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REPORTS

DATE:

JUNE 1994

Interception Trench System Work Plan

**Amoco Pipeline Station
Artesia, New Mexico**

Prepared For:

**AMOCO OIL COMPANY
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Project 2436

June 1994

Mittelhauser
CORPORATION

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1.0 INTRODUCTION

The Amoco Pipeline Company (Amoco) operates a pipeline pumping station near Artesia, New Mexico designated by Amoco as the "Artesia Pumping Station, Facility 10195". The station is located in Eddy County, within the Empire oil field, approximately 8 miles southeast of the city of Artesia, as depicted in Figure 1. The station acts as a temporary storage and transfer facility along an Amoco crude oil pipeline.

Physiographically, the station is located within the Pecos River Valley drainage basin, approximately 2.6 miles east-northeast of the Pecos River. The station is located immediately west of Scoggin Draw, an intermittent drainage that is a tributary of the Pecos River. The local drainage forms a network of connected tributaries which interconnect and transmit surface runoff to the Pecos River.

1.1 BACKGROUND

In May of 1993, an initial investigation was performed by CURA, Inc. following the discovery of a crude oil leak from the storage tank at the station. During that investigation, four borings were advanced to determine whether the hydrocarbon product had impacted subsurface soil and groundwater. Three of the borings were converted to groundwater monitoring wells (MW-1, MW-2, and MW-3). The location of these wells is shown in Figure 2. Hydrocarbons were encountered in samples and soil cuttings produced during the CURA drilling operation. Free phase petroleum, ranging in apparent thickness from 0.21 to 1.75 feet was encountered in each of the three monitoring wells.

Subsequent to the initial investigation, Amoco contracted Mittelhauser Corporation (Mittelhauser) to delineate the lateral extent of the free-phase product and characterize any impact to the local perched groundwater. Mittelhauser conducted two additional

field investigations. The results were reported in two reports titled "Subsurface Investigation" and "Phase III Subsurface Investigation" dated October 1993 and April 1994, respectively. The location of all monitoring wells is shown in Figure 2. We believe the work performed, to date, delineates the extent of the free product.

1.2 PURPOSE

The purpose of this Work Plan is to describe the system we propose to install to prevent further free-phase migration and to recover the free-phase product.

2.0 SYSTEM DESIGN

The interception trench system is composed of two primary components:

- Interception Trench
- Free-Phase Recovery and Groundwater Depression System

Each component is described in the following section.

2.1 INTERCEPTION TRENCH

Since prior investigations have shown that groundwater flow is through fractures, an interception trench is proposed. The trench intercepts water during its entire length; therefore, the possibility of water and free-phase product bypassing the system is greatly reduced as compared to alternate systems such as the use of well points. The critical components of the system are described below. The trench system design is shown in Figure 3.

- Location - The location will be approximately 60 feet south of the line formed by MW-13, MW-10, and MW-12 as shown on Figure 2. These wells appear to define the leading edge of the plume. No product or odor was detected in the

next downgradient well, MW-14. The final location of the trench will be based on field conditions.

- Trench Length - This design calls for a length of approximately 120 feet. This length should be sufficient based on our current information. We will be prepared to install a longer trench, if necessary, based on field conditions.
- Depth - A depth of 25 feet was chosen. Logs for wells in the area, plus water table elevations on March 25, 1994, are provided in the Phase III Subsurface Investigation Report.
- Width - A width of 3 feet was chosen to allow adequate room for installation of recovery sumps and a liner.
- Gravel/Fill - We will use a depth of approximately 20 feet of 1 to 1½-inch gravel that has been screened to remove fines. This depth of gravel will allow easy flow of water and product in the trench even if the water table fluctuates. The final 5 feet will be fill from materials excavated during the trench installation.
- Liner - We will use a liner to the depth of 25 feet on the back wall of the trench. The purpose of the liner is to prevent migration of product through the trench into fractures on the back side. The liner will be "Petrogard VI", manufactured by MPC Containment Systems. The performance specifications and the chemical compatibility chart are contained in Attachment A.
- Sumps - We will install three 24-inch sumps in the trench. The location will be based on field observations of the locations of maximum flow. After construction of the top of the trench, the sumps will be drilled to an additional depth of 6 feet to enhance groundwater depression. The diameter of the last 6 feet will be 12 inches.
- Top Construction - The top of the trench will be composed of 4 to 5 feet of fill, the same plastic liner as used on the back wall, and 8 inches of concrete at the surface. The liner will be placed on top of the gravel and below the fill to prevent migration of fill materials into the gravel. The surface will be finished at the same grade as the Scoggin Draw. Standpipes will rise 3 feet above the surface level to prevent flooding during heavy rains.
- Installation Considerations - A bulldozer will be used to remove the first 6 feet of materials. A backhoe will be used to dig the additional 19 feet. No personnel will be allowed inside the trench.

It is possible that cave-in will occur below the water table, which we assume to be at 20 feet. If this occurs, a water-bentonite slurry will be pumped into the trench. This slurry will prevent further cave-in and the materials that caved in can be removed by the backhoe. The final excavation will be completed by digging beneath the slurry and pumping more slurry until the final depth is reached. At this time, the liner and sumps will be installed. The bottom of the liner will be weighted to ensure passage through the slurry. Finally, the slurry will be pumped out. If cave-in does not occur, the bentonite slurry technique as described in this paragraph will not be used.

Materials dug from the trench will be placed on the north side of the trench to divert rainwater during installation.

- Safety - We do not anticipate that digging the trench will result in a potentially flammable atmosphere. However, due to the fractured nature of the subsurface we can not rule out this possibility. Therefore, safety precautions will be a high priority.

2.2 FREE-PHASE RECOVERY AND GROUNDWATER DEPRESSION SYSTEM

A schematic diagram of the design of the free-phase recovery/groundwater depression system is shown in Figure 4. The major components are described below:

- Recovery Pump - A Grundfos Model 10E5 total fluids pump will be set approximately 2 feet below the water table in the recovery sump shown in Figure 3. Initially one pump will be installed. Up to two additional pumps may be installed later if required. Technical information on the pump is supplied in Attachment B.
- Oil/Water Separator - A Hydro-Flo Technologies Model DP012-F21 oil/water separator will be used. An equalization tank will be placed before the separator to dampen pulses from the pump and allow a smooth flow of water to the separator. Both the equalization tank and separator will be elevated 48 inches to allow gravity feed of the separated oil and water. Technical information on the oil/water separator is contained in Attachment C.
- Air Stripper - We will install a Northeast Environmental Products Model 2341-P air stripper. The chosen stripper is a four-tray, polyethylene shallow tray unit. The anticipated operating range is 5-10 GPM; however, the system has additional capacity. General information on the Northeast Environmental

products, plus specific detail descriptions of Model 2341-P, are provided in Attachment D.

Water from the air stripper will be sent to a holding tank and then pumped to an irrigation system approximately 200 feet west of the Scoggin draw using a Grundfos Model 10E5 pump. At the expected flow rate of approximately 5 GPM, rapid evaporation and infiltration will occur. The required discharge limits, from the air stripper, are shown below (These limits were provided by the OCD as the infiltration discharge requirements of the state):

Benzene - 10 ppb
Ethylbenzene - 750 ppb
Xylene - 620 ppb
Toluene - 750 ppb

One sample was taken from MW-5 as part of the subsurface investigation that was reported in October 1993. This sample showed a benzene concentration of 1,500 ug/l parts per billion (ppb), toluene at 290 ug/l ppb, ethylbenzene at 94 ug/l ppb and xylene at 480 ug/l ppb. With the exception of benzene, the water met the above discharge limits. As shown in Attachment D, the removal efficiency for benzene, using the model 2341-P at a flow rate of 5 gpm is substantially in excess of 99.9 percent. Therefore, the system should have no difficulty in achieving the required removal efficiency.

Assuming all BETX materials are discharged to the atmosphere, and the flow rate is 5 gpm, the discharge to the atmosphere will be 0.007 lbs/hr. Per discussions with the New Mexico Air Permit Division, an air permit is not required.

- Recovery Tank - The free product will be recovered in a tank, the volume of which will be approximately 1,000 gallons. The removed product will be pumped from the tank to a vacuum truck which will take the product back to the pipeline station. A pipeline from the tank back to the station may be installed at a later date.
- Power - 230 volt, single phase power is adequate for all equipment identified in this Work Plan. Arrangements have been made with Central Valley Electric Co-op to supply the power.

3.0 MONITORING

After the trench and free-phase recovery and groundwater depression system is installed, and before startup, the following monitoring will be conducted:

- All wells will be gauged for product thickness.
- For all monitoring wells that do not contain free product, a water sample will be obtained and analyzed for volatile organics using EPA method 8020 and for naphthalene using EPA method 8270.

After startup of the air stripper, one sample of the stripper influent and effluent will be obtained. The following analyses will be performed on each of the two samples:

- Volatile organics using EPA method 8020
- Naphthalene using EPA method 8270
- ICAP metals using EPA method 6010A
- Mercury and Selenium using EPA methods 7470 and 7740
- Sodium, calcium, magnesium, potassium, chloride, bicarbonates, carbonates, fluoride, sulfate, total dissolved solids (TDS)

A sample of the effluent from the air stripper will be obtained and analyzed for volatile organics using EPA method 8020 once per month for the first six months after startup. In addition, all wells will be gauged for product thickness quarterly during this six-month period.

After six months, sampling and analyses of the effluent from the air stripper will occur on a quarterly basis. The analysis will be for BETX using EPA method 8020. All wells will also be gauged.

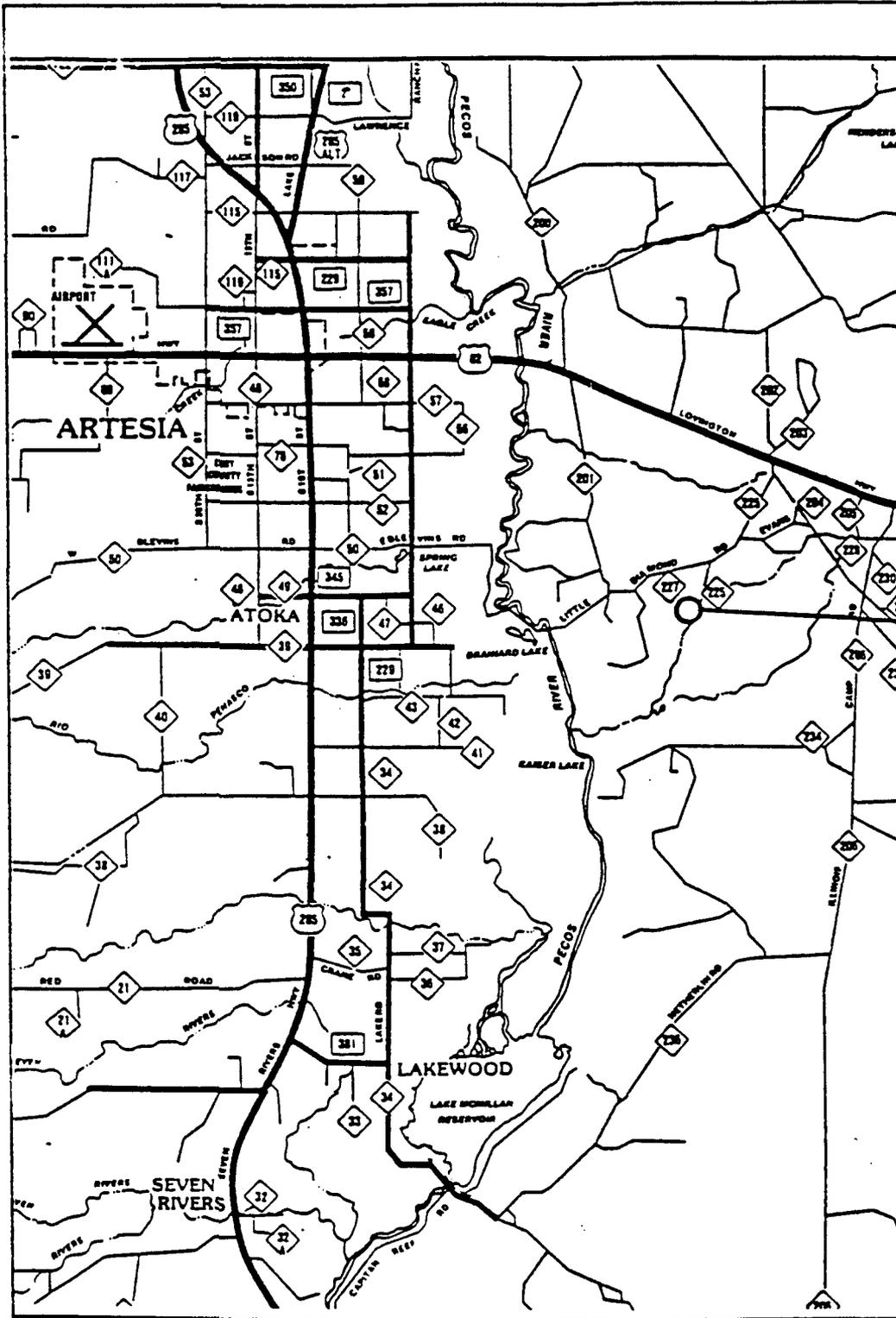
4.0 REPORTING

Within 60 days after installation and startup of the free-phase recovery/groundwater depression system, a report will be prepared and submitted to the state. This report will provide the analytical results from the monitoring described above.

