushing		1109	Bronze — ASTM B584 C89835 Federalloy III
44	Sand Collar		1109	Bronze — ASTM B584 C89835 Federalloy III
45	Suction Strainer		6952	Galvanized — ASTM A123
46	Plug		1046	Steel — ASTM A197 Mall. Iron
47	Screw Bearing	Bronze Construction	1109	Bronze — ASTM B584 C89835 Federalloy III
		Wood-Lined Construction	2242	Mild Steel — ASTM A108, Gr. 1018
48	Bowl Shaft		2227	Stainless — ASTM A582, Type 416
49	Hex Bolt		2298	Steel — SAEJ 429, Gr. 8
50	Lock Washer		2242	Steel — ASTM A108, Gr. 10180
51	Suction Adapter	Submersible Only	1018	Ductile Iron — Astm A536, Gr. 65-45-12
52	Adapter Plate	Submersible Only (Optional)	1018	Ductile Iron — ASTM A536, Gr. 65-45-12
53	Motor Coupling	Submersible Only	2218	Stainless Steel — ASTM A582, Type 416
54	Motor Mounting Bolts	Submersible Only	2229/2228	Stainless — ASTM A276, Type 316/304SS
55	Suction Screen	Submersible Only	3215	AISI 304 Stainless
56	Cable Guard	Submersible Only	3215/6266	AISI 304 Stainless or Polyethylene (UHMW)
57	Discharge Bearing	Submersible Only	1109	Bronze — ASTM B584 C89835 Federalloy III
	Discharge Bearing Plug	Submersible Only	1046	Steel — ASTM A197 Mall. Iron
	Upthrust Washer	Submersible Only	6266	Polyethylene (UHMW)

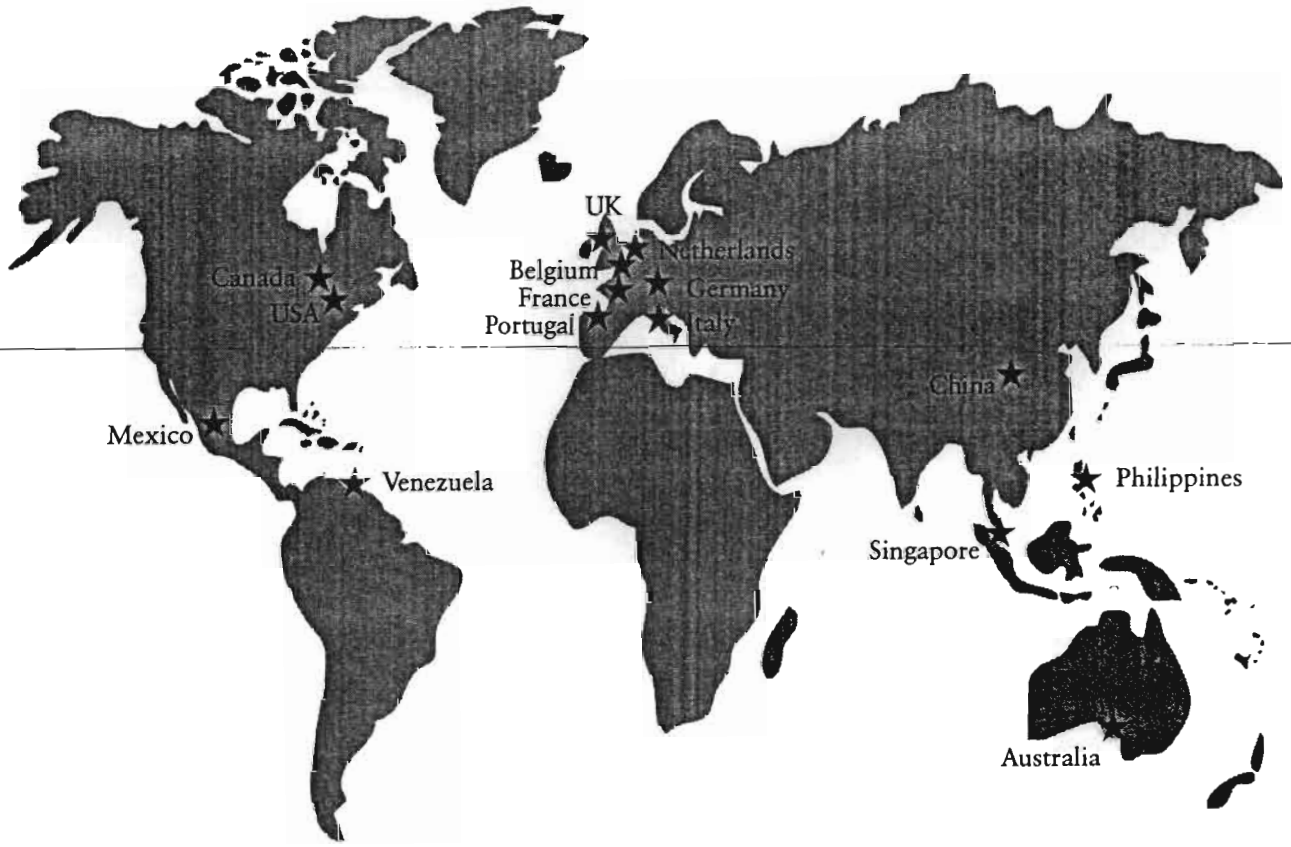
Services

- Municipal
- Wastewater Plants
- Commercial/Industrial
- Golf Courses/Turf Irrigation
- Agricultural Irrigation
- Dewatering
- Mining
- Cooling Tower
- Water Parks
- Snowmaking
- Flood Control





GOULDS PUMPS



ulds Pumps, Inc., headquartered in Seneca Falls, New York, designs, manufactures and services pumps motors and accessories for industrial, agricultural, commercial and residential markets. The company was founded in 1848 and remains an acknowledged industry leader. Sales offices and manufacturing facilities are located worldwide.

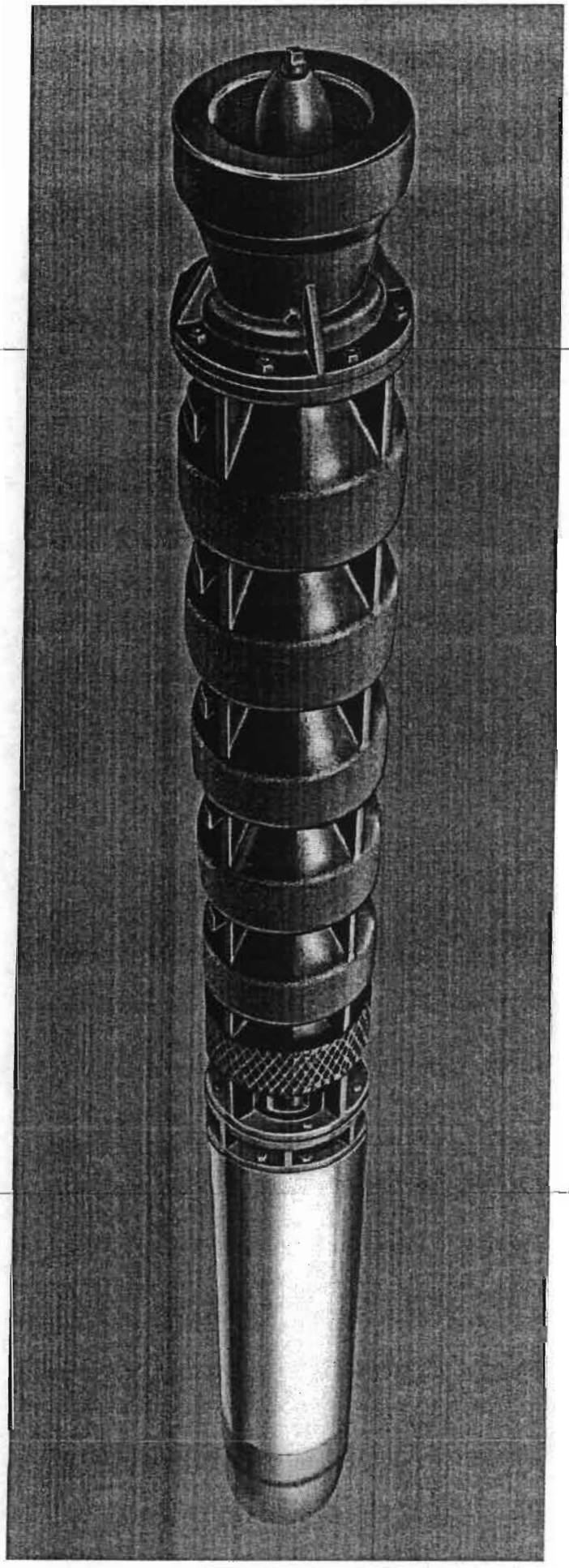
The Goulds Pumps, Inc. Water Technologies Group specifically manufactures pumps for home water systems, agriculture and irrigation, commercial applications, drainage, sewage and effluent installations. Manufacturing and distribution facilities are located in North and South America, Europe and Asia Pacific.

Turbine Distribution Centers:	Phone	Fax
LUBBOCK, TX P.O. Box 5487, Lubbock, TX 79408	1-806-743-5700	1-806-743-5730
MEMPHIS, TN 5815 Shelby Drive, Memphis, TN 38141	1-901-375-9965	1-800-453-4745
LAKE MARY, FL 1150 Emma Oaks Trail, Suite 150, Lake Mary, FL 32746	1-407-829-7724	1-407-829-7725
FRESNO, CA 3878 S. Willow Ave., #104, Fresno, CA 93725	1-559-265-4730	1-800-453-7523 1-559-265-4740
Specifications & Special Projects:		
LUBBOCK CUSTOMER SERVICE CENTER	1-806-743-5700	1-800-453-4749

Visit our website at www.goulds.com

Goulds Pumps

ITT Industries



Model VIS

Vertical Industrial Submersible Pump

- Capacities to 4,000 GPM (908 m^3/h)
- Heads to 1,400 feet (427m)
- Bowl sizes from 6" to 20"

Design Advantages

- Ideal for deep set applications where use of lineshaft pumps is impractical.
- Complete unit is installed underground resulting in quiet operation and space saving.
- Long life/low maintenance — no lubrication, alignment.

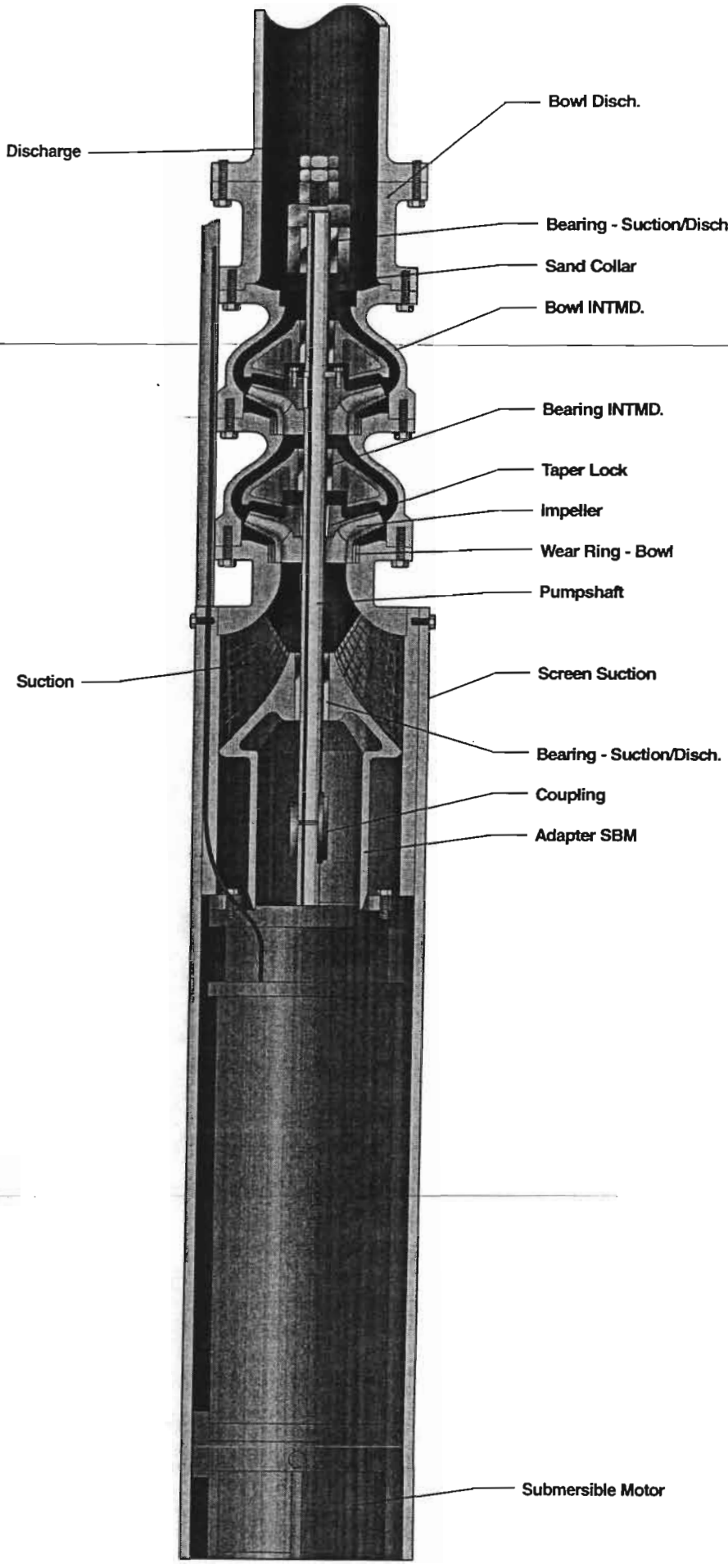
Services

Irrigation
Service Water
Deep Well

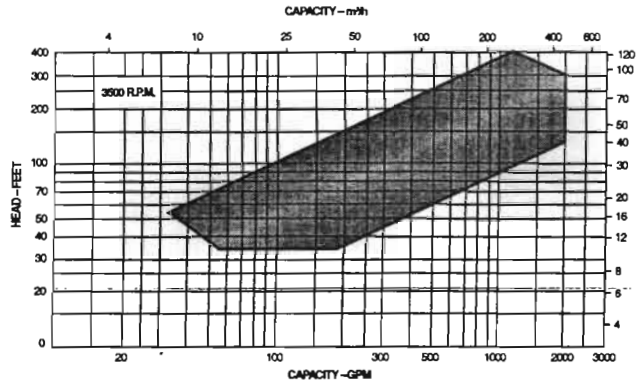
Cross Sectional
VIS

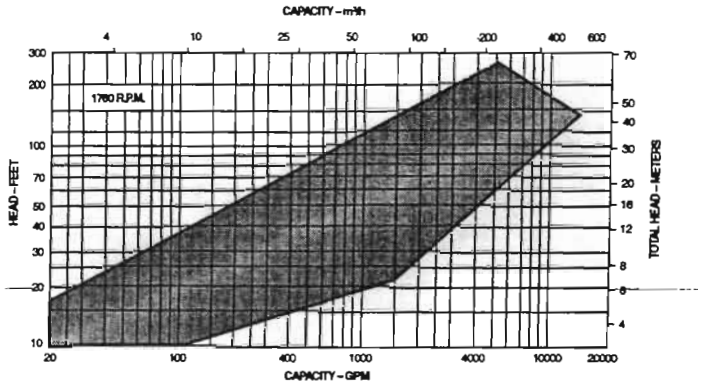
Typical Markets Served

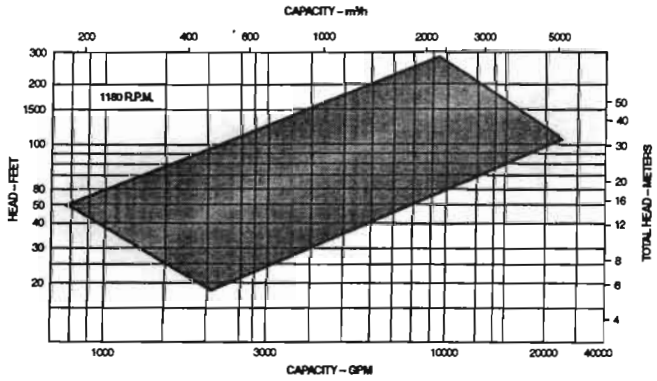
- General Industry
- Municipal
- Hydrocarbon Processing

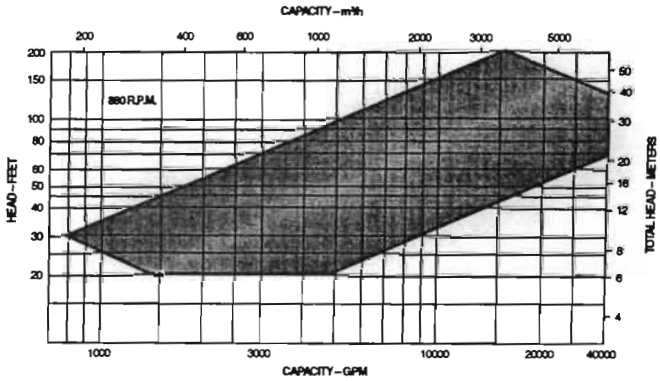


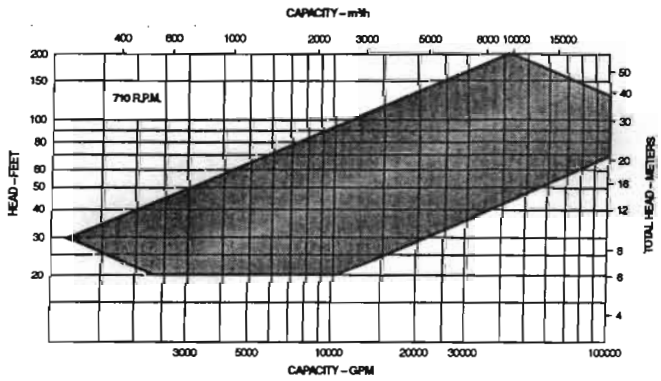
Hydraulic Coverage for models VIT, VIC and VIS

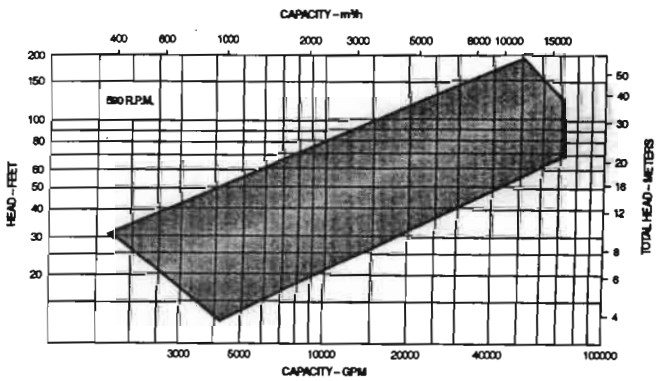


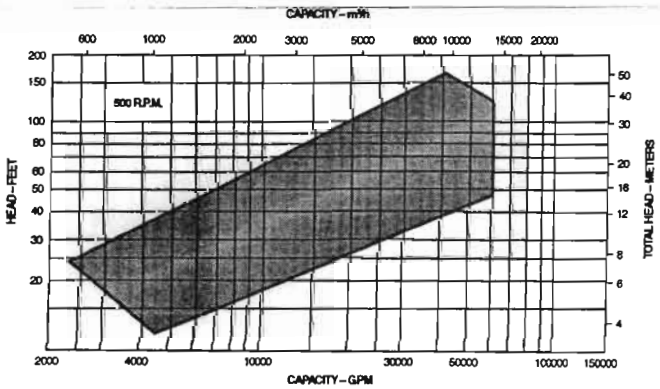


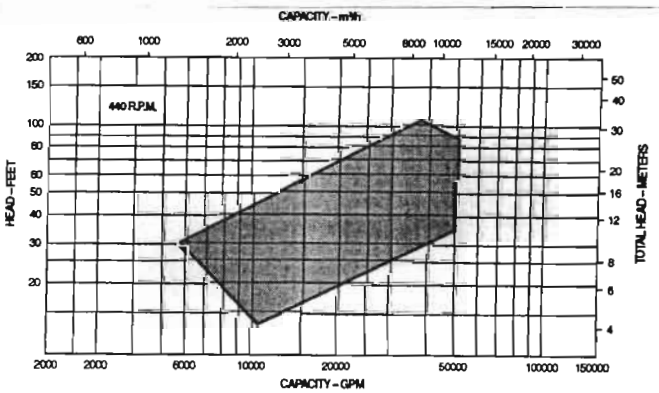






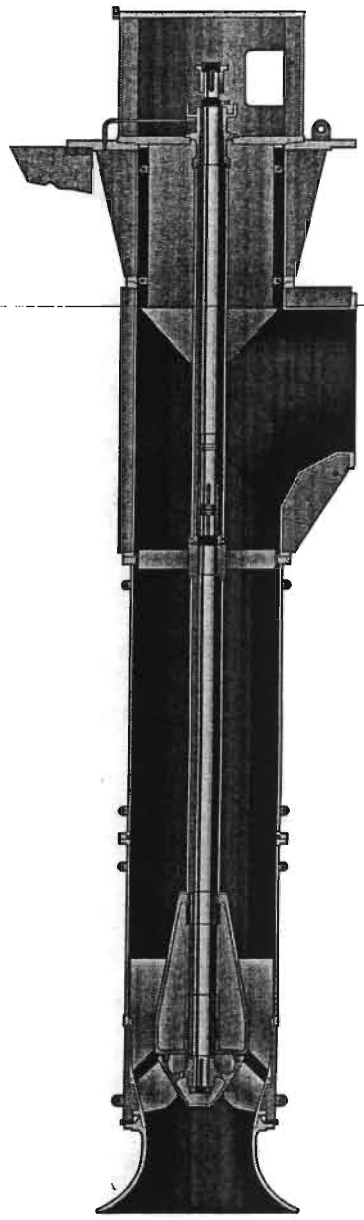


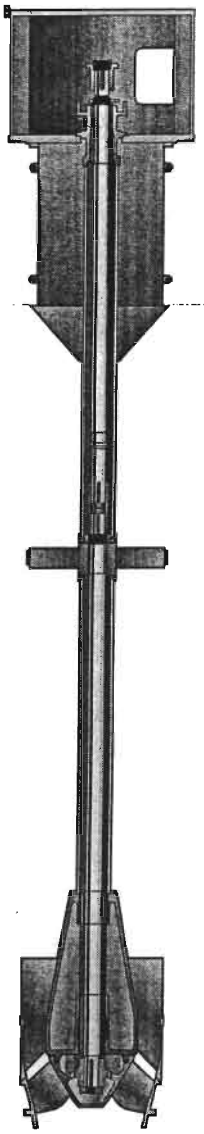


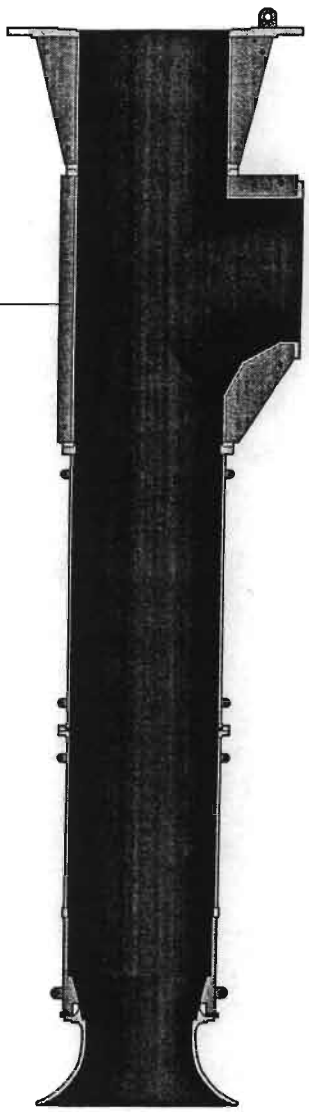


* Head is per stage.

Model WCAX, YDD, WCA and WCB





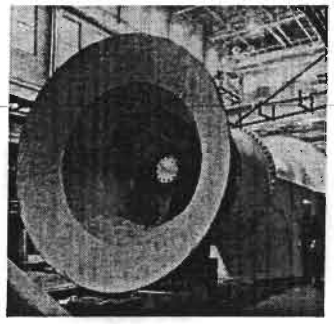


DESIGN OPTIONS AND FEATURES PROVIDE IMPORTANT COST SAVINGS BENEFITS

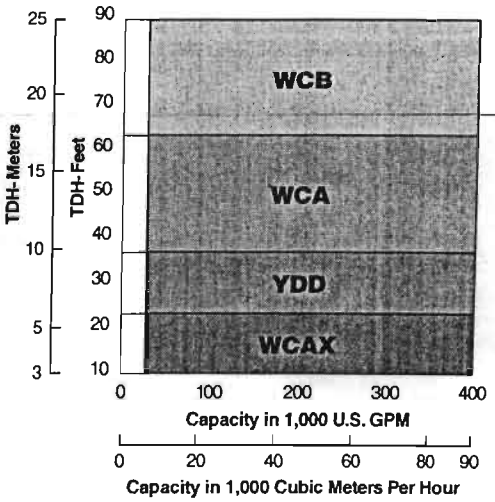
Available as an option on all ITT A-C Pump wet-pit pumps, the "pullout" design reduces maintenance costs and downtime as the discharge piping remains undisturbed when removing the pump.

The unique hydraulic thrust relief design (achieved by opening an area behind the impeller to the outside of the pump) results in low thrust values from maximum flow to shutoff head. This reduces the cost of the driver by reducing the size of the required thrust bearing.

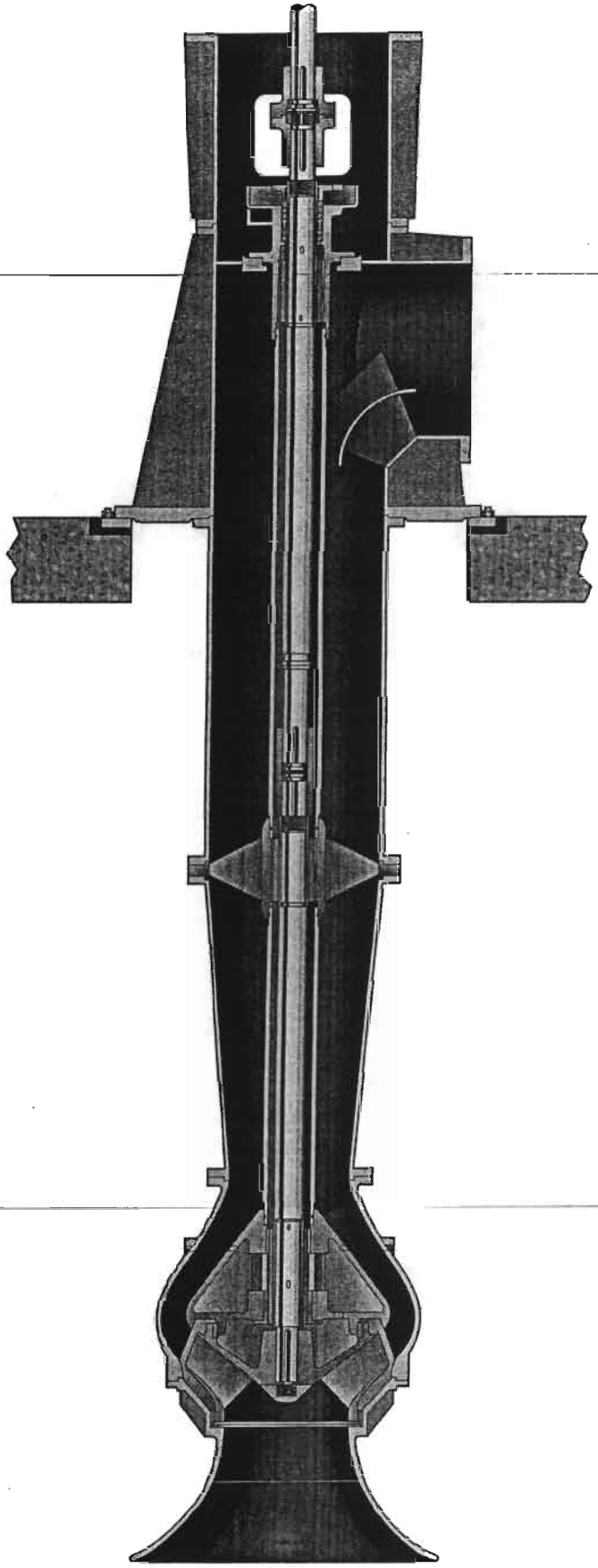
To reach high pressure heads the pumps can be arranged for up to a three stage configuration. ITT A-C Pump's advanced hydraulic designs provide some of the highest efficiency pumps available in the pumping industry.

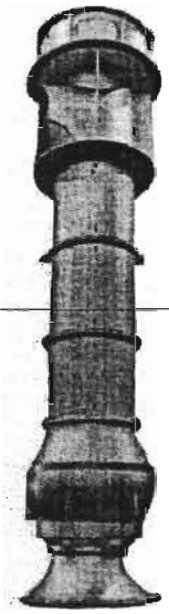


RANGE CHART



Model WMCC-WMCE



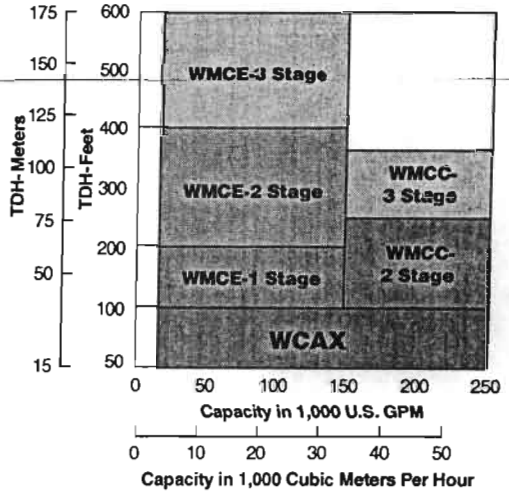


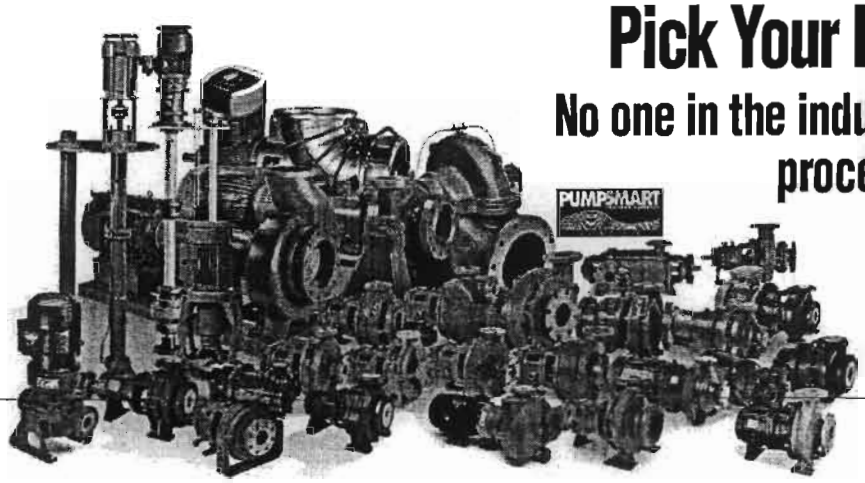
VERTICAL WET PIT PUMPS OFFER MAXIMUM FLEXIBILITY

The vertical wet pit column pump is the backbone of flood control applications. It has the capability of operating over a wide range of heads, varying suction water levels, and takes a minimum of floor space.

