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APPLE VALLEY SHOPPING CENTER

INTERIM REMEDIAL MEASURES WORK PLAN

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1.0 INTRODUCTION

The Apple Valley Shopping Center Site (the Site) is located in the Town of LaGrange, Dutchess County, New York, approximately seven (7) miles east of the City of Poughkeepsie (see Figure 1, "Site Location Map"). The Site consists of the Apple Valley Shopping Center (AVSC), located at the southwest corner of the junction of State Route 55 and Titusville Road. The AVSC was constructed in 1967 – 1968, and contains a number of businesses including the former Apple Valley Dry Cleaners (AVDC) currently Absolute Pizza, the Norgetown Laundromat (NL) currently Apple Valley Laundromat, and a Grand Union supermarket (GU) currently Foodtown.

The Site is currently owned by Apple Valley Corporation; the previous owner was James A. Klein Enterprises (JAK). JAK is subject to an Administrative Order on Consent No. II-CERCLA-10224 ("the Order" or the "USEPA Order") (see Appendix A) entered into on October 4, 1991 between JAK and the United States Environmental Protection Agency (USEPA) with respect to the Site. The Order requires JAK to undertake an Emergency Removal Action at the Site. Such Emergency Removal Action has been ongoing since 1992. The principal contaminant at the Site, as demonstrated by groundwater sampling, soil gas sampling and soil testing, is tetrachloroethene (also known as perchloroethene or PCE); lesser quantities of trichloroethene (TCE) and other chlorinated solvents have also been detected.

The Woodbridge Estates Subdivision (WES) is located southwest of the Site. The water supplies of several residences within the WES were impacted by migration of groundwater from the Site. Treatment of the impacted residential water supplies was required by the USEPA Order.

1.1 Purpose of IRM

This Interim Remedial Measures (IRM) Work Plan is proposed to supplement the ongoing Emergency Removal Action undertaken by JAK. The IRM Work Plan targets source areas previously identified at the Site, including the primary source area, or "hot spot," located approximately 15 to 20 feet behind the former location of the AVDC. The goal of the IRM is to accelerate the rate of contaminant removal in this area of the Site.

1.2 Site History, Previous Investigations and Remedial Actions

1.2.1 Site History

In 1988, the Dutchess County Department of Health (DCDOH) collected and analyzed samples of groundwater from several residential supply wells located in the Woodbridge Estates Subdivision[1]. The samples contained PCE as well as TCE and isomers of dichloroethene (DCE). The DCDOH also sampled the AVSC's supply wells, well AV-1 (abandoned due to poor yield) and its replacement, well AV-2. Concentrations of the same chlorinated compounds were detected, with greater than 5,000 parts per billion (ppb) of PCE in well AV-1. Chlorinated hydrocarbons were also found in the discharge from the sump at the base of the Grand Union supermarket loading dock. A point-of-entry (POE) granular activated carbon (GAC) filter system was installed by JAK to treat the Shopping Center's well water and, in 1989, a third supply well (AV-3) was installed at an upgradient location on the shopping center property.

[1] See tabulated analytical results and analytical reports included in *Work Plan, Apple Valley Shopping Center Superfund Site, LaGrange, New York, Superfund Emergency Removal Action* prepared by TRC Environmental Consultants, Inc.

In 1990, the DCDOH conducted more extensive sampling of the water supply wells in the WES, and found that a number of wells were contaminated with chlorinated compounds at levels above the NYS standards for public drinking water supplies. In September 1990, the NYSDEC requested the intervention of the USEPA to initiate actions under CERCLA's emergency removal authorities to provide potable water to residents whose supply wells had been impacted.

1.2.2 Regulatory and Legal Framework

In December 1990, the NYSDEC notified JAK that the Shopping Center property had been included in the New York State Registry of Inactive Hazardous Waste Disposal Sites and that JAK was considered a Potential Responsible Party (PRP) by reason of ownership of the Site. Immediately thereafter, JAK began the provision of bottled water to the affected residences in the Woodbridge Estates Subdivision pending further negotiations with the NYSDEC. On December 21, 1990, the USEPA notified counsel for JAK that it had assumed responsibility for the Site and would be initiating actions under the emergency removal authorities, and that the USEPA viewed JAK as a PRP.

An agreement was reached between the USEPA and JAK in late September 1991, and the Order on Consent was issued with an effective date of October 4, 1991. The Order on Consent required treatment of the groundwater supplies at the Shopping Center and at the impacted residences within the WES. A further purpose of the Order was to abate or control off-site migration of contaminants to unaffected water supplies, including the Titusville public water supply.

1.2.3 Emergency Removal Action

Pursuant to the EPA Order in 1992, JAK installed point-of-entry (POE) granular activated carbon (GAC) filters on the wells of eight (8) residences in the WES. A groundwater withdrawal and treatment program was also initiated to control migration of contaminated groundwater from the Site and to effect a collapse of the off-site contaminant plume. As required by the EPA Order, this program involved the installation of two (2) low-profile air strippers. One air stripper (AVS) serviced Shopping Center well AV-2. This well is pumped continuously at 20 gallons per minute (gpm). Treated water from AV-2 is distributed for use by Shopping Center tenants and excess water is discharged to an adjacent wetland. In early 1999, the Shopping Center was placed on municipal water. The treated discharge of the AVS is discharged to the wetland.

The second air stripper (LRS) serviced two (2) residential supply wells at Locust Crest Court (Lot Nos. 10 and 11). These wells were pumped intermittently for a combined continuous discharge of 10 gpm. Treated water from these wells was distributed for use by the residents of Lots 10 and 11, and excess water was discharged to an adjacent wetland. JAK also retained responsibility for operation and maintenance of the GAC filters and air strippers.

Pursuant to the Order and with EPA's consent, in 1996, five (5) of the original eight (8) POE GAC filters were decommissioned since sampling established that water supplies at those locations had been cleaned to levels below the standards for treatment cessation as established by the EPA Order. In 1999, a sixth residence was removed from the program. The two remaining GAC systems service Lots 10 and 11.

In 2001, the air stripper servicing Lots 10 and 11 of the Woodbridge Estates Subdivision was decommissioned. The same year, the Apple Valley air stripper, AVS, was replaced with a unit manufactured by QED Environmental.

1.2.4 Previous Investigations

The site has been subject to several investigations during the period 1990-2002. In addition to the initial DOH investigations, the following investigative activities were undertaken at the site. A soil gas survey was conducted by Dunn Geoscience Corporation (DGC) in February of 1991. A second soil gas survey was conducted at the request of TRC Corporation by Specialized Environmental Monitoring (SEM) in May, 1993[2]. Both surveys were conducted on behalf of JAK.

Several soil sampling efforts were conducted at the AVSC Site on behalf of the Norgetown Laundromat, Grand Union and JAK. In August, 1991, U.S. Hydrogeologic, Inc. (USH) conducted a soil sampling investigation on behalf of the owner of the Norgetown Laundromat Facility[3]. On April 27, 1993, Soiltesting, Inc. conducted a soil boring program of the AVSC Site, in conjunction with Ecosystems Strategies, on behalf of the owner of the Norgetown Laundromat Facility[4]. On January 20, 1997, soil samples were collected on behalf of JAK[5]. On behalf of Grand Union in January, 1997, Malcolm Pirnie conducted an extensive soil sampling investigation at the site[6]. During the Malcolm Pirnie investigation, approximately seventy (70) soil samples were collected from 15 Geoprobe borings and one groundwater sample was collected from one of the Geoprobe borings.