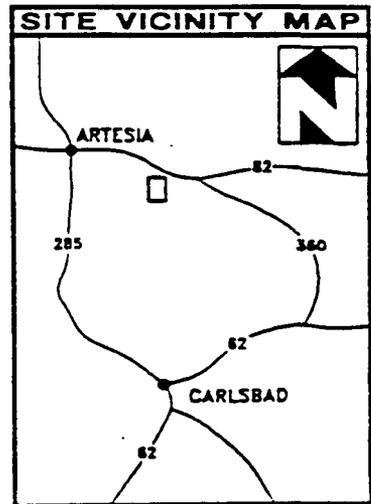
5.0 SCHEDULE

The schedule for installation and startup of the free-phase recovery/groundwater depression system is shown in Figure 5. The figure shows the major lead time items. Such items as delivery of pumps are not shown since they do not affect the schedule.

FIGURES



SITE



REF: CURA PRELIMINARY SUBSURFACE INVESTIGATION, JUNE 1993

DATE	EJC
CHK BY	
APP BY	
DESIGN	BXB
DATE	10/1/83
SCALE	AS SHOWN
LOG NO	24360010
PLN NO	2436-01



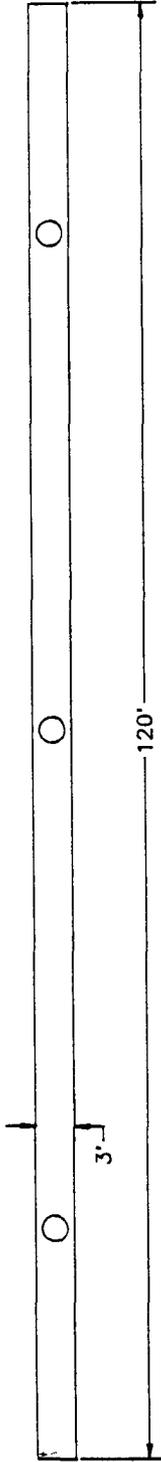
SITE MAP
AMOCO OIL PIPELINE CO.
ARTESIA, NEW MEXICO

MITTELHAUSER
 Corporation

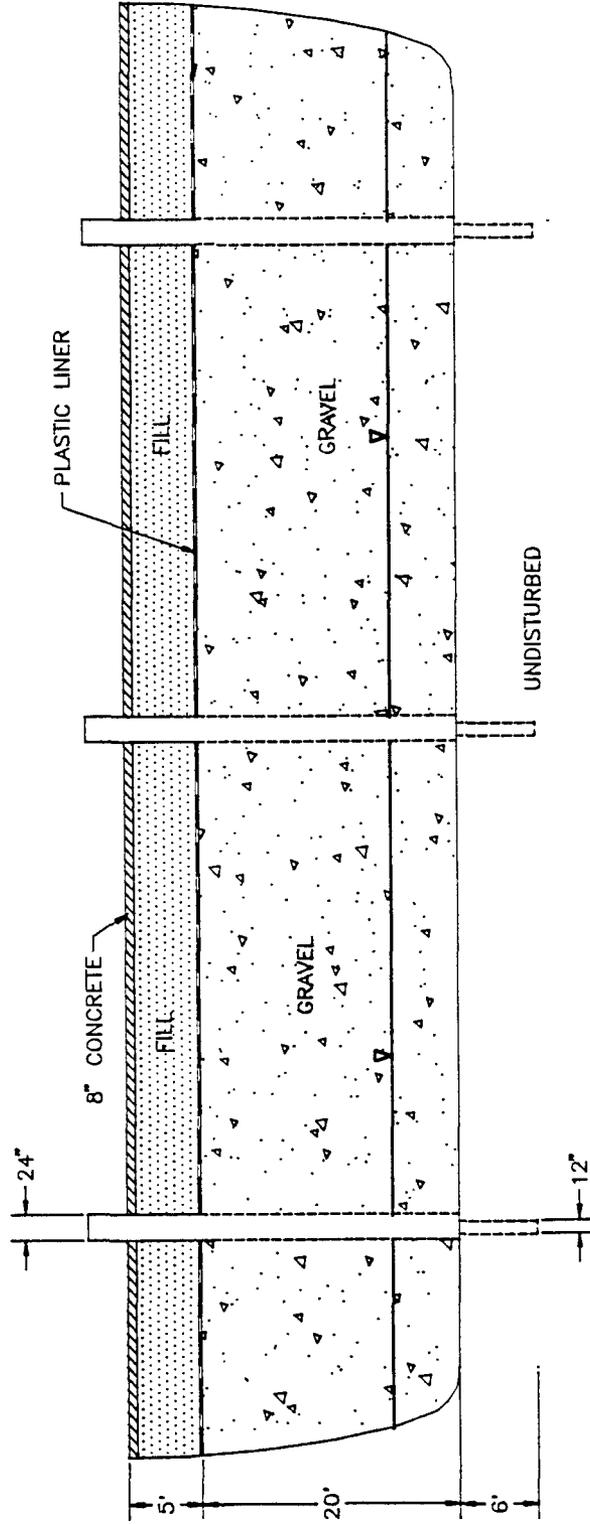
FIGURE 1

REV A

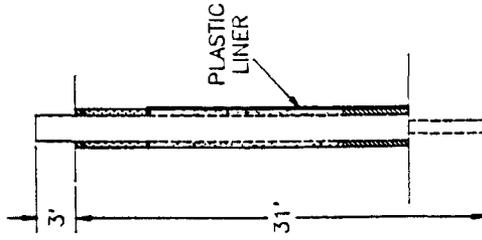
TOP VIEW



SECTION VIEW



SIDE VIEW

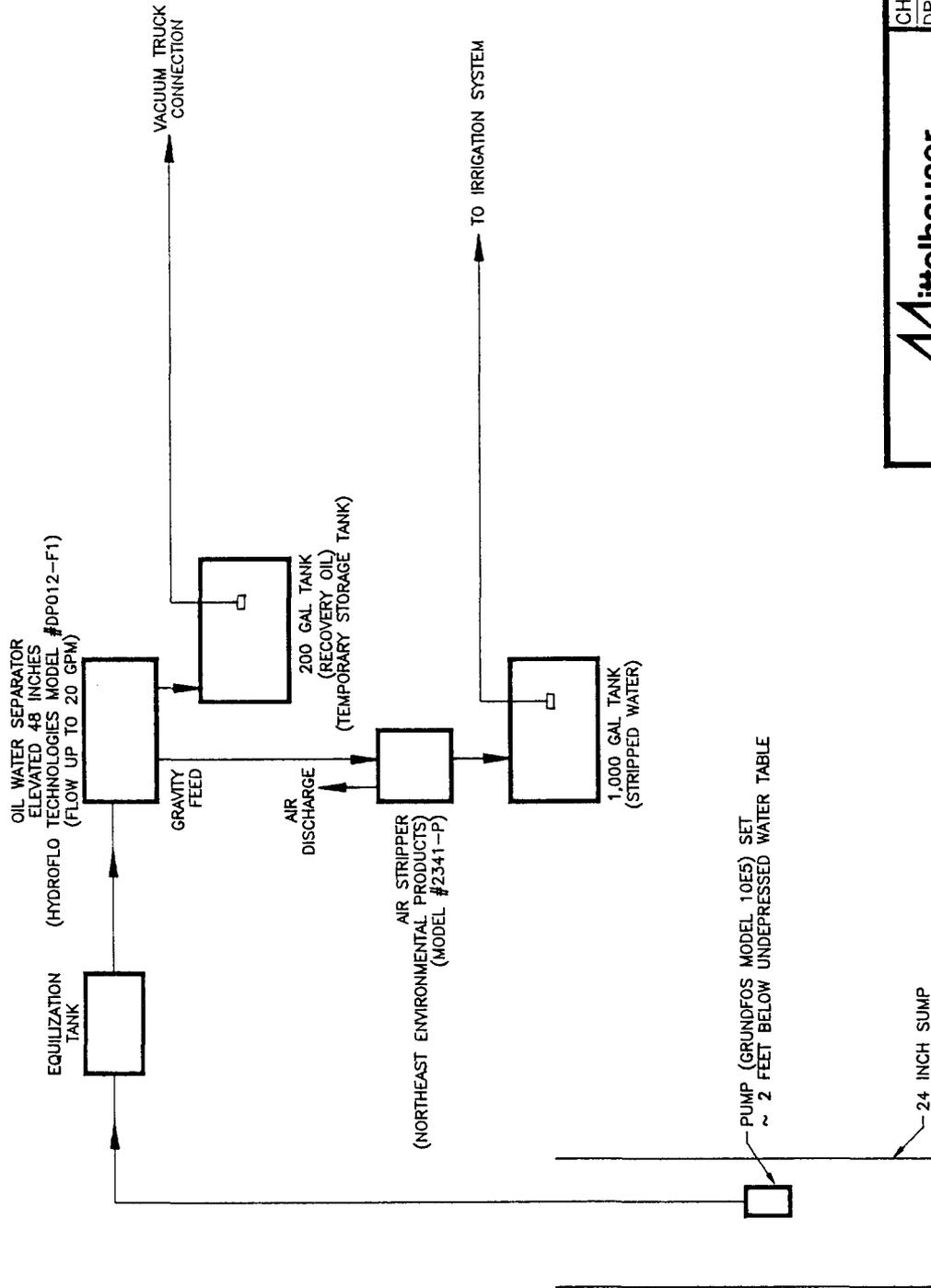


—▽— GROUNDWATER ELEVATION

Mittelhauser
CORPORATION

TRENCH SYSTEM DESIGN
AMOCO OIL
ARTESIA, NEW MEXICO

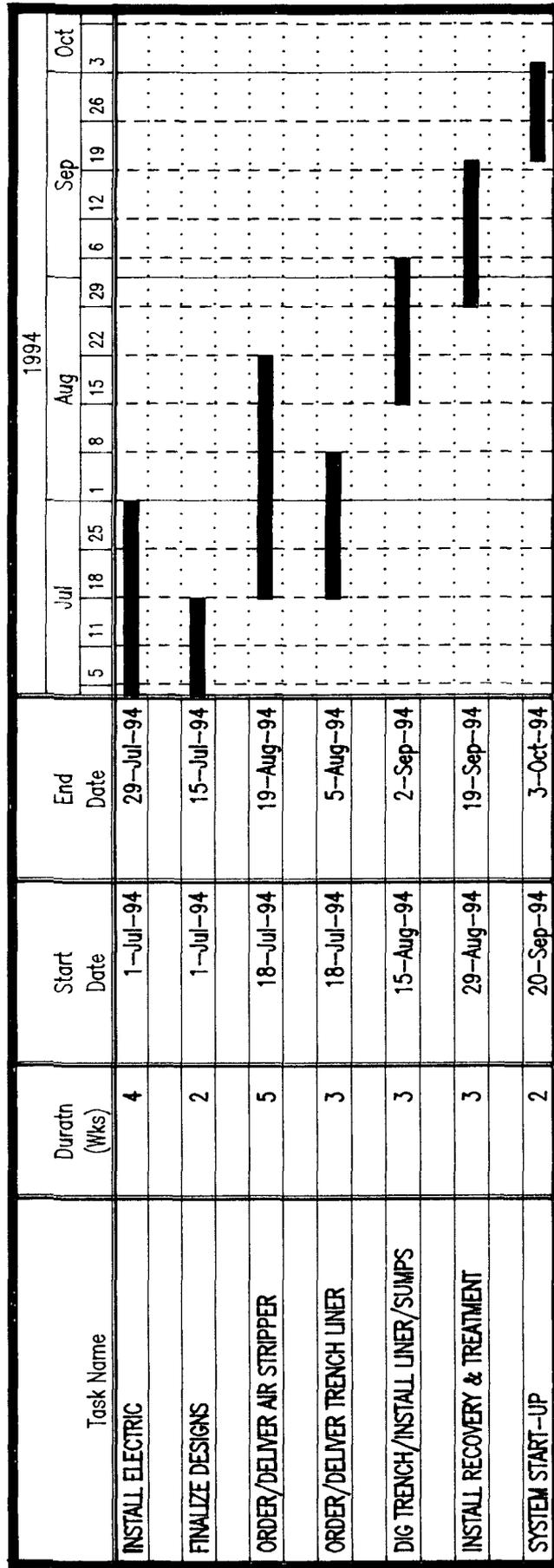
CHECK BY HMM
DRAWN BY BCP
DATE 6-9-94
SCALE NONE
CAD NO. 243603B
PRJ NO. 2436.00-03
FIGURE



	CHECK BY HNM
	DRAWN BY RGW
	DATE 6-21-94
	SCALE NONE
	CAD NO. 243603D
PRJ NO. 2436.00-03	
FIGURE	4

SCHEMATIC DIAGRAM
FREE PHASE RECOVERY AND
GROUNDWATER DEPRESSION SYSTEM

FIGURE 5
SYSTEM INSTALLATION AND STARTUP SCHEDULE
 Assumes Workplan Approval on July 18, 1994



Schedule does not include pumps, recovery tank, or oil/water separator since these are "off-the-shelf" items.

ATTACHMENT A

Liner Performance Specifications

PETROGARD® VI

PERFORMANCE SPECIFICATION

1.0 SCOPE

- 1.1 This specification establishes the requirement for a custom factory prefabricated flexible liner system utilizing the latest state-of-the-art concepts for secondary containment in accordance with the latest Federal and Local regulations.
- 1.2 The work shall include design, factory fabrication, field interface assembly, anchorage hardware, piping, prefabricated interface ports, test wells, and monitoring wells.
- 1.3 The materials of construction shall be compatible with the product to be stored in the primary containment vessel(s), and the material's product resistance to permeability shall conform to the criteria stated elsewhere in this specification.

2.0 APPLICABLE DOCUMENTS

- 2.1 Specification: Federal Standard 191, material testing of protective coated industrial textiles.
- 2.2 Specification: A.S.T.M. Standard D751-73, method of testing coated fabrics.
- 2.3 Specification: MIL-I-4520, quality control inspection and testing for the fabrication of flexible membrane materials.
- 2.4 Specification: Buyers general specification and site drawings.

3.0 REQUIRED SUBMITTALS

- 3.1 The successful bidder shall provide material and joint test certification demonstrating that the material and fabrication joints shall comply with the physical and chemical resistance requirements of this specification.
- 3.2 The bid proposal shall include design drawings showing secondary containment interface details at all apertures and shall also include installation instructions.
- 3.3 The liner system shall be fabricated by MPC Containment Systems, Ltd., Chicago, IL.

4.0 WARRANTY

- 4.1 A minimum twenty year warranty covering material and workmanship is required.

5.0 ENVIRONMENTAL DESIGN REQUIREMENTS

- 5.1 The flexible secondary containment liner shall be capable of withstanding the following environmental installation conditions: 5.1.1 Ambient Temperature: 25 - 100 Degrees F.

6.0 MATERIALS AND WORKMANSHIP

- 6.1 Flexible Liner Material Description
 - 6.1.1 The flexible liner material shall consist of a high strength reinforcing fabric weighing approximately seven and one half (7.5) ounces per square yard, coated with an overall protective multi-polymer, total weight is approximately thirty (30) ounces per square yard +/- 2 ounces.
Color: Black front and back.
 - 6.1.2 Coated Liner Material: The coating compound shall be selected to have characteristics suitable for high temperature thermal-welding, shall be compounded to withstand the attack of high temperature, humidity and mildew, while at the same time, resisting the attack of the products to be stored in the primary containment vessel(s).
 - 6.1.3 Weight and Thickness: 30 ounces per square yard +/- 2 ounces; 30 mils. +/- 2 mils.
 - 6.1.4 Tensile Strength:

Grab lbs., A.S.T.M. D-751	650 lbs/650 lbs.
1" strip lbs., A.S.T.M. D-751	485 lbs/485 lbs.
 - 6.1.5 Hydrostatic Resistance: Fed. Std. 5512.1 600 psi
 - 6.1.6 Adhesion per one inch of width
A.S.T.M. D-751 (2" per minute) 15 lbs.
 - 6.1.7 Low Temperature: A.S.T.M. D-2136 -40°
 - 6.1.8 Flexibility/Resistance to Cracking: PASS
Lab Procedure: Ten (10) pound weighted roller, sample size 2" x 12", fold 180 Degrees, pass roller ten times: PASS

- 6.1.9 Chemical Resistance: The liner material shall meet the following test criteria for automotive fuels:
Test Procedure: A.S.T.M. E-96 (Transmission of Material)

	Requirement:*
A. Unleaded Gasoline	9.03 x 10 ⁻¹⁰ cm/sec
B. A.S.T.M. Fuel B	9.19 x 10 ⁻¹⁰ cm/sec
C. Methanol	3.39 x 10 ⁻¹¹ cm/sec

- 6.1.10 Bursting Strength:
A.S.T.M. D-751, Section 18.2 800 lbs. minimum
- 6.1.11 Puncture Resistance:
A.S.T.M. D-751, Section 18.2
(Ball Tip) 800 lbs. minimum