ITT A-C Pump offers several specific speed designs in the axial and mixed flow range to meet a broad range of customer requirements. Mechanical designs are HEAVY-DUTY for long life and reliability.

RANGE CHART

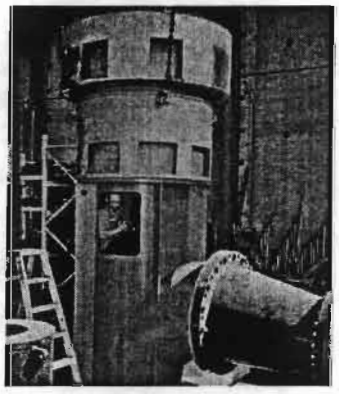




Pick Your Perfect Process Pump

No one in the industry offers the broad range of process pumps that Goulds does...

Whether it's for pumping severe corrosives, abrasive slurries, fibrous/stringy solids, high temperature liquids, hazardous fluids, low flow or high capacity services – Goulds has a perfect, reliable solution. The Goulds selection of pump solutions includes horizontal and vertical configurations in a range of alloy and non-metallic constructions, sealed and sealless.



Your local PRO Service Center offers high quality repair/rebowling capability for your vertical turbine pumps. They're experienced with pumps of all manufacturers – including Aurora, Byron-Jackson, Floway, Goulds, A-C, Ingersoll-Rand, Johnston and Peerless – among a range of others.

Experienced PRO technicians are equipped with the latest technology and training. They provide full factory engineering support for failure analysis, material upgrade and performance enhancements.

PRO Service Centers provide a thorough inspection and *as found* report. A complete workscope for all required repairs with a firm price are included. We're capable of handling all critical work such as non-destructive testing, welding and machining.

We welcome your inspection of our facility and processes.

PRO Advantages

- One (1) year warranty.
- Full Factory engineering support.
- Field service available to assure proper installation and start-up.
- Experience with all manufacturers' equipment provides best available practices and designs in all repairs.
  We recognize problems and address *root causes* of failure...not just mechanical symptoms.
- Twenty-four hour, seven-days-a-week *emergency service.*

UPGRADE

Our rotating equipment experience and engineering expertise allow us to improve equipment efficiency and/or improve MTBF. Some typical vertical turbine pump upgrades include:

- Review bearing spacing to assure latest technology is utilized.
- Adapt latest bowl/impeller design to improve efficiency, flow and/or discharge pressure.
- Provide finite element analysis of complete unit to eliminate resonance problems.
- Review metallurgical properties of unit versus pumpage to insure maximum product life.
- Convert from packing to mechanical seal design.
- Incorporate various external bearing/wear ring flush arrangements to improve service life.

Visit our website at www.gouldspumps.com

Goulds Pumps

ITT Industries
Engineered for life

GOULDS PUMPS ISO 9001 CERTIFIED

Form B3A-1 10/02

Malcolm Pirnie Inc.
ISTGROUP
FAIRCHILD MAIN PLANT SITE

PW - 1, 3600 RPM

H2Optimize ver: 6.041
06/27/03

PUMP DATA SHEET

FAIRBANKS MORSE, 60 Hz

Selection file: (untitled)

Catalog: FMTURB60.MPC v .1

Curve: 36-037

Design Point: Flow: 250 US gpm
Head: 85 ft

Pump: **VERT.TURBINE - 3600** **Size: 6G (2 stages)**
Speed: 3500 rpm Dia: 4.4 in

Limits: Temperature: 150 °F Sphere size: 0.34 in
Pressure: 400 psi_g Power: 132 bhp

Specific Speed: Ns: --- Nss: ---

Vertical Turbine: Bowl Size: 5.5 in Max Lateral: 0.25 in
Thrust K Factor: 2.2

Motor: 7.5 hp Speed: 3600 Frame: 132SA
IEC Standard TEFC Enclosure
sized for Max Power on Design Curve

Fluid: Water Temperature: 60 °F
SG: 1
Viscosity: 1.122 cP
Vapor pressure: 0.2568 psi_a
Atm pressure: 14.7 psi_a

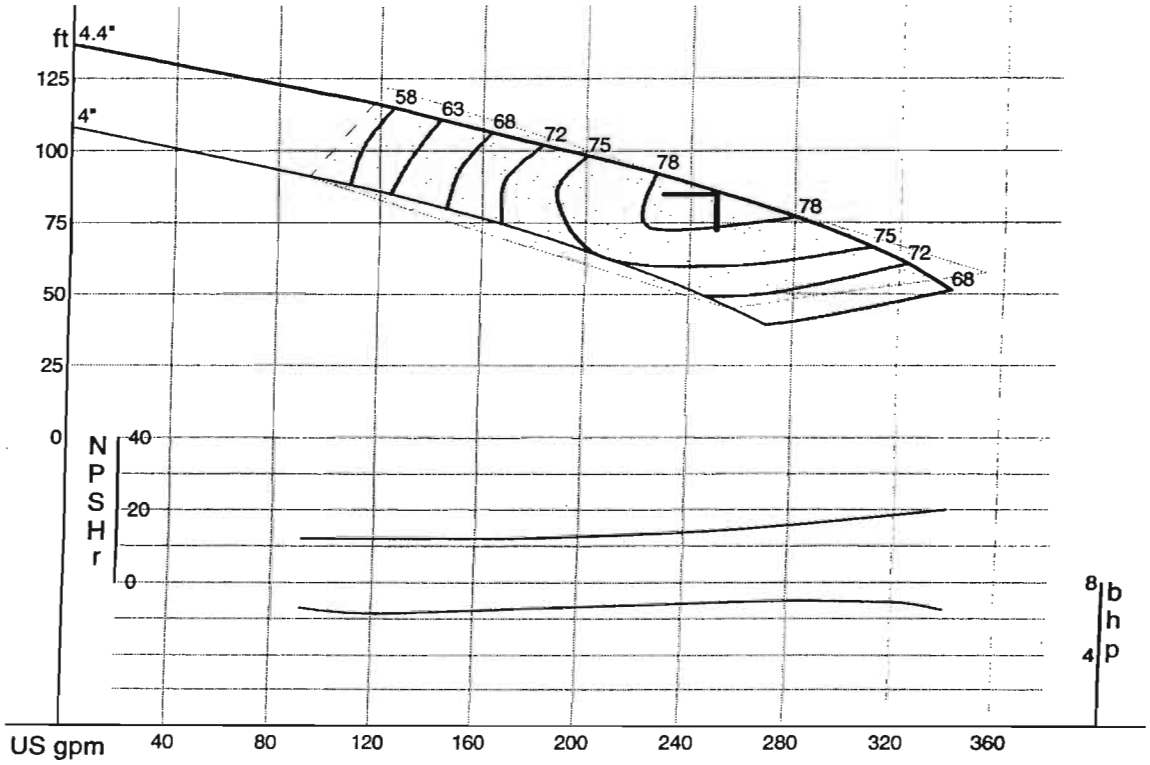
NPSHa: --- ft

Piping: System: ---
Suction: --- in
Discharge: --- in

--- Data Point ---
Flow: 250 US gpm
Head: 86 ft
Eff: 78.9%
Power: 6.87 bhp
NPSHr: 14.2 ft

-- Design Curve --
Shutoff Head: 137 ft
Shutoff dP: 59.3 psi
Min Flow: - US gpm
BEP: 79% eff
@ 254 US gpm
NOL Pwr: 6.99 bhp
@ 281 US gpm

-- Max Curve --
Max Pwr: 6.99 bhp
@ 281 US gpm



--- PERFORMANCE EVALUATION ---

Flow US gpm	Speed rpm	Head ft	Pump %eff	Power bhp	NPSHr ft	Motor %eff	Motor kW	Hrs/yr	Cost /kWh
300	3500	70.1	76	6.96	17.1				
250	3500	86	78.9	6.87	14.2				
200	3500	98.5	74.9	6.64	12.7				
150	3500	109	64.5	6.41	12.2				
100	3500	119	46.2	6.52	12.2				

Malcolm Pirnie Inc.
ISTGROUP
FAIRCHILD MAIN PLANT SITE

PW-1, 1000 RPM

H2Optimize ver: 6.041
06/27/03

PUMP DATA SHEET

FAIRBANKS MORSE, 60 Hz

Selection file: (untitled)

Catalog: FMTURB60.MPC v .1

Curve: 18-049

Design Point: Flow: 250 US gpm
Head: 85 ft

Pump: **VERT.TURBINE - 1800** **Size: 7B (5 stages)**
Speed: 1750 rpm Dia: 5.0625 in

Limits: Temperature: 150 °F Sphere size: 0.44 in
Pressure: 400 psi_g Power: 65 bhp

Specific Speed: Ns: --- Nss: ---

Vertical Turbine: Bowl Size: 7.5 in Max Lateral: 0.25 in
Thrust K Factor: 3.7

Motor: 7.5 hp Speed: 1800 Frame: 132S
IEC Standard TEFC Enclosure
sized for Max Power on Design Curve

Fluid: Water Temperature: 60 °F
SG: 1
Viscosity: 1.122 cP
Vapor pressure: 0.2568 psi_a
Atm pressure: 14.7 psi_a

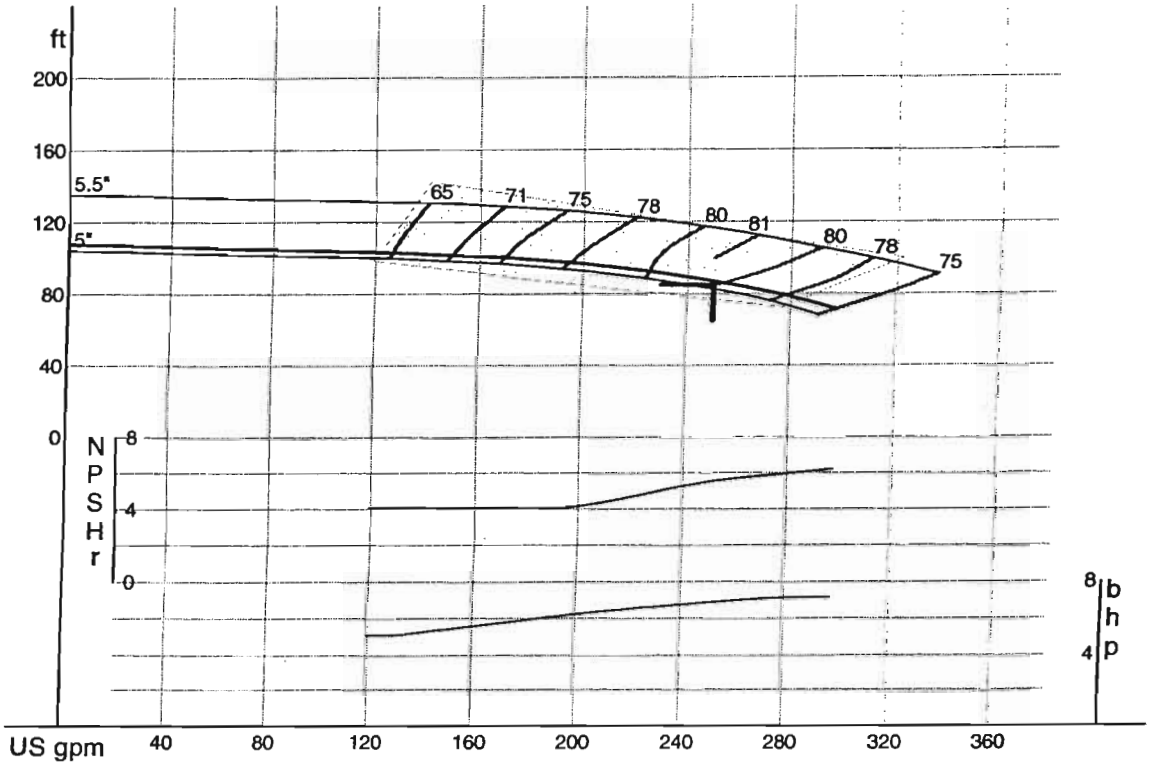
NPSHa: --- ft

Piping: System: ---
Suction: --- in
Discharge: --- in

--- Data Point ---
Flow: 250 US gpm
Head: 86.9 ft
Eff: 80.1%
Power: 6.85 bhp
NPSHr: 5.5 ft

-- Design Curve --
Shutoff Head: 108 ft
Shutoff dP: 46.8 psi
Min Flow: - US gpm
BEP: 80.4% eff
@ 238 US gpm
NOL Pwr: 7.15 bhp
@ 298 US gpm

-- Max Curve --
Max Pwr: 10.3 bhp
@ 336 US gpm



--- PERFORMANCE EVALUATION ---

Flow US gpm	Speed rpm	Head ft	Pump %eff	Power bhp	NPSHr ft	Motor %eff	Motor kW	Hrs/yr	Cost /kWh
300	Flow Rate is Out of Range for this Pump								
250	1750	86.9	80.1	6.85	5.5				
200	1750	96.6	78.3	6.22	4.23				
150	1750	102	71.1	5.41	4.09				
100	Flow Rate is Out of Range for this Pump								

Malcolm Pirnie Inc.
ISTGROUP
FAIRCHILD MAIN PLANT SITE

FW-2, 3600 RPM

PUMP DATA SHEET

FAIRBANKS MORSE, 60 Hz

H2Optimize ver: 6.041
06/27/03

Selection file: (untitled)

Catalog: FMTURB60.MPC v .1

Curve: 36-021

Design Point: Flow: 150 US gpm
Head: 75 ft

Pump: **VERT.TURBINE - 3600** **Size: 6D (2 stages)**
Speed: 3500 rpm Dia: 4.125 in

Limits: Temperature: 150 °F Sphere size: 0.281 in
Pressure: 530 psi_g Power: 132 bhp

Specific Speed: Ns: --- Nss: ---

Vertical Turbine: Bowl Size: 5.63 in Max Lateral: 0.5 in
Thrust K Factor: 2.4

Motor: 5.5 hp Speed: 3600 Frame: 112M
IEC Standard TEFC Enclosure
sized for Max Power on Design Curve

Fluid: Water Temperature: 60 °F
SG: 1
Viscosity: 1.122 cP
Vapor pressure: 0.2568 psi_a
Atm pressure: 14.7 psi_a

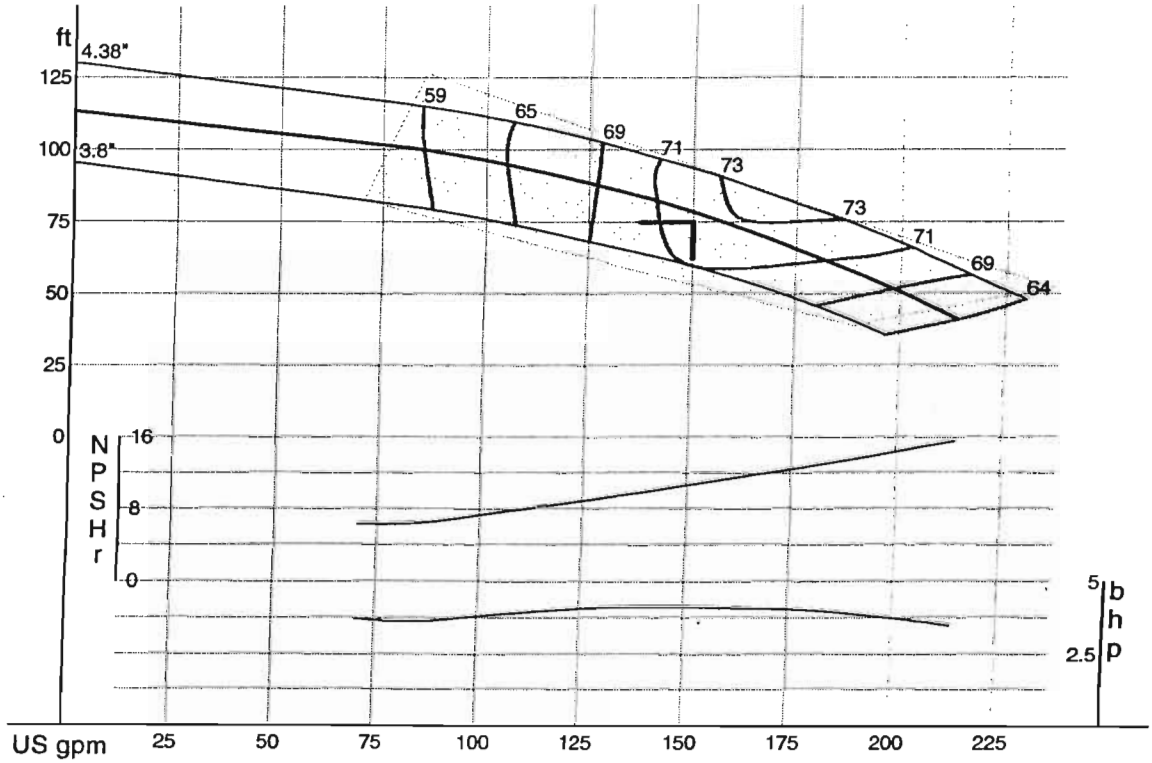
NPSHa: --- ft

Piping: System: ---
Suction: --- in
Discharge: --- in

--- Data Point ---
Flow: 150 US gpm
Head: 78.4 ft
Eff: 71.8%
Power: 4.12 bhp
NPSHr: 10.7 ft

-- Design Curve --
Shutoff Head: 113 ft
Shutoff dP: 49.1 psi
Min Flow: - US gpm
BEP: 72.7% eff
@ 160 US gpm
NOL Pwr: 4.14 bhp
@ 141 US gpm

-- Max Curve --
Max Pwr: 4.92 bhp
@ 156 US gpm



--- PERFORMANCE EVALUATION ---

Flow US gpm	Speed rpm	Head ft	Pump %eff	Power bhp	NPSHr ft	Motor %eff	Motor kW	Hrs/yr	Cost /kWh
180	3500	62.8	71.2	4	12.8				
150	3500	78.4	71.8	4.12	10.7				
120	3500	90.1	67.7	4.02	8.64				
90	3500	98.7	60.5	3.69	6.78				
60	Flow Rate is Out of Range for this Pump								

Malcolm Pirnie Inc.
ISTGROUP
FAIRCHILD MAIN PLANT SITE

PW-2, 3600 RPM

PUMP DATA SHEET

FAIRBANKS MORSE, 60 Hz

H2Optimize ver: 6.041
06/27/03

Selection file: (untitled)

Catalog: FMTURB60.MPC v .1

Curve: 36-037

Design Point: Flow: 150 US gpm
Head: 75 ft

Fluid: Water Temperature: 60 °F
SG: 1
Viscosity: 1.122 cP
Vapor pressure: 0.2568 psi_a
Atm pressure: 14.7 psi_a

Pump: **VERT.TURBINE - 3600** **Size: 6G (2 stages)** (SAME AS PW-1)
Speed: 3500 rpm Dia: 4 in

Limits: Temperature: 150 °F Sphere size: 0.34 in
Pressure: 400 psi_g Power: 132 bhp

NPSHa: --- ft

Specific Speed: Ns: --- Nss: ---

Piping: System: ---
Suction: --- in
Discharge: --- in

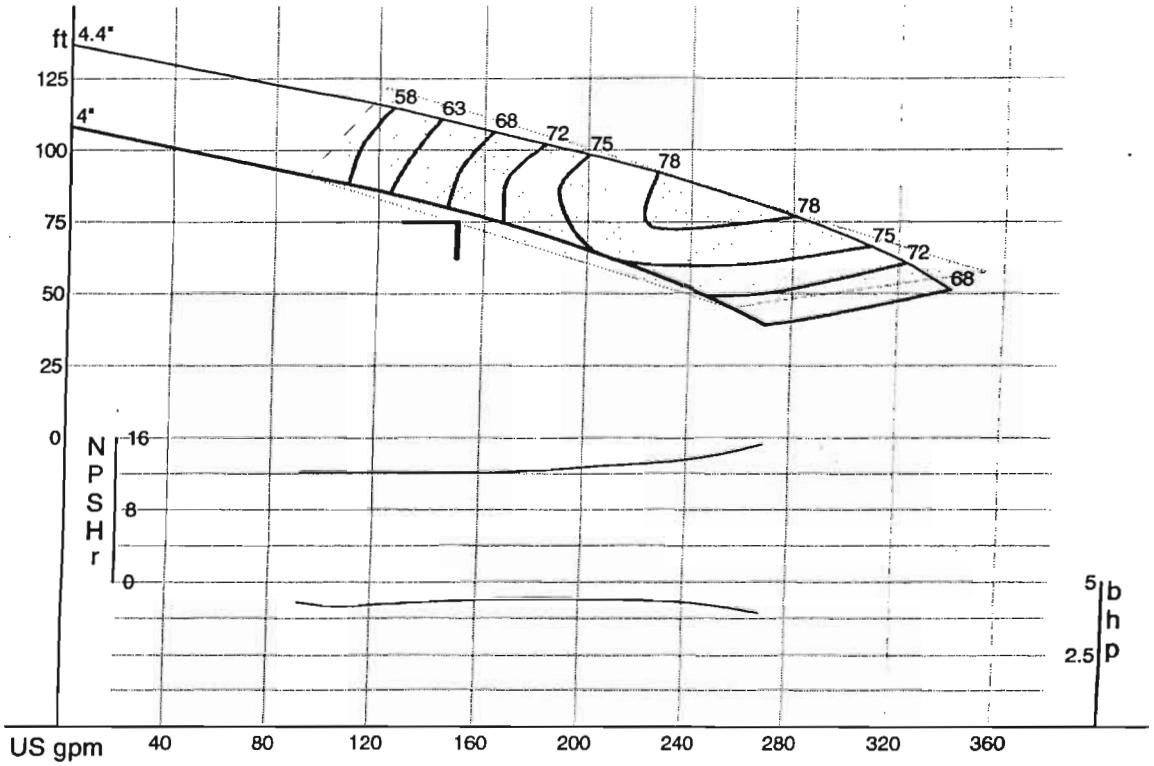
Vertical Turbine: Bowl Size: 5.5 in Max Lateral: 0.25 in
Thrust K Factor: 2.2

Motor: 5.5 hp Speed: 3600 Frame: 112M
IEC Standard TEFC Enclosure
sized for Max Power on Design Curve

--- Data Point ---
Flow: 150 US gpm
Head: 79 ft
Eff: 68.7%
Power: 4.35 bhp
NPSHr: 12.2 ft

-- Design Curve --
Shutoff Head: 108 ft
Shutoff dP: 46.9 psi
Min Flow: - US gpm
BEP: 75% eff
@ 207 US gpm
NOL Pwr: 4.4 bhp
@ 207 US gpm

-- Max Curve --
Max Pwr: 6.99 bhp
@ 281 US gpm



— PERFORMANCE EVALUATION —

Flow US gpm	Speed rpm	Head ft	Pump %eff	Power bhp	NPSHr ft	Motor %eff	Motor kW	Hrs/yr	Cost /kWh
180	3500	71.1	73	4.4	12.4				
150	3500	79	68.7	4.35	12.2				
120	3500	85.9	61.6	4.22	12.2				
90	Flow Rate is Out of Range for this Pump								
60	Flow Rate is Out of Range for this Pump								

Malcolm Pirnie Inc.
ISTGROUP
FAIRCHILD MAIN PLANT SITE

PW-2; 1800 RPM

PUMP DATA SHEET

FAIRBANKS MORSE, 60 Hz

H2Optimize ver: 6.041
06/27/03

Selection file: (untitled)

Catalog: FMTURB60.MPC v .1

Curve: 18-043

Design Point: Flow: 150 US gpm
Head: 75 ft

Pump: **VERT.TURBINE - 1800** **Size: 7A (4 stages)**
Speed: 1750 rpm Dia: 5.3125 in

Limits: Temperature: 150 °F Sphere size: 0.44 in
Pressure: 400 psi_g Power: 65 bhp

Specific Speed: Ns: --- Nss: ---

Vertical Turbine: Bowl Size: 7.5 in Max Lateral: 0.25 in
Thrust K Factor: 3.7

Motor: 4 hp Speed: 1800 Frame: 100LB
IEC Standard TEFC Enclosure
sized for Max Power on Design Curve

Fluid: Water Temperature: 60 °F
SG: 1
Viscosity: 1.122 cP
Vapor pressure: 0.2568 psi_a
Atm pressure: 14.7 psi_a

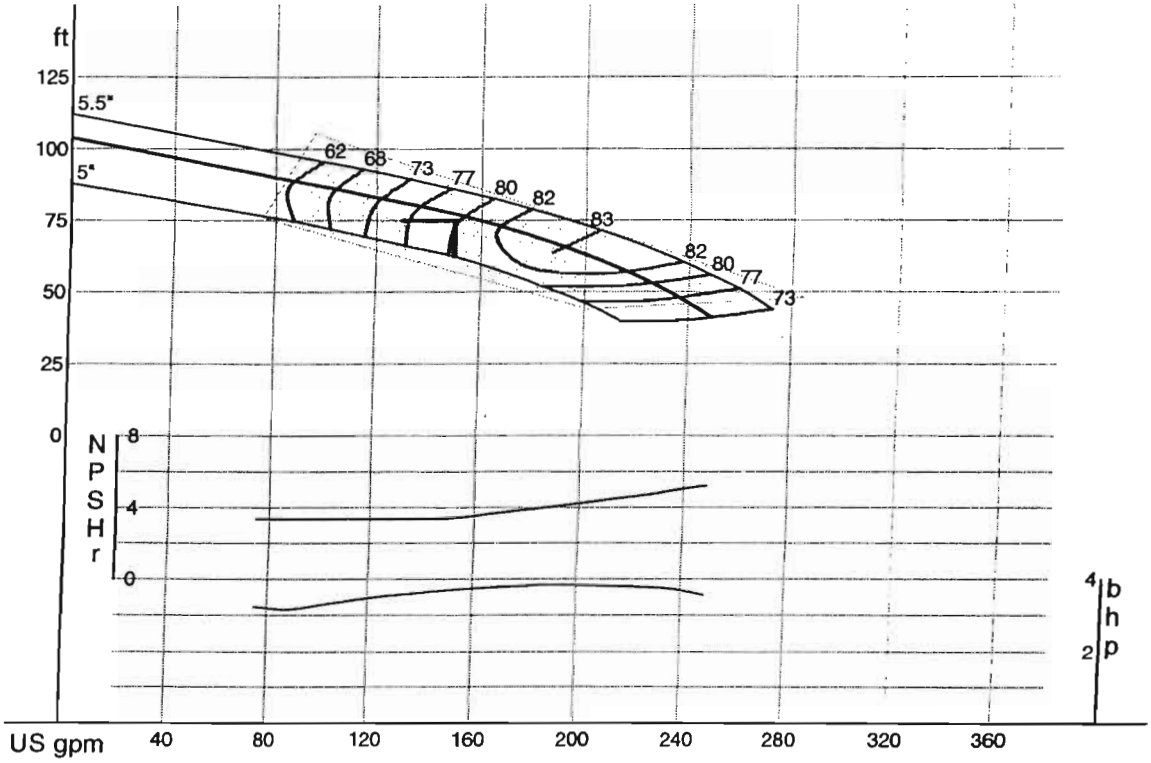
NPSHa: --- ft

Piping: System: ---
Suction: --- in
Discharge: --- in

--- Data Point ---
Flow: 150 US gpm
Head: 77.3 ft
Eff: 79.3%
Power: 3.68 bhp
NPSHr: 3.44 ft

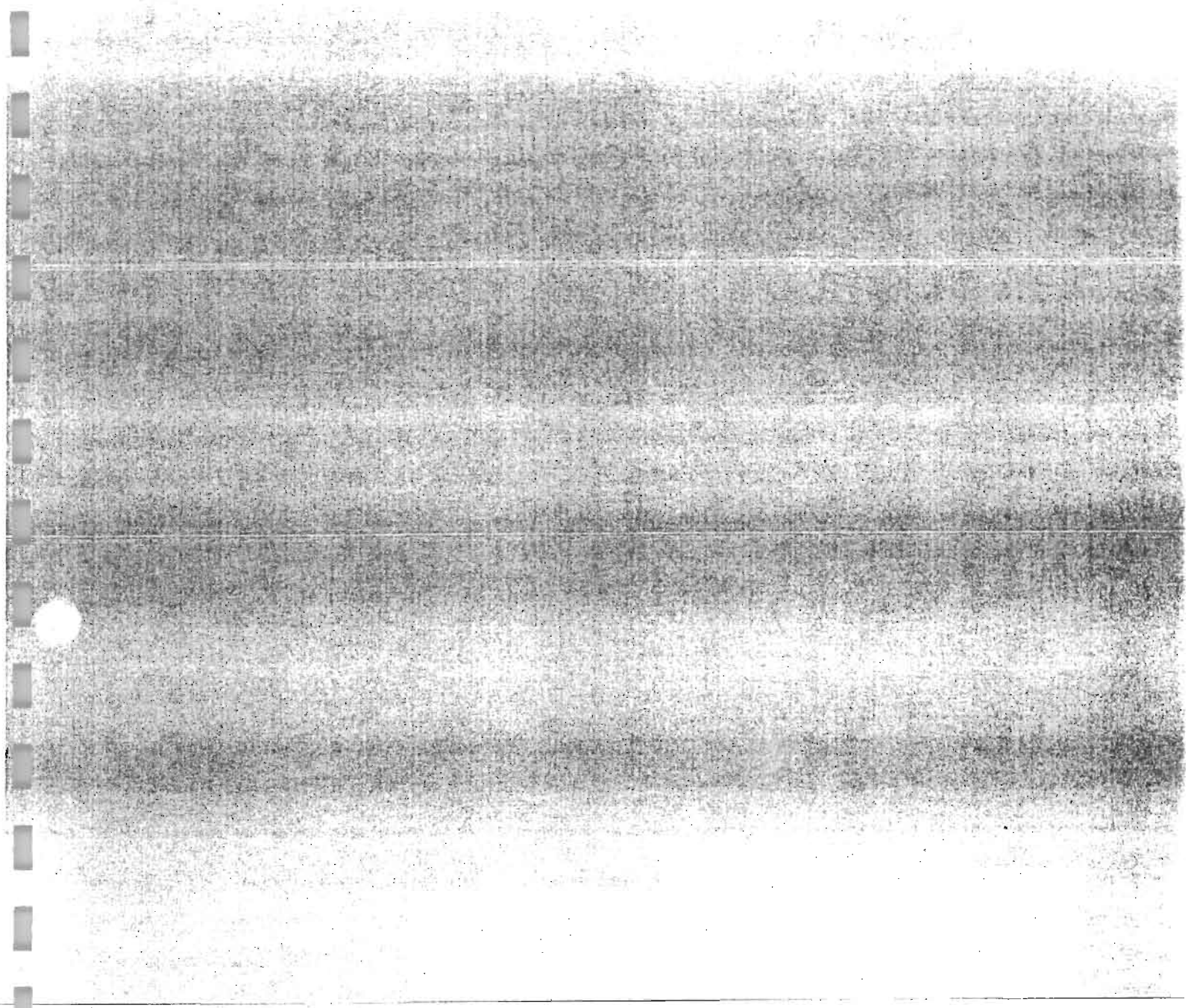
-- Design Curve --
Shutoff Head: **104** ft
Shutoff dP: 45 psi
Min Flow: - US gpm
BEP: 83% eff
@ 192 US gpm
NOL Pwr: 3.84 bhp
@ 192 US gpm