There have been nearly one hundred (100) separate groundwater sampling events in association with the Site. Groundwater samples were analyzed from AVSC supply wells AV-1, AV-2 and AV-3 during the September 1992 baseline sampling event requested by TRC Corporation on behalf of JAK and conducted by Specialized Environmental Monitoring (SEM). Off-site groundwater data have been generated through sampling of tap water or treatment system influents at residences in the Woodbridge Estates subdivision. Further, off site groundwater data were obtained by sampling at commercial establishments which were generally located upgradient of the Site at locations along NYS Route 55. Sampling of tap water was initiated by the Dutchess County Department of Health (DCDOH) in 1988. Sampling of treatment system influents was continued by JAK after the installation of point-of-entry (POE) systems at certain residences.

Aquifer pump testing of well AV-2 was conducted in 1993 on behalf of JAK by TRC Corporation to determine the hydraulic properties of the impacted bedrock aquifer and to inform the design of the groundwater withdrawal program[7].

A Focused Remedial Investigation / Feasibility Study (RI/FS) was conducted in 2001 by Earth Tech of New York, Inc., on behalf of the NYSDEC[8]. Site work included additional borings and the installation of

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[2] *Soil Gas Sampling and Analysis, Apple Valley Shopping Center Superfund Site, Town of LaGrange, Dutchess County, New York* prepared by TRC Environmental Consultants, Inc., and dated May 14, 1993.

[3] *Final Report on the Norgetown Laundromat Facility,* prepared by U.S. Hydrogeologic, Inc., and dated October 24, 1991.

[4] Collected by Ecosystems Strategies, Inc. on April 27, 1993 and reported in a memo from Paul H. Ciminello dated May 19, 1993, and the Matrix Analytical Report dated May 11, 1993.

[5] Matrix Analytical, Inc., report dated January 30, 1997

[6] See the Field Borehole Logs prepared by Malcolm Pirnie for 15 borings conducted on January 28 and 29, 1997, and as discussed in *Addendum to Plaintiff's Expert Report* dated March 14, 1997, by Galson Corporation.

[7] See the results of the three-day constant-discharge pump test conducted by TRC Environmental Consultants, Inc., from March 25 to April 1, 1993, as reported in a memo dated April 12, 1993, from Mr. Andrew M. Koenigsberg of TRC to Ms. Theresa A. Beddoe of TRC.

new monitoring wells, soil, sediment and groundwater sampling, photolineament analysis and surveying of wells, including packer testing, video logging and caliper and temperature logging.

1.3 Definition of Contaminant Source Areas

During the course of site investigations, several sources of the contaminants were identified. The principal source area is located approximately 15 to 20 feet south of the former Apple Valley Dry Cleaners (AVDC). This area was originally identified as a "hot spot" during the soil gas surveys conducted at the site. This "hot spot" was the location at which releases of PCE occurred in association with deliveries of solvent by Morwhite, Inc. of Albany, NY, to the AVDC. Morwhite's deliveries were made using a hose and nozzle system. While other sources have been identified at the Site, it is clear that this "hot spot" constitutes the primary source area at the Site. Morwhite demonstrated the operation of its hose and nozzle delivery system during discovery in *Klein v. Grand Union, et al.* in February 1993. Uncontrolled leakage from the Morwhite delivery system occurred during the demonstration. Morwhite delivery records indicate a release of approximately sixty gallons occurred on November 27, 1985 in association with a delivery to the AVDC. A witnessed release of PCE occurred on June 2, 1992, during a delivery to AVDC. Morwhite delivery records indicate that this release was approximately 9.5 gallons. Sampling of a bedrock monitoring well (MW-RCI) installed at the "hot spot" during the January 1997 reclassification investigation revealed concentrations of PCE at 23 mg/l.

The former AVDC facility operated as a commercial dry cleaning facility from 1968 to 1993. PCE was stored at the AVDC facility in a 55-gallon drum maintained by Morwhite until 1993. In February 1991, William Cooke, the owner of the AVDC, reported that he moved the drum for the first time in approximately 14 years. Upon lifting the drum, he observed that a quantity of PCE under the drum. The exterior of the storage drum was visibly corroded and rusted and had several pin-prick holes in the bottom. The delivery of PCE to such container was contrary to the standard of care set forth in guidance documents provided to Morwhite by its suppliers, such as Dow Chemical. Testing of soil and soil gas from beneath the floor where the drum stood indicated that PCE released from the drum had entered the soils beneath the floor.

The former Norgetown Laundromat (NL) contained a single dry cleaning machine. Within the NL, dry cleaning fluid was stored in a 55-gallon drum which was located on an unpaved floor in a rear closet. Morwhite also supplied PCE to Norgetown. Soil sampling established the presence of PCE in the soils of the unpaved floor within the NL. Spills during delivery at the location of the truck were suggested by the 1993 soil gas survey in the parking lot to the rear of NL.

2.0 SUMMARY OF EXISTING CONDITIONS

2.1 Geology

The Site is situated in the western edge of the Taconic Overthrust Province of eastern New York State, which is directly bordered on the west by the Hudson Lowlands. In this province, low-angle thrust faulting has formed a rolling highland of northeast / southwest trending hills. The Site is located in the middle of a northeast / southwest trending arm of a large thrust sheet and is underlain by the lower-

[8] *Remedial Investigation Report, Apple Valley Shopping Center Site 3-14-084*, prepared by Earth Tech of New York, Inc., and dated February 2003. *Feasibility Study Report, Apple Valley Shopping Center Site 3-14-084*, prepared by Earth Tech of New York, Inc., and dated January 2003.

Ordovician pelitic rocks of the Stuyvesant Falls Formation. These shales and siltstones have been metamorphosed into slates.

Recent glaciation of the Hudson Valley has overlain this bedrock with varying thicknesses of till. The till consists of poorly sorted material of various sizes; at the Site, the till is rich in sand. Fill is also present on site, and consists of reworked glacial till and other materials transported to the Site from off-site sources. The thickness of the overburden ranges from zero to about 20 feet, and reflects the topography of the bedrock surface. The slate bedrock outcrops east and south of the Foodtown store.

2.2 Hydrogeology

The presence of groundwater in the overburden at the Site is intermittent, and is the result of infiltration of meteoric water moving through the unconsolidated material in a series of wetting fronts. These fronts pass through the material until losses due to soil retention cause the front to stall and dissipate. Direct recharge of the bedrock aquifer occurs only where the surface of the bedrock is shallow enough to intersect the wetting fronts as they move through the unconsolidated material.

The surface of the bedrock is substantially weathered. In these areas, the friable bedrock probably forms a hydrologic continuum with the overburden, with downward-flowing groundwater becoming increasingly confined to fractures, joints, faults, veining and bedding planes as the rock becomes more competent with depth.