- 6.1.12 Stiffness: A.S.T.M. D-747 30,000 psi max. each direction

7.0 LINER MATERIAL FABRICATION DETAILS

- 7.1 All panel joints shall be thermal automatic high pressure welded, utilizing a two inch lap-seal construction with a tolerance of +/- a quarter of an inch on the lap.
- 7.2 The coating formulation shall be suitable for thermal type fabrication and shall also be capable of conforming to the following test procedures without affecting the requirements of Section 6.0.
 - 7.2.1 Dead Load Criteria for Joints:
 - 7.2.1.1 Seams carry a minimum dead load of 50% of the minimum strip tensile without separation of the fabric in the warp direction when the temperature of the FML is 70 degrees F. when tested in accordance with MIL-T-52983E.
 - 7.2.1.2 Seams carry a minimum dead load of 25% of the strip tensile when the temperature of the FML is 160 degrees F. when tested in accordance with MIL-T-52983E.
 - 7.2.1.3 Seams shall carry a minimum seam shear strength of 95% of the minimum strip tensile strength of the fabric when tested in accordance with A.S.T.M. D-751, Section 50.

7.3 Patterning:

- 7.3.1 The flexible membrane liner shall be fabricated from full length modular panels with a maximum of one horizontal splice seam per panel. Splice seams shall be used only when required to utilize full roll size.
- 7.3.2 Panel joints shall be patterned as shown on the drawings.
- 7.3.3 Secondary joints and reinforcing areas shall be thermally welded. Stitching and cementing shall not be allowed for normal panel fabrication.
- 7.3.4 Aperture locations located in the liner shall be suitably reinforced as common practice by the factory fabricator.
Aperture locations in general shall be produced from rigid bulkhead fittings and other mechanical compression members made from synthetic type materials which normally resist corrosion.

8.0 ANCHORAGE SYSTEM

- 8.1 The liner shall be provided with an anchorage system which shall include hardware as detailed in the manufacturer's installation drawings.

9.0 INSTALLATION

- 9.1 Installation of the factory manufactured liner system shall be performed by a factory approved and certified contractor.
- 9.2 A contractor who is not trained or certified may install the secondary containment liner system only under the direction of a factory authorized field technical assistance supervisor. Under this condition, the factory will provide a field report to the construction manager confirming that the liner was installed under his direction.
- 9.3 The manufacturer of the secondary containment system shall supply detailed installation drawings covering all components supplied.

10.0 TESTING OF THE SECONDARY CONTAINMENT LINER SYSTEM

- 10.1 The liner manufacturer shall provide written certification that the liner has been vacuum box tested at all panel thermal welded joint locations, and all panel materials have been visually inspected with defects noted and corrected prior to packaging.
- 10.2 When a membrane liner is fabricated, seamed, sealed, modified or repaired in the field, the part so fabricated, seamed, sealed, modified or repaired shall be subjected to a performance test prescribed by the manufacturer.

PETROGARD® VI

CHEMICAL COMPATIBILITY CHART

The following fluids were tested and are considered compatible with PetroGard® VI when used as a secondary containment dike liner with above ground storage tanks:

Antifreeze (ethylene glycol)	#6 Fuel Oil	Mineral Spirits
Animal Oil	Gasoline, leaded	MTBE
ASTM Fuel A	Gasoline, regular unleaded	Naptha
ASTM Fuel B	Gasoline, premium unleaded	Phosphoric Acid (50%)
ASTM Oil #2	Glycerin	Raw Linseed Oil
Aviation Gas	Hydraulic Fluid	SAE-30 Oil
20% Chlorine Solution	Hydrochloric Acid (50%)	Sea Water
Clorox	Hydrofluoric Acid (5%)	Sodium Hydroxide (60%)
Conc. Ammonium Hydroxide	Hydrofluoric Acid (50%)	Sulphuric Acid (50%)
Corn Oil	Hydrofluosilicic Acid (30%)	50% Tanic Acid
Crude Oil	Ivory Soap	Transformer Oil
Diesel Fuel	JP-4 Jet Fuel	Turpentine
Ethanol	JP-5 Jet Fuel	Urea Formaldehyde
Ethyl Alcohol	JP-8 Jet Fuel	Vegetable Oil
Fertilizer Solution	Kerosene	Water (200°F.)
#2 Fuel Oil	Methanol	

The data shown is the result of the following laboratory tests and is intended to serve only as a guide:

Permeability	ASTM E-96
Solubility & Swell	ASTM D-543
Tensile & Elongation	ASTM D-751

Results were arrived at by visual and physical examination of the samples after immersion in the test fluid for 7 days at room temperature. Results represent the ability of the material to retain its performance properties. When considering PetroGard VI for a specific application, it is important to study other requirements such as permeability, service temperature, concentration, size to be contained, etc. MPC Containment Systems Ltd. Technical Department should be consulted for further recommendations. This table is presented and accepted at user's risk.

We believe that the above information is the best currently available on the subject. It is offered as a possible helpful suggestion in experimentation you may care to undertake along these lines. It is subject to revision as additional knowledge and experience are gained.

For more information, call today.