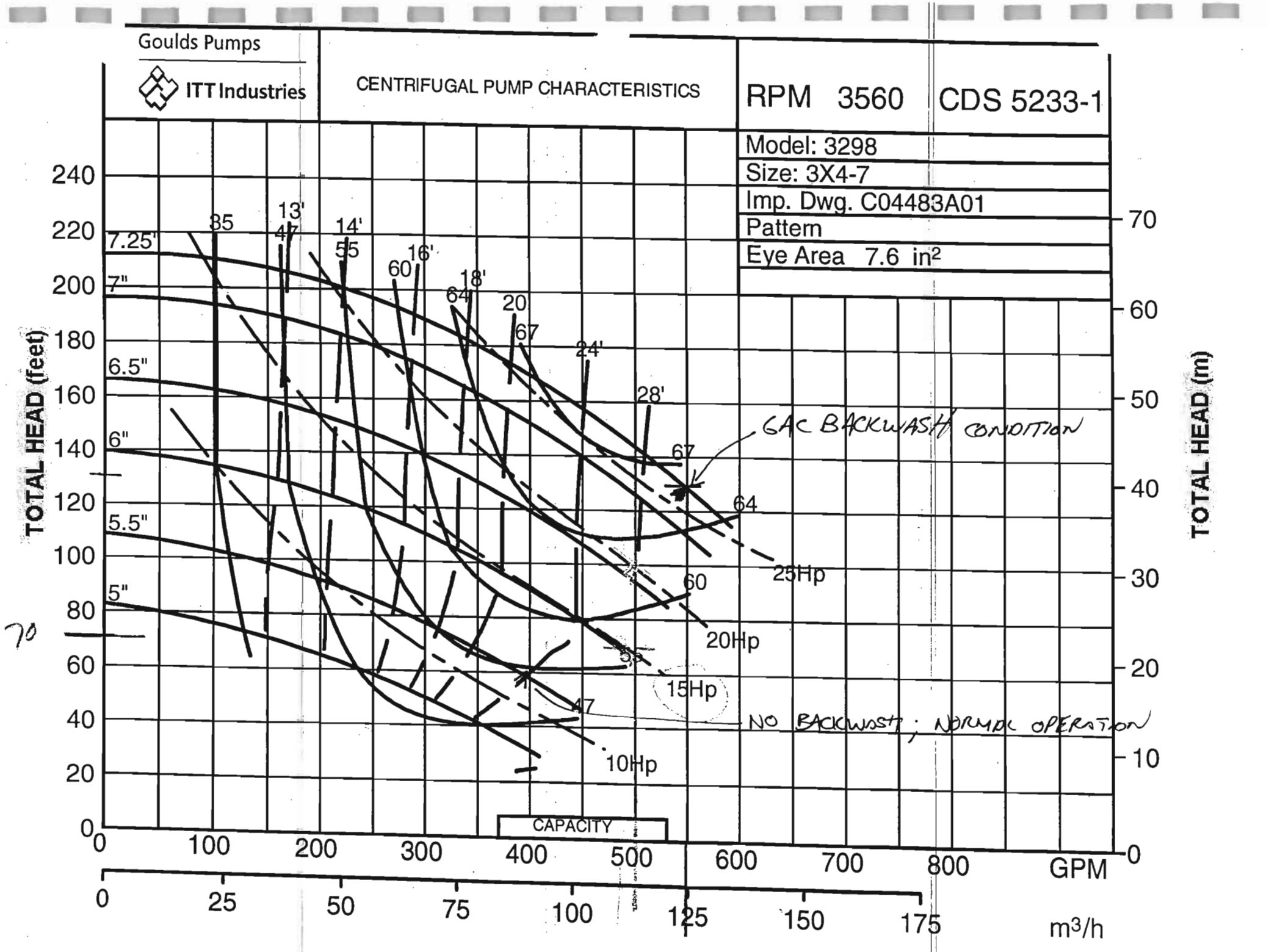
-- Max Curve --
Max Pwr: 4.47 bhp
@ 206 US gpm



— PERFORMANCE EVALUATION —

Flow US gpm	Speed rpm	Head ft	Pump %eff	Power bhp	NPSHr ft	Motor %eff	Motor kW	Hrs/yr	Cost /kWh
180	1750	69.3	82.5	3.8	3.9				
150	1750	77.3	79.3	3.68	3.44				
120	1750	83.1	72.5	3.47	3.39				
90	1750	88.4	63	3.18	3.39				
60	Flow Rate is Out of Range for this Pump								

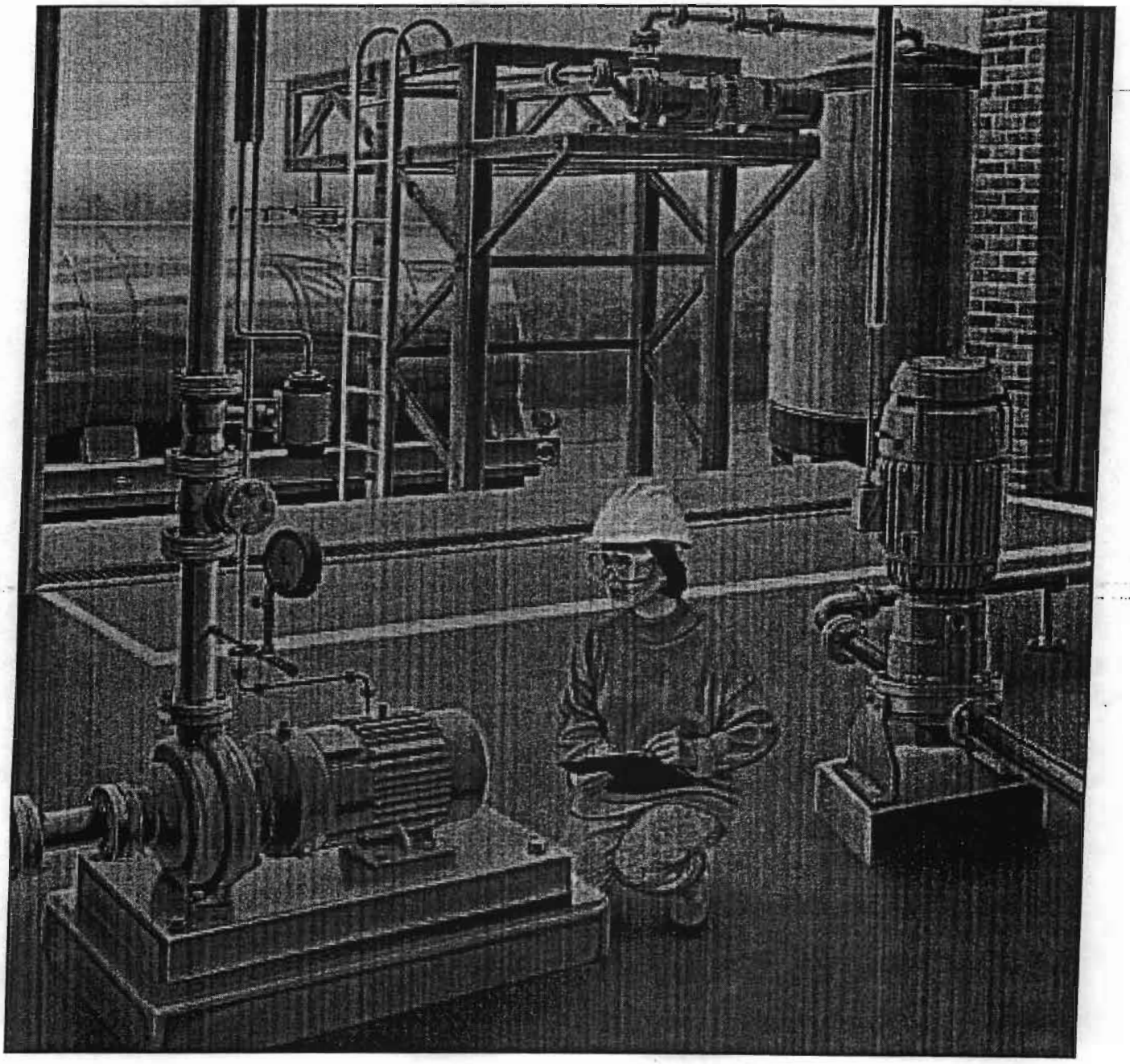



Goulds Pumps
ITT Industries
CENTRIFUGAL PUMP CHARACTERISTICS
RPM 3560
CDS 5233-1
Model: 3298
Size: 3X4-7
Imp. Dwg. C04483A01
Pattern
Eye Area 7.6 in²
TOTAL HEAD (feet)
TOTAL HEAD (m)
7.25'
7"
6.5"
6"
5.5"
5"
35
47
55
60
64
67
13'
14'
16'
18'
20
24'
28'
25Hp
20Hp
15Hp
10Hp
GAC BACKWASH CONDITION
NO BACKWASH; NORMAL OPERATION
CAPACITY
GPM
m³/h
70

BULLETIN 725.7
October 2001

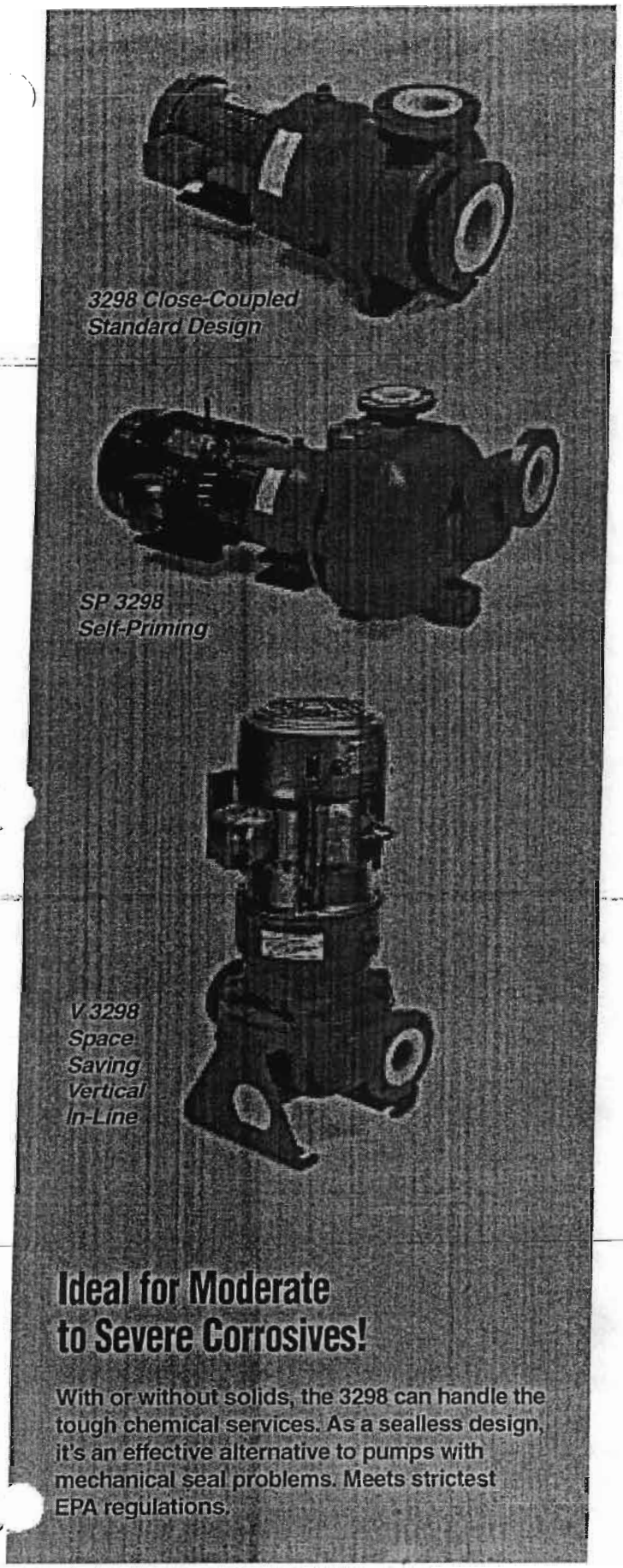
GOULDS PUMPS

Goulds Model 3298 Chemical Process Pumps



Goulds Pumps

ITT Industries
Engineered for life



Ideal for Moderate to Severe Corrosives!

With or without solids, the 3298 can handle the tough chemical services. As a sealless design, it's an effective alternative to pumps with mechanical seal problems. Meets strictest EPA regulations.

Goulds Model 3298

Chemical Process Pumps

- Capacities to 1200 GPM (270 m^3/h)
- Heads to 530 feet (162 m)
- Temperatures to 250° F (121° C)
- Pressures to 225 PSIG (1551 kPa)

Performance Features for Chemical Services

Extended Pump Life
- Tefzel® (ETFE) Construction
- Sealless Design
- Stationary Silicon Carbide Shaft
- Optional Silicon Carbide Safeglide™ Bearings

Optimum Performance
- Non-slip Synchronous Drive
- Efficiency Equivalent to Sealed ANSI Pumps, 30% Higher than Metal Sealless Pumps

Ease of Maintenance
- Minimum Parts
- No Pump/Motor Alignment Required with Close-Coupled Design
- ANSI Dimensional
- Optional Frame-Mounted Design
- No Mechanical Seal

Safety
- Drive and Driven Magnet Assembly Safety Clearances (Frame-Mounted Design)
- Adapter and Casing Drain Connections
- Zero Emissions

Services

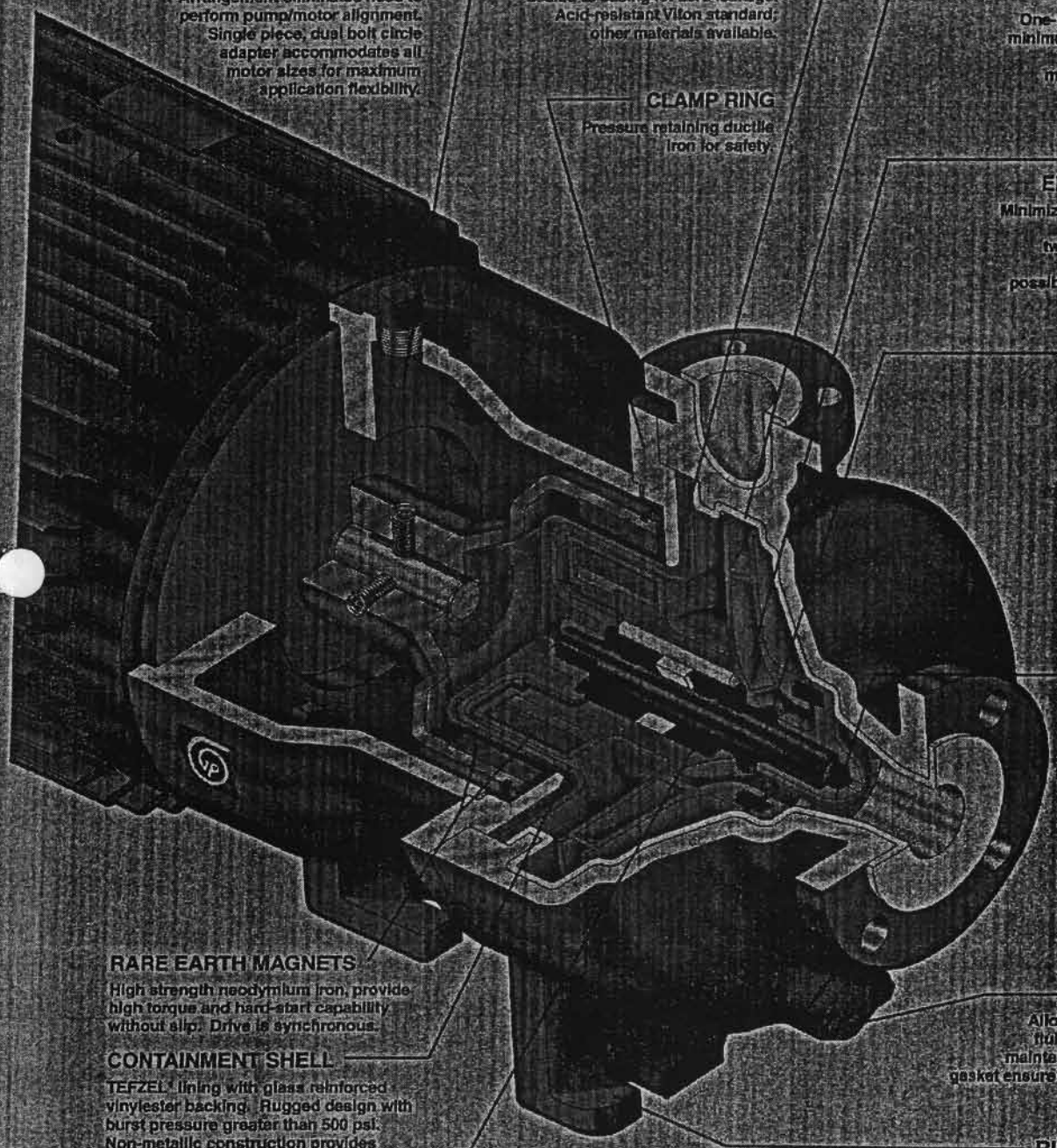
- Hydrochloric Acid
- Hydrobromic Acid
- Sodium Hypochlorite
- Chlorine Dioxide
- Sodium Hydroxide
- Sulfuric Acid

Applications

- Rail Car or Tank Unloading
- Batch Chemical Processes
- Specialty Chemicals
- Column Reflux or Bottoms
- Reactor Feed

Model 3298 Chemical Process Pumps

Design Features for Wide Range of Process Services



CLOSE-COUPLED DESIGN
Arrangement eliminates need to perform pump/motor alignment. Single piece, dual bolt circle adapter accommodates all motor sizes for maximum application flexibility.

FULLY CONFINED O-RING
Sealed to casing for zero leakage. Acid-resistant Viton standard; other materials available.

CLAMP RING
Pressure retaining ductile iron for safety.

TEFZEL* LINING WITH DUCTILE IRON CASING
One-piece solid casing lined with minimum 1/8 inch (3 mm) TEFZEL*. Rotolining process assures mechanical integrity of lining.

ONE-PIECE ENCLOSED IMPELLER
Minimizes axial thrust for extended thrust bearing life. Unlike two-piece designs, one-piece construction eliminates possibility of front shroud failure.

SOLID STATIONARY SHAFT
Pure sintered silicon carbide construction eliminates shaft deflection. Fully supported stationary design maximizes radial bearing life. Straight geometry eliminates stress concentrations and possibility of failure during pump operation.

BEARING SPIDER
Fully supports solid stationary shaft for extended bearing life. Standard silicon carbide thrust bearing maximizes thrust load capability for long pump life.

ANSI DIMENSIONS
Allows easy retrofit of problem ANSI pumps.

CASING DRAIN
Allows complete draining of fluid from pump for system maintenance. Blind flange and gasket ensure leak-free seal for safety.

RIGID CASING FEET
Reduce effect of pipe loads on pump and motor shaft alignment.

RARE EARTH MAGNETS
High strength neodymium iron, provide high torque and hard-start capability without slip. Drive is synchronous.

CONTAINMENT SHELL
TEFZEL* lining with glass reinforced vinylester backing. Rugged design with burst pressure greater than 500 psi. Non-metallic construction provides efficiencies same as sealed ANSI pumps. (30% higher efficiencies than metal sealless pumps.)

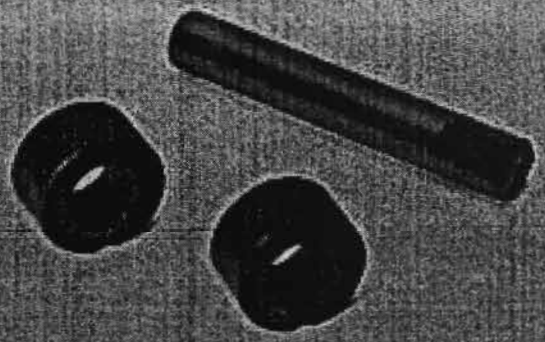
RADIAL BEARING WITH TEFLON* SPACER
Two-piece design with Teflon* spacer allows bearings to self-align under load. Independent movement maximizes bearing life. Carbon bearing construction standard; silicon carbide and Safeglide™ silicon carbide optional.

TEFZEL* (ETFE) CONSTRUCTION
Provides superior corrosion resistance; inert to most chemicals. Tough material for superior solids handling/abrasion resistance (same or better than 316 SS).

*E.I. DuPont Reg. Trademark

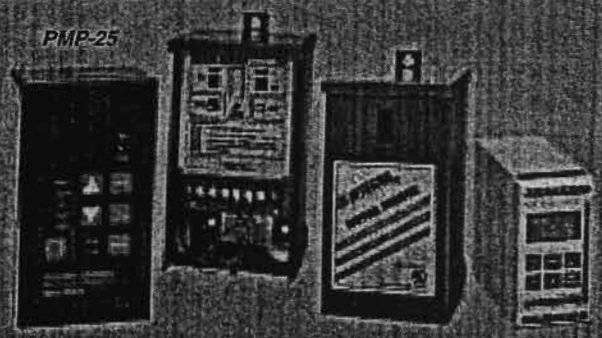
Exceptional Performance for Chemical Services

Dry Run Protection with Safeglide™



SAFEGLIDE™ BEARINGS AND SHAFT

Goulds unique Safeglide™ diamond-like carbon coating provides extra protection for the silicon carbide bearings, allowing the pump to withstand tough conditions and system upsets. If your system cannot guarantee fluid 100% of the time, Goulds recommends Safeglide™.



POWER MONITORS

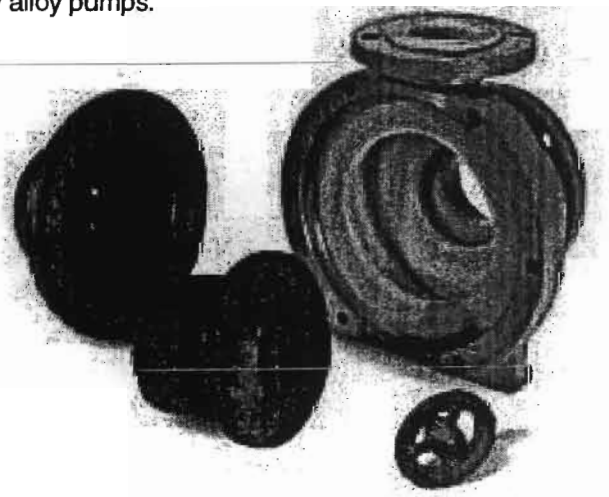
No pump is designed to run dry for an extended period of time. Goulds recommends that pumps be protected with a power monitor. Easy to install and easy to operate, power monitors will ensure extended time between planned maintenance for the 3298 or any other pump in the facility.

Ultimate Protection

Magnetic drive pump failures are often due to dry running and closed discharge valve conditions. With Safeglide™ silicon carbide bearings and a power monitor, you have the best protection technology can offer. Goulds always recommends the use of a power monitor because **FAILURE IS NOT AN OPTION!**

TEFZEL® Construction for Extreme Corrosion Resistance

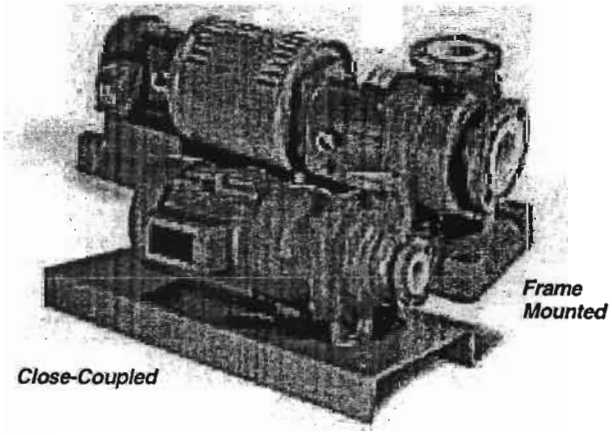
TEFZEL® (ETFE) is inert to most chemicals, and has good abrasion resistance. TEFZEL® lined casing and containment shell with solid TEFZEL® impeller provide superior corrosion resistance and long life unequalled by alloy pumps.



Installation/Pump Replacement Flexibility

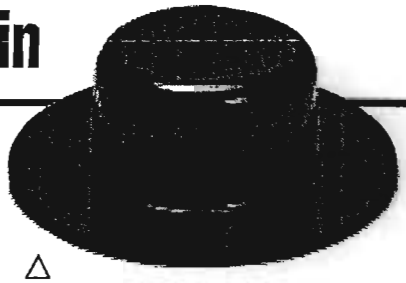
The 3298 is available in close-coupled or frame-mounted designs for true installation or pump replacement flexibility.

Since the 3298 meets ANSI dimensional standards, retrofitting mechanically sealed ANSI pumps is easy: simply replace the old pump with the equivalent close-coupled or frame-mounted ANSI size 3298.



Reliable, Simple – Easy To Maintain

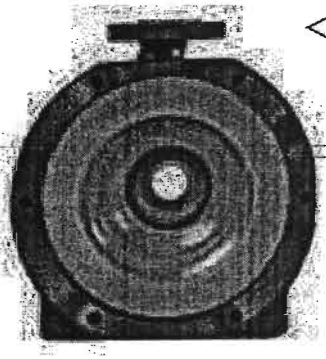
Design Features for Extended Pump Life



△

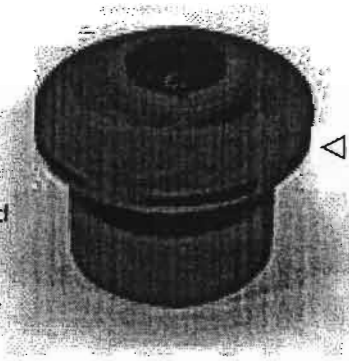
CONTAINMENT SHELL

TEFZEL® lining with glass reinforced vinylester backing. Burst pressure greater than 500 psig. Fully confined O-ring seals containment shell to casing. Non-metallic construction provides efficiencies same or better than sealed ANSI pumps; 30% higher efficiencies than metal sealless pumps. Non-metallic construction eliminates magnet losses and heat generation. Heat sensitive liquids are easily pumped.



◁ **CASING WITH TEFZEL® LINING**

One-piece solid ductile iron casing with Tefzel® lining. Generous lining thickness of 1/8 inch (3 mm). Rotolining process assures integrity of lining. Rugged foot mounted design provides maximum resistance to and distortion from pipe loads. Flange loads are the same as metal ANSI pumps. Casing drain allows complete evacuation of pump fluid.



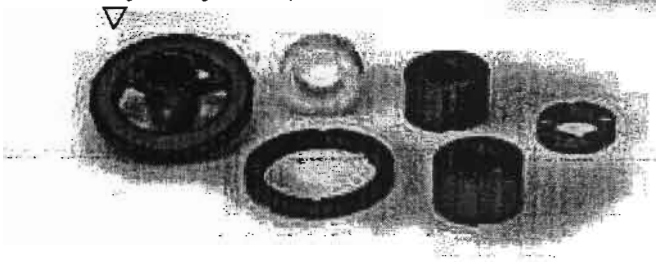
RADIAL AND THRUST BEARINGS

Carbon radial bearings, carbon-filled Teflon®, and silicon carbide thrust bearings are standard. Pure sintered silicon carbide thrust and radial bearings are optional for superior corrosion and abrasion resistance. Safeglide™ bearings also optional for dry run system upset conditions.

◁ **ENCLOSED ONE-PIECE IMPELLER/MAGNET ASSEMBLY**

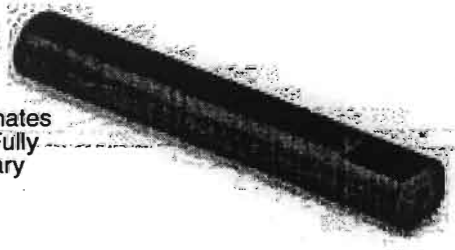
Enclosed design minimizes axial thrust, extends thrust bearing life. One-piece construction eliminates front shroud failure possible with two-piece impellers. Neodymium iron magnets are molded in place, reducing the chance of permeation.

▽



STATIONARY SHAFT ▷

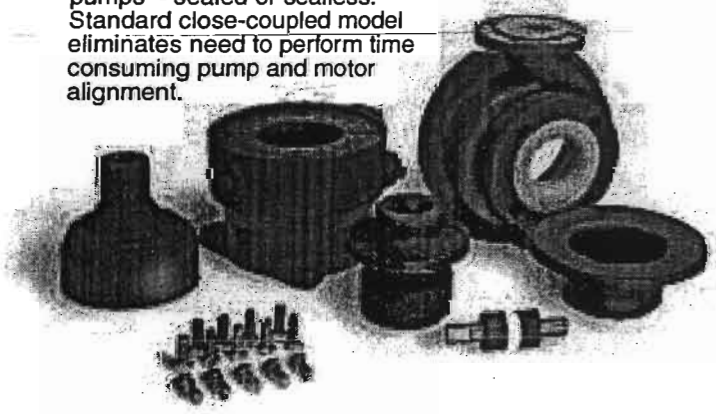
Silicon carbide construction eliminates shaft deflection. Fully supported stationary design maximizes radial bearing life.



Extreme Ease of Maintenance

DESIGN CONCEPT

The 3298 design concept is simple – few parts and only one bolt size. One-craft maintenance is all that's required – with one wrench! Planned maintenance is fast and easier than other process pumps – sealed or sealless. Standard close-coupled model eliminates need to perform time consuming pump and motor alignment.



SIMPLE OPERATION

Unlike most magnetic drive pumps, the 3298 is as easy to operate as any standard ANSI pump. Non-metallic construction with no heat build-up makes the 3298 ideally suited for tank transfer, tank unloading, or any batch type service.

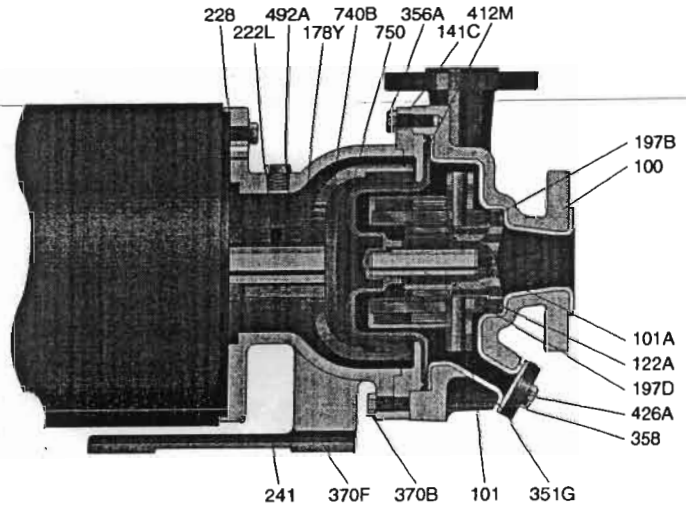
ZERO LEAKAGE

The 3298 is sealless and environmentally safe. No mechanical seal assures zero leakage on moderate to severe corrosives, hazardous liquids. A great solution to pumps with mechanical seal problems.