Groundwater flow within the bedrock largely occurs through more transmissive zones. These zones were not consistently associated with higher degrees of fracturing or faulting as measured by lower Rock Quality Designation (RQD), or with any other anomaly. Nor were all zones of low RQD more transmissive. Fracture interconnectivity may be the limiting factor that determines which bedrock zones will produce and which will not. In its investigation, EarthTech was unable to conclusively correlate one transmissive feature as extending through two wells.

Given the restriction of groundwater flow through fractures and other transmissive features in the bedrock, regional groundwater flow direction is to the southwest. Regional base level for groundwater discharge is established by the Hudson River to the west. In the vicinity of the Site, groundwater flow is deflected southward by groundwater withdrawals within the Woodbridge Estates Subdivision and at the Titusville well field which services the Town of LaGrange Titusville Water District and produces approximately 48 gpm. At AVSC, flow directions are further influenced by the continuous pumping of AV-2 at a rate of 20 gpm.

2.3 Soil and Groundwater Contamination

Extensive soil sampling at the Site has been conducted by various parties, as discussed above in Section 1.2.4. The most recent sampling conducted by EarthTech confirmed the results of previous studies that low levels of PCE and other chlorinated compounds remain in soil at some site locations. However, all soil concentrations for PCE and other compounds are below the concentrations which require action according to the NYSDEC Recommended Soil Cleanup Objectives (RSCOs).

Prior to initiation of remedial measures under the EPA Order, exceedances of the drinking water standards for PCE (5 ppb), TCE (5 ppb), DCE (5 ppb) and vinyl chloride (2 ppb) were documented in several off-site residential wells within the WES. Samples collected by JAK demonstrated that a substantial reduction in the extent and concentration of the plume had occurred. With the exception of the continuously operating well/air stripper system at Lots Nos. 10 and 11, all other residential treatment

systems have been taken out of service as it was demonstrated that the standards imposed by the EPA Order have been achieved.

2.4 Effectiveness of Existing Remedial Measures

As noted in Section 1.2.3, by 1999, the contaminant plume had been withdrawn from the WES with the exception of Locust Court's lots 10 and 11. These lots are directly adjacent to the site. The USEPA allowed the removal of six homes from active treatment with granular activated carbon (GAC). The remaining two homes, located on Lots 10 and 11 of the subdivision, had GAC systems that received treated water from the residential air stripper. In 2001, the residential air stripper was permanently decommissioned. The water supplies at Lots 10 and 11 continue to be treated by GAC systems.

The decommissioning of the residential air stripper also resulted in the reduction of the continuous groundwater withdrawal from 30 gpm to 20 gpm. No rebound of contaminant concentrations at Lots 10 and 11 has resulted from this reduction.

Sampling in 1997 and in 2001 has confirmed data from the original pump test of AV-2 conducted in 1992. The vicinity of the "hot spot" source area behind the location of the former Apple Valley Dry Cleaner has not seen a significant reduction in contaminant concentrations since the remediation began. The original pump test indicated that the area of the "hot spot" was poorly connected hydraulically to the fracture systems connected to AV-2 and the residential wells of the Woodbridge Estates Subdivision. This was suggested by the poor yield of well AV-1 during its use, while well AV-2 produces at 20 gpm.

This IRM Work Plan is proposed to address the contamination remaining in the source areas on the Apple Valley Shopping Center property. This contamination resides in the bedrock aquifer as there is no permanent groundwater in the overburden behind the shopping center, and there is only slight residual contamination remaining in the soils there.

3.0 PROPOSED RECOVERY WELL LOCATIONS AND DESIGN

Operation of AV-2 as a groundwater recovery well together with a low-profile air stripper will continue in conjunction with the IRM as described herein. The hydraulic control of groundwater migration that this extraction program has accomplished will be maintained as additional remedies are implemented at the Site. As noted above, the area behind the location of the former Apple Valley Dry Cleaner is poorly connected hydraulically to fracture systems that intersect AV-2, and therefore to fracture systems tapped by wells in the Woodbridge Estates Subdivision. Operation of AV-2 will continue as required by the EPA Order, cessation of operation of AV-2 will occur upon achievement of the remedial criteria established by the EPA Order.

3.1 Results of 2003 RI Packer Tests

Packer and other downhole testing performed by Earth Tech in 2001 indicated that, in the area behind the former AVDC, bedrock aquifer contamination exists from depths of 20 feet to 130 feet. All intervals sampled in wells AV-1 and MW-4B indicated elevated levels of Site contaminants. In the area of the "hot spot," further remedy is required to achieve groundwater standards. The efforts outlined herein address these further remedies proposed for the Site.

3.2 Proposed Recovery Well Locations and Depths

Three (3) additional recovery wells will be installed in order to treat the areas of elevated concentrations of Site contaminants. The first well will be located at the PCE "hot spot" defined in the May 1993 soil gas survey[9]. A well (MW-RCI) was installed and sampled at this location in January 1997 by the Site owner in response to a request by NYSDEC for groundwater data at the "hot spot." As noted above, 1997 analytical results for samples collected from MW-RCI indicated PCE at a concentration of 23,000 ug/l. This is significantly higher than the results obtained during the 2001 RI for well MW-4B of 6,390 ug/l at 70 to 75 feet below ground surface. For this reason, this recovery well will be located at the "hot spot." Locations of the three (3) additional recovery wells are shown on Plate 1, "Site Plan".

It is believed that during construction to connect the Apple Valley Shopping Center to municipal water, MW-RCI may have been truncated and buried. MW-RCI is an open-bore bedrock well installed to a depth of 55 feet and cased to 15 feet. Bedrock at that location occurred at 10 feet, with weathered rock encountered from 10 to 12 feet. The surface completion of the boring is no longer visible, and the casing could not be located by surface geophysical techniques due to interference from utilities. A final attempt to locate MW-RCI will be conducted using shallow, manual excavation to three feet. If MW-RCI is not located, a new boring will be installed in its place. If MW-RCI is located, it will be deepened to a minimum of 130 feet. The recovery well in this location will be designated RW-1. The minimum depths of each of the recovery wells have been established based on the available packer test data from the RI.

The second recovery well (RW-2) will be installed downgradient (southwest) of the location of RW-1. The location of this well is close to the end of the former Grand Union trash compactor pad. This location was the area with the highest concentration of TCE identified by the May 1993 soil gas survey, and is chosen to assist in capturing any contamination that might migrate from the area of the "hot spot" toward the residential subdivision. The location of this recovery well is close to that recommended by the 2001 FS in Figure 4-1. RW-2 will be installed to a minimum depth of 150 feet.

The third recovery well (RW-3) will address the highest area of PCE contamination behind the Norgetown Laundromat identified during the May 1993 soil gas survey. This location is approximately 42 feet from the southern wall of the building and 40 feet from the eastern wall of the building, and is close to that recommended by the 2001 FS in Figure 4-1. RW-3 will be drilled to a minimum depth of 130 feet.