4834 S. Oakley Ave.
Chicago, Illinois 60609
312 927-4120
(Outside IL) 800 621-0146
(Fax) 312 650-6028

ATTACHMENT B

Grundfos Submersible Pumps and Technical Specifications



GRUNDFOS

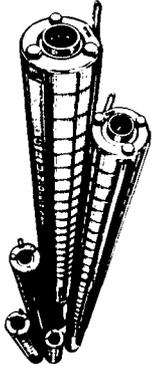
**Redi-Flo
Environmental
Submersible Pumps**

10E

Submittal Data

3450 RPM

60 Cycle



JOB or CUSTOMER:

ENGINEER:

CONTRACTOR:

SUBMITTED BY: _____ DATE: _____

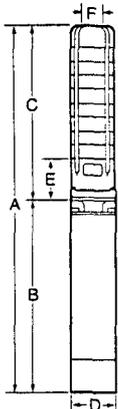
APPROVED BY: _____ DATE: _____

ORDER NO.: _____ DATE: _____

SPECIFICATION REF.:

QUANTITY	TAG NO.	MODEL NO.	GPM	FEET	VOLT	PHASE	COMMENT

Dimensions



Technical Data

FLOW RANGE: 5 to 14 US GPM

MOTORS: Grundfos MS402E Environmental Submersible Motor (Standard)
Maximum Operating Temperature: 104°F (40°C)
Maximum Operating Pressure: 220 PSI
Maximum Number of Starts Per Hour: 100
Minimum Recommended Flow Past Motor: 0.25 ft/sec
 (NOTE: Franklin Pollution Recovery motor is optional.)

DISCHARGE SIZE: 1¼" NPT

PUMP END CONSTRUCTION MATERIALS: Stainless Steel and Teflon®

INSTALLATION: Unit to be installed vertically for submerged operation.

Electrical Data, Dimensions, and Weights ①

PUMP TYPE	MOTOR				DIMENSIONS (In Inches)						NET WEIGHT (LBS.)②	SHIP. WEIGHT (LBS.)②
	HP	SF	PH	VOLTS	OVERALL LENGTH A	MOTOR LENGTH B①	PUMP END LENGTH C	MAX. DIA. D	INLET E	DISCH. PIPE SIZE (NPT) F		
10E5	1/8	1.75	1	230	20 5/16	10	10 5/16	3 31/32	3 1/4	1 1/4	24	25
10E8	1/2	1.60	1	230	23 9/16	10 13/16	12 3/4	3 31/32	3 1/4	1 1/4	26	28
10E11	3/4	1.50	1	230	26 9/16	11 3/8	15 3/16	3 31/32	3 1/4	1 1/4	28	30
10E14	1	1.40	1	230	29 11/16	12	17 11/16	3 31/32	3 1/4	1 1/4	31	32
10E19	1 1/2	1.30	1	230	35 3/8	13 9/16	21 13/16	3 31/32	3 1/4	1 1/4	35	37

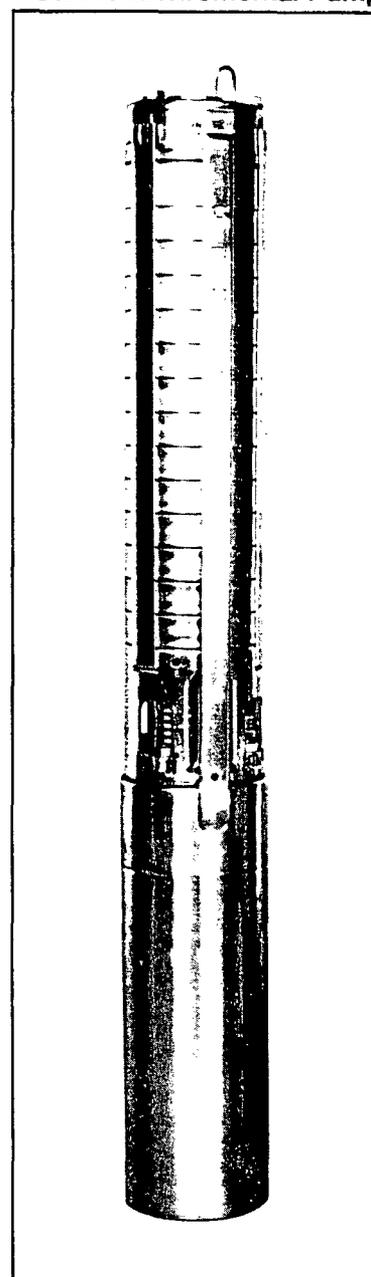
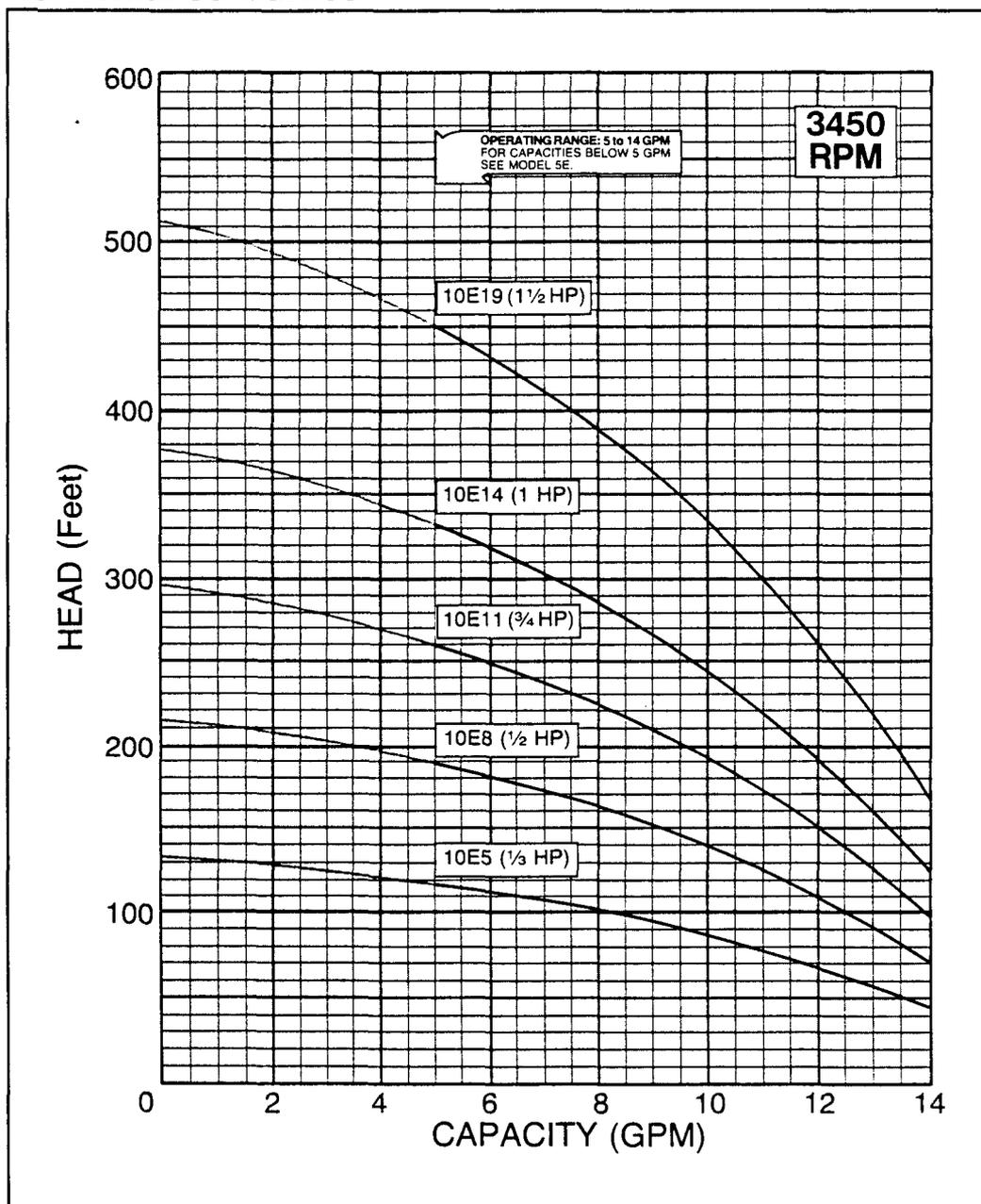
① Data for Grundfos MS402E motors. ② Does not include motor leads.

**BERTANE
COMPANY**

100 E. Chicago St., #805
 P.O. Box 1217
 Elgin, IL 60121
 708/741-0606 • FAX 708/741-6231

Performance Curves

Redi-Flo Environmental Pump



Materials of Construction

REDI-FLO PUMP END	
Check Valve Housing	304 Stainless Steel
Check Valve	304 Stainless Steel
Check Valve Seat	304 Stainless Steel & Teflon®
Diffuser Chamber	304 Stainless Steel
Impeller Seal Ring	Teflon®
Impeller	304 Stainless Steel
Suction Interconnector	304 Stainless Steel
Inlet Screen	304 Stainless Steel
Pump Shaft	304 Stainless Steel
Coupling	329/420/431 Stainless Steel
Straps	304 Stainless Steel
Cable Guard	304 Stainless Steel
Priming Inducer	304 Stainless Steel
Intermediate Bearings	Teflon®

GRUNDFOS ENVIRONMENTAL MOTOR	
Nema Top	304 Stainless Steel
Studs & Fasteners	304 Stainless Steel
Nuts	316 Stainless Steel
Sand Slinger	Viton®
Shaft Extension	431 Stainless Steel
Diaphragm	Viton®
Stator Housing	304 Stainless Steel
Fill Plug Screw	304 Stainless Steel
Fill Plug Washer	Teflon®

GRUNDFOS ENVIRONMENTAL MOTOR LEADS	
Connector Sleeve	304 Stainless Steel
Connector Potting	Scotch Cast #4® Epoxy w/Viton® Cap
Connector Plug	Viton®
Lead Insulation	Teflon®

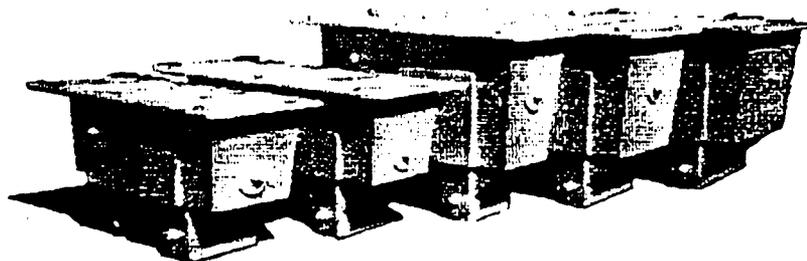
NOTE: Specifications are subject to change without notice.

ATTACHMENT C

**Hydro-Flo Technologies, Inc.
Oil/Water Separators Technical Specifications**

HYDRO-FLO TECHNOLOGIES, INC.

Mastering the Art of Oil/Water Separation



HYDRO-FLO
TECHNOLOGIES'
Dyna-Pak oil/water
separators provide
maximum efficiency and
higher capacities in a
compact, cost effective
package

**"DP" SERIES - COALESCING TYPE,
CROSS CORRUGATED PLATE OIL/WATER SEPARATOR
MOLDED FIBERGLASS CONSTRUCTION**

DESIGN CRITERIA

While other manufacturers are still using outdated information from chapters 3 & 5 of the API manual on disposal of refinery wastes, API bulletin #1630, first edition, May 1979, HYDRO-FLO uses the latest design criteria as defined by the American Petroleum Institute, API publication #421, Feb. 1990, The Design & Operation of Oil/Water Separators. Gallons per minute, specific gravity of the "aqueous" phase, specific gravity of the "oil" phase, oil droplet removal rate, viscosity of the wastewater, wastewater temperature, cross sectional velocity, etc....all of these factors have an impact on the operation of your separation system. Don't rely on old and outdated information. Come to Hydro-Flo for separators designed around today's information and technology.

OPERATION

INFLUENT DIFFUSION CHAMBER

The flow enters the separator submerged, through an influent diffusion chamber. Dispersion across the depth and width of the separation chamber is achieved through the use of a non-clog diffuser. Heavy solids fall out of suspension here and are channeled to the sludge collection chamber.