Parts List and Materials of Construction

Item Number	Part Name	Material
100	Casing	Ductile Iron/TEFZEL*
101	Impeller Assembly	TEFZEL
101A	Bearing Spider	TEFZEL/Silicon Carbide
109A	Bearing End Cover (Frame-Mounted)	Ductile Iron
112	Ball Bearing (Frame-Mounted)	Steel
113A	Plug–Oil Fill (Frame-Mounted)	Steel
122A	Stationary Shaft	Silicon Carbide
122B	Drive Shaft (Frame-Mounted)	Steel
141C	Clamp Ring	Ductile Iron
144A	Rub Ring (M&L Frame-Mounted)	Cast Iron
157A	Bearing Spacer–Radial	TEFLON*
178S	Key, Impeller to Bearings	TEFLON
178Y	Key, Drive Carrier	Steel
197B	Radial Bearing	Standard-Carbon Graphite, Optional–Silicon Carbide
197C	Bearing, Reverse Thrust	Silicon Carbide
197D	Bearing, Impeller Thrust	Standard-Carbon-Filled TEFLON, Optional–Silicon Carbide
203	Rear Impeller Wear Ring (M and L Group only)	Carbon-Filled TEFLON
222L	Set Screw (Close-Coupled)	Steel
228	Frame	Cast Iron
241	Frame Foot	Cast Iron
314H	Retaining Ring, Impeller/Driven Magnet Assembly	TEFZEL
332A	Labyrinth Seal (Frame-Mounted)	Carbon-Filled TEFLON
333D	Lip Seal (Frame-Mounted)	Buna Rubber
351G	Gasket, Case Drain	Gylon
355A	Hex Nut (Frame-Mounted)	Steel
356A	Hex Cap Screw–Clamp Ring to Case	304 Stainless Steel
358	Flange, Case Drain	Steel
360A	Gasket–Bearing End Cover to Frame (Frame-Mounted)	Varnished Kraft
360W	Gasket–Frame to Clamp Ring	Aramid Fibers with EPDM Rubber
361H	Retaining Ring (L Group Only)	TEFLON Encapsulated Silicon
370B	Hex Cap Screw–Frame to Clamp Ring	304 Stainless Steel
370C	Hex Cap Screw–End Cover to Frame (Frame-Mounted)	304 Stainless Steel
370F	Hex Cap Screw–Frame Foot	304 Stainless Steel
372Y	Hex Cap Screw–Frame To Rub Ring (M & L Group Only)	304 Stainless Steel
412M	O-ring–Containment Shell	Standard-Viton, Optional-EPDM, Optional-Viton Encapsulated in TEFLON
418	Hex Tap Bolt–Jacking (M & L Group Only)	304 Stainless Steel
426A	Hex Cap Screw–Case Drain	304 Stainless Steel
496D	O-ring–Reverse Thrust Bearing	Viton Encapsulated in TEFLON
529	Washer, Wave Spring (L Group Only)	Steel
740A	Driven Magnet Assembly (L Group Only)	TEFZEL Neodymium Iron
740B	Drive Carrier Assembly	Cast Iron/Neodymium Iron
750	Containment Shell	TEFZEL/Fiber Reinforced Vinyl Ester

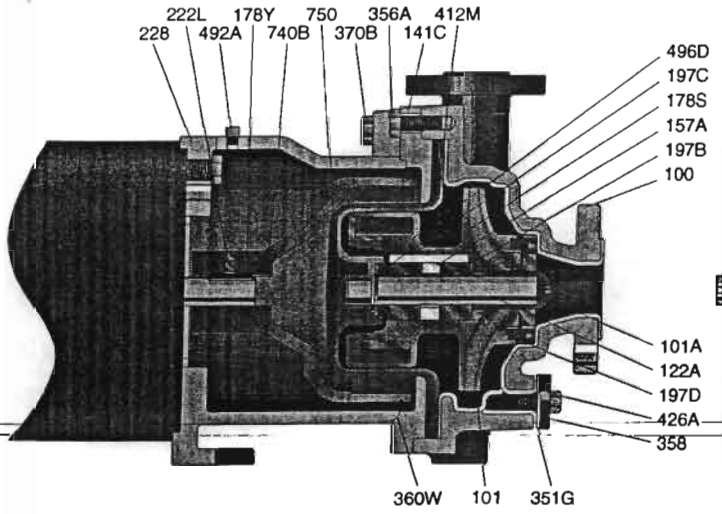
*Registered trademarks for fluoropolymer resins, films and fibers made by DuPont.



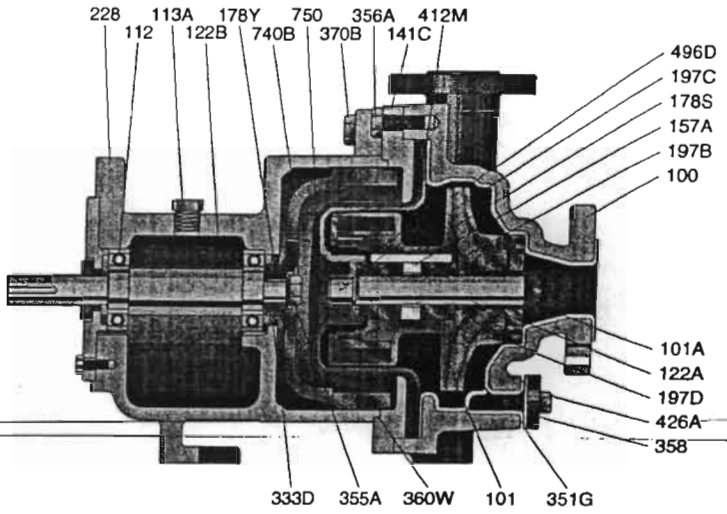
3298 XS

The 3298 *XS* provides additional low flow coverage below the hydraulics of the smallest traditional ANSI pump size. XS pumps meet user requirements for low flow capabilities. Applying an oversized ANSI pump is not required.

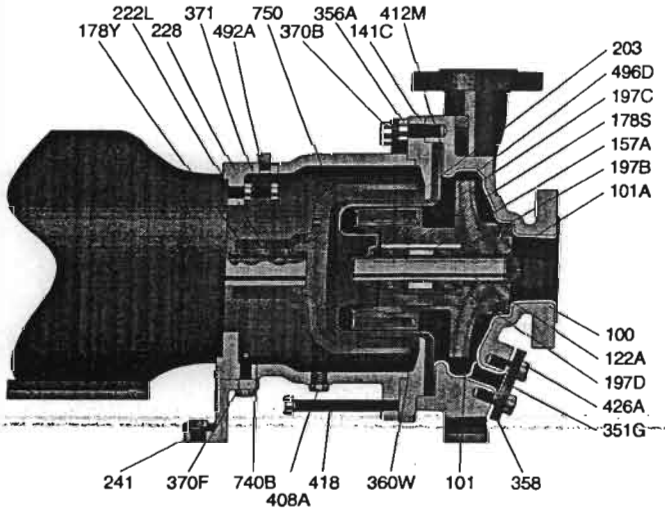
- Capacities to 120 GPM (27 m^3/h)
- Heads to 160 feet (49 m)
- Temperatures to 250° F (121° C)
- Pressures to 150 PSIG (1034 kPa)



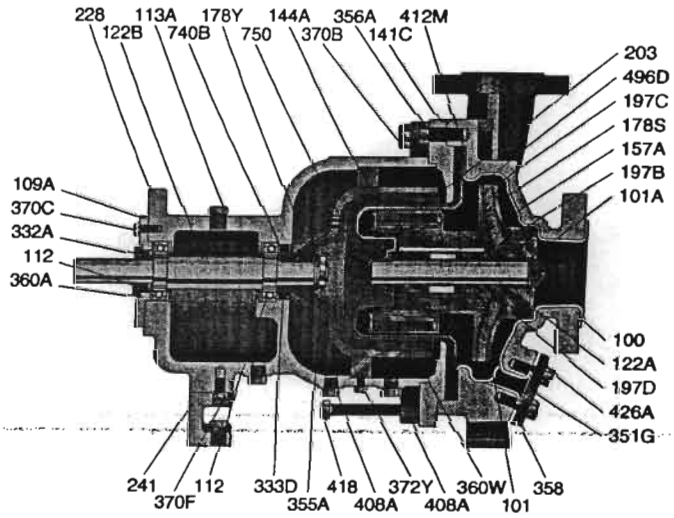
3298 S Close-Coupled



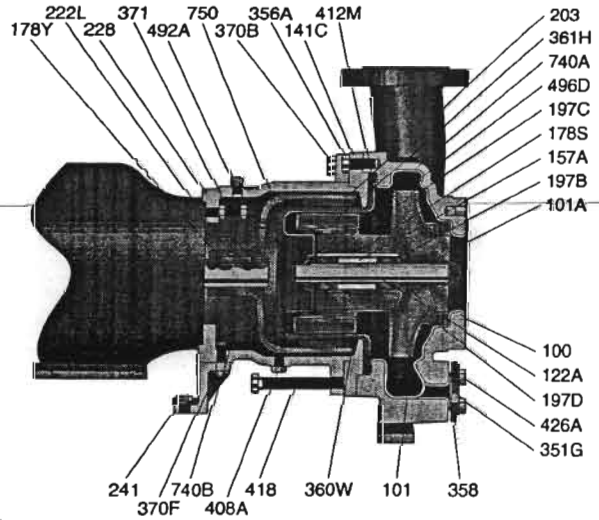
3298 S Frame-Mounted



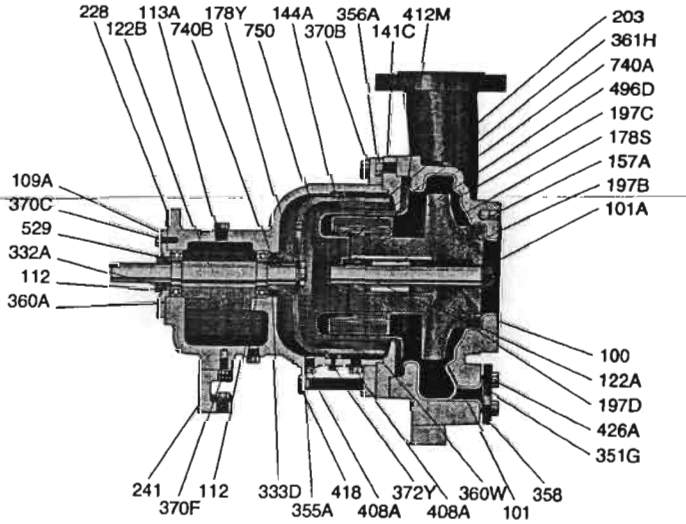
3298 M Close-Coupled



3298 M Frame-Mounted

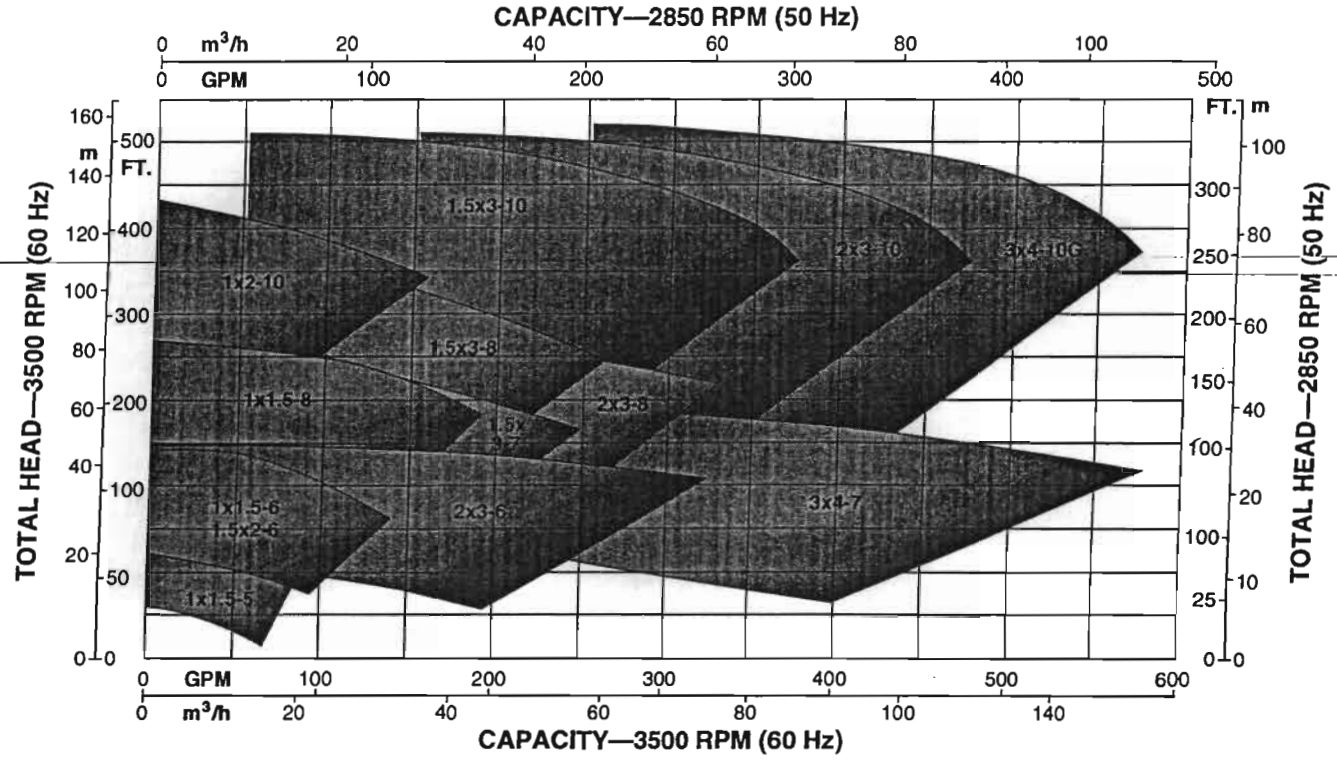


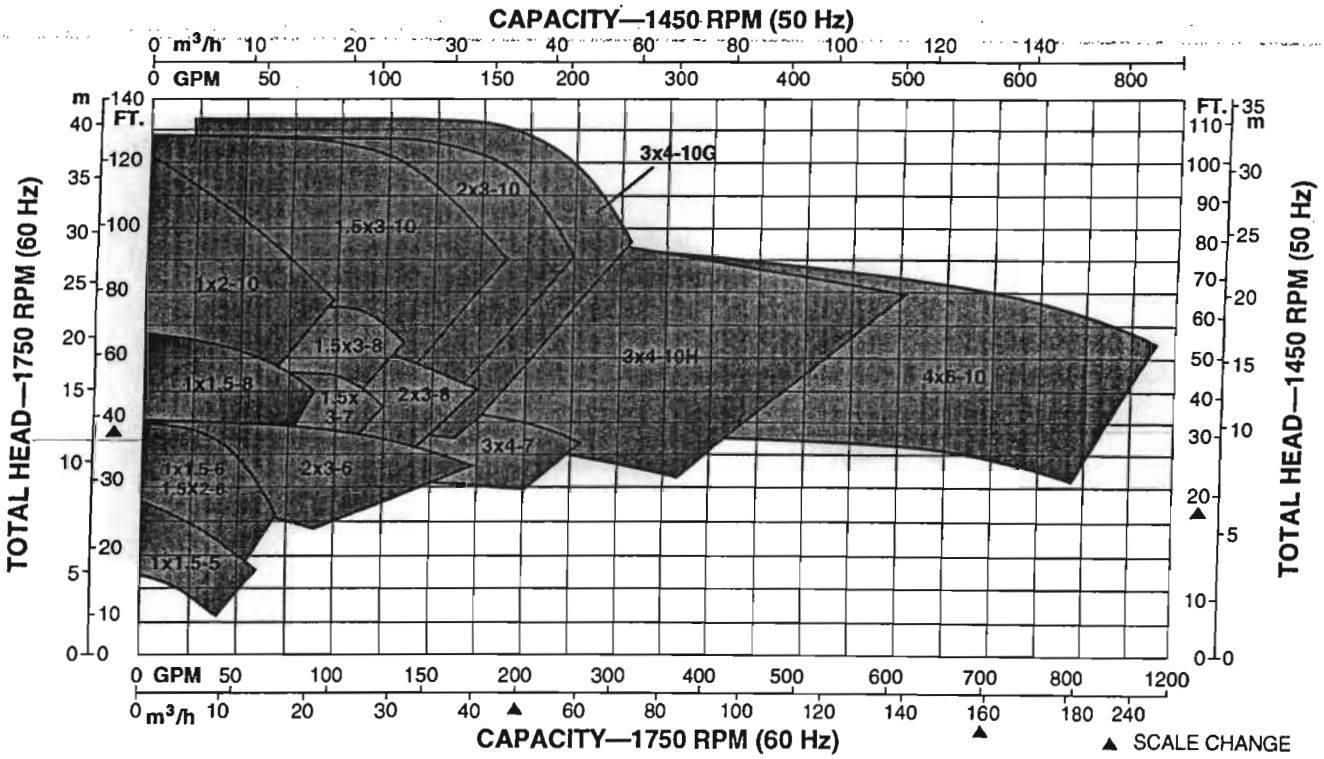
3298 L Close-Coupled



3298 L Frame-Mounted

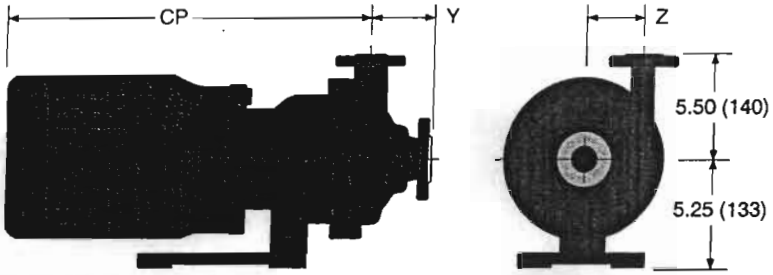
Hydraulic Coverage Model 3298





Dimensions Model 3298

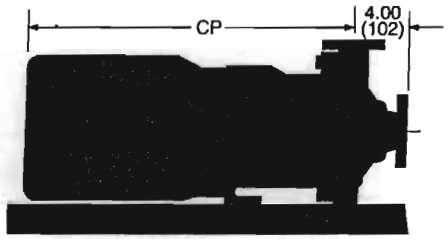
All dimensions in inches and (mm). Not to be used for construction.

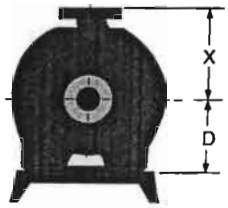


3298 XS

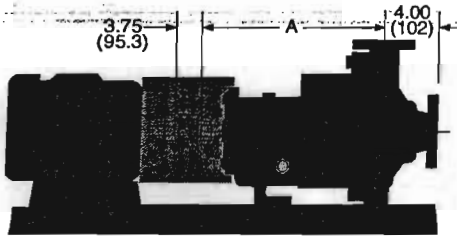
DIMENSIONS (1 x 1½ - 5)

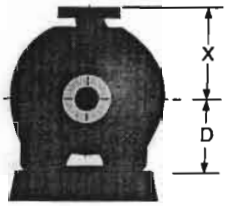
Group	Size	Motor Frame	CP (Approx.)	Motor Weight lb (kg)	Pump Weight lb (kg)	Y	Z
XS	1 x 1.5-5	56C	18.9 (429)	45 (21)	46 (21)	3.15 (80)	2.34 (59)
		143-145TC	18.9 (480)	65 (30)			
		182-184TC	19.9 (505)	105 (48)			
	1.5 x 2-6	56C	16.6 (422)	45 (21)	60 (27)	3.41 (87)	2.56 (65)
		143-145TC	18.6 (472)	65 (30)			
		182-184TC	19.6 (498)	105 (48)			
		213-215TC	25.0 (635)	150 (68)			





3298 Close-Coupled Design





3298 Frame-Mounted Design

CLOSE-COUPLED

Motor Frame	Group	CP (Approx.)
143TC	S	19 (483)
	M	NA
	L	
145TC	S	18 (457)
	M	NA
	L	
182TC/184TC	S	22.1 (562)
	M	25 (635)
	L	NA
213TC/215TC	S	25.6 (651)
	M	28.5 (724)
	L	
254TC/256TC	S	30.1 (765)
	M	33 (838)
	L	
284TSC/286TSC	S	NA
	M	37 (940)
	L	
324TSC/326TSC	S	NA
	M	40 (1016)
	L	
364TSC	S	NA
	M	
	L	42.5 (1080)

BARE PUMP DIMENSIONS

Group	Size	A	D	X	Close-Coupled	Frame Mounted
S	1 x 1.5-6	13.50 (343)	5.25 (133)	6.50 (165)	68 (31 kg)	97 (44 kg)
	2 x 3-6				79 (36 kg)	108 (49 kg)
	1 x 1.5-8				84 (38 kg)	113 (52 kg)
	1.5 x 3-7				89 (41 kg)	118 (54 kg)
M	1 x 2-10	19.50 (495)	8.25 (210)	8.47 (215)	170 (78 kg)	190 (87 kg)
	1.5 x 3-8			8.47 (215)	176 (80 kg)	194 (88 kg)
	2 x 3-8			9.47 (241)	178 (81 kg)	196 (90 kg)
	3 x 4-7			10.97 (279)	193 (89 kg)	214 (98 kg)
L	1.5 x 3-10	19.50 (495)	8.25 (210)	8.47 (215)	180 (82 kg)	203 (92 kg)
	2 x 3-10		8.25 (210)	9.47 (241)	184 (84 kg)	207 (94 kg)
	3 x 4-10G		8.25 (210)	10.97 (279)	198 (91 kg)	221 (102 kg)
	3 x 4-10H		10.00 (254)	12.47 (317)	198 (91 kg)	221 (102 kg)
	4 x 6-10		10.00 (254)	13.47 (342)	223 (103 kg)	249 (115 kg)

- Pipe size requirement: minimum 4-inch diameter piping, at a maximum velocity of 3.14 ft/sec.
- Typical pump:
    1. Fairbanks Morse Pump size 6D, 2-stages, 5.5 HP, max speed 3,500 rpm.
    2. Fairbanks Morse Pump size 7A, 4-stages, 4.0 HP, max speed 1,800 rpm.

Air Stripper/Discharge Pump:

- Pump requirement: Centrifugal/End Suction type, minimum of 550-gpm flow at a total dynamic head (TDH) of 130-ft, which includes the necessary capacity for backwashing the GAC_{liquid} treatment units.
- Pipe size requirement: minimum 6-inch diameter piping, at a maximum velocity of 5.07 ft/sec.
- Typical pump:
    1. Goulds Pump Model 3298 (3 x 4 – 7), 25 HP motor at a maximum speed of 3,550 rpm.

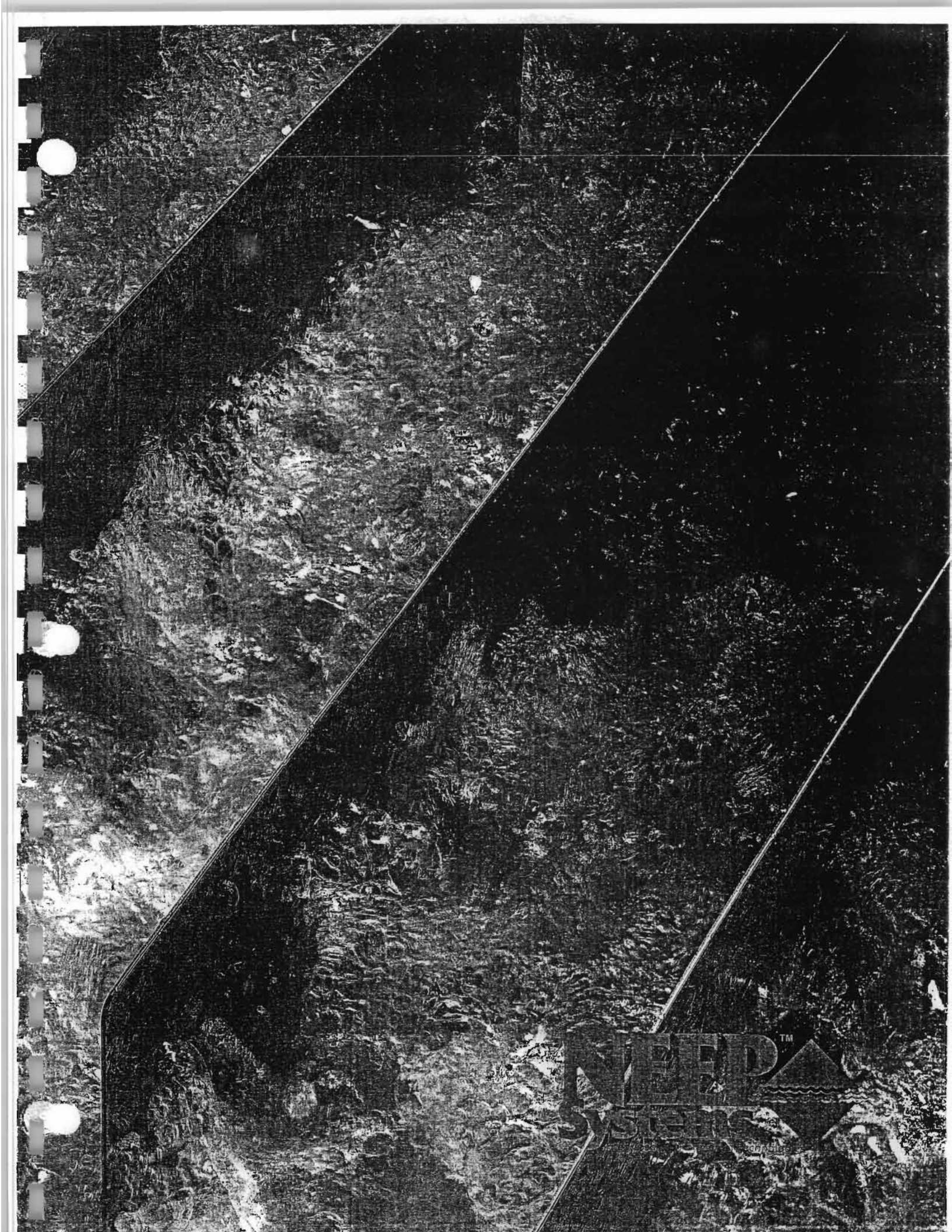
Calculation Approved by: _____

Project Manager/Date

MALCOLM PIRNIE

APPENDIX F

NEEP SYSTEMS LOW PROFILE AIR STRIPPER PRODUCT INFORMATION AND PERFORMANCE PROJECTION


NEED
Systems

ShallowTray®
low profile air strippers

Installation, Operation, & Maintenance Manual

North East Environmental Products, Inc.
17 Technology Drive West Lebanon New Hampshire 03784
Tel: 603-298-7061 Fax: 603-298-7063 Email: sales@neepsystems.com

ShallowTray®
low profile air strippers

MODEL NUMBER

41241

SERIAL NUMBER

41241-04-5601

Part Number 500-200-00560

North East Environmental Products, Inc.
17 Technology Drive West Lebanon New Hampshire 03784
Tel: 603-298-7061 Fax: 603-298-7063 Email: sales@neepsystems.com

TABLE OF CONTENTS

Special Cautions!

Prior to start-up:

- ***Connect the Interlock Switches.***
  Connect the High Water Level Interlock, the Low Air Pressure/Vacuum Interlock, and the High Air Pressure/Vacuum Interlock (if required).

  It is important that a qualified, licensed electrician perform these installations.

- ***Fill the Sump Tank and Stripper Tray Inlet Chambers.***
  Fill the sump tank to a depth of at least 5 inches (12.7cm), and fill the seal pots on each tray. Use clean water only.

  Please see Equipment Set-up in the Operating Instructions section of this manual.

NEEP Systems

17 Technology Drive.
West Lebanon, NH 03784
603-298-7061 Fax: 603-298-7063
www.neepsystems.com info@neepsystems.com

Section 1: Components List

ShallowTray® Low Profile Air Stripper Specification Sheet - Stainless Steel Syste

ShallowTray Serial #: 41241-04-5601 Customer: Fairchild Ship date: 9/5/0

Engineered By: Scott Cook Order Date: _____

Design Review: Engineering _____ Sales _____

Additional Treatment Equipment:

aporMate Serial #: _____ Neozone Serial #: _____ EconoPump Serial #: _____

I. Special Components / Requirements / Information / Comments

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

II. Design Criteria

Design Water Flow Rate: 250 gpm

Maximum Water Flow Rate: 270 gpm, which is considered a ✓ Low Water Flow Design, or ___ a High Water Flow Desig and is based on the blower model selection.

Weir Height: 4" Inlet, 2" Outlet

Equipment Power Requirements: 3 ø, 460 volts, 60 Hz

INSTALL ALL EQUIPMENT PER APPLICABLE NATIONAL AND LOCAL CODES.
CUSTOMER TO PROTECT EXPLOSION-PROOF MOTORS FROM RAIN.