3.3 Supplemental Drilling and Packer Testing

The borings will be advanced through the overburden using hollow stem augers. Continuous split spoon samples of the overburden will be collected for classification and screening with a photoionization detector (PID). If a boring has samples with PID readings above background levels, the sample with the highest reading from that boring will be submitted for chemical analysis for volatile organic compounds (VOCs) using USEPA Method 524.2. The samples will be placed in laboratory-supplied bottleware, labeled, and stored on ice in a cooler for transport to the laboratory under appropriate Chain of Custody procedures. All personnel participating in drilling activities on-site will follow procedures described in the Health and Safety Plan (HASP) attached in Appendix B.

The borings will be advanced through the bedrock using smooth core boring methods to aid packer testing during the drilling process. Based on the drilling experience reported in Section 2.4.3 of the RI, wire

[9] *Soil Gas Sampling and Analysis, Apple Valley Shopping Center Superfund Site, Town of LaGrange, Dutchess County, New York* prepared by TRC Environmental Consultants, Inc., and dated May 14, 1993.

lined coring equipment with 3½ inch OD drill rods is proposed. All bedrock cores will be screened using a PID and its geologic description will be logged. As the recovery wells will be six inches in diameter, when the boring has been cored to its maximum depth, it will be opened to six inches using water rotary techniques.

Each boring will first be cored to its minimum depth. Each successive water-bearing zone encountered during drilling will then be isolated and sampled using packers. It is presumed that the packer testing will be conducted at sequential core-length intervals. Water samples collected on-site during drilling will be analyzed using a portable gas chromatograph (GC) for chlorinated hydrocarbons. A minimum of 10% of the samples analyzed by the on-site GC will be sent to an approved laboratory for confirmatory analysis.

Drilling will be continued if the bottom interval indicates significant contamination (total VOCs > 100 ug/l). Drilling will be discontinued at each location once the field chemistry data indicates significantly decreasing concentrations or that the underlying uncontaminated zone has been encountered (total VOCs < 50 ug/l).

The packer testing will include three activities:

- Measuring the potentiometric head within the test zone.

- Determining the yield of the fractures within the test zone. Water will be pumped from the test zone using a submersible pump to determine yield. A zone that yields less than 0.2 gpm will be considered non-producing, and no samples will be collected from it.

- Sampling the groundwater after purging the volume in the drop pipe plus three times the volume of water stored in the borehole between the packers. Samples will be collected directly from the pump's discharge tubing and placed in 40 ml sample vials for subsequent analysis using the on-site portable GC for chlorinated compounds. A minimum of 10% of the samples analyzed by the on-site GC will be sent to an approved laboratory for confirmatory analysis.

3.4 Proposed Recovery Well Design

Based on the results of the packer testing, discrete-interval well screens will be installed in the three wells. The wells will be installed to maximize contaminant removal efficiency by screening those fracture zones with the highest contaminant concentration and sealing off other zones with minimal contaminant concentrations. If more than one zone of contamination is present in a single recovery well, the installation of the well screen will include two (or more) screened zones with intermediate zones sealed to prevent cross-contamination. Data from the 2001 RI indicate that contamination in the areas in which the recovery wells will be located, once encountered, occurs at relatively high concentrations (total VOCs > 100 ug/l) for the entire depth interval (see, for instance, Figure 6-4B of the Final RI). This minimizes concerns related to cross-contamination of unpolluted fracture systems.

Following completion of drilling the wells and screens will be installed in the borings. After a minimum of 24 hours after well installation, the wells will be developed using a dedicated submersible pump. A minimum of ten well volumes will be removed from each well. Field parameters such as temperature, pH, and conductivity will be analyzed following the purge of each well volume, and development will continue until the parameters have stabilized (vary no more than 10%).

All drill cuttings will be containerized in 55-gallon, DOT drums for disposal pending the receipt of analytical results. Development and purge water will be pumped directly into a temporary storage tank on the bed of a utility truck, and will periodically be transferred into the influent tank of the on-site

treatment system at AV-2 for treatment and discharge. The existing stripper is capable of reliable operation at flow rates up to 35 gpm. It is not the intent to subject the air stripper to significant slugs of highly turbid water. Rather, the water will be containerized, either in a temporary storage tank on the bed of a utility truck or, if that proves impracticable, in a freestanding temporary storage tank placed in the vicinity of the air stripper to which the truck will deliver. Water from containers will be allowed to decant and will flow into the air stripper's inlet line. The flow from the tank will be restricted to 5 gpm or less. The air stripper may require periodic cleaning to remove accumulated silt and clay deposits more frequently than under current operations. The manufacturer has confirmed that the air stripper will be able to treat the turbid water without any other complication.

Air stripper performance will be regularly monitored by effluent sampling for analysis by the field GC. Analytical results will be documented. Periodic duplicate samples will be provided to an approved off-site laboratory for confirming analyses.

3.5 Proposed Recovery Well Operation

The three additional recovery wells (RW-1, RW-2 and RW-3) will be plumbed into an air stripper for treatment. The wells will be equipped with recovery pumps capable of producing 20 gpm; although the target discharge is 10 to 15 gpm for each well. Each well will be brought online at a discharge rate that will be determined based on the results of the packer testing performed during their installation. Water level in each recovery well will be monitored closely for at least three days after system start-up, and the discharge from each well will be adjusted to provide for optimal drawdown. Each well will be pumped continuously at its optimal discharge rate.

4.0 EXTRACTION AND TREATMENT SYSTEMS

4.1 Existing Extraction and Treatment System

The existing air stripper is located in a secure building adjacent to recovery well AV-2 and is shown on Plate 1, "Site Plan".

The existing air stripper treats groundwater that is pumped from Recovery well AV-2. The system consists of a High Density Polyethylene (HDPE) EZ Stacker Stackable Tray Air Stripper model #EZ-2.4P manufactured by QED Environmental Systems, Inc. The EZ-2.4P is rated to operate at a flow range of 1 to 25 gallons per minute (gpm) and currently has the capacity to handle the AV-2 flow rate of 20 gpm. The air stripper configuration consists of a series of four (4) shell/tray modules. The multiple sieve tray design uses forced-draft air bubble generation to remove volatile organic compounds (VOCs) from the groundwater. Information concerning the existing installed system is presented in Appendix C.

4.2 Proposed Extraction and Treatment System

It is estimated that the three additional recovery wells proposed in Section 3.2, namely RW-1, RW-2 and RW-3, will each be pumped at a rate of 10 to 15 gallons per minute (gpm) to produce an optimal drawdown. This combined pumping rate of 30 to 45 gpm, in addition to the flow rate for AV-2 of 20 gpm, results in a total flow rate of 50 to 65 gpm. This is well above the existing 25 gpm capacity for the existing air stripper at AV-2. A second air stripper is therefore required to accommodate the additional flow rate from the recovery wells. Model EZ-4.6P, also manufactured by QED, has an operational flow rate capacity of 1 to 40 gpm. This unit is recommended to supplement the existing stripper. Once the packer tests are completed on the proposed recovery well installations a final decision on the air stripper

unit sizing may be made. Sufficient floor space is available in the existing metal building to accommodate the second stripper.