SEPARATION CHAMBER

The separation chamber is fitted with DYNA-PAC cross corrugated coalescing media. The pack creates a uniform cross-sectional resistance which further helps disperse the flow throughout the separation chamber. The sinusoidal flow of wastewater through the pack serves to promote intimate contact between the oil droplets and the plate surfaces. The coalesced oil has the least restricted path to exit the waste stream, and slides to the top of the pack on the surfaces of the plates. Solids encounter a 60 degree angle of inclination which is optimum for solids settling. The solids slide down the plates gathering both mass and velocity as they near the bottom of the pack and drop into the sludge collection chamber.

SLUDGE COLLECTION CHAMBER

The sludge collection chamber is located directly beneath the coalescing media pack and provides ample storage capacity

for the settled sludge. The sides of the chamber are sloped at 45 degrees to insure easy and complete removal of the settled sludge.

OIL REMOVAL

The separated oil accumulates at the surface of the separation chamber where it displaces the water. As the oil layer increases, oil will automatically spill over into the adjustable rotary pipe skimmer. The oil can then flow by gravity into the integral oil reservoir for temporary storage, or be pumped automatically to remote storage tanks.

EFFLUENT CHAMBER

The aqueous phase leaving the DYNA-PAC flows under the oil retention baffle and up over an adjustable effluent weir, which will maintain the liquid level throughout the separator. As the clean water passes over the effluent weir it enters the effluent chamber where it can either flow by gravity or be pumped automatically to the MSD or further processing.

REMOVABLE LID

The entire separator is covered with a removable lid. The lid is held in place with 1/2 turn, quick release latches and gasketed with industrial duty "D" shaped gasket material to ensure a vapor tight seal.

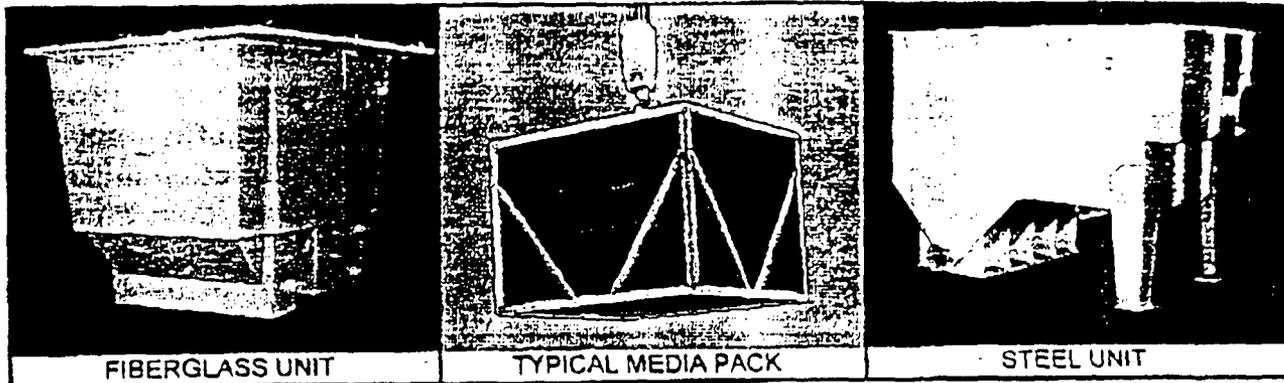
"DP" SERIES COALESCING TYPE

Cross Corrugated Plate Oil/Water Separator

205 East Kehoe Boulevard - Suite #2, Carol Stream, IL 60188 - Phone 708/462-7550, Fax 708/462-7728

HYDRO-FLO TECHNOLOGIES, INC.

Mastering the Art of Oil/Water Separation



FIBERGLASS UNIT

TYPICAL MEDIA PACK

STEEL UNIT

HYDRO-FLO, the supplier of choice.

The reasons for choosing HYDRO-FLO are many and diverse. Of these, our professional approach in the sizing and application of our equipment, our competitive pricing and speedy delivery, and our ability to handle the many custom features required for these types of projects are just a few of the reasons. For more information please call HYDRO-FLO today.

HYDRO-FLO TECHNOLOGIES, INC.	THE COMPETITION
<p>HYDRO-FLO uses the latest design criteria as defined by the American Petroleum Institute, API publication #421, Feb. 1990, The Design & Operation of Oil/Water Separators.</p> <p>Gallons per minute, specific gravity of the "aqueous" phase, specific gravity of the "oil" phase, oil droplet removal rate, viscosity of the wastewater, wastewater temperature, cross sectional velocity, etc... all of these factors have an impact on the operation of your separation system. Don't specify or buy an improperly designed separator. Call HYDRO-FLO today and have a separation system designed for your unique application.</p>	<p>The competition uses arbitrary design criteria.</p> <p>Some manufacturers use two gallons per minute per cubic foot of media supplied. Others use 10 gallons worth of capacity per gallon per minute. And still others use 5 to 10 minutes overall retention time based on "their feel for the project". None of these factors are legitimate sizing criteria. Sometimes they work, but most often their performance is inadequate at best. Don't be fooled by arbitrary design criteria. Have your equipment designed properly from the start with HYDRO-FLO.</p>
<p>HYDRO-FLO uses different media sizes to best solve your separation problem.</p> <p>What is the makeup of your wastewater? Does it consist of low quantities of suspended solids and large quantities of highly viscous oils? Does it consist of high quantities of heavy suspended solids and low quantities of light viscosity oils? At HYDRO-FLO we select the media based on your situation. Our media will give you the best possible maintainability without sacrificing performance.</p>	<p>The competition only offers one size of media regardless of design considerations.</p> <p>Different applications require different types of media. Filter manufacturers offer different size filter eliminates. Plate sedimentation equipment manufacturers offer different spacing on their pack assemblies. If your current supplier of oil/water separation equipment doesn't offer different media for different applications, come to HYDRO-FLO and allow us to recommend the correct media for your application.</p>

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HYDRO-FLO TECHNOLOGIES, INC.

Mastering the Art of Oil/Water Separation

HYDRO-FLO TECHNOLOGIES, INC.	THE COMPETITION
<p>HYDRO-FLO incorporates the features you request.</p> <p>In addition to our standard features (influent diffusion chamber with non-clog diffuser, integral sludge collection chamber, rotary pipe oil skimmer, effluent chamber with sheen baffle, etc.) HYDRO-FLO has incorporated many features recommended by our customers. (See below)</p>	<p>The competition doesn't!</p> <p>Most manufacturers incorporate features based on what other suppliers offer. They are more concerned with keeping pace with them than they are with supplying what the customer wants. Sometimes this thinking eliminates just the feature that you need. Look at the list below and see just how much more you get with a HYDRO-FLO separation system.</p>
<p>We supply an integral product recovery tank/pump sump for the internal storage of all recovered product. This eliminates the need for external storage and additional secondary containment.</p>	<p>They do not provide for internal storage.</p>
<p>We supply heavy duty lids with industrial duty gaskets for a vapor tight seal. Along with that come quick release 1/2 turn draw latches for ease of maintenance.</p>	<p>They supply inexpensive gaskets normally used to seal home doors and windows. The separators incorporate cumbersome nuts and bolts for lid removal.</p>
<p>We incorporate heavy duty rotary unions with zerk fittings into our rotary pipe skimmer. Also, we use industrial duty fittings and hardware for years of trouble free operation.</p>	<p>They use general duty compression couplings with commercial grade hardware. For example they use a cad plated bolt dipped in vinyl for a control handle on their rotary pipe skimmer.</p>
<p>We supply integrally molded tank fittings (instead of bulkhead fittings with gaskets). This is a more expensive method of fabrication, but it eliminates leaks from gasket compatibility problems.</p>	<p>They offer bulkhead fittings with gaskets. They leak, the gaskets swell and deteriorate over time. They are a high maintenance item that eventually has to be replaced.</p>
<p>We supply an integral sludge collection hopper for the storage and easy removal of accumulated sludge. The removal of accumulated sludge is important for the proper operation of this equipment and a hopper is the best method for the storage and removal. We are currently the only manufacturer of molded fiberglass separators who incorporates this feature!</p>	<p>The competition either offers no provision for the collection and removal of accumulated sludge, or they have a flat bottom with a pipe manifold. This is not an effective method for the removal of sludge. The pipes tend to plug up and there is little space for sludge to accumulate before fouling out the pack.</p>

HYDRO-FLO manufactures the finest separator available today.

We encourage you to compare our equipment to any others available. HYDRO-FLO beats the competition hands down. Our quality of design and manufacture, our many standard features, our fast delivery and our low prices all mean that HYDRO-FLO is the best value for your oil/water separation dollar. Try us once and find out why others are switching from their current supplier to HYDRO-FLO.

"DP" SERIES COALESCING TYPE

Cross Corrugated Plate Oil/Water Separator

205 East Kehoe Boulevard - Suite #2, Carol Stream, IL 60188 - Phone 708/462-7550, Fax 708/462-7728

Hydro-Flo Technologies Engineering Specification

205 E. Kehoe Blvd.
Carol Stream, IL 60188
(708) 462-7550
FAX: (708) 462-7728

Wednesday, May 11, 1994

COALESCING TYPE OIL/WATER SEPARATOR Model # DP012-F21

1.0 EQUIPMENT SCOPE

1.1 The separator shall be a specially fabricated rectangular channel tank with supporting structure. The separation process shall be fully automatic requiring no moving parts. The design of the separator must satisfy the requirements of API PUBLICATION 421, Feb. 1990 on DESIGN & OPERATION OF OIL/WATER SEPARATORS and Stoke's law. Performance enhancement must be achieved by the use of DYNA-PAK cross corrugated coalescing media.

1.2 The separator must be designed to separate oil from wastewater meeting the following criteria:

- A) Designed flow rate = 20 gpm
- B) Specific gravity of the waste water aqueous phase = 1.00
- C) Specific gravity of the oil phase = .85
- D) Viscosity of the oil phase = .0115
- E) Oil droplet removal rate = 10 mg/l of oil droplets > 30 microns
- F) Maximum allowable (dynamic) viscosity of the wastewater to be .0115 poise
- G) Media pack size to be 36 W x 24 H x 24 L (inches)
- H) Maximum allowable wastewater temperature = 110 degrees F.
- I) Minimum projected surface area = 252 square feet
- J) Minimum coalescing surface area = 504 square feet
- K) Maximum cross sectional velocity = 0.89 ft/min @ 20 gpm
- L) Minimum separation chamber retention time = 6.73 min @ 20 gpm
- M) Minimum sludge chamber capacity = 26 gal
- N) Material of construction = molded fiberglass

Hydro-Flo Technologies Engineering Specification

COALESCING TYPE OIL/WATER SEPARATOR
Model # DP012-F21

2.0 EQUIPMENT

2.1 The separator shall be a specially fabricated rectangular channel tank with supporting structure that includes:

2.1.A INFLUENT DIFFUSION CHAMBER

The flow shall enter the separator submerged, through an influent diffusion chamber. Dispersion across the depth and width of the DYNA-PAK is to be achieved through the use of a non-clog diffuser. Heavy solids that fall out of suspension here must be channeled to the sludge collection chamber.

2.1.B SEPARATION CHAMBER

The separation chamber must be fitted with DYNA-PAK cross corrugated coalescing media. Adequate space is to be left before and after the chamber to prevent short circuiting through the pack.

2.1.C SLUDGE COLLECTION CHAMBER

The sludge collection chamber must be located directly beneath the coalescing media pack and provide ample storage capacity for the settled sludge. The sides of the chamber must be sloped at 45 degrees to insure easy and complete removal of the settled sludge.

2.1.D ROTARY PIPE OIL SKIMMER

The rotary pipe oil skimmer must be located at the effluent end of the separation chamber and incorporate an adjustable oil skimming weir. The rotating action is to be achieved by the use of rotating unions with zerk fittings for lubrication.