III. Basic System Components

CAUTION: MAXIMUM PRESSURE OR VACUUM ACROSS STAINLESS STEEL SYSTEM = 32"

✓ Sump Tank, Cover — ✓ 304L stainless steel ___ 316L stainless steel

4 Aeration Trays (quantity) — ✓ 304L stainless steel ___ 316L stainless steel

✓ Latches — 304L stainless steel

✓ Main Blower (with inlet screen and damper) — American Fan Model # BC6-08-26B

Minimum Required Blower Performance: 2400 cfm @ 22 "wc — Blower P/N 911

25 hp, 3 ø, 460 volts, 3450 rpm — Coupling P/N 180

60 Hz, ✓ TEFC or ___ EXP — Riser P/N _____

8 "Blower Inlet Size, 8 "Blower Outlet Size — slip x slip

✓ Blower on Inlet (Pressure system)

___ Blower on Outlet (Vacuum system)

___ Blowers on In & Out (Combo system)

Main Blower Sized For:
22 "wc required for ShallowTray Air Stripper
Ø "wc additional available for airstream equipment

✓ Demister Pad — Koch style 4310, 4" thick, 304 ss

✓ Spray Nozzle — Hollow cone, 90° pattern, sized for 15 psi, brass

✓ Sight Tube — Brass, Nalgene tubing

✓ Aeration Tray Gaskets — High density nitrile sponge rubber

✓ Inlet Piping Connection — Schedule 80 PVC, Brass

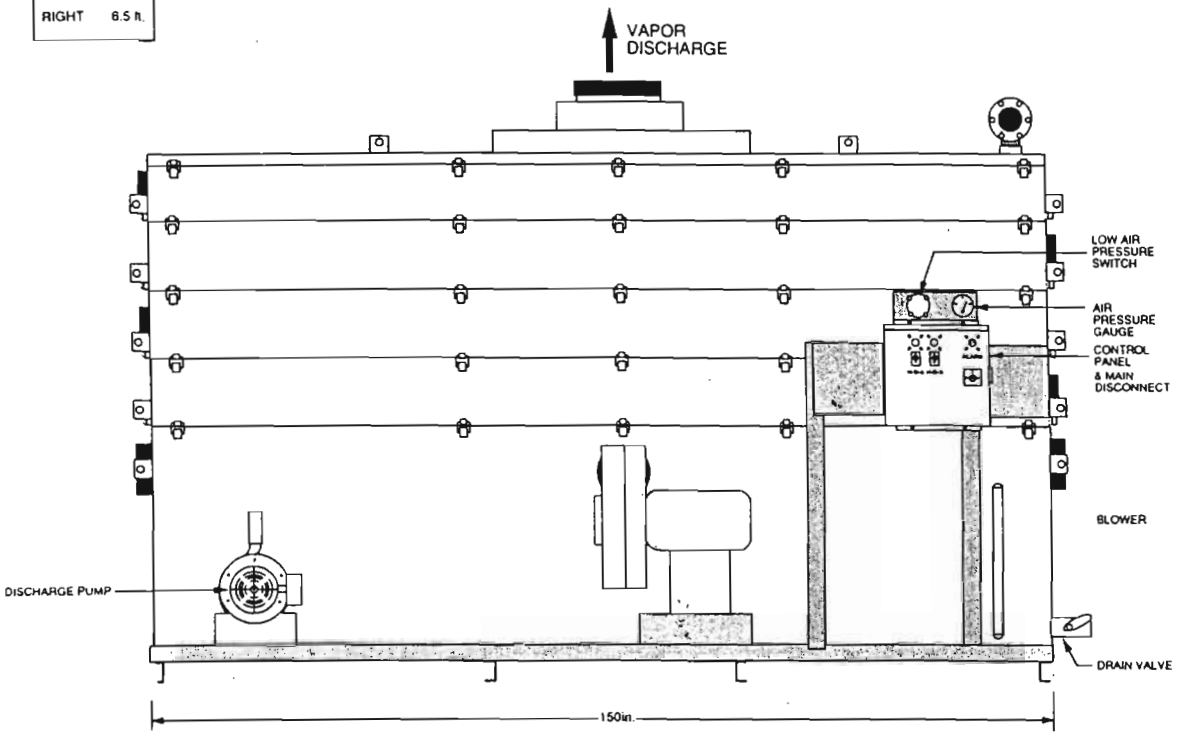
✓ Blower and Vent Line Connections — Flexible rubber couplings

✓ Frame	3 in. and 4 in. welded steel, C-Channel
✓ Air Pressure Gauge (0 - 40 "wc)	Dwyer Magnehelic 2000 series
___Gravity Discharge Riser	PVC 80 Piping, with vacuum relief valve
___Additional Blower (with inlet screen and damper)	_____ Fan Model #_____
Required Performance	_____cfm @ _____" wc Blower P/N_____
	_____hp, ____Ø, _____volts, _____rpm, _____ Hz, ____TEFC or ____EXP
	____"Blower Inlet Size, ____"Blower Outlet Size
___Feed Pump	_____ Pump Model #_____
Required Performance	_____ gpm @ _____' TDH Feed Pump P/N_____
	_____hp, ____Ø, _____volts, _____rpm, _____ Hz, ____TEFC or ____EXP
	Port Sizes: _____ inch inlet, _____ inch outlet. Impellor Size_____inches
✓ Discharge Pump	Mepco Pump Model # R6 2 1/2
Required Performance	270 gpm @ 50 ' TDH Discharge Pump P/N 580
	7.5 hp, 3 Ø, 460 volts, 3450 rpm, 60 Hz, ✓ TEFC or ___EXP
	Port Sizes: 3 inch inlet, 2 1/2 inch outlet. Impellor Size 5 inches
✓ Main Disconnect Switch	Integral with electrical enclosure, rotary style
___Control Panel	Motor starters, system alarm interlock circuit, operator switches, alarm light. NEMA _____ Enclosure, _____ Amps, _____Ø, _____Volts, _____Hz, _____ wire and grou
✓ Control Panel w/ Pump Level Control	Motor starters, system alarm interlock circuit, pump level control circuit, operator switches, alarm light. NEMA 4 Enclosure, 60 Amps, 3 Ø, 460 Volts, 60 Hz, 3 wire and grou
___PurgePanel ™	NEMA 7 Main Disconnect switch, NEMA 4 enclosure, air pressure gauge. Low air pressure switch, Blower (100 cfm @ 2" w.c.)
✓ Autodialer	Sensaphone 4100
✓ Control Circuit Transformer	460:120vac
___Intrinsically-Safe Relay	_____ Pepperl+Fuchs, WE77/Ex2-UL repeater relay Dual Channel, SPDT relay output _____Warrick 27A1E0 latching relay Single Channel, SPDT relay output
✓ Intermittent Operation	Blower time-delay circuit added to panel design. Blower shuts off 5 minutes after inlet water flow stops.
___Auto Operation	# of wells _____
___Well Probes	Warrick, series 3Y, 80' cord
___Blower Start/Stop Switch	Local blower switch mounted near blower
___Power Lapse Indicator	Black-out / Brown-out indicating light, switch and circuit added to panel design
___Individual Alarm Light	Light and relay circuit added to panel design
___Strobe Alarm Light	___Red, ___ Blue, Federal Signal, NEMA 4, UL listed
___Alarm Horn	Federal Signal
✓ Low Air ✓ Press. ___Vacuum Switch	Dwyer 1950-1, preset at 1.6" wc (range=0.3"wc to 1.6" wc), Explosion-proof
___High Air ___Press. ___Vacuum Switch	Dwyer 1950, _____"wc to _____"wc, Explosion-proof
___Low Water Level Alarm Float Switch	Mechanical, SJ Electro, (qty)____N.O., (qty)____N.C.
✓ High Water Level Alarm Float Switch	Mechanical, SJ Electro, (qty)____N.O., (qty) 1 N.C.
✓ Discharge Pump Float Switch	Mechanical, SJ Electro. (qty) 1 N.O., (qty)____N.C.
___Water Flow Meter	Halliburton, MCII digital readout
___Air Flow Meter	Dwyer 2000-0 meter, single-point insertion pitot tube, mounting kit
___Water Press. Gauge, ___inlet, ___outlet	Dial gauge, liquid-filled
___Water Temp. Gauge, ___inlet, ___outlet	Dial gauge
___Line Sampling Port, ___inlet, ___outlet	Schedule 80 PVC
___Air Blower Silencer	Clevaflex, CSA series
✓ Washer Wand	Nozzle, Elbow, 1/4" steel pipe
✓ Viewport Set - (4) 4"Ø, (1) 8"Ø	Lexan viewports with rubber coupling

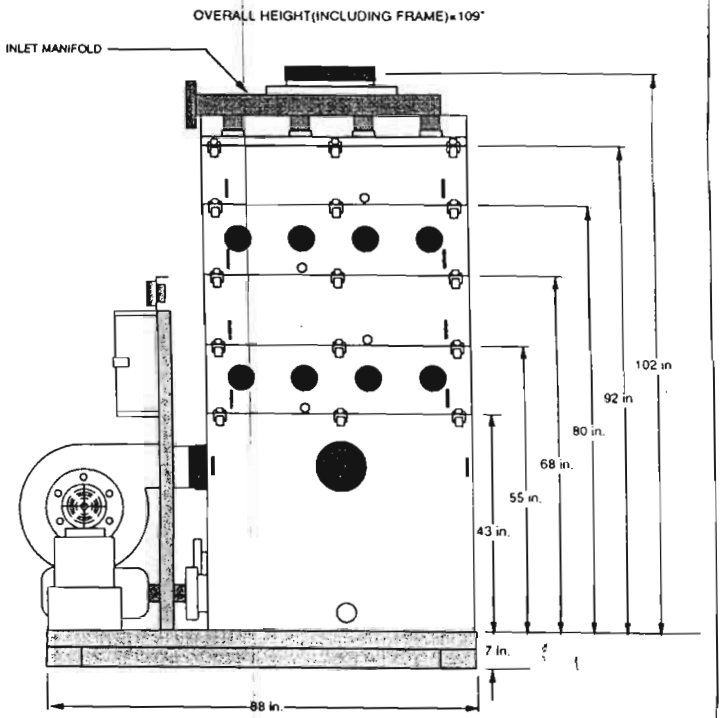
MINIMUM C

FRONT	1.5 ft.
TOP	24 in
REAR	N/A
LEFT	6.5 ft.
RIGHT	6.5 ft.

FRONT



RIGHT SIDE



BASIC SYSTEM

- ✓ SUMP TANK
- ✓ STRIPPER TRAYS
- ✓ BLOWER
- ✓ MIST ELIMINATOR
- ✓ PIPING
- ✓ SPRAY NOZZLE
- ✓ WATER LEVEL SIGHT TUBE
- ✓ GASKETS
- ✓ LATCHES

OPTIONAL ITEMS

- ✓ SKID & STANCHION
- ✓ AIR PRESSURE GAUGE
- ___ GRAVITY DISCHARGE PIPING
- ✓ DISCHARGE PUMP
- ___ FEED PUMP
- ___ ADDITIONAL BLOWER
- ___ EXPLOSION-PROOF MOTOR(S)
- ___ LOCAL DISCONNECT NEMA 7
- ✓ CONTROL PANEL
- ✓ MAIN DISCONNECT SWITCH
- ___ I.S. COMPONENTS/REMOTE MOUNT
- ✓ INTERMITTENT OPERATION
- ___ STROBE LIGHT
- ___ ALARM HORN
- ___ POWER LOSS INDICATOR
- ✓ LOW AIR PRESSURE ALARM SWITCH
- ✓ HIGH WATER LEVEL ALARM SWITCH
- ✓ DISCHARGE PUMP LEVEL SWITCH
- ___ WATER PRESSURE GAUGE(S)
- ___ DIGITAL WATER FLOW INDICATOR
- ___ AIR FLOW METER
- ___ TEMPERATURE GAUGE(S)
- ___ LINE SAMPLING PORT(S)
- ___ AIR BLOWER SILENCER
- ✓ WASHER WAND
- ✓ AUTO DIALER

NOTE:

1.) THIS DRAWING IS REPRESENTATIVE OF A TYPICAL CONFIGURATION SIMILAR TO THE UNIT REQUIRED, AND IS NOT INTENDED FOR ENGINEERING DESIGN OR LAYOUT. PLEASE CONTACT YOUR NEEP REPRESENTATIVE FOR DETAILED DESIGN INFORMATION.

CONNECTION INFORMATION

ITEM	SIZE
BLOWER INLET	8 in. Ø STUB
DISCHARGE PUMP	2.5 in. Ø FNPT
WATER INLET	6 in. Ø FLANGE
AIR EXHAUST NOZZLE	18 in. Ø STUB W/18 in. CPLG

POWER: 3Ø, 460 Volt, 3 WIRE + GROUND 60 Hz

*CONSULT N.E.E.P. FOR AMPACITIES AND OTHER VOLTAGE OPTIONS

NORTH EAST ENVIRONMENTAL PRODUCTS, INC.
17 TECHNOLOGY DRIVE
WEST LEBANON, NEW HAMPSHIRE 03784
PHONE: 603-298-7061 FAX: 603-298-7063

TOLERANCES UNLESS OTHERWISE SPECIFIED ± 1 INCH

DRAWING NAME: ShallowTray® Model 41241

DRAWING #: 41241-04-5601

DRAWN: SAC

CUSTOMER: MAC: Fairchild, Mairoll, Babylon

DATE: 07/17/01

SCALE: NTS | SIZE: A | SHEET: 1 OF: 1

Troubleshooting Guide for Poor Removal

WATER ISSUES

1. What is the water flow rate through the stripper?

2. Is there foam in the air stripper caused by surfactants, greases, fats , etc.?

3. What else is in the water besides the contaminates in question?

4. Are there occasional slugs of free product that could contaminate the sump of the air stripper?

5. Does the sump tank have at least 4 inches of water at all times?

6. Are the seal pots on each tray full of water?

7. Are the samples being taken, stored, and tested per approved methods?

AIR ISSUES

1. What is the air flow rate through the stripper?
   - How is it measured?
   - How does it compare with the shop tests?

2. Is there water blowing out the exhaust stack?

3. Is there air blowing out the water discharge piping?

4. What is the design of the air intake and exhaust?
   - Is there any constriction of the flow of air?

14. is there any way contaminated air can get into the blower intake?

MECHANICAL AND OTHER ISSUES

1. Is the blower spinning in the correct direction? i.e.Top of blower wheel spinning towards blower outlet. (The blower will blow air even if running backwards.)

2. Is the system level?

3. When system shuts down, does blower continue to run for 5 minutes after influent water stops?

4. Have there been any power outages that would cause untreated water to fall into the sump?

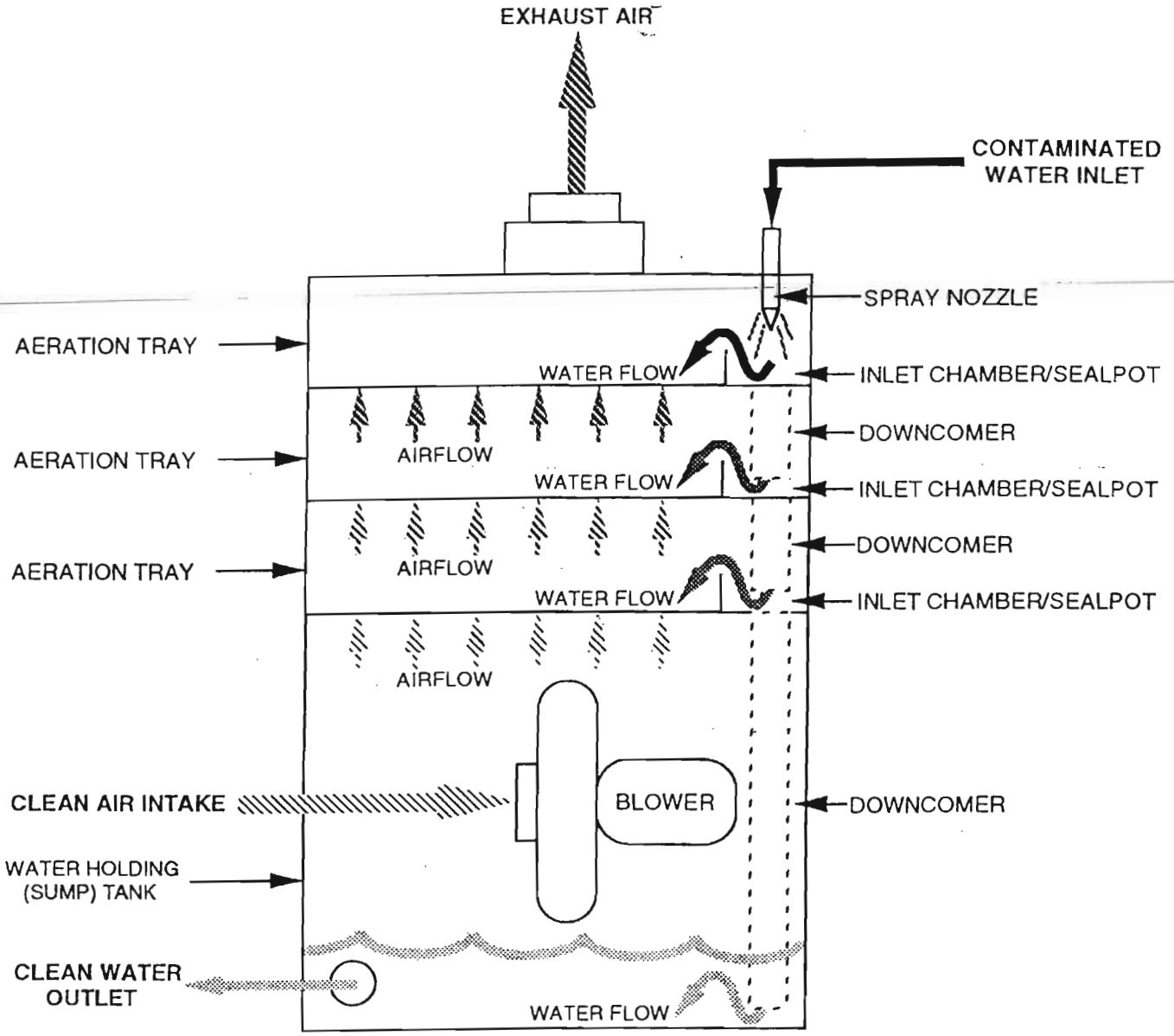
5. Are trays properly stacked so that the downcomers are in seal pots?

FOULING ISSUES

1. Is there any scaling or fouling on the trays? The holes in the trays should be 3/16 of an inch in diameter.

2. What is the sump tank pressure reading? Has it changed over time?

AERATION PROCESS, COUNTER-CURRENT AIR AND WATER FLOW



FOR REFERENCE ONLY !

DO NOT ASSEMBLE PER THIS DRAWING. SEE DRAWINGS THAT ARE SPECIFIC TO THIS UNIT.

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17 TECHNOLOGY DRIVE
WEST LEBANON, NH 03784
(603) 298-7061

TOLERANCES UNLESS OTHERWISE SPECIFIED ±1 in.	DRAWING NAME: AERATION PROCESS		
	DRAWING #: 900-200-00003		
DRAWN: MS DATE: 1/11/93	CUSTOMER:		
REV: A 3/9/94	SCALE:	SIZE: A	SHEET : OF:

TYPICAL VENT LINE INSTALLATION

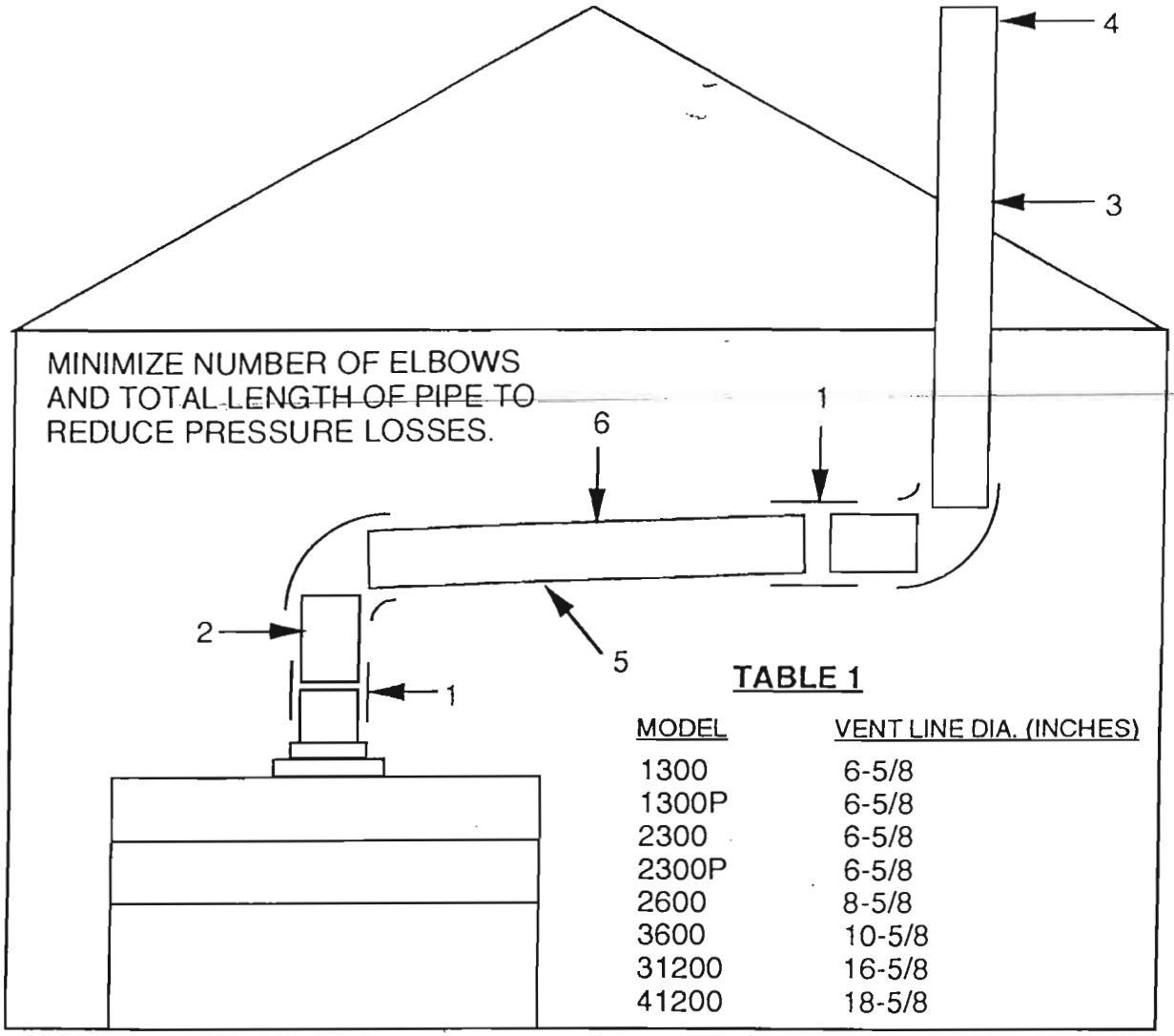


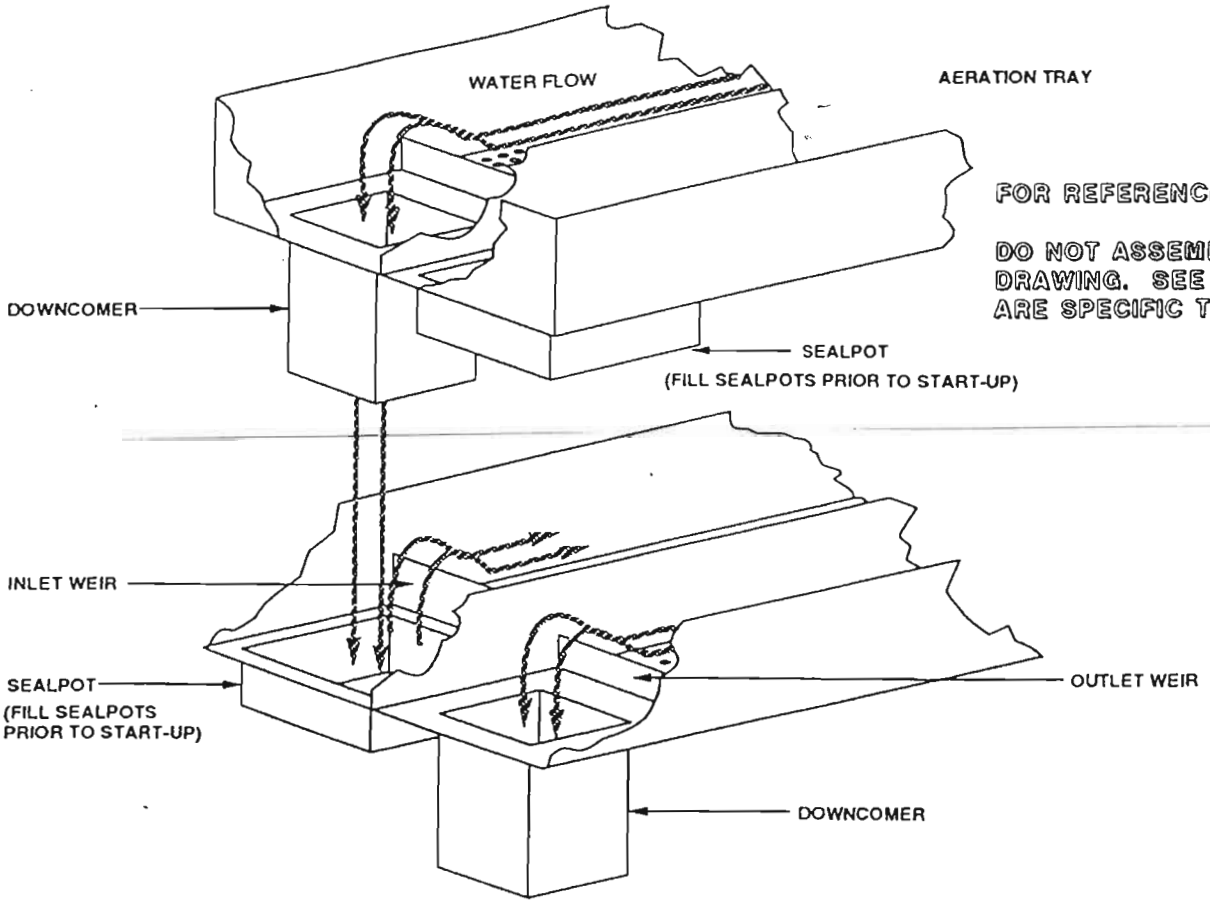
TABLE 1

MODEL	VENT LINE DIA. (INCHES)
1300	6-5/8
1300P	6-5/8
2300	6-5/8
2300P	6-5/8
2600	8-5/8
3600	10-5/8
31200	16-5/8
41200	18-5/8

NOTES:

1. RUBBER COUPLING WITH STAINLESS STEEL RING CLAMPS.
2. VENT LINE PIPE DIAMETER MUST BE EQUAL TO OR GREATER THAN THE AIR EXHAUST VENT DIAMETER ON THE AIR STRIPPER COVER.
3. FIRMLY SUPPORT PIPE AT ROOF PENETRATION.
4. FOR INTERMITTENT OPERATION, INSTALL WIRE MESH OF 1/4" (OR LARGER). FOR DRINKING WATER SUPPLY, INSTALL ELBOW WITH WIRE MESH.
5. ALLOW CLEARANCE FOR REMOVING SECTION OF VENT LINE FOR EASY ACCESS TO AERATION TRAYS.
6. PITCH VENT LINE TOWARD SHALLOW TRAY UNIT.
7. USE PIPING THAT HAS ADEQUATE STRENGTH (PRESSURE OR VACUUM) SPECIFICATIONS, AND THAT IS OF SUITABLE MATERIAL.

SEALPOT FUNCTION - WATER SEAL



FOR REFERENCE ONLY !

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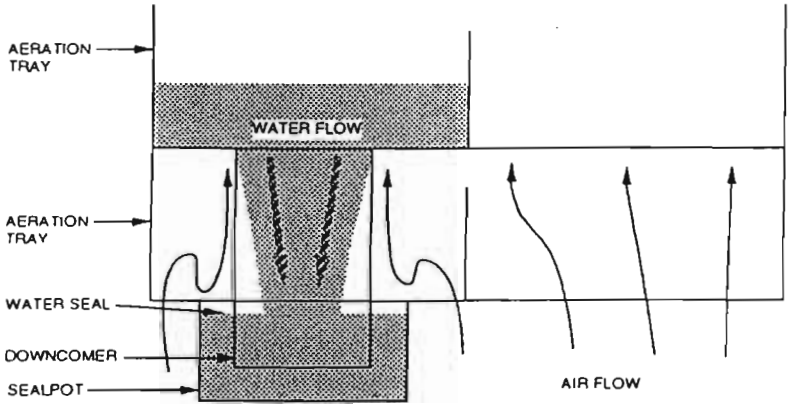
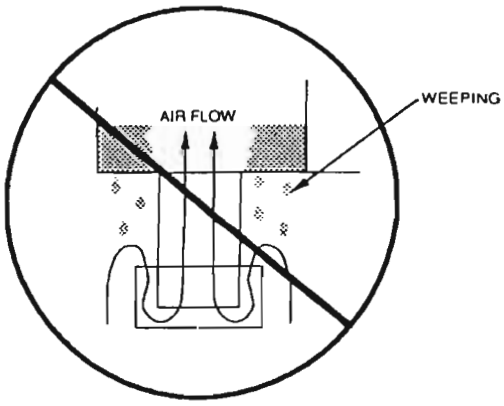
CAUTION!

SEALPOT MUST BE FILLED WITH WATER TO CREATE WATER SEAL.



FILLED SEALPOT



UNFILLED SEALPOT

1. EACH AERATION TRAY CONTAINS A SEALPOT. ALL SEALPOTS MUST BE FILLED WITH WATER TO FORM A WATER SEAL AROUND THE DOWNCOMERS.
2. IF SEALPOTS ARE NOT FILLED, AIR WILL TRAVEL UP THE DOWNCOMER AND PREVENT WATER FROM FLOWING DOWN THEM. THIS WILL CAUSE THE WATER TO WEEP THROUGH THE 3/16" AERATION HOLES ON THE BOTTOM OF EACH TRAY, RESULTING IN POOR REMOVAL EFFICIENCY.
3. THE SUMP TANK WATER LEVEL ACTS AS A WATER SEAL FOR THE BOTTOM TRAY DOWNCOMER MAINTAIN AT LEAST 3" OF WATER IN THE SUMP TANK AT ALL TIMES.
4. SEALPOTS CAN BE FILLED MANUALLY, OR BY FOLLOWING THE PROCEDURES LISTED IN THE OPERATION AND MAINTENANCE MANUAL

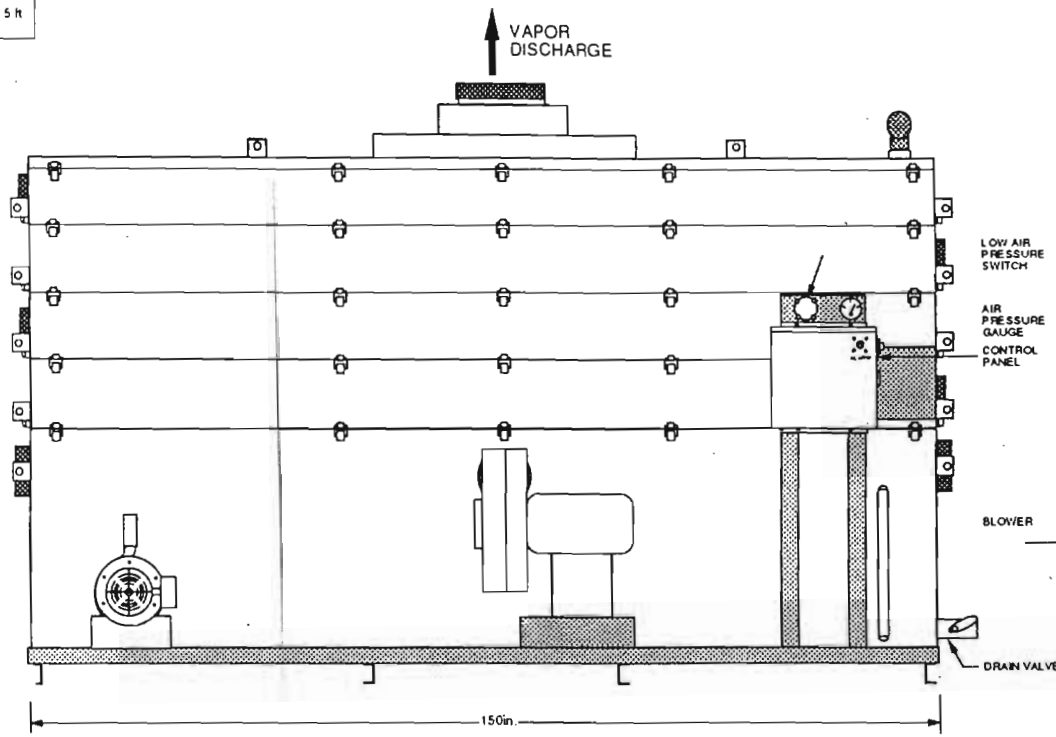
NORTH EAST ENVIRONMENTAL PRODUCTS, INC.
17 TECHNOLOGY DRIVE
WEST LEBANON, NH 03784
(603) 298-7061

TOLERANCES UNLESS OTHERWISE SPECIFIED ( ) in.	DRAWING NAME: SEALPOTS
	DRAWING #: 900-160-00061
DRAWN: MS DATE: 11/19/92	CUSTOMER:
REV: A 3/9/94	SCALE: SIZE: A SHEET: OF

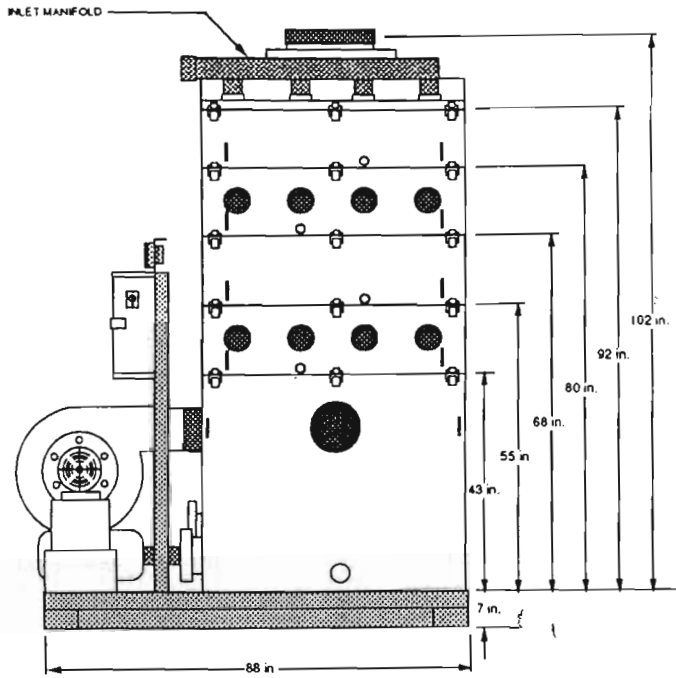
MINIMUM CLEARANCE

FRONT	1.5 ft
TOP	24 in
REAR	N.A.
LEFT	6.5 ft
RIGHT	6.5 ft

FRONT



RIGHT SIDE



BASIC SYSTEM

- ✓ SUMP TANK
- ✓ STRIPPER TRAYS
- ✓ BLOWER
- ✓ MIST ELIMINATOR
- ✓ PIPING
- ✓ SPRAY NOZZLE
- ✓ WATER LEVEL SIGHT TUBE
- ✓ GASKETS
- ✓ LATCHES

OPTIONAL ITEMS

- ✓ SKID & STANCHION
- ✓ AIR PRESSURE GAUGE
- ___ GRAVITY DISCHARGE PIPING
- ✓ DISCHARGE PUMP
- ___ FEED PUMP
- ___ ADDITIONAL BLOWER
- ___ EXPLOSION-PROOF MOTOR(S)
- ___ LOCAL DISCONNECT NEMA 7
- ✓ CONTROL PANEL
- ✓ MAIN DISCONNECT SWITCH
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NOTE:

1.) THIS DRAWING IS REPRESENTATIVE OF A TYPICAL CONFIGURATION SIMILAR TO THE UNIT REQUIRED, AND IS NOT INTENDED FOR ENGINEERING DESIGN OR LAYOUT PLEASE CONTACT YOUR NEEP REPRESENTATIVE FOR DETAILED DESIGN INFORMATION.