The blowdown from the stripper will be plumbed to the discharge pipe from the existing stripper unit.

The air exhaust from the stripper will be equipped with a VF Series carbon filter manufactured by Tetrasolv Filtration.

Information concerning the QED EZ-Stacker Model 4.6P and the VF Series carbon filter are contained in Appendix C.

The proposed QED unit occupies an area of Approximately 8 ft. x 3.5 ft. The VF Series carbon filter occupies an area 3 ft.x3 ft. Some rearrangement of existing equipment is expected in order to install and configure the new equipment into the existing building.

5.0 OPERATION AND MAINTENANCE OF EXTRACTION AND TREATMENT SYSTEM

Once well installation is complete and treatment equipment is installed in the building, the overall system operation will be controlled to allow the water pumped from AV-2 to continue to be treated by the existing stripper. Piping will be added to allow the water to be diverted to the new stripper during periods of maintenance and repairs.

The new stripper will receive the discharge from RW-1, 2 and 3. The system flow rate will be controlled by variable flow pumps and/or valves on the discharge line from each new recovery well. The recovery well operation will be controlled to maintain an appropriate drawdown condition. The flow rate may require periodic adjustments to fine-tune the operation and to optimize the drawdown condition.

Both air stripper systems are expected to operate 7 days a week, 24 hours a day. Each system will be inspected on a weekly basis by a representative or employee of the site owner to ensure each unit is functioning properly.

Air stripper tray cleaning will be periodically required due to iron precipitation, solids loading and/or bio-fouling. Tray cleaning is required when there is an increase in observed sump pressure, when removal rates are not being met for the stripper or when noticeable discoloration on the trays is observed. The length of time between maintenance cleaning will depend on the site conditions. According to the manufacturer, typical cleaning is typically required at one (1) to six (6) month intervals.

The Tetrasolv Filtration Carbon Vapor filter will be installed in a series flow utilizing two (2) filters. Influent groundwater enters the primary filter and exits through the secondary adsorber. Filters require periodic monitoring with regards to inlet and outlet pressure and sampling from inlet and outlet points to determine system performance. The carbon must be removed and replaced in order to meet discharge limits.

Engineering Specifications and Operation & Maintenance Manuals for the air stripper systems and carbon vapor filters are provided in Appendix C.

6.0 PROPOSED MONITORING WELL LOCATIONS AND DESIGN

Figure 4-1 of the FS prepared by Earth Tech indicates the proposed location of four additional monitoring wells. The wells are spaced at approximate 100-foot intervals along the southwest boundary line of the AVSC property. However, the site property line is generally not accessible due to steep slopes and is heavily wooded. As an alternative to the boundary wells proposed by the FS, existing MW-3 and two (2) new monitoring wells designated MW-6 and MW-7 be located as presented on Plate 1.

The two (2) new monitoring wells will be installed using water rotary techniques through both overburden and bedrock. They will be installed to an elevation corresponding to ten feet below the deepest zone of contamination identified in the new recovery wells. Casing will be installed a minimum of five feet into bedrock. The boring in bedrock will be left open hole. Simple boring logs will be developed by examination of the wash. After completion, these wells will be developed as described in Section 1.3.

Dedicated submersible pumps will be installed at the bottom of the wells to facilitate the collection of groundwater samples.

The solids from the drilling water bath will be containerized to await disposal. A sample of the solids from each of the four borings will be collected for analysis for VOCs by USEPA Method 524.2. After receipt of sample results, appropriate disposal will be arranged.

Wastewater from the drilling, development and sampling processes will be treated by the on-site air stripper serving AV-2, as described previously.

7.0 FIELD SAMPLING SCHEDULE

7.1 Groundwater Quality

Monitoring of groundwater quality will be performed using standard quality control procedures. Samples will be collected from monitoring wells after the wells have been purged such that field parameters have stabilized. Samples collected from residential systems will be collected after purging the system for at least five minutes. All samples will be placed in laboratory-supplied bottleware, labeled appropriately and stored on ice in a cooler for transport under appropriate Chain of Custody procedures by overnight courier to the analytical laboratory. Water elevation readings will be obtained for all monitoring wells sampled. All personnel involved with groundwater sampling on-site will follow procedures described in the Health and Safety Plan (HASP) presented in Appendix B.

7.1.1 On-Site Recovery Wells and Air Stripper Effluent

After the second air stripper, AVS2, is operational, the output of the pumps servicing the three new recovery wells will be optimized by adjusting the flow until a reasonable static drawdown has been reached in each well. When the pump operations have been optimized, samples of groundwater will be collected for analysis by an approved laboratory using USEPA Method 524.2. Groundwater samples will be collected from the following locations:

- RW-1
- RW-2
- RW-3

- AVS-Influent
- AVS-Effluent
- AVS2-Effluent

These six locations will be sampled after one full month of pumping, after three full months of pumping and quarterly thereafter except as modified by Section 7.1.4 below.

7.1.2 On-Site Monitoring Wells

After the AVS2 operating parameters have been stabilized, the following on-site monitoring wells and boundary wells will be sampled for analysis for VOCs by USEPA Method 524.2. Prior to any monitoring, a screen will be designed based on the logging data presented in the RI and installed in the well AV-1. AV-1 will be used preferentially over the well MW-4b as it is deeper and penetrates more contaminated fracture systems than does well MW-4b. MW-4b will be retained on site for potential monitoring at a later time. Locations of AV-1 and MW-4b are shown on Plate 1, "Site Map".

- MW-1
- MW-2
- MW-3
- MW-6
- MW-7
- AV-1

Retain MW-4A as well

This sampling will be repeated quarterly for the six (6) months of pumping and annually thereafter except as modified by Section 7.1.4 below.

7.1.3 Off-Site Monitoring Wells and Residential Wells

The production wells servicing Lots 10 and 11 of the Woodbridge Estates Subdivision are presently sampled semi-annually under the terms of the USEPA Consent Order with James A. Klein. Additional residences and monitoring wells will be added to this semi-annual regime during this program. The term of the semi-annual sampling will be adjusted such that the first event will fall six months after AVS2 is brought online. The samples will be analyzed by USEPA Method 524.2 for VOCs. The following sampling points are to be included in these events subject to access being granted by the owners:

- L-8
- L-9, Gall
- L-10, Rosenbloom, upstream and between the two carbon canisters
- L-11, Alben, upstream and between the two carbon canisters
- L-12, Frinton
- L-13, Chung
- MW-5

7.1.4 Sampling Termination

More than two

All sampling will be conducted on the schedules indicated until such time as two sequential sampling events have indicated no impacts to groundwater above the following NYSDEC action levels at that location. For groundwater contamination, the "NYSDEC action levels" are those concentrations specified

in NYS Technical and Operational Guidance Series 1.1.1 (TOGS 1.1.1). For target site compounds, these action levels are:

PCE:	Tetrachloroethene	5 µg/L
TCE:	Trichloroethene	5 µg/L
DCE:	Dichloroethene (both isomers)	5 µg/L
VC:	Vinyl chloride	2 µg/L

Sampling of that location will then be terminated after notice to the NYSDEC. and approval by

7.2 Monitoring of Sub Slab Vapors and Indoor Air Quality in the Shopping Center

The methods and procedures for sub slab vapor and indoor air monitoring at the AVSC have been the subject of considerable discussions and negotiations between JAK, NYSDEC and NYSDOH. The parties met at the AVSC on May 12, 2004 to select the sampling locations and to discuss the sampling methodology to be employed.