2.1.E RECOVERED PRODUCT STORAGE CHAMBER

The recovered product storage chamber must be located beneath the separation chamber and include fittings for pump suction, atmospheric vent, and both high and low level controls. Also, the chamber must have provisions for the installation of an optional sight glass. The sight glass is to be used for the visual verification of recovered product level.

2.1.F EFFLUENT CHAMBER

The aqueous phase leaving the DYNA-PAK shall pass under the oil retention baffle and up over the effluent weir, which will maintain the liquid level throughout the separator.

2.1.G REMOVABLE LIDS

The entire separator must be covered with a removable lid. The lid must come with a D shaped, vapor tight, seal. The lid will be held in place, and the seal compressed, by adjustable 1/2 turn draw latches.

Hydro-Flo Technologies Engineering Specification

COALESCING TYPE OIL/WATER SEPARATOR

Model # DP012-F21

3.0 MATERIALS OF CONSTRUCTION

3.1 The tank shell, baffles and lids must be fabricated of fiberglass reinforced polyester resin consisting of 25% chopped fiberglass as a minimum.

3.2 The media pack shall be fabricated of oleophilic cross corrugated coalescing media manufactured by HYDRO-FLO TECHNOLOGIES.

3.3 All piping must be fabricated of fiberglass reinforced polyester resin unless specified otherwise.

3.4 All surfaces of the fabricated tank must be covered with a continuous layer of chemically resistant, ultraviolet stabilized, polyester gelcoat.

3.5 The rotary pipe skimmer must be fabricated of corrosion resistant plastic and type 304 stainless steel.

3.6 The lid seal must be fabricated of closed cell, neoprene foam.

NOTE: All wetted fittings are to be fiberglass and must be molded as an integral part of the separator. Bulkhead fittings with gaskets are not allowed under any circumstances.

4.0 WARRANTY

4.1 HYDRO-FLO TECHNOLOGIES shall warrant its products to be free of defects in materials and workmanship. The warranty period will last for one year from date of shipment.

5.0 INSTALLATION, OPERATION AND MAINTENANCE MANUALS

5.1 HYDRO-FLO TECHNOLOGIES shall supply one (1) copy of the installation, operation and maintenance manual.

6.0 START-UP ASSISTANCE

6.1 HYDRO-FLO TECHNOLOGIES will, upon request, furnish one process engineer to assist in start-up and operator training. The service of this engineer will be provided for two (2) 8 hour calendar days at the discounted rate of \$250.00 per day plus travelling and living expenses (one trip). However, the purchaser assumes all responsibility for the readiness of the HYDRO-FLO equipment when they request start up service. Should HYDRO - FLO's service engineer arrive at the job site and determine that the equipment cannot be started up within a reasonable amount of time, HYDRO-FLO shall have the option of bringing the service engineer home and billing the customer for time, travel and living expenses. Additional field service is also available from HYDRO-FLO at the prevailing rate at the time of service, plus all travel and living expenses. The current rate is \$550.00 per day.

7.0 MANUFACTURERS

7.1 The unit shall be manufactured by HYDRO-FLO TECHNOLOGIES.

Hydro-Flo Technologies Engineering Specification

205 E. Kehoe Blvd.
Carol Stream, IL 60188
(708) 462-7550
FAX: (708) 462-7728

Wednesday, May 11, 1994

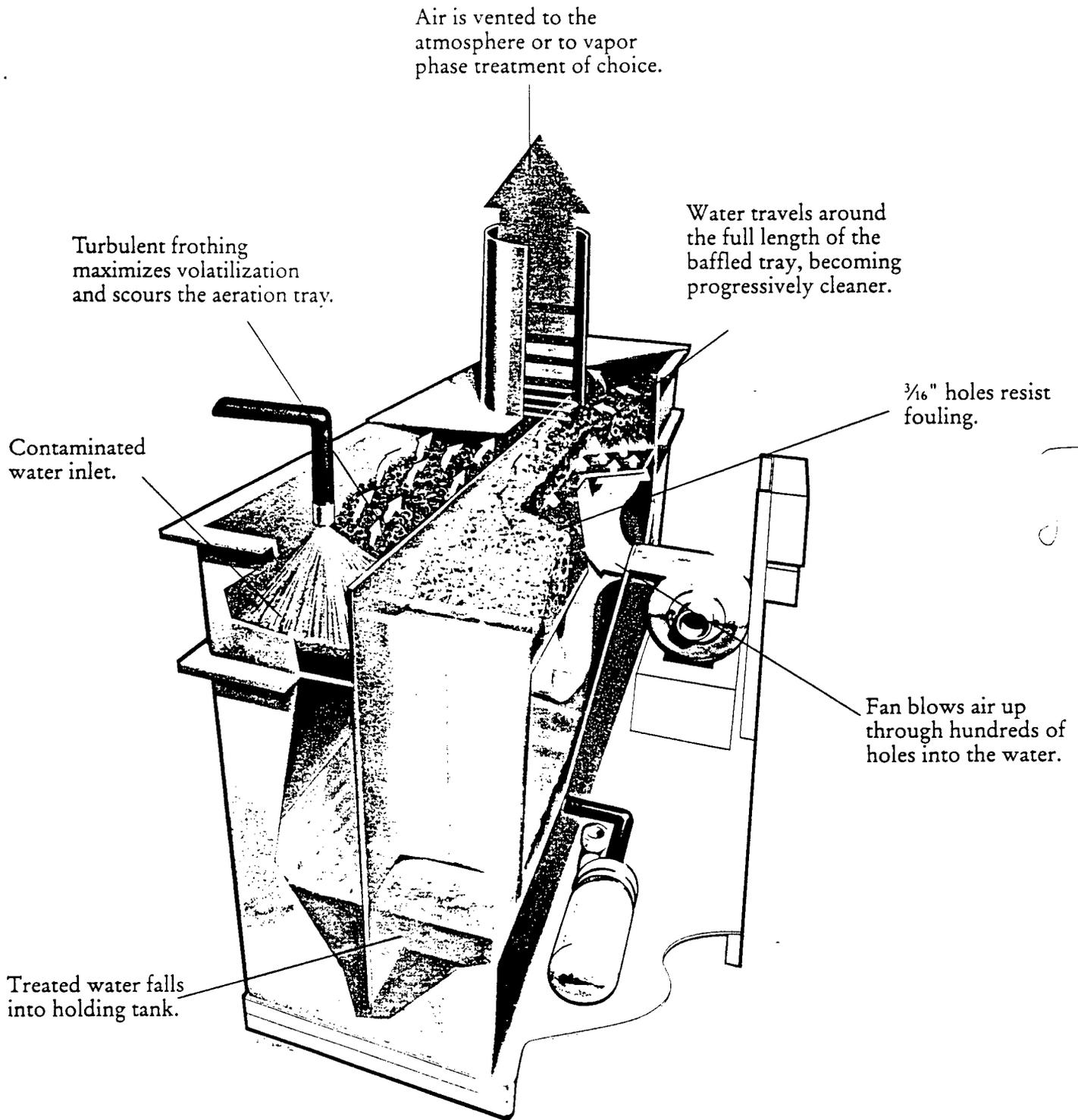
COALESCING TYPE OIL/WATER SEPARATOR STANDARD OPTIONS LISTING

- A) Effluent Pump Packages
- B) Influent Pump Packages
- C) Oil Pump-Out Packages
- D) Sludge Pump-Out Packages
- E) Floating Skimmers / Suction Strainers
- F) Equalization / Bulk Storage Tanks
- G) Replacement Media Packs
- H) Elevated Structural Steel Platforms
- I) Equipment Lease Or Rental Schedules

ATTACHMENT D

General Information on the Northeast Environmental
Products Shallow Tray Air Stripper

The ShallowTray™ Process



This illustration is representative of the ShallowTray™ Model 2611.

Protected under U.S. Patent No. 5,045,215. Other U.S. and International Patents Pending.

Photo on front cover: top view of 2300 Series aeration tray in action.
Photo on back cover: cross section of a ShallowTray in action (full scale).

ShallowTray is a trademark of North East Environmental Products, Inc.
© 1992 North East Environmental Products, Inc.
Our policy is one of continual improvement and we reserve the right to alter any detail of our products at any time without notice.

Printed on recycled paper
#5 March

Low Profile

The discreet size of a ShallowTray™ air stripper does not advertise a contamination site. It is easily accessed for maintenance and can be installed inside a building. The system is also ideal as a trailer-mounted, portable stripper for pump tests, pilot studies, short-term cleanup, or emergency response. There is no tower.

Treatment

The ShallowTray process uses forced draft, countercurrent air stripping through baffled aeration trays to remove volatile organic compounds from water.

Contaminated water is sprayed into the inlet chamber through a coarse mist spray nozzle. The water flows over a flow distribution weir and along the baffled aeration tray. Air, blown up through $\frac{1}{16}$ " diameter holes in the aeration tray, forms a froth of bubbles generating a large mass transfer surface area where the contaminants are volatilized. The necessary contact or residence time to reach required volatilization is achieved through model size, addition of trays, and flow rate selection.

Resistant to Fouling

ShallowTray systems are resistant to fouling problems. Treatment trays have large $\frac{1}{16}$ " diameter aeration holes. In addition, the turbulent action of the froth scours the surfaces of the tray reducing build-up of oxidized iron.

If, under extreme conditions, oxidized iron accumulates or hardness begins to scale up, trays can

be easily cleaned through ports using a washing wand and pressure washer. Trays can also be easily removed for a thorough inspection and cleaning.

Full Range Turndown

Not only are ShallowTray systems forgiving of "surprise" inorganics in the water, they also allow operation anywhere within the rated flow range. In fact, as the flow rate is reduced, performance increases. Also, as demands change (stricter effluent contaminant levels) so can the ShallowTray system. Its modular design allows for the addition of trays which increase the percent removal of contaminants.

No Disposal

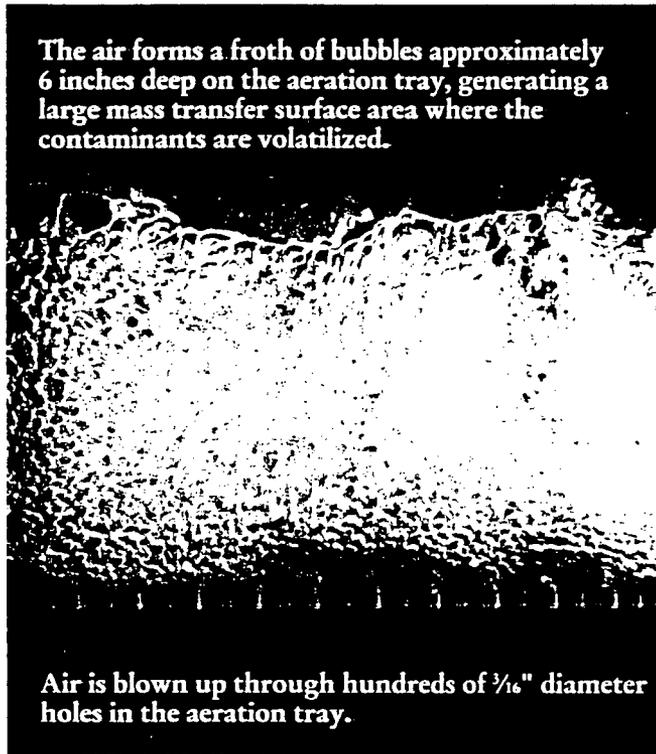
ShallowTray systems have no packing or diffusers to contend with and no costs associated with GAC breakthrough, fouling or disposal and replacement.

System Size

To determine the system size required for your site, first identify the flow rate. This guides you to the ShallowTray Series needed. As an example, with a flow rate of 30gpm, select the 2600 Series, which is rated for flows from 1 to 50gpm.

Next, identify the contaminants present and the removal requirement. Generally, this determines the number of trays required. However, the graphs in this brochure should be used as a guideline only. For a proposal, send us or your representative the specifications. Request for Quotation sheets are available.