POWER: 3Ø, 460 Volt, 3 WIRE + GROUND 60 Hz

*CONSULT N.E.E.P. FOR AMPACITIES AND OTHER VOLTAGE OPTIONS

CONNECTION INFORMATION

ITEM	SIZE
GRAVITY DISCHARGE	10 in. Ø SOCKET, PVC80
DISCHARGE PUMP	2.5 in. Ø FNPT
WATER INLET	6 in. Ø FNPT
AIR EXHAUST NOZZLE	18 in. Ø STUB W/18 in. CPLG

NORTH EAST ENVIRONMENTAL PRODUCTS, IN
17 TECHNOLOGY DRIVE
WEST LEBANON, NEW HAMPSHIRE 03784
PHONE: 603-298-7061 FAX: 603-298-7

TOLERANCES UNLESS OTHERWISE SPECIFIED: ± 1 INCH	DRAWING NAME: ShallowTray® Model 41241
	DRAWING #: 41241-04-5601
DRAWN: gwc	CUSTOMER: MAC: Fairch[illegible] Mairoll, Babylo
DATE: 1/22/02	SCALE: NTS
	SHEET : 1 OF

North East Environmental Products Incorporated
17 Technology Drive West Lebanon, New Hampshire 03784
Phone: 603-298-7061 Fax: 603-298-7063

Friday, 11 April 2003

To: Ben Girard
Malcolm Pirnie Incorporated
40 Centre Drive
Orchard Park, New York 14127

Ph: 716-667-6645
Fax: 716-667-0279

From: Don Shearouse, P.E. ***don_shearouse@neepsystems.com***

Subject: ShallowTray #41241-5601: Tray Addition Upgrade

To follow-up your request, the following budgetary pricing to provide an additional tray and upgraded blower and control panel as well as offgas vapor-phase granular activated carbon (VGAC) for the existing ShallowTray. Attached modeling provides the offgas mass loadings from the upgraded model 41251 air stripper exhaust at 2400 scfm and increased influent concentration at 400 gpm.

One (1) series 41200 stripper tray, 304L SS fabrication; with gasket, latches, weirs, downcomer, & sealpot; US$ each $8,100.00

Induced draft ductwork, 18"Ø, from stripper exhaust to blower inlet, total US$, each $2,000.00

Blower, American Fan model RB 354-24.5 to deliver 2400 scfm at 38" w.c. (26" w.c. for stripper, 12" w.c. for VGAC and piping losses), complete with 50 HP 3Ø 460 volt 60 Hz TEFC motor, total: $10,000.00

Discharge ducting, 12"Ø flexible hose with clamps, for connecting blower discharge to VGAC vessels, interconnection between vessels, and connection to owner provided discharge stack (18" minimum diameter), total: $2,000.00

Three (3) [two online in series, one offline standby] VF-10000 vapor phase carbon adsorber vessels, each 7'8"H x 8'W x 10'L, requiring 5" w.c. each at 2400 scfm, each with 10,000 pounds of reactivated VGAC, each: $19,500.00

One (1) control panel, NEMA 4, 24" x 24" x12", for 125 amp 460 volt 3Ø service; factory built, tested, and UL certified, complete with 200 amp main disconnect, fuses, starter, overload, run light, and H-O-A switch for 50 HP blower motor and 7.5 HP pump motor, alarm lights, intermittent operation circuitry, and control power transformer: price US$, each: $3,288.00

Total Upgrade Package Selling Price, US$: $83,888.00

Shipping, unloading, electrical conduit and wiring, and mechanical installation is not included.

Please don't hesitate to phone or fax if we can assist with any questions, comments, or concerns you may have.

Kindest Regards,

D. Shearone

Total number of pages INCLUDING this cover page: THREE

Visit our website at www.neepsystems.com

ShallowTray
low profile air strippers

ShallowTray®
low profile air strippers

HIGH FLOW

System Performance Estimate

Client and Proposal Information:

Malcolm Pirnie: Ben Girard
fax#: 716-667-0279
Fairchild Republic, Farmingdale, NY
#41241-04-5601 add a tray

Series chosen:	41200	
Water Flow Rate:	400.0 gpm	90.9 m3/hr
Air Flow Rate:	2400 scfm	4080 m3/hr
Water Temp:	50 °F	10 °C
Air Temp:	40 °F	4 °C
A/W Ratio:	45	45
Safety Factor:	None	

Contaminant	Untreated Influent Effluent Target	Model 41211 Effluent lbs/hr PPMv %removal	Model 41221 Effluent lbs/hr PPMv %removal	Model 41231 Effluent lbs/hr PPMv %removal	Model 41241 Effluent lbs/hr PPMv %removal	Model 41251 Effluent lbs/hr PPMv %removal
Trichloroethylene	1500 ppb	484 ppb	156 ppb	50 ppb	16 ppb	5 ppb
Solubility 1100 ppm	ppb	0.20 4.1	0.27 5.4	0.29 5.8	0.30 6.0	0.30 6.0
Mwt 131.5		67.7487%	89.5986%	96.6454%	98.9181%	99.6511%

This report has been generated by ShallowTray Modeler software version Ev2.2. This software is designed to assist a skilled operator in predicting the performance of a ShallowTray air stripping system. North East Environmental Products, Inc. (NEEP) is not responsible for incidental or consequential damages resulting from the improper operation of either the software or the air stripping equipment.

Report Generated: 4/11/03 Modeler Ev2.3 ppmv

MALCOLM PIRNIE

APPENDIX G

WATERLINK BARNEBEY SUTCLIFFE, LIQUID PHASE GRANULAR ACTIVATED CARBON SYSTEM PRODUCT INFORMATION AND PERFORMANCE PROJECTIONS

Product Bulletin

"DD"

WATERLINK®
Barnebey Sutcliffe

PROTECT™ LS SERIES

Large Capacity Liquid Adsorbers

Barnebey Sutcliffe Corporation offers a complete line of large capacity code design liquid phase adsorbers. The **PROTECT™ LS Series** is designed as a high flow, high pressure adsorber that can easily be put into service.

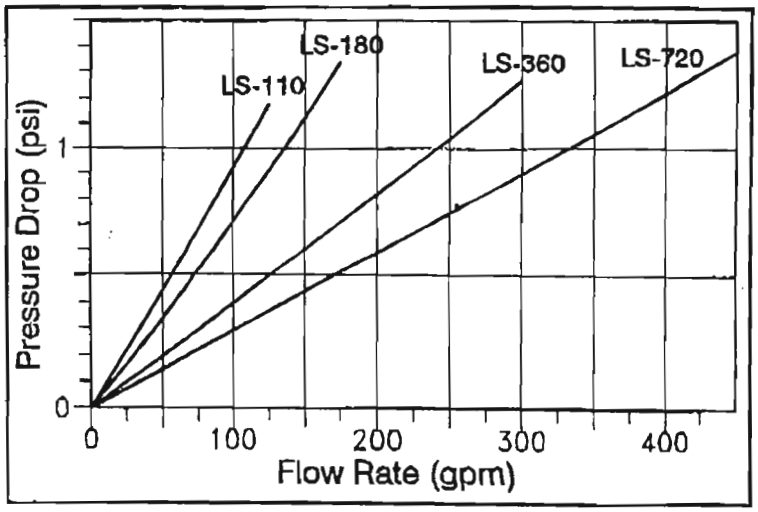
The **PROTECT™ LS Series** adsorbers are designed for a operating pressure of 100-psi, maximum temperature of 140°F, and are designed to hold from 3,200 to 20,000-lbs. of activated carbon or 110 to 720-ft³ of other granular media.

Model #	GAC ft³/lbs	Recommended Maximum Flow Rate	Estimated Weight (Empty/Operating)
LS-110	110/3,200	110-gpm	4,015/17,525
LS-180	180/5,000	160-gpm	4,225/24,480
LS-360	360/10,000	275-gpm	8,545/53,365
LS-720	720/20,000	430-gpm	16,700/101,965

For smaller sizes and flow rates see Product Information Bulletin # CD1.

Important Features

- Durable carbon steel construction.
- ASME Section VIII Div. 1 Code design for 100-psi.
- Lifting lugs to facilitate moving and placement.
- Lower carbon steel header with PVC contoured laterals positioned for superior distribution and eliminates the need for a GAC support bed.
- Upper carbon steel header with PVC laterals allow for backwashing and/or upflow operation.
- Flanged influent/effluent connections.
- Elliptical manways on top head and lower side shell for easy access.
- Pressure relief, vent and utility connections.
- Heavy duty chemical resistant internal epoxy lining.
- Exterior protected with a rust-inhibitive epoxy urethane for a durable finish.
- Can be filled with any of Barnebey's reactivated or virgin activated carbons or other granular media.
- All models available for rent.



For More Information and Pricing Call
1-800-886-2272
and Talk to One of Our Knowledgeable Technical Support Personnel
or Visit Our Web Site at
http://www.bscarbons.com

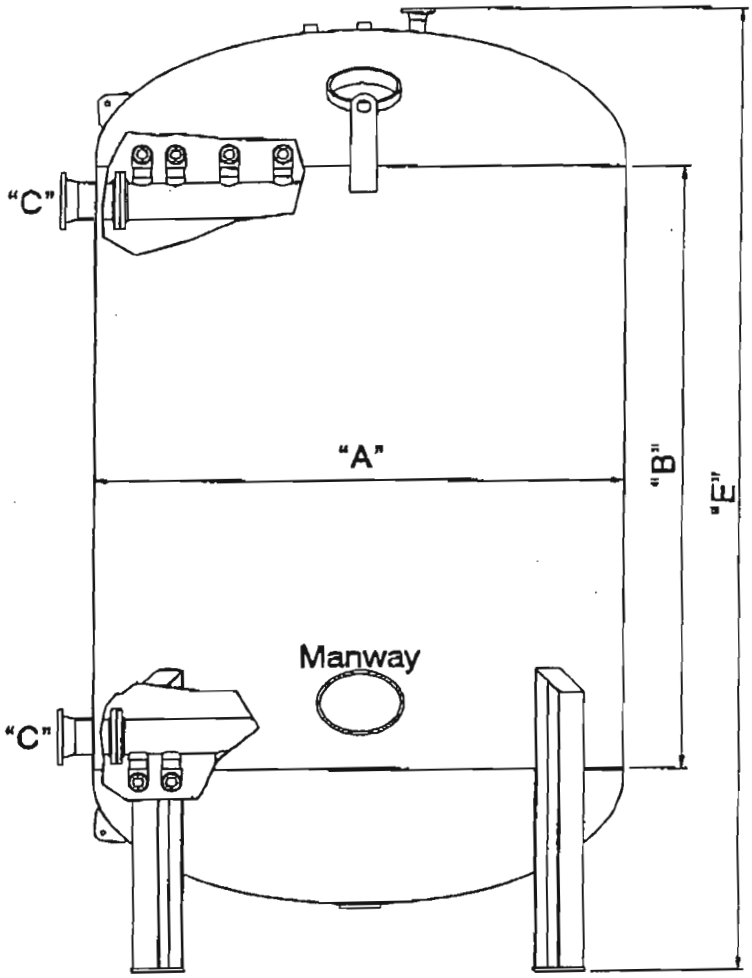
Volume and weight based on liquid phase bituminous carbon @ 28-lbs/ft³.

Estimated pressure drop based on virgin 8x30 carbon.

Design and specifications subject to change without notice.

"DD"

Description	Type	Orientation	Location
Inlet/Outlet	150# RF Spool	180°	Side Shell
Pressure Relief	150# RF Nozzle	90°	Top Head
Vent	2" Full Clpg	225°	Top Head
Drain/Media Transfer	150# RF Pad Flg	Center	Bottom Head
Utility	2" Full Clpg	Center	Top Head
Manway #1	14"x18" Elliptical	270°	Side Shell
Manway #2	14"x18" Elliptical	315°	Top Head



Available Options:

- ◊ FDA & NSF Approved Linings
- ◊ ASME Code Stamp
- ◊ Custom Linings
- ◊ Custom Colors
- ◊ Higher Operating Temperatures
- ◊ Stainless Steel Construction
- ◊ Stainless Steel Internals
- ◊ Media Fill Piping
- ◊ Vent Piping
- ◊ Large Round Manway
- ◊ PRV
- ◊ Air Release Valves
- ◊ Prepiped Dual Systems
- ◊ Skid Mounted Multi Vessel Systems
- ◊ Call for Your Custom Configuration

Barnebey Sutcliffe Corp.
1-800-886-2272

Drawings not to scale.
Design and specifications subject to change without notice.

Model #	Diameter "A"	Can Length "B"	Inlet/Outlet "C"	Overall Hgt. "E"	Pressure Relief	Drain/Media Transfer
LS-110	60"	96"	4"	146"±	2"	2"
LS-180	72"	96"	4"	151"±	2"	2"
LS-360	96"	120"	6"	190"±	3"	3"
LS-720	120"	144"	8"	230"±	3"	4"

"CC"

BARNEBEY SUTCLIFFE
A WATERLINK COMPANY

Powerful Solutions for a New Tomorrow

Activated Carbon 207A-12

Coal Based Activated Carbon

207A-12 is manufactured from specific grades of bituminous coal by high-temperature steam activation under rigidly controlled conditions. The carbon is versatile for use in a range of liquid-phase purification applications, including potable water treatment, wastewater treatment and industrial processes.

Specifications

Iodine Number [BSC 90-032]	1000 mg/g Minimum
Moisture Content [ASTM D-2867]	5 % w/w Maximum
Particle Size [ASTM D-2862]	12x40 US Mesh
On 12	15 % w/w
Through 40	5 % w/w

Typical Properties

Ball Pan Hardness [ASTM D-3802]	90
Ash Content [ASTM D-2866]	15% w/w
Bulk Density [ASTM D-2854]	0.50 g/cm^3
Backwashed and Drained Density	0.48 g/cm^3

Packaging Options

50 Pound bags	Bulk tanker	15 Gallon drum
55 Gallon drum	1,000 Pound bulk sacks	

Unless otherwise specified, particle size distribution will be 5% maximum on the top screen and 5% maximum through the bottom screen. An MSDS is available for all BSC activated carbon products. If the moisture exceeds the referenced value, BSC weight adjusts to the referenced value.

835 N. Cassady Ave. • Columbus, OH •43219• 1-800-886-2272 • 614-258-9501• Fax 614-258-3464 • E-mail: activated_carbon@waterlink.com• www.bscarbons.com
Rocky Mountain Office • Reno, NV • 775-355-7770 • Fax 775-355-7785 • Western Regional Office • Los Angeles, CA • 562-802-3400 • Fax 562-802-3480
Gulf Coast Office •Sulphur, LA •337-527-0084 • Fax 337-527-0087 • Northeast Regional Office • Downingtown, PA • 610- 870-3070 • Fax 610-870-3072

Product Bulletin

"EE"

WATERLINK
Barnebey Sutcliffe

PROTECT™ LD SERIES

Dual Vessel Liquid Adsorption Systems

Barnebey Sutcliffe Corporation offers a complete line of code design liquid phase adsorbers. The **PROTECT™ LD Series** consists of a pair of code design high pressure adsorbers, skid mounted with lead/lag piping.

The **PROTECT™ LD Series** adsorbers are designed for a maximum pressure of 100-psi, maximum temperature of 140°F, and are designed to hold a from 6,400 to 40,000-lbs. of activated carbon or 220 to 1,440-ft³ of other granular media.

Model #	GAC ft³/lbs	Recommended Maximum Flow Rate*	Estimated Weight** (Empty/Operating)
LD-110	220/6,400	220-gpm	10,635/37,655
LD-180	360/10,000	320-gpm	10,035/51,550
LD-360	720/20,000	550-gpm	22,620/112,260
LD-720	1,440/40,000	860-gpm	44,040/214,570

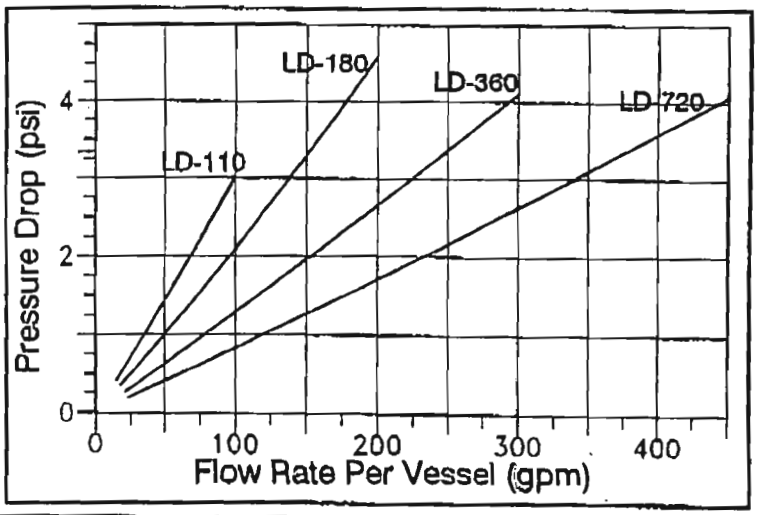
* This maximum flow rate can only be attained if the two vessels are operated in parallel. If units are operated in series, the maximum flow rate will be half of the number shown above.

** Operating weight based on system loaded with GAC and filled with water.

Note: Pressure drop chart reflects series operation.

Important Features

- Durable carbon steel construction.
- ASME Section VIII Div. 1 Code design for 100 psi.
- Lifting lugs, horizontal and vertical, for individual vessel moving and placement.
- Lower carbon steel header with PVC contoured laterals positioned for superior distribution and eliminates the need for a GAC support bed.
- Upper carbon steel header with PVC laterals allow for backwash and/or upflow operation.
- Piping header allows vessels to operate in lead/lag, parallel, or single configurations.
- Graphite rupture disk protects against over pressure and allows for easy replacement.
- Heavy duty chemical resistant internal lining.
- Exterior protected with a rust-inhibitive epoxy urethane for a durable finish.
- Can be filled with any of Barnebey's reactivated or virgin activated carbons or other granular medias.
- All models available for rent.



For More Information and Pricing Call
1-800-886-2272
and Talk to One of Our Knowledgeable Technical Support Personnel
or Visit Our Web Site at
http://www.bscarbons.com

Volume and weight based on liquid phase bituminous carbon @ 28-lbs/ft³.

Estimated pressure drop based on virgin 8x30 carbon.

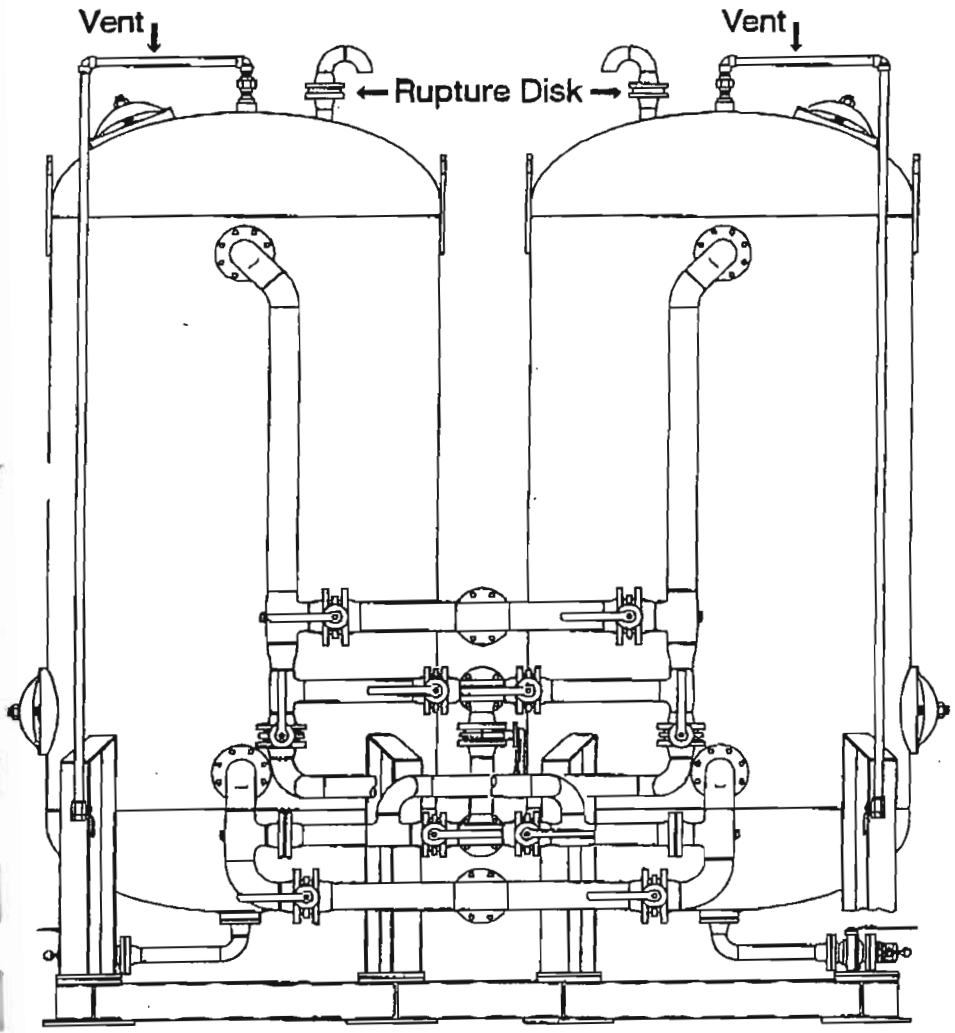
Design and specifications subject to change without notice.

"EE"

Model #	Service	Backwash	Vent	Rupture	GAC	Screen
LD-110	3"	4"	1"	2"	2"	1"
LD-180	3"	4"	1"	2"	2"	1"
LD-360	4"	6"	1"	3"	3"	1"
LD-720	6"	8"	1"	3"	4"	1"

Available Options:

- ◊ FDA & NSF Approved Linings
- ◊ Custom Linings
- ◊ Custom Colors
- ◊ Higher Operating Temperatures
- ◊ ASME Code Stamp
- ◊ Stainless Steel Construction
- ◊ Stainless Steel Internals
- ◊ GAC Fill Line
- ◊ PRVs
- ◊ Air Release Valves
- ◊ Call for Your Custom Configuration



Barnebey Sutcliffe Corp.
1-800-886-2272

Drawings not to scale.
Design and specifications subject to change without notice.

Model #	Vessel Diameter	Can Length	Overall Length	Overall Width	Overall Hgt.
LD-110	60"	96"	11'-4"±	6'-11"±	13'-5"±
LD-180	72"	96"	13'-6"±	7'-11"±	14'-0"±
LD-360	96"	120"	17'-5"±	10'-3"±	17'-7"±
LD-720	120"	144"	22'-4"±	12'-11"±	20'-11"±

BARNEBEY SUTCLIFFE
A WATERLINK COMPANY

BARNEBEY SUTCLIFFE CORP.
835 North Cassady Avenue
Columbus, OH 43219-2203 USA
Phone: (614) 258-9501
Fax: (614) 258-3464
Web: www.bscarbons.com
Email: activated_carbon@waterlink.com
Email: wreinhart@waterlink.com

Fax

TO:	**David M. Patton, P.E.**	FROM:	Elwood V. Reinhart
COMPANY:	**Malcolm Pirnie, Inc. (Buffalo)**	DATE:	August 11, 2003
FAX NO.:	**1-716-667-0279**	TIME:	1:51 PM
SUBJECT:	**QUOTATION FOR GROUNDWATER PUMP & TREAT PROJECT Fairchild Republic Airport Farmingdale, Long Island, NY LIQUID PHASE GAC TREATMENT (polishing air stripper H2O effluent)**	Page #1 of 11 page(s)	

Dear David, good afternoon!

I am faxing you the information and budget pricing for the "Liquid Phase GAC Treatment System" to polish the water effluent from the existing Neep air stripper system. The attached Exhibits AA through EE are for your review and our further discussion upon your receipt.

Exhibit AA: The **Neep ShallowTray Air Stripper, System Performance Estimate** is attached. We re-calculated performance for 400 gpm water flow rate in lieu of the original 250 gpm. Based on upgrading the existing 412241 to a 41251 by adding a 5th tray and changing the fan to meet the new requirements, you have a new effluent calculation for water polishing.

Mark Stouffer is due back tomorrow and I will have him early tomorrow **re-calculate the Mass Balance Calculation at 400 gpm** of the various constituents. I can then insert the new ppm numbers into the charts and fax them to you for carbon consumption based on 100% efficiency.

Exhibit BB: The three pages are the **carbon consumption based on "no" air stripper on-line.** This means that based on the water influent concentrations, the usage would be approx. 3429 lbs. of carbon per day based on 400 gpm flow rate. The carbon beds would be estimated to last about 5 days on an emergency basis if the air stripper is off-line. As a polisher of the water effluent from the air stripper, the carbon beds would last a long time. At the low concentrations of the constituents (7 ppb total VOC's) it's difficult to predict how long the beds will last.

Exhibit CC: This is the Product Information Sheet for our **Type 207A-12 12x40 mesh** virgin activated GAC carbon that is recommended for the liquid phase carbon adsorbers.

Carbon Replacement Cost is estimated at $0.72/lb. FOB Columbus, OH, supplied in super sacks.

Exhibit DD: This exhibit shows the LS Series and I have selected **two LS-360 adsorbers** without any external face piping. Two adsorbers would be required for the 400 gpm flow rate. Each adsorber has 10,000 lbs. of carbon. Carbon to be installed in the field by others.

Budget Price: Two LS-360 adsorbers with carbon but without external piping and valves is $57,800.00 FOB Sulfur, LA, fabricated at our own tank fabrication facility.

Exhibit EE: I have also quoted on a **duplex LD-360** as shown in this exhibit in case you wish to include face piping for service, back washing and rinsing of the carbon beds if required. As a polisher of the water effluent, this will depend on the turbidity of the water effluent. It's always good anyway to fluff the carbon beds to prevent a "packed bed" that does not allow for back washing that reclassifies the bed and prevents short circuit of the bed and removes turbidity. Carbon to be installed in the field by others.

Budget Price: One LD-360 adsorber duplex system with carbon and external piping and valves is $70,020.00 FOB Sulfur, LA, fabricated at our own tank fabrication facility.

Carbon Service Change-Out: We estimate $26,724.00 for the Vac & Rebed of 20,000 lbs. of carbon per dual bed change-out. This budget price includes labor and equipment to remove and replace the carbon bed, transportation costs for the service crew, super sacks for the disposal of the spent carbon, transportation of virgin carbon to the site and disposal of the spent carbon & TCLP testing by BSC. 20,000 lbs. of virgin carbon is included in this price. Price does not include a forklift operator, which is to be provided by the end user as required. Service prices are based on non-hazardous media as determined by the TCLP testing. Spent Carbon Profile Application will be required with the TCLP test results. If carbon proves to be hazardous per the TCLP test result, the adder for the hazardous service is approximately $4,000.00 for each 20,000 lbs. carbon service change-out.

If the 20,000 lbs. of carbon (10,000 lbs. per adsorber) is to be installed by the Adsorber/Carbon supplier, during system start-up, the estimated service price is $4,100.00 to be added to the total price. Deduct $900.00 for travel of service crew if this installation can be accomplished at the same time as BSC Service Crew installs carbon in the vapor phase adsorbers.

David, again thank you for the opportunity to work with you on the Fairchild Republic Pump & Treat Remediation Site in Farmingdale, Long Island, NY. Will call you shortly on this project.