The parties mutually selected four locations at which sub slab vapors and indoor ambient air samples will be obtained. The locations are as follows:

Location 1: The rear of the Foodtown Supermarket (southernmost portion of the building)

A one (1) inch diameter hole will be drilled through the concrete floor slab at the approximate centerline of the structure. The sample location will be to the immediate south of the internal partition separating the retail area from the rear storage area in close proximity to the employee breakroom.

Location 2: Rear entrance of Pizzeria

A closet area near the rear entrance was selected for sampling. A one (1) inch diameter hole will be drilled in the closet floor for sub slab sampling. The closet is immediately adjacent to the kitchen area.

Location 3: Former Nextel Store

An area near the approximate center of the vacated store formerly occupied by Nextel was selected for sampling. A one (1) inch diameter hole will be installed through the slab along the western partition out of traffic areas.

Location 4: Pharmacy

The storage area at the southernmost portion of the pharmacy building beyond the retail space was selected for sampling. The sample location is near the employee restroom and passageway to the front retail space. A one (1) inch diameter hole will be drilled through the slab close to the partition separating the rear area from the front retail space.

At all sub slab sample locations a half (½) inch diameter black iron pipe will be installed in the hole and grouted in place. The pipe will be threaded to accommodate a threaded cap. With the cap screwed on, the top of the cap will be flush with the floor. The pipe will extend eight (8) to twelve (12) inches below the floor elevation into the bedding material of the concrete slab. Dedicated Teflon tubing will be inserted into the iron pipe and extended to the bottom of the hole. The annulus will be backfilled with

bentonite chips to seal the hole. The top end of the Teflon tube will be fitted with a push connect or to allow connection to the sampling tube to the Summa canister.

Standard procedures recommended by the analytical laboratory will be followed in order to obtain representative samples of sub slab vapors via Summa canisters. Such procedures will be provided to the NYSDOH prior to conducting the field sampling.

Indoor air sampling will also be performed at each sub slab location. Each air sample monitor will be exposed for a minimum of 24 hours, then retrieved, placed on ice in a cooler and transported to an approved laboratory for analysis for tetrachloroethene by NYSDOH Method 311-9.

Notify NYSDOH

Following completion of drilling, well installation, and implementation of the air stripper, sub slab vapor and indoor air sampling event will be scheduled to coincide with the groundwater sampling event. If the results do not exceed actionable levels, no further sub slab or indoor air sampling will be conducted. If action levels are exceeded for one (1) or more parameters, a second event will be conducted during the heating season.

NYSDOH will decide

8.0 QUALITY ASSURANCE PROJECT PLAN

Proposed IRM activities described herein will be performed largely by a drilling company and various equipment vendors. STERLING and Upstate HydroTech Consulting, LLC will obtain quotations and will assist Apple Valley Corporation in selecting qualified, capable contractors and vendors.

Once this IRM Work Plan is approved by the NYSDEC, the process of contractor and vendor selection will commence. Prior to construction, a Quality Assurance Project Plan (QAPP) will be developed in conjunction with the equipment for the project and submitted to the NYSDEC for review and comment.

The QAPP is expected to identify Mr. Mark P. Millspaugh, P.E. as the overall QA/QC Officer for the project. Mr. John Conrad, President of Conrad Geoscience, will be the Geological Project Manager responsible for all drilling and well installation activities.

Ms. Jennifer DiCerbo, P.E. will be the Engineering Project Manager and will be responsible for the design and installation of the new air stripper and carbon filter.

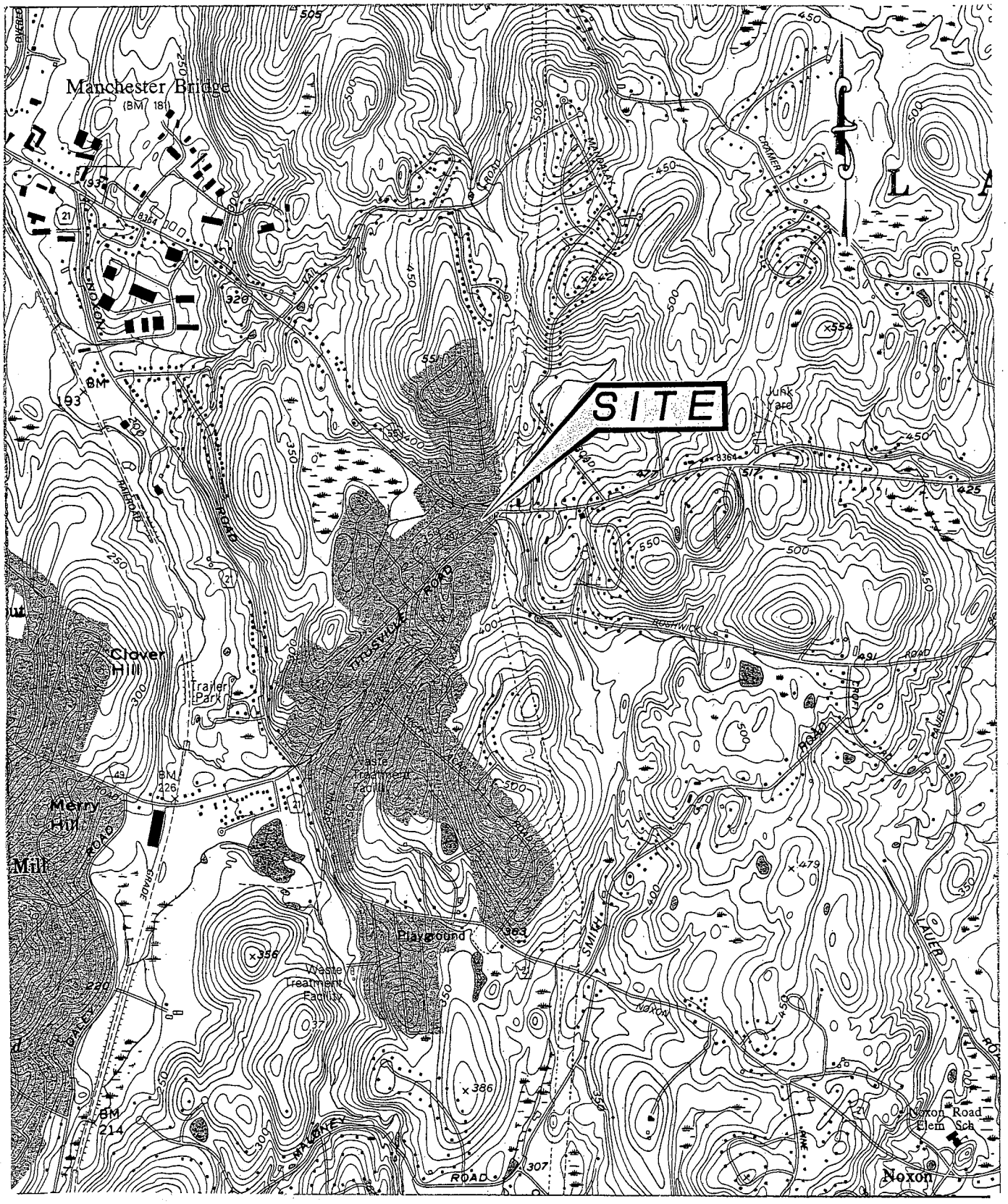
9.0 PROPOSED SCHEDULE

The following schedule is anticipated:

Item	Anticipated Completion
Submit IRM Work Plan	Complete
NYSDEC Review/Comment	Complete
Submit IRM Work Plan	July 2, 2004
NYSDEC Approval	July 15, 2004
Initiate Drilling	August 1, 2004
Initiate Treatment Upgrade & Submit QAPP	September 30, 2004
System Start-Up/Shake-Down	October 3, 2004
Sample Recovery Wells RW-1, RW-2, RW-3, Existing Air Stripper Influent & Effluent and New Air Stripper Effluent	November 3, 2004

FIGURE 1

SITE LOCATION MAP



MAP REFERENCE: NYSDOT 7.5' PLEASANT VALLEY QUAD, 1989

STERLING

Sterling Environmental Engineering, P.C.

One Columbia Circle • Albany, New York 12203

SITE LOCATION MAP

APPLE VALLEY SHOPPING CENTER

TOWN OF LAGRANGE DUTCHESS CO., N.Y.

PROJ. No.:	23008	DATE:	05/19/03	SCALE:	1" = 2000'	DWG. NO.	23008001	FIGURE	1

PLATE 1

SITE MAP

MAP REFERENCE:
THIS MAP HAS BEEN PREPARED FROM AN ACCURATE FIELD SURVEY BY R.T. KIM L.S., LATHAM , NY. IN AUGUST 2002.
HORIZONTAL COORDINATE SYSTEM: NEW YORK STATE PLANE, NAV 1985.
VERTICAL DATUM: NAVD 1985.
CONTOUR INTERVAL: 2 FEET.

SURVEY NOTES:
THIS SURVEY HAS BEEN PREPARED WITHOUT THE BENEFIT OF AN ABSTRACT OF TITLE AND IS SUBJECT TO ANY STATEMENT OF FACT AN ABSTRACT OF TITLE MAY REVEAL.

LEGEND:

- EXISTING BEDROCK MONITORING WELL
- OVERBURDEN MONITORING WELL (DIRECT PUSH)
- OVERBURDEN SOIL BORING (DIRECT PUSH)
- WATER SUPPLY WELL
- SEDIMENT/SURFACE WATER SAMPLE
- APPROXIMATE AIR SAMPLE LOCATION
- PROPERTY BOUNDARY
- P.P. UTILITY POLE
- L.P. LIGHT POLE
- C.B STORM WATER CATCH BASIN
- M.H. SANITARY SEWER MANHOLE
- F.H. FIRE HYDRANT
- L.P. UTILITY POLE WITH LIGHT
- W.V. WATER VALVE
- W.S.O. WATER SHUT OFF
- RW-1 PROPOSED RECOVERY WELL LOCATION
- MW-6 PROPOSED MONITORING WELL LOCATION

PLATE 1

NOTES:

1) BASE MAP IS PLATE TITLED "ALTERNATIVE #4, ENHANCED CONTAINMENT", PREPARED FOR APPLE VALLEY SHOPPING CENTER BY EARTH TECH, DATED 1/2002

2) PROPOSED WELL LOCATIONS BASED ON 2/26/03 STERLING LETTER TO THE NYSDEC

LICENSED PROFESSIONAL ENGINEER — M. E. MILLSPAUGH — 059102 — STATE OF NEW YORK

UNAUTHORIZED ALTERATION OR ADDITION TO THIS DRAWING IS A VIOLATION OF SECTION 7209, SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW.

NO.	DATE	RECORD OF WORK	DRN	CKD	APPR

PROJECT	
PROJ. ENGR.:	M. Millspaugh, P.E.
PROJ. NO.:	23008
PREPARED BY:	L. Davis
DRAFTED BY:	A. Kohli
CHECKED BY:	
APPROVED BY:	
DATUM:	
CONTOUR INTERVAL =	FEET

0 25 50 100
1" = 50'

SITE PLAN
IRM WORKPLAN
APPLE VALLEY SHOPPING CENTER
TOWN OF LAGRANGE — DUTCHESS CO., N.Y.

STERLING
Sterling Environmental Engineering, P.C.
One Columbia Circle • Albany, New York 12203

DATE:	5/28/03	SCALE:	1"=50'	DWG. NO.	23008002	SHEET	1 OF 1

APPENDIX A

1991 USEPA ADMINISTRATIVE ORDER ON CONSENT

→ 2 copies

3072
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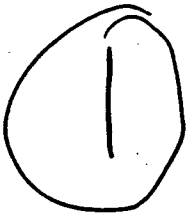
U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION II



IN THE MATTER OF THE APPLE VALLEY SHOPPING CENTER SUPERFUND SITE	
JAMES A. KLEIN, Respondent	ADMINISTRATIVE ORDER ON CONSENT
Proceeding under Section 106(a) of the Comprehensive Environmental Response, Compensation, and Liability Act, as amended, 42 U.S.C. § 9606(a)	Index Number II-CERCLA-10224

I. JURISDICTION

1. This Administrative Order on Consent ("Order") is issued to the above-captioned Respondent (hereinafter referred to as the "Respondent") pursuant to the authority vested in the President of the United States under Section 106(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended ("CERCLA"), 42 U.S.C. § 9606(a), which authority was delegated to the Administrator of the United States Environmental Protection Agency ("EPA") pursuant to Executive Order 12580 and duly redelegated to the Regional Administrators of EPA. Notice of this Order and the negotiations preceding its issuance were provided to the New York State Department of Environmental Conservation ("NYSDEC").

II. FINDINGS OF FACT AND CONCLUSIONS OF LAW

2. The Apple Valley Shopping Center Site (hereinafter, the "Site") is located in the Town of LaGrange in Dutchess County, New York. The Site consists of the Apple Valley Shopping Center (the "Shopping Center"), located on Route 55 in the Town of LaGrange, New York, and also includes those portions of the residential community of Woodbridge Estates which are within the areal extent of contamination, as well as all suitable areas in very close proximity to the contamination necessary for implementation of the response action. The Site is mixed residential and commercial.

3. A municipal well of the Titusville Water District is located approximately 1600 feet downgradient of the Shopping Center and is directly across Titusville Road from Woodbridge Estates. Approximately 150 homes are served by this well.

4. The Site constitutes a "facility" within the meaning of Section 101(9) of CERCLA.

5. In July, 1967, Respondent James A. Klein purchased the real property upon which the Shopping Center is located from Union Vale Sales, Ltd. The Shopping Center was constructed on the property between 1967 and 1968. Mr. Klein has owned the Shopping Center and the associated real property from 1967 through the present.