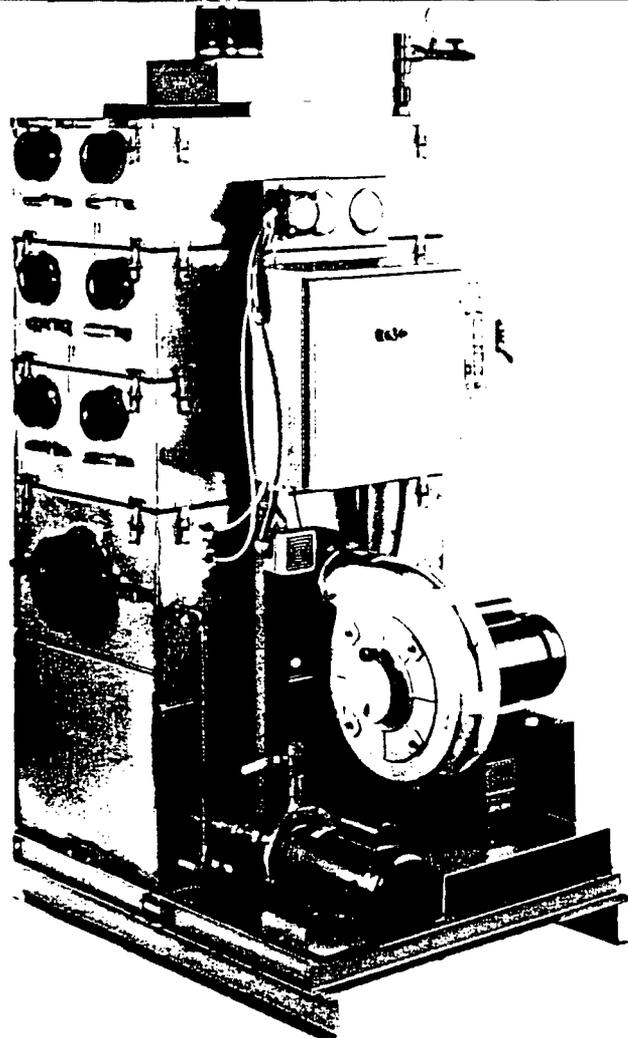
The air forms a froth of bubbles approximately 6 inches deep on the aeration tray, generating a large mass transfer surface area where the contaminants are volatilized.



Air is blown up through hundreds of $\frac{1}{16}$ " diameter holes in the aeration tray.



2300 Series

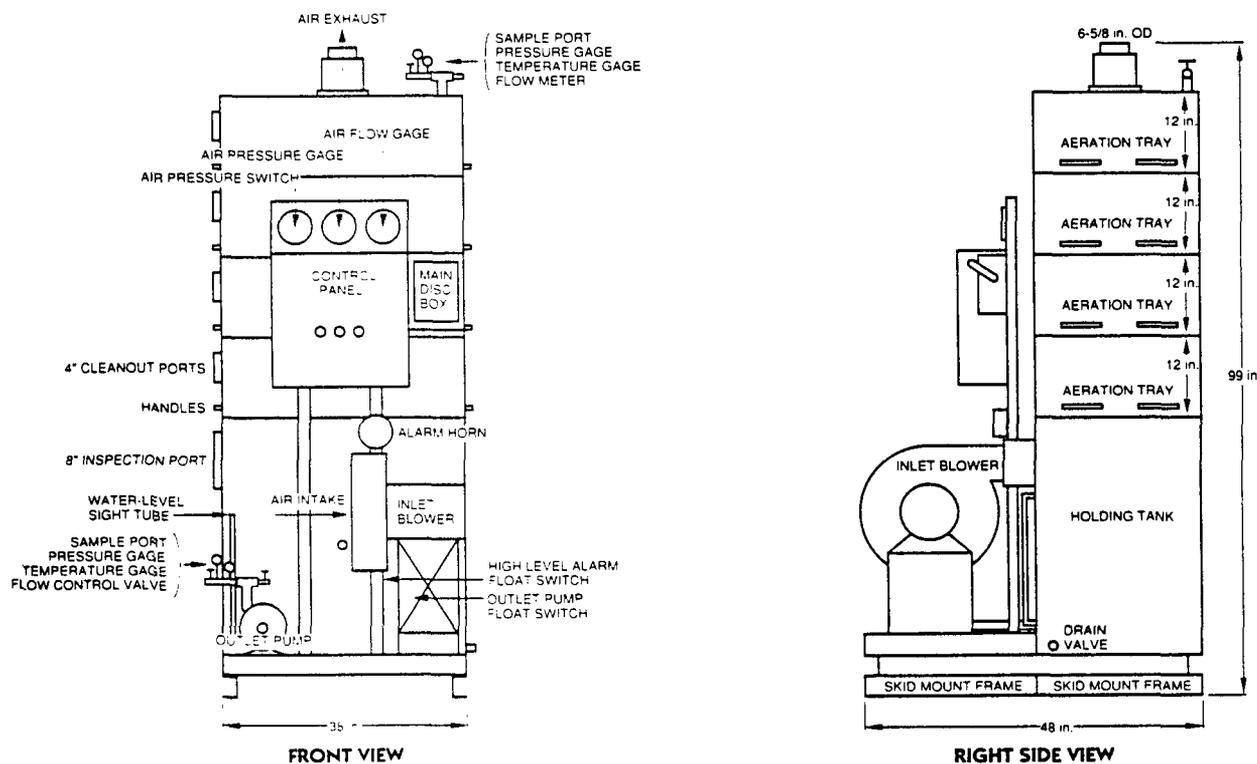


Model Pictured: 2331

Options chosen for system pictured:

- Discharge pump, TEFC
- NEMA 3R control panel with level controls for pump, alarm interlocks, motor starter, relays, 100 db alarm horn
- Main disconnect switch
- Low air pressure alarm switch
- High level alarm switch
- Discharge pump level switch
- Water pressure gauges
- Air flow meter
- Line sampling ports

Typical 2341 Configuration



*Use these drawings as a guideline only. Systems are built to your project's specifications.



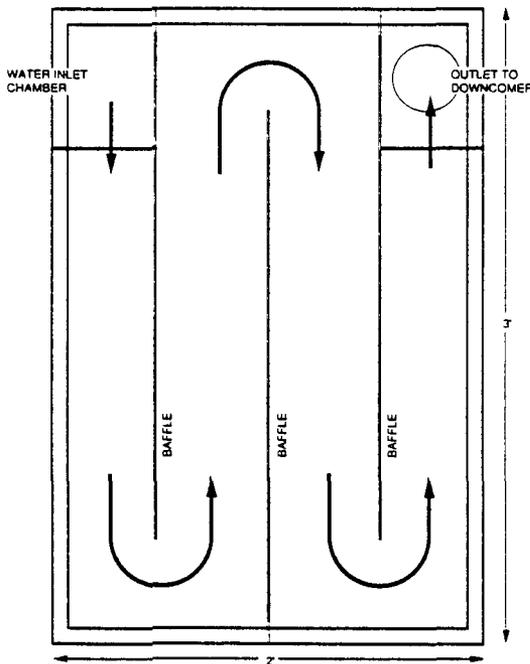
Model	flow rate	# trays	width	length	height	min. clear	approx. lbs.
2311	1-25gpm	1	4'	3'2"	5'3"	300	765
2321	1-25gpm	2	4'	3'2"	6'3"	300	845
2331	1-25gpm	3	4'	3'2"	7'3"	300	925
2341	1-25gpm	4	4'	3'2"	8'3"	300	1005