Sincerely,

BARNEBEY SUTCLIFFE CORPORTION

Woody Steinhart

Regional Sales Manager
Carbon & Service Division

Enclosures
CC: D. Ivey

"AA"

ShallowTray®
low profile air strippers

System Performance Estimate

Client and Proposal Information:

Barnebey Sutcliffe Corp
Republic Airport
Farmington, NY

Liquid Phase

8/11/03

HIGH FLOW

Upgrade to

Series chosen:	41200	
Water Flow Rate:	400 gpm	90.9 m3/hr
Air Flow Rate:	2400 scfm	4080 m3/hr
Water Temp:	60 °F	10 °C
Air Temp:	50 °F	10 °C
A/W Ratio:	45 :1	
Safety Factor:	5%	

EXISTING

Contaminant	Untreated Influent / Effluent Target	SELECTED MODEL Model 41211 Effluent lbs/hr / ppmv / %removal	Model 41221 Effluent lbs/hr / ppmv / %removal	Model 41231 Effluent lbs/hr / ppmv / %removal	Model 41241 Effluent lbs/hr / ppmv / %removal	Model 41251 Effluent lbs/hr / ppmv / %removal
Benzene Solubility 1,780 ppm Mwt 78.12	2 ppb ppb	<1 ppb 0.00 0.01 68.72%	<1 ppb 0.00 0.01 80.21%	<1 ppb 0.00 0.01 85.94%	<1 ppb 0.00 0.01 95.04%	<1 ppb 0.00 0.01 98.70%
Vinyl Chloride Solubility 1100 ppm Mwt 62.5	6.17 ppb ppb	<1 ppb 0.00 0.04 84.91%	<1 ppb 0.00 0.05 97.72%	<1 ppb 0.00 0.05 98.66%	<1 ppb 0.00 0.05 99.59%	<1 ppb 0.00 0.05 99.99%
1,1-Dichloroethylene Solubility 500 ppm Mwt 96.94	18.85 ppb ppb	2 ppb 0.00 0.05 93.41%	<1 ppb 0.00 0.06 97.25%	<1 ppb 0.00 0.06 99.64%	<1 ppb 0.00 0.06 99.92%	<1 ppb 0.00 0.06 99.99%
1,1-Dichloroethylene Solubility 500 ppm Mwt 96.94	8.67 ppb ppb	<1 ppb 0.00 0.00 83.41%	<1 ppb 0.00 0.00 97.25%	<1 ppb 0.00 0.00 99.54%	<1 ppb 0.00 0.00 99.92%	<1 ppb 0.00 0.00 99.99%
cis-1,2-DCE Solubility 6,800 ppm Mwt 96.94	233.33 ppb ppb	99 ppb 0.03 0.73 57.50%	42 ppb 0.04 1.04 81.94%	13 ppb 0.04 1.17 92.32%	8 ppb 0.05 1.23 98.74%	3 ppb 0.05 1.25 99.91%
Chloroform Solubility 8,000 ppm MW 118.38	1.83 ppb ppb	<1 ppb 0.00 0.00 58.83%	<1 ppb 0.00 0.01 83.89%	<1 ppb 0.00 0.01 93.52%	<1 ppb 0.00 0.01 97.40%	<1 ppb 0.00 0.01 99.95%
Trichloroethylene Solubility 1100 ppm Mwt 131.5	813.83 ppb ppb	275 ppb 0.11 2.17 86.21%	93 ppb 0.14 2.80 88.58%	31 ppb 0.16 3.14 96.14%	11 ppb 0.18 3.23 98.70%	4 ppb 0.18 3.26 99.56%
Tetrachloroethylene Solubility 150 ppm Mwt 165.83	77.5 ppb ppb	23 ppb 0.01 0.17 70.41%	7 ppb 0.01 0.23 91.24%	2 ppb 0.02 0.24 97.41%	<1 ppb 0.02 0.25 98.23%	<1 ppb 0.02 0.25 99.77%
1,1- Dichloroethane Solubility 5,500 ppm Mwt 98.96	9.33 ppb ppb	3 ppb 0.00 0.03 64.37%	1 ppb 0.00 0.04 87.31%	<1 ppb 0.00 0.05 95.45%	<1 ppb 0.00 0.05 98.39%	<1 ppb 0.00 0.05 99.43%
1,1,1-Trichloroethane Solubility 4,400 ppm Mwt 133.41	7.67 ppb ppb	2 ppb 0.00 0.02 79.02%	<1 ppb 0.00 0.03 95.60%	<1 ppb 0.00 0.03 98.06%	<1 ppb 0.00 0.03 99.81%	<1 ppb 0.00 0.03 99.98%
1,2-Trichlorotrifluoroethane (F113) Solubility 200ppm Mwt 187	8.17 ppb ppb	<1 ppb 0.00 0.02 91.49%	<1 ppb 0.00 0.02 98.28%	<1 ppb 0.00 0.02 99.94%	<1 ppb 0.00 0.02 99.99%	<1 ppb 0.00 0.02 100.00%
Based on theoretical data only, CONSULT NEEP REPRESENTATIVE FOR WARRANTY						
Dichlorodifluoromethane Solubility 280 ppm Mwt 121	3 ppb ppb	<1 ppb 0.00 0.01 84.53%	<1 ppb 0.00 0.01 98.73%	<1 ppb 0.00 0.01 99.99%	<1 ppb 0.00 0.01 100.00%	<1 ppb 0.00 0.01 100.00%
Based on theoretical data only, CONSULT NEEP REPRESENTATIVE FOR WARRANTY						

upgrade with 5th tray + upgrade fan

Total ppb	1172 ppb	407 ppb	144 ppb	52 ppb	19 ppb	7 ppb
Total VOC lbs/hr - ppmv		0.15 3.27	0.21 4.40	0.22 4.80	0.23 4.95	0.23 5.00
Total		85.29%	97.88%	99.54%	99.97%	99.40%

This report has been generated by ShallowTray Modeler software version 6.12e. This software is designed to assist a skilled operator in predicting the performance of a ShallowTray air stripping system. North East Environmental Products, Inc. (NEEP Systems) is not responsible for incidental or consequential damages resulting from the improper operation of either the software or the air stripping equipment. This software is © Copyright North East Environmental Products, Inc., 2001.

Report Generated: 8/11/2003 Modeler V6.12e 5/24/2001

"BB"

Barnebey & Sutcliffe Corp.
Technical Department
Liquid Phase Consumption Calculation
Activated Carbon Type 207A

WATER FLOW RATE (gpm): 400

Rev 2
08/07/03

Compound	Inlet Concentration	Adsorption Capacity	Carbon Usage (lb GAC/ 1000 gal H20)	Carbon Usage Corrected For TOC (lb GAC/ 1000 gal H20)	Carbon Usage Rate (lb gac /24 hrs	Range
	(ugm/l)	% (w/w)				
ACENAPHTHENE	0.000	0.000	0.0000	0.000	0.000	
ACENAPHTHYLENE	0.000	0.000	0.0000	0.000	0.000	
ACETALDEHYDE	0.000	0.000	0.0000	0.000	0.000	
ACETIC ACID	0.000	0.000	0.0000	0.000	0.000	
ACETONE	0.000	0.000	0.0000	0.000	0.000	
ACETONITRILE	0.000	0.000	0.0000	0.000	0.000	
ACETOPHENONE	0.000	0.000	0.0000	0.000	0.000	
ACETYLAMINOFLUORENE-2	0.000	0.000	0.0000	0.000	0.000	
ACRIDINE ORANGE	0.000	0.000	0.0000	0.000	0.000	
ACRIDINE YELLOW	0.000	0.000	0.0000	0.000	0.000	
ACROLEIN	0.000	0.000	0.0000	0.000	0.000	
ACRYLAMIDE	0.000	0.000	0.0000	0.000	0.000	
ACRYLONITRILE	0.000	0.000	0.0000	0.000	0.000	
ADENINE	0.000	0.000	0.0000	0.000	0.000	
ADIPIC ACID	0.000	0.000	0.0000	0.000	0.000	
ALDRIN	0.000	0.000	0.0000	0.000	0.000	
ALPHA-BHC	0.000	0.000	0.0000	0.000	0.000	
ALPHA-CHLOROTOLUENE	0.000	0.000	0.0000	0.000	0.000	
ALPHA-ENDOSULFAN	0.000	0.000	0.0000	0.000	0.000	
ALPHA-NAPHOL	0.000	0.000	0.0000	0.000	0.000	
ALPHA-NAPHTHYLAMINE	0.000	0.000	0.0000	0.000	0.000	
AMINOBIPHENYL-4	0.000	0.000	0.0000	0.000	0.000	
ANDRIN	0.000	0.000	0.0000	0.000	0.000	
ANETHOLE	0.000	0.000	0.0000	0.000	0.000	
ANILINE	0.000	0.000	0.0000	0.000	0.000	
ANISIDINE	0.000	0.000	0.0000	0.000	0.000	
ANTHRACENE	0.000	0.000	0.0000	0.000	0.000	
ATRAZINE	0.000	0.000	0.0000	0.000	0.000	
ARACLOR 1254	0.000	0.000	0.0000	0.000	0.000	
BENZENE	2.000	0.131	0.0129	0.138	79.582	IR
BENZIDINE DIHYDROCHLORIDE	0.000	0.000	0.0000	0.000	0.000	
BENZO(A)PYRENE	0.000	0.000	0.0000	0.000	0.000	
BENZO(GHI)PERYLENE	0.000	0.000	0.0000	0.000	0.000	
BENZO(K)FLUORANTHENE	0.000	0.000	0.0000	0.000	0.000	
BENZOFLUORANTHENE-3,4	0.000	0.000	0.0000	0.000	0.000	
BENZOIC ACID	0.000	0.000	0.0000	0.000	0.000	
BENZOTHIAZOLE	0.000	0.000	0.0000	0.000	0.000	
BENZYL ALCOHOL	0.000	0.000	0.0000	0.000	0.000	
BETA-BHC	0.000	0.000	0.0000	0.000	0.000	
BETA-ENDOSULFAN	0.000	0.000	0.0000	0.000	0.000	
BETA-NAPHTHOL	0.000	0.000	0.0000	0.000	0.000	
BETA-NAPHTHYLAMINE	0.000	0.000	0.0000	0.000	0.000	
BIPHENOL-O-O	0.000	0.000	0.0000	0.000	0.000	
2-2'BIPYRIDINE	0.000	0.000	0.0000	0.000	0.000	
BIS(CHLOROETHOXY-2)METHANE	0.000	0.000	0.0000	0.000	0.000	
BIS(CHLOROETHYL-2)ETHER	0.000	0.000	0.0000	0.000	0.000	
BIS(CHLOROISOPROPYL-2)ETHER	0.000	0.000	0.0000	0.000	0.000	
BIS(ETHYLHEXYL-2) PHTHLATE	0.000	0.000	0.0000	0.000	0.000	
BROMODICHLOROMETHANE	0.000	0.000	0.0000	0.000	0.000	
BROMOFORM	0.000	0.000	0.0000	0.000	0.000	
BROMOPHENOL	0.000	0.000	0.0000	0.000	0.000	
BROMOPHENYL-4 PHENYL ETHER	0.000	0.000	0.0000	0.000	0.000	
BROMOURACIL-5	0.000	0.000	0.0000	0.000	0.000	
BUTANOL-1	0.000	0.000	0.0000	0.000	0.000	
BUTYL-N PHTHALATE	0.000	0.000	0.0000	0.000	0.000	
BUTYLBENZYL PHTHALATE	0.000	0.000	0.0000	0.000	0.000	
CARBON TETRACHLORIDE	0.000	0.000	0.0000	0.000	0.000	
CHLORDANE	0.000	0.000	0.0000	0.000	0.000	
CHLOROACETONE	0.000	0.000	0.0000	0.000	0.000	
CHLOROBENZENE	0.000	0.000	0.0000	0.000	0.000	
CHLOROETHANE	0.000	0.000	0.0000	0.000	0.000	
CHLORO-1 NITROBENZENE-2	0.000	0.000	0.0000	0.000	0.000	
CHLOROETHYL-2 VINYL ETHER	0.000	0.000	0.0000	0.000	0.000	
CHLOROFORM	1.630	0.012	0.1304	0.403	232.348	IR
CHLORONAPHTHALENE-2	0.000	0.000	0.0000	0.000	0.000	
CHLOROPHENOL O	0.000	0.000	0.0000	0.000	0.000	
CHLOROPHENOL-2	0.000	0.000	0.0000	0.000	0.000	
CHLOROPHENYL-4 PHENYL ETHER	0.000	0.000	0.0000	0.000	0.000	
1-CHLOROPROPANE	0.000	0.000	0.0000	0.000	0.000	
CHLOROURACIL-5	0.000	0.000	0.0000	0.000	0.000	
CHRYSENE	0.000	0.000	0.0000	0.000	0.000	
COUMARIN	0.000	0.000	0.0000	0.000	0.000	
CRESOL	0.000	0.000	0.0000	0.000	0.000	

"BB"

CYCLOHEXANE	0.000	0.000	0.0000	0.000	0.000	
CYCLOHEXANONE	0.000	0.000	0.0000	0.000	0.000	
DDD	0.000	0.000	0.0000	0.000	0.000	
DDE	0.000	0.000	0.0000	0.000	0.000	
DDT	0.000	0.000	0.0000	0.000	0.000	
DIBENZO(A,H)ANTHRACENE	0.000	0.000	0.0000	0.000	0.000	
DIBROMO-1,2-3-CHLOROPROPANE	0.000	0.000	0.0000	0.000	0.000	
DIBROMOCHLOROMETHANE	0.000	0.000	0.0000	0.000	0.000	
1,2-DIBROMOCHLOROPROPANE (DBCP)	0.000	0.000	0.0000	0.000	0.000	
DIBUTYL PHTHALATE-N	0.000	0.000	0.0000	0.000	0.000	
DICHLOROBENZENE-1,2	0.000	0.000	0.0000	0.000	0.000	
DICHLOROBENZENE-1,3	0.000	0.000	0.0000	0.000	0.000	
DICHLOROBENZENE-1,4	0.000	0.000	0.0000	0.000	0.000	
DICHLOROBENZIDINE-3,3	0.000	0.000	0.0000	0.000	0.000	
DICHLOROBROMOMETHANE	0.000	0.000	0.0000	0.000	0.000	
2,4-DICHLOROCRESOL	0.000	0.000	0.0000	0.000	0.000	
DICHLOROETHANE-1,1	0.000	0.000	0.0000	0.000	0.000	
DICHLOROETHANE-1,2	9.330	0.032	0.2504	0.548	314.473	IR
DICHLOROETHENE-1,1	11.520	0.072	0.1365	0.412	237.279	IR
DICHLOROETHENE-TRANS	233.330	0.376	0.5252	0.770	443.458	IR
DICHLOROMETHANE	0.000	0.000	0.0000	0.000	0.000	
DICHLOROPHENOL-2,4	0.000	0.000	0.0000	0.000	0.000	
2,4-DICHLOROPHENOXY ACETIC ACID	0.000	0.000	0.0000	0.000	0.000	
DICHLOROPROPANE-1,2	0.000	0.000	0.0000	0.000	0.000	
DICHLOROPROPENE-1,2	0.000	0.000	0.0000	0.000	0.000	
DIELDRIN	0.000	0.000	0.0000	0.000	0.000	
DIETHYL ETHER	0.000	0.000	0.0000	0.000	0.000	
DIETHYL KETONE	0.000	0.000	0.0000	0.000	0.000	
DIETHYL PHTHALATE	0.000	0.000	0.0000	0.000	0.000	
DIETHYLENE GLYCOL	0.000	0.000	0.0000	0.000	0.000	
DIETHYLFORMAMIDE	0.000	0.000	0.0000	0.000	0.000	
DIMETHYL MALONIC ACID	0.000	0.000	0.0000	0.000	0.000	
DIMETHYL PHENOL-2,6	0.000	0.000	0.0000	0.000	0.000	
DIMETHYL PHTHALATE	0.000	0.000	0.0000	0.000	0.000	
DIMETHYLAMINOZOBENZENE-4	0.000	0.000	0.0000	0.000	0.000	
DIMETHYLPHENOL-2,4	0.000	0.000	0.0000	0.000	0.000	
DIMETHYLPHENYLCARBINOL	0.000	0.000	0.0000	0.000	0.000	
DINITRO-O-CRESOL-4,6	0.000	0.000	0.0000	0.000	0.000	
DINITROPHENOL-2,4	0.000	0.000	0.0000	0.000	0.000	
DINITROTOLUENE-2,4	0.000	0.000	0.0000	0.000	0.000	
DINITROTOLUENE-2,6	0.000	0.000	0.0000	0.000	0.000	
1,4-DIOXANE	0.000	0.000	0.0000	0.000	0.000	
DIPHENYLAMINE	0.000	0.000	0.0000	0.000	0.000	
DIPHENYLHYDRAZINE-1,1	0.000	0.000	0.0000	0.000	0.000	
EDTA	0.000	0.000	0.0000	0.000	0.000	
ENDOSULFAN SULFATE	0.000	0.000	0.0000	0.000	0.000	
ENDRIN	0.000	0.000	0.0000	0.000	0.000	
ETHANOL	0.000	0.000	0.0000	0.000	0.000	
ETHYL BUTYL KETONE	0.000	0.000	0.0000	0.000	0.000	
ETHYL ACETATE	0.000	0.000	0.0000	0.000	0.000	
ETHYLBENZENE	0.000	0.000	0.0000	0.000	0.000	
ETHYLBUTANOL-2	0.000	0.000	0.0000	0.000	0.000	
ETHYLENE DIBROMIDE	0.000	0.000	0.0000	0.000	0.000	
ETHYL ETHER (DIETHYL ETHER)	0.000	0.000	0.0000	0.000	0.000	
FLUORANTHENE	0.000	0.000	0.0000	0.000	0.000	
FLUORENE	0.000	0.000	0.0000	0.000	0.000	
FLUOROURACIL-5	0.000	0.000	0.0000	0.000	0.000	
FREON 11	0.000	0.000	0.0000	0.000	0.000	
FREON 113	0.000	0.000	0.0000	0.000	0.000	
FREON 12	0.000	0.000	0.0000	0.000	0.000	
GAMMA-BHC	0.000	0.000	0.0000	0.000	0.000	
GLUCOSE	0.000	0.000	0.0000	0.000	0.000	
GUANINE	0.000	0.000	0.0000	0.000	0.000	
HEPTACHLOR	0.000	0.000	0.0000	0.000	0.000	
HEPTACHLOR EPOXIDE	0.000	0.000	0.0000	0.000	0.000	
HEPTANOIC ACID	0.000	0.000	0.0000	0.000	0.000	
HEXACHLOETHANE	0.000	0.000	0.0000	0.000	0.000	
HEXACHLOROBENZENE	0.000	0.000	0.0000	0.000	0.000	
HEXACHLOROBUTADIENE	0.000	0.000	0.0000	0.000	0.000	
HEXACHLOROCYCLOPENTADIENE	0.000	0.000	0.0000	0.000	0.000	
2-HEXANONE	0.000	0.000	0.0000	0.000	0.000	
HEXANOL-1	0.000	0.000	0.0000	0.000	0.000	
HYDROQUINONE	0.000	0.000	0.0000	0.000	0.000	
ISOOCTANE	0.000	0.000	0.0000	0.000	0.000	
ISOPHORONE	0.000	0.000	0.0000	0.000	0.000	
ISOPROPYL ALCOHOL	0.000	0.000	0.0000	0.000	0.000	
ISOPROPYL ETHER	0.000	0.000	0.0000	0.000	0.000	
ISOPROPYLACETATE	0.000	0.000	0.0000	0.000	0.000	
LINDANE	0.000	0.000	0.0000	0.000	0.000	
MALATHION	0.000	0.000	0.0000	0.000	0.000	
METHIONINE	0.000	0.000	0.0000	0.000	0.000	
2-METHYLBENZENEAMINE	0.000	0.000	0.0000	0.000	0.000	
2-METHYLBUTANE	0.000	0.000	0.0000	0.000	0.000	
METHYL ETHYL KETONE	0.000	0.000	0.0000	0.000	0.000	
METHYL ISOBUTYL KETONE	0.000	0.000	0.0000	0.000	0.000	
METHYL PARATHAION	0.000	0.000	0.0000	0.000	0.000	

"BB"

METHYL-2-PROPANOL-1	0.000	0.000	0.0000	0.000	0.000	
METHYLENE BLUE	0.000	0.000	0.0000	0.000	0.000	
METHYL CHLORIDE	0.000	0.000	0.0000	0.000	0.000	
METHYLENE CHLORIDE	0.000	0.000	0.0000	0.000	0.000	
METHYLENE-BIS-4,4(CHLOROA	0.000	0.000	0.0000	0.000	0.000	
METHYL NAPTHALENE	0.000	0.000	0.0000	0.000	0.000	
MTBE	0.000	0.000	0.0000	0.000	0.000	
N-NITROSODI-N-PROPYLAMINE	0.000	0.000	0.0000	0.000	0.000	
NAPHTHALENE	0.000	0.000	0.0000	0.000	0.000	
NITROBENZENE	0.000	0.000	0.0000	0.000	0.000	
NITROBIPHENYL-4	0.000	0.000	0.0000	0.000	0.000	
NITROPHENOL-2	0.000	0.000	0.0000	0.000	0.000	
NITROPHENOL-4	0.000	0.000	0.0000	0.000	0.000	
NITROSODIPHENYLAMINE N	0.000	0.000	0.0000	0.000	0.000	
O-CRESOL	0.000	0.000	0.0000	0.000	0.000	
P-CRESOL	0.000	0.000	0.0000	0.000	0.000	
P-NITROANILINE	0.000	0.000	0.0000	0.000	0.000	
P-NONYLPHENOL	0.000	0.000	0.0000	0.000	0.000	
PARACHLOROMETA CRESOL	0.000	0.000	0.0000	0.000	0.000	
PARATHION	0.000	0.000	0.0000	0.000	0.000	
PCB 1221	0.000	0.000	0.0000	0.000	0.000	
PCB 1260	0.000	0.000	0.0000	0.000	0.000	
PCB-1232	0.000	0.000	0.0000	0.000	0.000	
PCE	0.000	0.000	0.0000	0.000	0.000	
PEG 1000	0.000	0.000	0.0000	0.000	0.000	
PEG 400	0.000	0.000	0.0000	0.000	0.000	
PENTACHLOROPHENOL	0.000	0.000	0.0000	0.000	0.000	
PENTANOL-1	0.000	0.000	0.0000	0.000	0.000	
PHENANTHRENE	0.000	0.000	0.0000	0.000	0.000	
PHENOL	0.000	0.000	0.0000	0.000	0.000	
PHENYLACTIC ACID	0.000	0.000	0.0000	0.000	0.000	
PHENYLMERCURIC ACETATE	0.000	0.000	0.0000	0.000	0.000	
PHTHALIC ACID	0.000	0.000	0.0000	0.000	0.000	
PROPAZINE	0.000	0.000	0.0000	0.000	0.000	
PROPANOL-1	0.000	0.000	0.0000	0.000	0.000	
PROPIONITRILE	0.000	0.000	0.0000	0.000	0.000	
PROPENAOLDEHYDE	0.000	0.000	0.0000	0.000	0.000	
PROPYL ACETATE	0.000	0.000	0.0000	0.000	0.000	
PROPYL AMINE	0.000	0.000	0.0000	0.000	0.000	
PROPYLENE GLYCOL	0.000	0.000	0.0000	0.000	0.000	
PROPYLENE GLYCOL ETHYL AMINE	0.000	0.000	0.0000	0.000	0.000	
PYRIDINE	0.000	0.000	0.0000	0.000	0.000	
PYRENE	0.000	0.000	0.0000	0.000	0.000	
RESORCINOL	0.000	0.000	0.0000	0.000	0.000	
SILVEX	0.000	0.000	0.0000	0.000	0.000	
SIMAZINE	0.000	0.000	0.0000	0.000	0.000	
STYRENE	0.000	0.000	0.0000	0.000	0.000	
TETRACHLOROETHANE-1,1,2,2	0.000	0.000	0.0000	0.000	0.000	
TETRACHLOROETHENE (PERC)	77.506	1.958	0.0335	0.215	123.727	IR
TETRAHYDROFURAN	0.000	0.000	0.0000	0.000	0.000	
TETRAHYDRONAPHTHALENE-1,2,3,4	0.000	0.000	0.0000	0.000	0.000	
THIOUREA	0.000	0.000	0.0000	0.000	0.000	
THYMINE	0.000	0.000	0.0000	0.000	0.000	
TOLUENE	0.000	0.000	0.0000	0.000	0.000	
TRANS-1,2-DICHLOROETHENE	0.000	0.000	0.0000	0.000	0.000	
TRIBROMOMETHANE	0.000	0.000	0.0000	0.000	0.000	
TRICHLOROBENZENE-1,2,4	0.000	0.000	0.0000	0.000	0.000	
TRICHLOROETHANE-1,1,1	7.670	0.058	0.1084	0.372	214.185	IR
TRICHLOROETHANE-1,1,2	0.000	0.000	0.0000	0.000	0.000	
TRICHLOROETHENE	813.930	1.942	0.3550	0.642	389.772	IR
TRICHLOROFLUOROMETHANE	9.170	0.182	0.0428	0.240	136.512	BR
TRICHLOROMETHANE	0.000	0.000	0.0000	0.000	0.000	
TRICHLOROPHENOL-2,4,6	0.000	0.000	0.0000	0.000	0.000	
TRIMETHYLBENZENE	0.000	0.000	0.0000	0.000	0.000	
UREA	0.000	0.000	0.0000	0.000	0.000	
VALERIC ACID	0.000	0.000	0.0000	0.000	0.000	
VALINE	0.000	0.000	0.0000	0.000	0.000	
VINYL ACETATE	0.000	0.000	0.0000	0.000	0.000	
VINYL CHLORIDE	0.170	0.002	2.2183	2.215	1275.997	IR
XYLENE P	0.000	0.000	0.0000	0.000	0.000	
XYLENOL	0.000	0.000	0.0000	0.000	0.000	
Total GAC Usage	*1172.460*		*3.8115*	*5.9637*	*3,429.32*	
Carbon Usage	*2185.407*	*lb/day without TOC Background*				
	3429.323	*lb/day with TOC Background*				
Average Adsorption Capacity	*0.28%*	*w/w without TOC Background*				
	0.16%	*w/w with TOC Background*				

ZE
20,000 lb UNITS

5.6 #voc/day / 3,429 #GAC/day => 0.00163 #voc/#GAC

OR 612 #GAC/#Voc

7ppb = 0.034 #voc/day

0.00163(20,000) #voc / .034 #voc/... => 941 days

BARNEBEY SUTCLIFFE
A WATERLINK COMPANY

BARNEBEY SUTCLIFFE CORP.
835 North Cassady Avenue
Columbus, OH 43219-2203 USA
Phone: (614) 258-9501
Fax: (614) 258-3464
Web: www.bscarbons.com
Email: activated_carbon@waterlink.com
wreinhart@waterlink.com

Fax

TO: Dave Patton
FROM: Elwood V. Reinhart
COMPANY: Malcolm Pirnie
DATE: 8/22/03
FAX NO.: 1-716-667-0279
TIME: 4:00 PM
SUBJECT: Backwash curves for 12x40 mesh coal base carbon
Page #1 of 2

Dave, attached is the "backwash" curves for the 12x40 coal based carbon we recommend using in the liquid phase adsorbers proposed for the Fairchild Republic project.

We recommend the following:

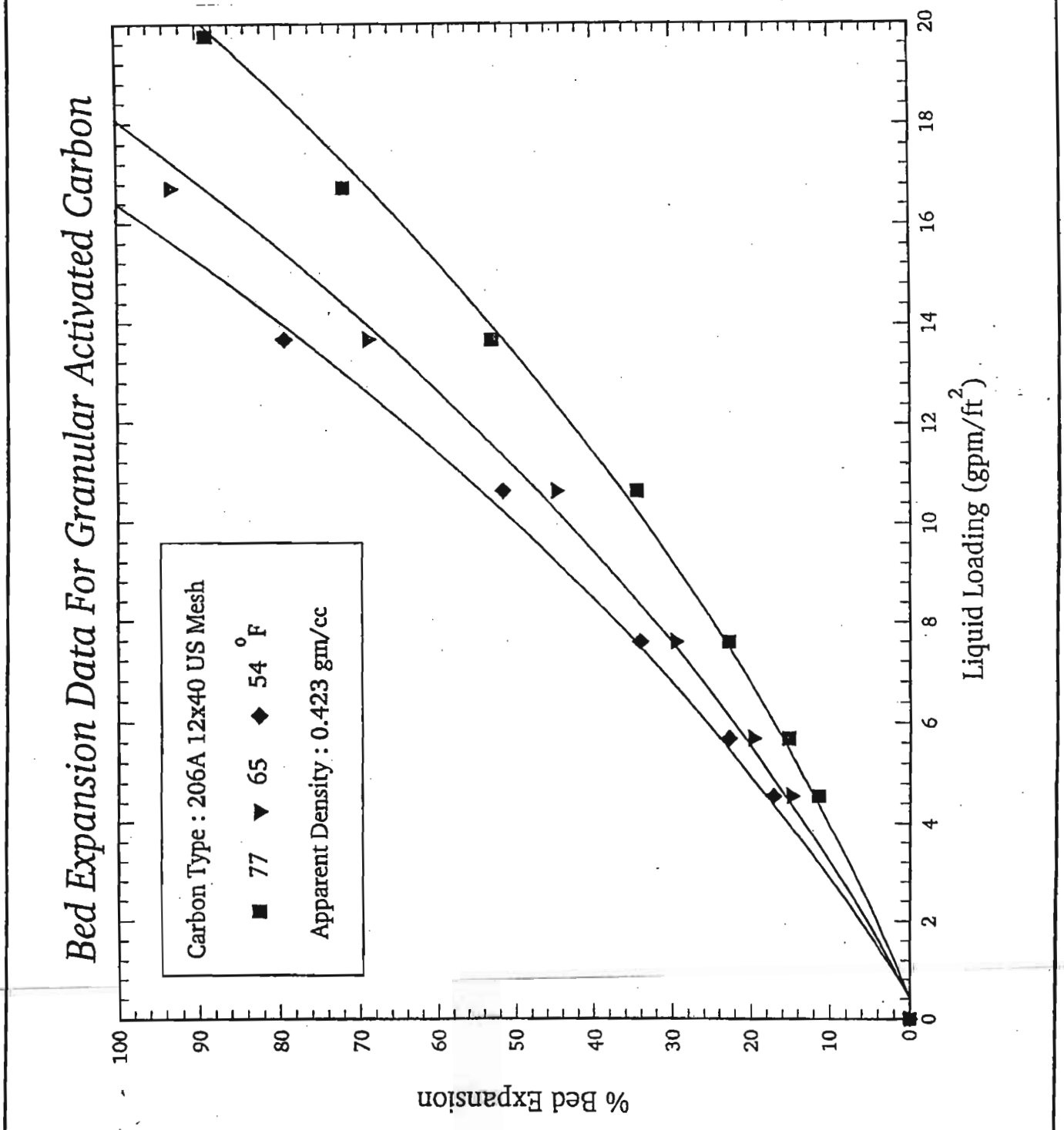
- 25% bed expansion @ 10-12 gpm/ft^2
- 50ft^2 for 8'ϕ adsorber = 500-600 gpm flow
- 4-15 minute BW rate, depends on how dirty the H_2O
- When 10psi ΔP reached also - clean ΔP, then it's time to BW the filter.

I'll call to discuss shortly.

Best regards,
Woody Reinhart

BARNEBEY & SUTCLIFFE CORP
Activated Carbon & Air Purification Equipment
P.O. Box 2526
Columbus, Ohio 43216

TECHNICAL DEPARTMENT



MALCOLM PIRNIE

APPENDIX H

WATERLINK BARNEBEY SUTCLIFFE, VAPOR PHASE GRANULAR ACTIVATED CARBON SYSTEM PRODUCT INFORMATION AND PERFORMANCE PROJECTIONS

BARNEBEY SUTCLIFFE
A WATERLINK COMPANY

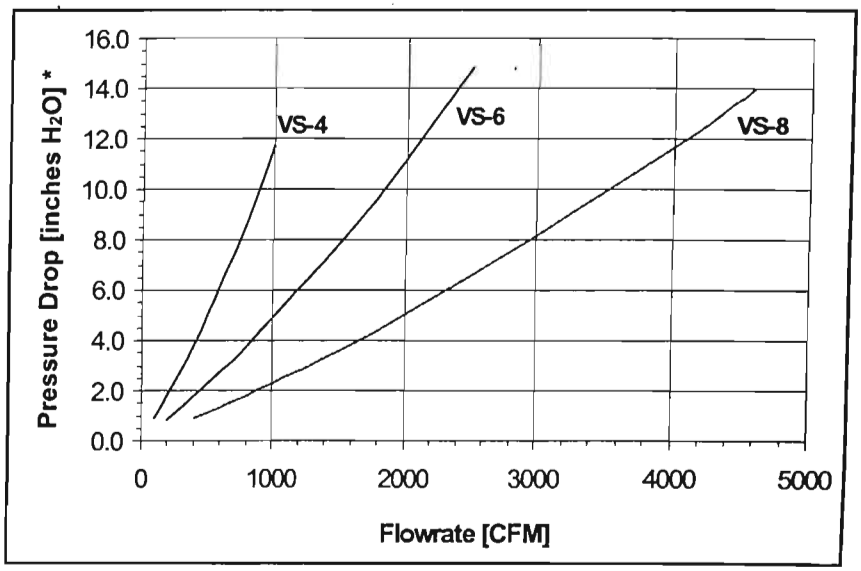
Powerful Solutions for a New Tomorrow

Protect VS Series

The Protect VS series vessels are portable, low pressure vapor adsorbers that are easily put into service. These vessels are designed to operate at a maximum pressure of 5 psi, maximum vacuum of 5" of mercury, operating temperature up to 150 °F, and hold from 2,000 to 8,000 pounds of activated carbon.

Important Features:

- Durable carbon steel construction
- Upper & lower open-air plenum area for efficient carbon usage
- Rust-prohibitive exterior epoxy urethane coating
- 16" Round inspection manway
- Condensate drain plug
- Forklift guides
- Lifting lugs to facilitate moving
- Fitting for sample port or Protect saturation indicator
- All models available to rent



* Estimated pressure drop based on 4x10 mesh carbon.

Model #	GAC		Recommended Maximum Flow Rate, cfm	Weight, lbs. (Empty / Operating)
	ft.^{3}	lbs.**		
VS-4	72	2,000	1,100	1,760 / 3,760
VS-6	180	5,000	2,500	3,340 / 8,340
VS-8	265	8,000	4,500	4,900 / 12,900

** Weight estimated based on vessel volume.

Corporate Capabilities:

Barnebey Sutcliffe has been manufacturing and servicing adsorption equipment for over 80 years. Some of our other products and services include:

- Wide variety of coal & coconut shell carbons
- Broad range of filtration media
- National network of service centers
- Carbon reactivation (hazardous & non-hazardous)
- Vessel rental
- Spent media exchange
- Technical support
- Custom-engineered systems
- ASME Code certified fabrication facility

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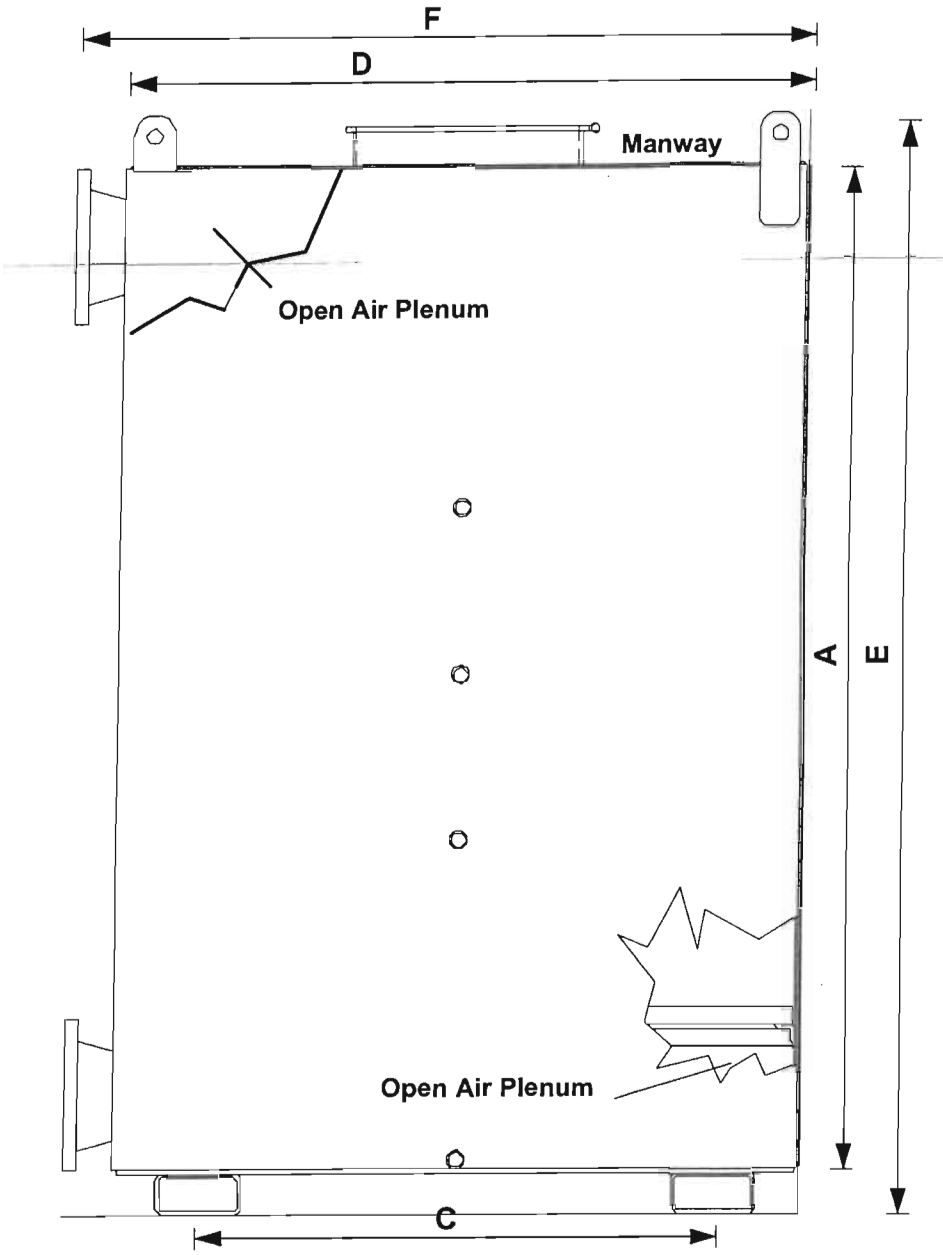

Available Options:

- Internal linings
- Camloc quick connectors
- Higher operating pressures / vacuum
- Stainless steel construction
- Pressure relief valves
- Butterfly isolation valves
- Carbon saturation indicators

To discuss your application needs, call us at one of our regional offices or at

1-800-866-2272

www.bscarbons.com

Model	Cross-Sectional Area, ft^2	Side Shell A	Inlet / Outlet B	Forklift Guides C	Overall Width D	Overall Height E	Overall Length F
VS-4	16	72"	6" 150# flg	36"	49" ±	79" ±	52" ±
VS-6	36	96"	8" 150# flg	48"	73" ±	103" ±	77" ±
VS-8	64	96"	12" 150# flg	48"	97" ±	103" ±	101" ±

Due to the ongoing improvement of our products, we reserve the right to change system specifications and performance criteria without notification. Warning: Some compounds and/or high concentrations can lead to heat buildup in GAC and potential bed fire. Contact BSC for information.

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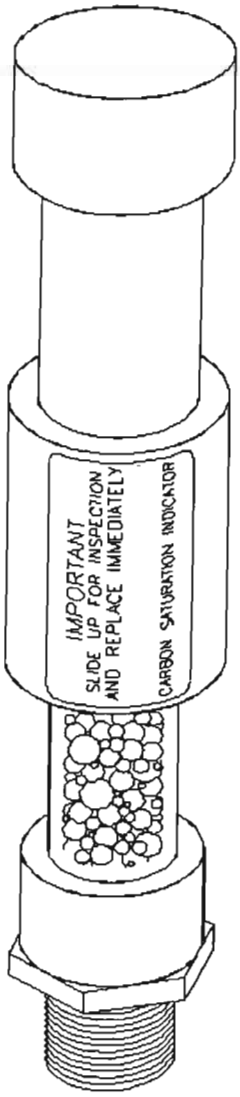
Carbon Saturation Indicator

Barnebey Sutcliffe has developed the unique Protect Carbon Saturation Indicator as a monitoring device to compliment vapor phase adsorbers operating in positive pressure applications. This indicator provides a simple and inexpensive method of determining when a carbon bed needs to be replaced.

The device works similarly to a litmus test, indicating when volatile organics have saturated the activated carbon and breakthrough has begun. When the carbon can no longer adsorb the organics, media in the indicator changes color from purple to brown.

The exterior cover houses the clear internal cylinder which contains the media, and protects it from ultraviolet light and

Barnebey Sutcliffe is continually improving carbon capacity and system performance. Due to the ongoing improvement of our products, we reserve the right to change system specifications and performance criteria without notification.



Installation on a Protect vapor phase adsorber:

- Remove the threaded cap from the bottom of the indicator
- Remove the threaded plug from the 3/4" adsorber port and thread indicator into the opening
- Remove the green sealing tape from the top and bottom of the indicator.
- Lift the protective cover for inspection and replace. Leave the protective cover down in between inspections.

When the bright purple color of the media changes to a dull brown, it is time to replace the activated carbon and the Carbon Saturation Indicator.

To discuss your application needs, call us at one of our regional offices or at

1-800-866-2272

www.bscarbons.com

Corporate Capabilities:

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- National network of service centers
- Carbon reactivation (hazardous & non-hazardous)
- Vessel rental
- Spent media exchange
- Technical support
- Custom-engineered systems
- ASME Code certified fabrication facility

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Capacity for Vapor Phase Contaminants

Factors Which Influence Adsorption

Various factors affect carbon's ability to adsorb contaminants. In vapor phase applications, the most important influences are molecular structure of the contaminant, concentration, competitive adsorption, relative humidity, pressure, and temperature.

Contaminant Structure and Concentration

Capacity generally increases for materials with a higher boiling point and higher molecular weight. As concentration of a compound increases, the capacity for that compound also increases.

Competitive Adsorption

Because chemicals adsorb to different degrees, the relative concentrations of chemicals plays a large part in adsorption efficiency. For example, even though waste stream may contain a large amount of a poorly adsorbed compound like butane and only a small amount of benzene, as the carbon comes into contact with fresh portions of the stream, benzene will displace the adsorbed butane.

Pressure and Temperature

Adsorption occurs when the energy exerted by the pore walls overcomes the energy of a contaminant molecule present in the operating environment. The molecules held to the pore walls more closely resemble a liquid than a gas. For this reason, anything which helps the contaminant substance to condense or become more liquid-like, will increase adsorption. Two ways of doing this are lowing temperature and increasing pressure. Increasing pressure forces the molecules closer together. A temperature decrease causes molecules lose energy, making it easier for them to be trapped by the force exerted by pore walls.

Relative Humidity

The effect of humidity depends on the type of contaminant. At higher humidity (relative humidity >50%), capacity is higher for water soluble compounds like acetone and methanol, but is lower for immiscible or partially immiscible solvents such as toluene, benzene, and chlorinated solvents.

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Trends for Vapor Phase Adsorption

Operating Condition	Change in Operating Condition	Resulting Change in Adsorption
Pressure	↑	↑
Concentration	↑	↑
Temperature	↑	↓
Relative Humidity	↑	↑ For water soluble ↓ For water insoluble

Relative Adsorption Capacity Table

The following table shows the relative capacity of a standard coconut shell carbon for removing selected chemical compounds from vapor under typical conditions.

Average index values are shown. Standard activated carbon has limited effectiveness for certain chemically reactive gases like ammonia, hydrogen sulfide and formaldehyde. Special impregnated carbons, however, have been formulated for many reactive gases, and can be recommended for the substances noted with an asterisk (*). Because carbon capacity depends heavily process conditions, please contact Barnebey Sutcliffe to review your specific application. This is by not a complete list of contaminants that can be treated by activated carbon.

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Key : 0 - 5 5 is highest adsorptive capacity, 0 is no capacity under normal conditions

Substance	Index	Substance	Index	Substance	Index
Acetaldehyde	*	Chlorine	3*	Ethane	0
Acetic acid	4	Chlorobenzene	5	Ether	3
Acetic anhydrite	4	Chlorobutadiene	4	Ethyl acetate	4
Acetone	3	Chloroform	4	Ethyl acrylate	4
Acetylene	0	Chloronitropropane	4	Ethyl alcohol	3
Acid gas	*	Chloronitropropane	4	Ethyl amine	*
Acrolein	3	Chloropicrin	4	Ethyl benzene	5
Acrylic acid	4	Cigarette smoke odor	4	Ethyl bromide	3
Acrylonitrile	4	Citrus and other fruits	4	Ethyl chloride	3
Adhesives	4	Cleaning compounds	4		
Amines	*	Cooking odors	4	Ethyl ether	3
Ammonia	*	Corrosive gases	*	Ethyl formate	3
Amyl acetate	4	Creosote	5	Ethyl mercaptan	3
Amyl alcohol	4	Cresol	5	Ethyl silicate	4
Amyl ether	4	Crotonaldehyde	4	Ethylene	0
Animal odors	3	Cyclohexane	5	Ethylene chlorohydrin	3
Anesthetics	3	Cyclohexanol	4	Ethylene oxide	*
Aniline	5	Cyclohexanone	5	Essential oils	5
Asphalt	4	Cyclohexene	5	Eucalyptole	4
Benzene	5	Decane	5	Fertilizer	4
Bleaching solutions	*	Deodorants	4	Film Processing Odors	3
Bromine	*	Detergents	4	Floral scents	4
Butadiene	3	Dibromethane	3	Fluorotrichloromethane	3
Butane	2	Dichlorobenzene	5	Food aromas	4
Butanone	4	Dichlorodifluoromethane	3	Formaldehyde	*
Butyl acetate	4	Dichloroethane	3	Formic acid	*
Butyl alcohol	4	Dichloroethylene	3		
Butyl cellosolve	4	Dichloroethyl ether	4	Gasoline	5
Butyl chloride	4	Dichloromonofluormethane	3		
Butyl ether	4	Dichloronitroethane	4	Heptane	5
Butylene	2	Dichloropropane	4	Heptylene	5
Butyne	2	Dichlorotetrafluorethane	4	Hexane	4
Butyraldehyde	3	Diesel fumes	4	Hexylene	4
Butyric acid	4	Diethylamine	*	Hexyne	4
		Diethyl ketone	4	Hospital odors	4
Caprylic acid	4	Dimethylaniline	5	Household smells	4
Carbolic acid	4	Dimethylsulfide	3	Hydrogen	0
Carbon disulfide	2	Dioxane	4	Hydrogen bromide	*
Carbon dioxide	1	Dipropyl ketone	4	Hydrogen chloride	*
Carbon monoxide	0			Hydrogen cyanide	*
Carbon tetrachloride	4	Epoxy	4	Hydrogen fluoride	*

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Key : 0 - 5 5 is highest adsorptive capacity, 0 is no capacity under normal conditions

Substance	Index
Hydrogen iodide	*
Hydrogen selenide	*
Hydrogen	*
Ink Odors	3
Iodine	4
Isophorone	4
Isoprene	3
Isopropyl acetate	4
Isopropyl alcohol	4
Isopropyl ether	4
Kerosene	5
Kitchen odors	4
Liquid fuels	5
Lubricating oils	5
Medicinal odors	4
Menthol	4
Mercaptans	*
Mercury	*
Mesityl oxide	4
Methane	0
Methyl acetate	2
Methyl acrylate	3
Methyl alcohol	1
Methyl bromide	2
Methyl butyl ketone	4
Methyl cellosolve acetate	4
Methyl chloride	2
Methyl chloroform	4
Methyl ether	3
Methyl ethyl ketone	3
Methyl formate	2
Methyl iodine	*
Methyl isobutyl ketone	4
Methylcyclohexane	5
Methylcyclohexanol	5
Methylcyclohexanone	5
Methylene chloride	3
Monochlorobenzene	5
Naphtha	5
Naphthalene	5
Nicotine	4
Nitric acid	*
Nitro benzenes	5
Nitroethane	4
Nitrogen dioxide	*
Nitroglycerine	4
Nitromethane	2
Nitropropane	4
Nitrotoluene	5
Nonane	5
Noxious gases	*
Octalene	5
Octane	5
Odorants	*
Ozone	5
Paint odors	4
Palmitic acid	4
p-dichlorbenzene	5
Paste	4
Pentane	3
Pentanone	4
Pentylene	3
Pentyne	3
Perchloroethylene	4
Perfumes	4
Pet odors	3
Phenol	5
Phosgene	3
Pitch	5
Plastics	4
Poison gases	*
Propane	1
Propionaldehyde	3
Propionic acid	4
Propyl acetate	4
Propyl alcohol	3
Propyl chloride	4
Propyl ether	4
Propyl mercaptan	4
Propylene	1
Propyne	1
Putrescine	4
Pyridine	4
Radiation products	*
Radioactive iodide	*
Resins	4
Ripening fruits	4
Rubber	4
Sewer odors	*
Styrene monomer	5
Sulfur dioxide	*
Sulfur trioxide	*
Sulfuric acid	*
Tetrachloroethane	5
Tetrachloroethylene	5
Toluene	5
Toluidine	5
Trichlorethylene	4
Trichloroethane	4
Turpentine	5
Urea	4
Uric acid	4
Valeric acid	4
Valericaldehyde	4
Varnish fumes	4
Vinegar	4
Vinyl chloride	1
Xylene	5
War gases	*

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Patton, David

From: Elwood V. Reinhart [wreinhart@waterlink.com]
Sent: Friday, August 15, 2003 3:55 PM
To: Patton, David
Subject: FWD: Malcom Pirnie - 99% RH.xls

Malcom Pirnie - 99% RH(4).xls

David, good afternoon!

Attached is a revised carbon consumption calculation based on the 70 deg. F @ 65% RH. I will call you on Monday to discuss the total project.

The estimated budget for an in-stack electric heater to heat the air up to 70 degF is approx. $4300.00. Unit would be installed in a 24" square duct on the off-gas side of the air stripper before the vapor phase carbon adsorbers. A transition piece will be required from the air stripper to the duct heater. We recently furnished a 30 KW Chromalox Duct Heater Model ADH-030LTXX based on 316 SST construction for minimal corrosion, for a similar air flow. The dimension of the inserted part into the duct is approx. 23-1/2 deep x 9-1/2" thick x 22" wide. I will send you the "D" size drawing which is the only one we have, i.e. no e-mail drawing readily available.

Have a great weekend and we shall chat on Monday.

Best regards,
Woody Reinhart
Regional Sales Manager
Barnebey Sutcliffe Corporation
835 North Cassady Avenue
Columbus, OH 43219-2203 USA
Phone: (614) 258-9501 x223
Fax: (614) 258-3464
E-mail: wreinhart@waterlink.com

---------- Forwarded Message ----------

FROM: Mark Stouffer <mstouffer@waterlink.com>
TO: "Woody Reinhart (SMTP)" <wreinhart@waterlink.com>
DATE: Fri, 15 Aug 2003 14:48:25 -0400

RE: Malcom Pirnie - 99% RH.xls

Barnebey & Sutcliffe Corp.

Vapor Phase Adsorption Model - Activated Carbon Consumption Calculation

12/08/02

Project:

System Conditions	
System Temperature (oF)	70
Flow Rate (acfm)	2,400
System Pressure (mmHg)	760
System Operation (hrs/day)	24
Humidity , %	50

Component	Inlet Concentration	Inlet Concentration	Activated Carbon Type AC		Activated Carbon Type 207A	
			Capacity	Usage	Capacity	Usage
	ppm	lb/day	% (w/w)	lb/day	% (w/w)	lb/day
ACETALDEHYDE	0.0000	0.00	0.00	0.00	0.00	0.00
ACETONE	0.0000	0.00	0.00	0.00	0.00	0.00
ACETIC ACID	0.0000	0.00	0.00	0.00	0.00	0.00
ACRYLONITRILE	0.0000	0.00	0.00	0.00	0.00	0.00
ALLYLCHLORIDE	0.0000	0.00	0.00	0.00	0.00	0.00
ANILINE	0.0000	0.00	0.00	0.00	0.00	0.00
BENZENE	0.0134	0.01	4.02	0.23	0.50	1.89
BUTANE-n	0.0000	0.00	0.00	0.00	0.00	0.00
BUTANOL-n	0.0000	0.00	0.00	0.00	0.00	0.00
BUTOXY ETHANOL-2	0.0000	0.00	0.00	0.00	0.00	0.00
BUTYL ACETATE-n	0.0000	0.00	0.00	0.00	0.00	0.00
CARBON TETRACHLORIDE	0.0130	0.02	7.00	0.25	0.84	2.12
CHLOROBENZENE	0.0000	0.00	0.00	0.00	0.00	0.00
CHLOROFORM	0.0050	0.01	1.29	0.41	0.04	12.44
CUMENE	0.0000	0.00	0.00	0.00	0.00	0.00
CYCLOHEXANE	0.0000	0.00	0.00	0.00	0.00	0.00
DICHLOROBENZENE-m	0.0000	0.00	0.00	0.00	0.00	0.00
DICHLOROETHANE-1,2	0.0496	0.04	3.99	1.10	0.37	11.86
DICHLOROETHYLENE-1,1 (EDC)	1.3120	1.14	7.69	14.77	1.31	86.63
DICHLOROMETHANE	0.0000	0.00	0.00	0.00	0.00	0.00
DIETHYLENE GLYCOL MONOBUTYL ETHER	0.0000	0.00	0.00	0.00	0.00	0.00
DIETHYL ANILINE	0.0000	0.00	0.00	0.00	0.00	0.00
DIMETHYLPENTANE-2,2	0.0000	0.00	0.00	0.00	0.00	0.00
ETHANOL	0.0000	0.00	0.00	0.00	0.00	0.00
ETHYL ACETATE	0.0000	0.00	0.00	0.00	0.00	0.00
ETHYLBENZENE	0.0000	0.00	0.00	0.00	0.00	0.00
ETHYL CHLORIDE	0.0000	0.00	0.00	0.00	0.00	0.00
ETHYLENE GLYCOL MONOPROPYL ETHER	0.0000	0.00	0.00	0.00	0.00	0.00
HEPTANE-n	0.0000	0.00	0.00	0.00	0.00	0.00
HEXANE-n	0.0000	0.00	0.00	0.00	0.00	0.00
ISOPRENE	0.0000	0.00	0.00	0.00	0.00	0.00
ISOPROPANOL	0.0000	0.00	0.00	0.00	0.00	0.00
ISOPROPYL ACETATE	0.0000	0.00	0.00	0.00	0.00	0.00
ISOPENTYL ACETATE	0.0000	0.00	0.00	0.00	0.00	0.00
METHANOL	0.0000	0.00	0.00	0.00	0.00	0.00
METHYL-2-PYROLIDONE	0.0000	0.00	0.00	0.00	0.00	0.00
METHYL ACRYLATE	0.0000	0.00	0.00	0.00	0.00	0.00
METHYL CHLORIDE	0.0000	0.00	0.00	0.00	0.00	0.00
METHYL ETHYL KETONE	0.0000	0.00	0.00	0.00	0.00	0.00
METHYL ISOBUTYL KETONE	0.0000	0.00	0.00	0.00	0.00	0.00
METHYL METHACRYLATE	0.0000	0.00	0.00	0.00	0.00	0.00
METHYL TERT BUTYL ETHER	0.0000	0.00	0.00	0.00	0.00	0.00
METHYLENE CHLORIDE	0.0000	0.00	0.00	0.00	0.00	0.00
OCTANE-n	0.0000	0.00	0.00	0.00	0.00	0.00
PENTANE-n	0.0000	0.00	0.00	0.00	0.00	0.00
PHENOL	0.0000	0.00	0.00	0.00	0.00	0.00
PROPANE	0.0000	0.00	0.00	0.00	0.00	0.00
PROPANOL	0.0000	0.00	0.00	0.00	0.00	0.00
PROPYLENE GLYCOL-1,2	0.0000	0.00	0.00	0.00	0.00	0.00
STYRENE	0.0000	0.00	0.00	0.00	0.00	0.00
TETRACHLOROETHYLENE	0.2464	0.36	32.37	1.13	12.90	2.83
TETRACHLOROETHANE	0.0000	0.00	0.00	0.00	0.00	0.00
TETRAHYDROFURAN	0.0000	0.00	0.00	0.00	0.00	0.00
TOLUENE	0.0000	0.00	0.00	0.00	0.00	0.00
TRI-O-CRESYL PHOSPHATE	0.0000	0.00	0.00	0.00	0.00	0.00
TRICHLOROETHANE-1,1,1	0.0302	0.04	7.12	0.51	0.99	3.62
TRICHLOROETHYLENE	3.2560	3.82	26.67	14.32	9.88	38.65
TRICHLOROTRIFLUOROETHANE-1,1,2	0.0173	0.03	5.11	0.57	0.48	6.00
TRIMETHYLAMINE	0.0000	0.00	0.00	0.00	0.00	0.00
VINYLCHLORIDE	0.0518	0.03	0.05	63.31	0.00	18399.78
XYLENE-m	0.0000	0.00	0.00	0.00	0.00	0.00
Total Usage	4.99473	5.49	95.30	96.59		18565.82
Average Adsorption Capacity (% w/w)			6%		0%	

The Adsorption Capacity Is Estimated Using The Polanyi Adsorption Theory And Toluene

AIR STRIPPER MASS BALANCE CALCULATION

Assumes 100% Efficiency

LIQUID STREAM

GAS STREAM

Water flow, gpm	Component	MW	Concentration, mg/l	lbmol/min	Flow, scfm	ppm
400	Benzene	78	0.002	8.53948E-08	2400	0.013485259
400	Vinyl Chloride	62.5	0.00617	3.28777E-07	2400	0.051919327
400	DCE	96.9	0.01085	3.72908E-07	2400	0.058888415
400	DCE, cis	96.9	0.2333	8.01838E-06	2400	1.266236617
400	chloroform	119	0.0018	5.03757E-08	2400	0.00795517
400	TCE	131.5	0.814	2.06155E-05	2400	3.255536423
400	PCE	165	0.0775	1.56428E-06	2400	0.247025431
400	DCA	98.96	0.00933	3.13992E-07	2400	0.049584491
400	TCA	133	0.00767	1.92061E-07	2400	0.030329666
400	F 113	187	0.00617	1.09885E-07	2400	0.017352716
400	Dichlorodifluor	121	0.003	8.25718E-08	2400	0.013039466

Barnebey & Sutcliffe Corp.

Vapor Phase Adsorption Model - Activated Carbon Consumption Calculation

System Conditions	
System Temperature (oF)	70
Relative Humidity	60
Flow Rate (acfm)	2,400
System Pressure (mmHg)	760
System Operation (hrs/day)	24

Project:

Rev 13

18-Aug-03

Component	Inlet Concentration	Inlet Concentration	Activated Carbon Type AC		Activated Carbon Type 207E4	
			Capacity	Usage	Capacity	Usage
	ppm	lb/day	% (w/w)	lb/day	% (w/w)	lb/day
ACETALDEHYDE	0.0000	0.00	0.00	0.00	0.00	0.00
ACETONE	0.0000	0.00	0.00	0.00	0.00	0.00
ACETIC ACID	0.0000	0.00	0.00	0.00	0.00	0.00
ACRYLONITRILE	0.0000	0.00	0.00	0.00	0.00	0.00
ALLYLCHLORIDE	0.0000	0.00	0.00	0.00	0.00	0.00
ANILINE	0.0000	0.00	0.00	0.00	0.00	0.00
BENZENE	0.0135	0.01	0.12	7.80	0.00	1020.74
BUTANE-n	0.0000	0.00	0.00	0.00	0.00	0.00
BUTANOL-n	0.0000	0.00	0.00	0.00	0.00	0.00
BUTOXY ETHANOL-2	0.0000	0.00	0.00	0.00	0.00	0.00
BUTYL ACETATE-n	0.0000	0.00	0.00	0.00	0.00	0.00
CARBON TETRACHLORIDE	0.0128	0.02	0.22	7.84	0.00	1005.33
CHLOROBENZENE	0.0000	0.00	0.00	0.00	0.00	0.00
CHLOROFORM	0.0080	0.01	0.00	224.75	0.00	698255.98
CUMENE	0.0000	0.00	0.00	0.00	0.00	0.00
CYCLOHEXANE	0.0000	0.00	0.00	0.00	0.00	0.00
DICHLOROBENZENE-m	0.0000	0.00	0.00	0.00	0.00	0.00
DICHLOROETHANE-1,2	0.0496	0.04	0.07	64.10	0.00	17469.02
DICHLOROETHYLENE-1,1 (EDC)	1.3120	1.14	0.53	213.92	0.01	10491.56
DICHLOROMETHANE	0.0000	0.00	0.00	0.00	0.00	0.00
DIETHYLENE GLYCOL MONOBUTYL ETHER	0.0000	0.00	0.00	0.00	0.00	0.00
DIETHYL ANILINE	0.0000	0.00	0.00	0.00	0.00	0.00
DIMETHYLPENTANE-2,2	0.0000	0.00	0.00	0.00	0.00	0.00
ETHANOL	0.0000	0.00	0.00	0.00	0.00	0.00
ETHYL ACETATE	0.0000	0.00	0.00	0.00	0.00	0.00
ETHYLBENZENE	0.0000	0.00	0.00	0.00	0.00	0.00
ETHYL CHLORIDE	0.0000	0.00	0.00	0.00	0.00	0.00
ETHYLENE GLYCOL MONOPROPYL ETHER	0.0000	0.00	0.00	0.00	0.00	0.00
HEPTANE-n	0.0000	0.00	0.00	0.00	0.00	0.00
HEXANE-n	0.0000	0.00	0.00	0.00	0.00	0.00
ISOPRENE	0.0000	0.00	0.00	0.00	0.00	0.00
ISOPROPANOL	0.0000	0.00	0.00	0.00	0.00	0.00
ISOPROPYL ACETATE	0.0000	0.00	0.00	0.00	0.00	0.00
ISOPENTYL ACETATE	0.0000	0.00	0.00	0.00	0.00	0.00
METHANOL	0.0000	0.00	0.00	0.00	0.00	0.00
METHYL-2-PYROLIDONE	0.0000	0.00	0.00	0.00	0.00	0.00
METHYL ACRYLATE	0.0000	0.00	0.00	0.00	0.00	0.00
METHYL CHLORIDE	0.0000	0.00	0.00	0.00	0.00	0.00
METHYL ETHYL KETONE	0.0000	0.00	0.00	0.00	0.00	0.00
METHYL ISOBUTYL KETONE	0.0000	0.00	0.00	0.00	0.00	0.00
METHYL METHACRYLATE	0.0000	0.00	0.00	0.00	0.00	0.00
METHYL TERT BUTYL ETHER	0.0000	0.00	0.00	0.00	0.00	0.00
METHYLENE CHLORIDE	0.0000	0.00	0.00	0.00	0.00	0.00
OCTANE-n	0.0000	0.00	0.00	0.00	0.00	0.00
PENTANE-n	0.0000	0.00	0.00	0.00	0.00	0.00
PHENOL	0.0000	0.00	0.00	0.00	0.00	0.00
PROPANE	0.0000	0.00	0.00	0.00	0.00	0.00
PROPANOL	0.0000	0.00	0.00	0.00	0.00	0.00
PROPYLENE GLYCOL-1,2	0.0000	0.00	0.00	0.00	0.00	0.00
STYRENE	0.0000	0.00	0.00	0.00	0.00	0.00
TETRACHLOROETHYLENE	0.2464	0.36	12.20	2.99	2.24	16.28
TETRACHLOROETHANE	0.0304	0.05	4.24	1.06	0.34	13.39
TETRAHYDROFURAN	0.0000	0.00	0.00	0.00	0.00	0.00
TOLUENE	0.0000	0.00	0.00	0.00	0.00	0.00
TRI-O-CRESYL PHOSPHATE	0.0000	0.00	0.00	0.00	0.00	0.00
TRICHLOROETHANE-1,1,1	0.0302	0.04	0.35	10.28	0.00	806.34
TRICHLOROETHYLENE	3.2560	3.82	8.96	42.64	1.39	273.88
TRICHLOROTRIFLUOROETHANE-1,1,2	0.0173	0.03	0.16	17.76	0.00	2910.77
TRIMETHYLAMINE	0.0000	0.00	0.00	0.00	0.00	0.00
VINYLCHLORIDE	0.0000	0.00	0.00	0.00	0.00	0.00
XYLENE-m	0.0000	0.00	0.00	0.00	0.00	0.00
Total Usage	4.976208	5.51	26.85	593.15		732263.28
Average Adsorption Capacity (% w/w)			1%		0%	

The Adsorption Capacity Is Estimated Using The Polanyi Adsorption Theory And Toluene