See 5+P

ShallowTray

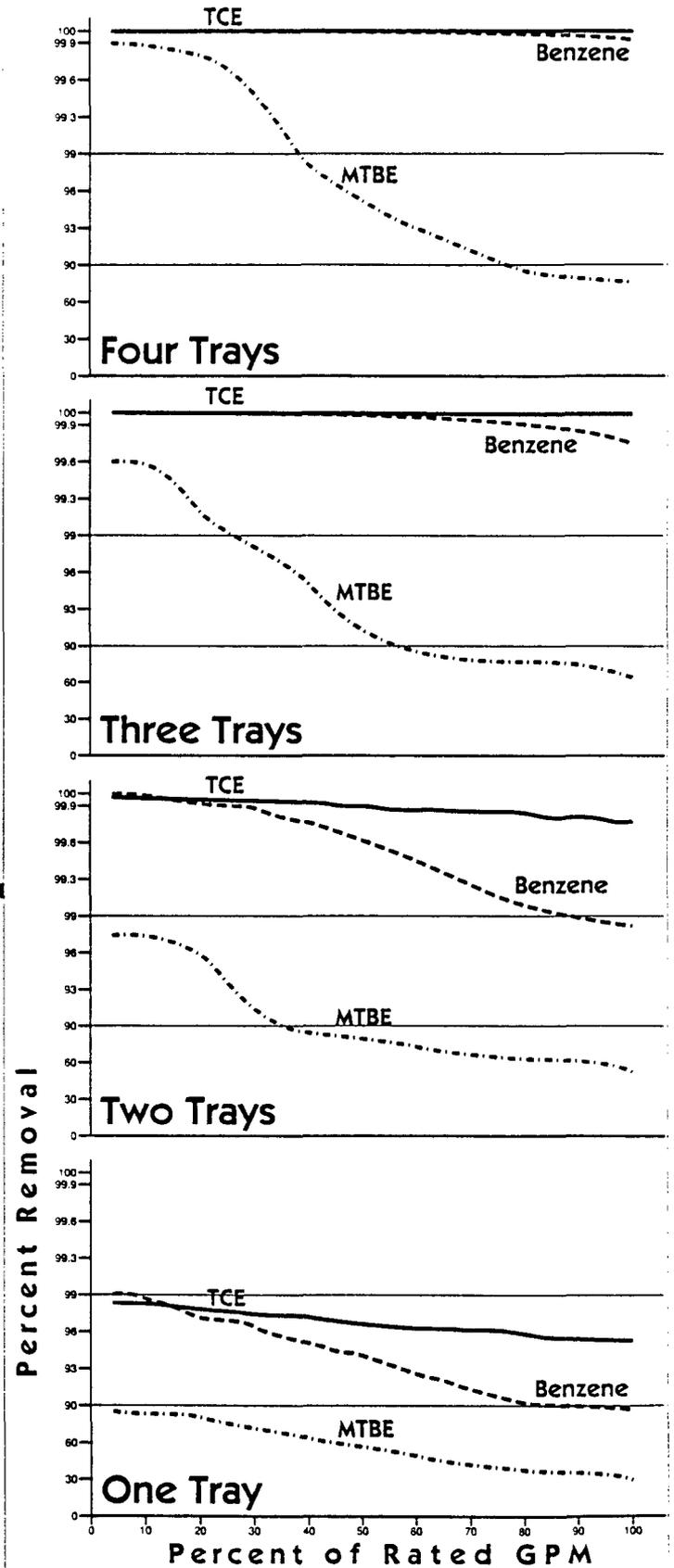
low profile air strippers

2300 AERATION TRAY



TOP VIEW

Percent Removal vs. Flow Rate



2300

GPM 0 5 10 15 20 25

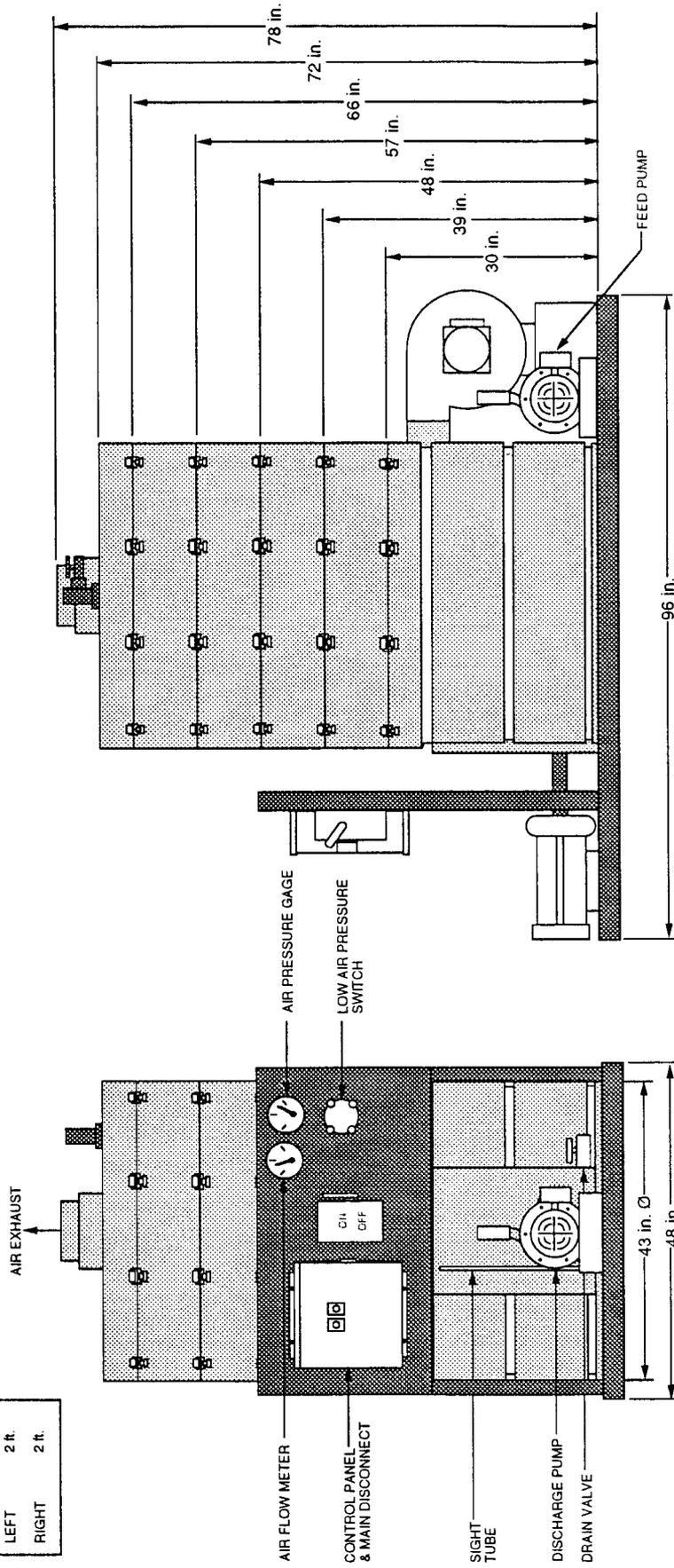
The graphs represent approximate removal efficiencies. Use the ShallowTray™ modeling program to calculate expected performance.



FRONT

RIGHT SIDE

MINIMUM CLEARANCE	
FRONT	1.5 ft.
TOP	12 in.
REAR	1.5 ft.
LEFT	2 ft.
RIGHT	2 ft.



BASIC SYSTEM

- SUMP TANK
- AERATION TRAYS
- BLOWER
- AIR PRESSURE GAGE
- DEMISTER PAD
- PIPING
- SPRAY NOZZLE
- WATER LEVEL SIGHT TUBE
- GASKETS
- LATCHES

OPTIONAL ITEMS

- ALUMINUM FRAME
- DISCHARGE PUMP
- FEED PUMP
- ADDITIONAL BLOWER
- EXP. MOTORS
- BLOWER START STOP PANEL
- CONTROL PANEL
- MAIN DISCONNECT SWITCH
- IS 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 GAGES
- DIGITAL WATER FLOW INDICATOR
- AIR FLOW METER
- TEMPERATURE GAGES
- LINE SAMPLING PORTS
- AIR BLOWER SILENCER
- WASHER WAND
- AUTO DIALER

NOTE:

1. DRAWING REPRESENTS A UNIT TYPICAL TO THE SPECIFICATION YOU REQUESTED. MINOR CHANGES MAY RESULT IN THE MANUFACTURING PROCESS.

CONNECTION INFORMATION

ITEM	SIZE
GRAVITY DISCHARGE	2 in. Ø FEMALE THD.
DISCHARGE PUMP	3/4 in. Ø FEMALE THD.
WATER INLET	1-1/4 in. Ø FEMALE THD.
AIR EXHAUST NOZZLE	6 in. Ø FLANGE

POWER: 1Ø, 230 volts, 3 WIRE and GROUND

*CONSULT N.E.E.P. FOR AMPACITIES AND OTHER VOLTAGE OPTIONS



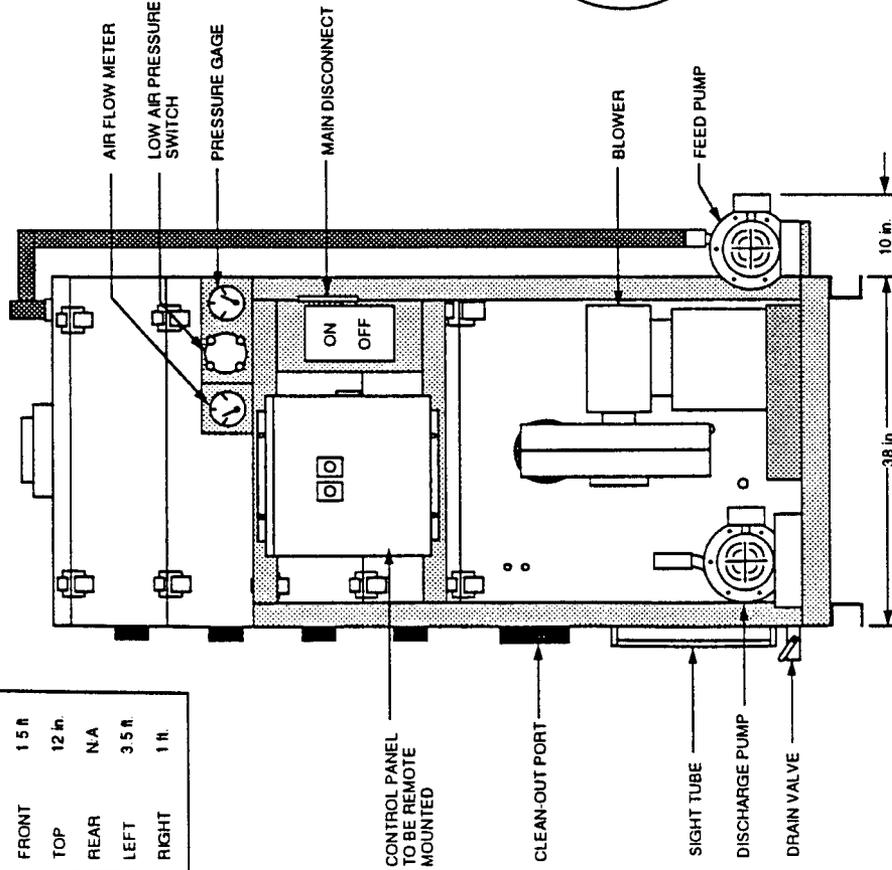
NORTH EAST ENVIRONMENTAL PRODUCTS, INC.
17 TECHNOLOGY DRIVE
WEST LEBANON, NH 03784
(603) 296-7061

TOLERANCES UNLESS OTHERWISE SPECIFIED 1:1	DRAWING NAME: 2341P
DRAWING #: 594419	CUSTOMER: Mittelhauser Corp
DATE:	SCALE:
SHEET: A	OF: 1

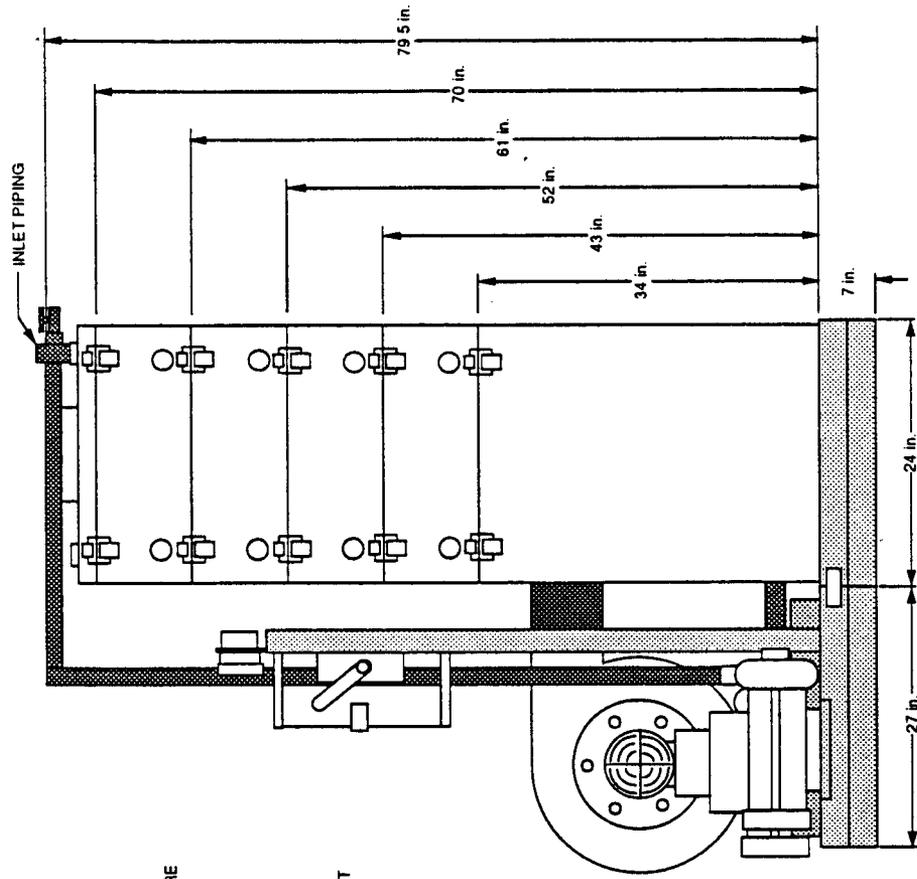
FRONT

MINIMUM CLEARANCE

FRONT	15 ft
TOP	12 in.
REAR	N.A.
LEFT	3.5 ft.
RIGHT	1 ft.



RIGHT SIDE



BASIC SYSTEM

- SUMP TANK
- AERATION TRAYS
- BLOWER
- AIR PRESSURE GAGE
- DEMISTER PAD
- PIPING
- SPRAY NOZZLE
- WATER LEVEL SIGHT TUBE
- GASKETS
- LATCHES
- FRAME

OPTIONAL ITEMS

- DISCHARGE PUMP
- FEED PUMP
- ADDITIONAL BLOWER
- EXP MOTORS
- BLOWER START/STOP PANEL
- CONTROL PANEL
- MAIN DISCONNECT SWITCH
- IS COMPONENTS/REMOTE MOUNT
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- AIR BLOWER SILENCER
- WASHER WAND
- AUTO DIALER

NOTE:

1. DRAWING REPRESENTS A UNIT TYPICAL TO THE SPECIFICATION YOU REQUESTED. MINOR CHANGES MAY RESULT IN THE MANUFACTURING PROCESS

POWER: 1Ø, 230 volts, 3 WIRE and GROUND

*CONSULT N.E.E.P. FOR AMPACITIES AND OTHER VOLTAGE OPTIONS

CONNECTION INFORMATION

ITEM	SIZE
GRAVITY DISCHARGE	2 in. Ø FEMALE THD.
DISCHARGE PUMP	3/4 in. Ø FEMALE THD.
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AIR EXHAUST NOZZLE	6 in. Ø FLANGE

	NORTH EAST ENVIRONMENTAL PRODUCTS, INC. 17 TECHNOLOGY DRIVE WEST LEBANON, NH 03784 (603) 298-7081		
	TOLERANCES UNLESS OTHERWISE SPECIFIED ± 1 in.	DRAWING NAME: 2341	DRAWING #: 594419
DRAWN: C/JG	DATE: 05/09/94	SCALE:	SHEET: OF