6. Various types of businesses, including dry cleaning operations, have been ongoing at the shopping center from 1968 through the present. Two businesses, the Apple Valley Dry Cleaners and Apple Valley Norgetown Laundromat, presently conduct dry cleaning operations at the shopping center.

7. Tetrachloroethene ("perchloroethene" or "perc") has been disposed of and/or otherwise released onto the ground at the Shopping Center in connection with dry cleaning operations at the Shopping Center.

8. Between May and October, 1990, the Dutchess County Health Department ("DCHD") sampled private drinking water wells at the Site. Three of the sampled wells exceeded the EPA Removal Action Level ("RAL") of 68.6 parts per billion ("ppb") for perc, and an additional three wells contained perc at levels above the Maximum Contaminant Level ("MCL") of 5 ppb promulgated under the Safe Drinking Water Act, 42 U.S.C. § 300f, et. seq. Four of the sampled wells contained levels of vinyl chloride above the MCL of 2 ppb, and two wells exceeded the MCL for trichloroethene ("TCE") of 5 ppb. Four of the sampled wells also contained significant quantities of cis 1,2-dichloroethene. TCE, vinyl chloride and cis 1,2-dichloroethene can be created by the degradation of perc in the groundwater.

9. Confirmatory private well sampling conducted by EPA on December 4, 1990 revealed concentrations of perc, vinyl chloride, TCE and cis 1,2-dichloroethene which generally corresponded with DCHD's results.

10. On February 13-14, 1991, a soil gas survey was performed at the Shopping Center by Respondent's consultant Dunn Geoscience Corporation. Soil gas samples collected at the Shopping Center identified levels of perc ranging up to 330,000 ppb of perc and 1800 ppb of TCE. The highest level of perc was detected beneath the floor inside the Apple Valley Dry Cleaners' store, and the highest level of TCE was detected in a sample taken directly outside that establishment.

11. The releases of perc at the Shopping Center are a likely source of the aforementioned groundwater contamination.

12. At the time of DCHD's and EPA's sampling of the residential wells, residents at the Site were relying on private groundwater wells as their sole source of drinking water.

13. The plume of contamination in the groundwater at the Site poses a threat of future contamination of the Titusville Water District's municipal well.

14. From late November, 1990 through the present, Respondent has been supplying residences at the Site with bottled water as an interim source of potable water.

15. Perc, TCE, vinyl chloride and cis 1,2-dichloroethane are hazardous substances within the meaning of Section 101(14) of CERCLA, 42 U.S.C. § 9601(14).

16. Exposure to perc, TCE, vinyl chloride and cis 1,2-dichloroethane by direct contact, inhalation or ingestion can result in a variety of adverse human health effects.

17. Respondent is a "person" within the meaning of Section 101(21) of CERCLA, 42 U.S.C. § 9601(21). Respondent is the present owner of the Apple Valley Shopping Center and also owned the Shopping Center during the time that hazardous substances were disposed of there. Respondent James Klein is thus a responsible party under Sections 107(a)(1) and 107(a)(2) of CERCLA, 42 U.S.C. §§ 9607(a)(1) and 9607(a)(2).

18. Releases, as the term "release" is defined in Section 101(22) of CERCLA, 42 U.S.C. § 9601(22), have occurred at the Site in that, among other things, hazardous substances have been disposed of into the environment.

19. Respondent has been given an opportunity to discuss with EPA the basis for issuance of this Order and its terms.

III. DETERMINATION

20. Based upon the Findings of Fact and Conclusions of Law set forth above and other information available to EPA, EPA has determined that the release and threat of release of hazardous substances into the environment from the Site may present an imminent and substantial endangerment to the public health, welfare, and the environment, within the meaning of Section 106(a) of CERCLA, 42 U.S.C. § 9606(a).

IV. ORDER

21. Based upon the foregoing Findings of Fact and Conclusions of Law, Determination, and other information available to EPA, it is hereby ordered and agreed that Respondent shall undertake a response action at the Site in accordance with the requirements

specified below. All activities specified below shall be initiated and completed as soon as possible even though maximum time periods for their completion are specified herein.

Description of Work

22. Within fifty (50) business days of the effective date of this Order, the Respondent shall submit to EPA for review and approval a detailed work plan (hereinafter, the "Work Plan") and implementation schedule for the performance of the following activities:

a. Installation and operation and maintenance of a system of extraction wells for the extraction of contaminated groundwater from the aquifer at the Site in order to prevent further migration of the contamination plume and to provide a source of potable water to residents at the Site. This system of extraction wells shall consist of private residential wells presently in use in Woodbridge Estates and, if necessary, the installation of one or more additional extraction wells on the Shopping Center property.

b. On-Site treatment of the extracted contaminated groundwater by air stripping so that the effluent from the air strippers does not exceed the federal Maximum Contaminant Levels ("MCLs") and New York State groundwater standards for organic and inorganic contaminants. Groundwater which has been treated by air stripping shall be provided to residents at the Site as potable water. Groundwater treated by air stripping also may be supplied to the Shopping Center as potable water. If required by the NYSDEC, NYSDOH, or DCHD, groundwater which has been treated by air stripping also shall be decontaminated by passage through carbon filters and/or sterilized by exposure to ultraviolet light prior to being provided to the residents and Shopping Center;

c. The total volume of groundwater to be extracted by each extraction well pursuant to this Order shall not exceed an average of 2 gallons per minute. The volume specified in this paragraph shall not apply to any extraction wells or air strippers installed on the Shopping Center property. Nothing in this paragraph shall preclude EPA from issuing a separate administrative order to Respondent under Section 106 of CERCLA or any other provision of law or from initiating other proceedings to require Respondent (or any other entities) to perform or pay the costs of additional removal, analysis, treatment, and disposal of groundwater from the extraction wells;

d. Construction of the air stripping units, identified above, and activated carbon units identified in Paragraph 22.j., below, in accordance with fabrication sketches to be provided by EPA. Respondent shall be responsible for operation and maintenance of the air strippers;

e. Respondent shall continue operation and maintenance of the extraction wells and air stripping units as long as EPA determines to be necessary;

f. Treated water which is not being provided to residences or the Shopping Center shall be reinjected into the ground, discharged to surface water, and/or otherwise disposed of, as approved by EPA;

g. Performance of air monitoring and calculation of maximum ambient emission levels prior to, during, and following construction at the Site, as required, to ensure that air emissions from the groundwater treatment units will meet the air emission applicable or relevant and appropriate requirements;

h. Periodic monitoring to help assess groundwater and surface water conditions and the effectiveness of the groundwater treatment system; and

i. Treatment/disposal of all residuals generated from the treatment of the groundwater (such as filtered suspended solids and spent carbon) in accordance with applicable regulations and requirements.

j. In the event that one or more homeowners in Woodbridge Estates refuse to allow Respondent to install air stripping units on their respective private residential wells, EPA may, in its discretion, require Respondent to install an activated carbon treatment unit on each such residential well, and an organic absorption unit for vinyl chloride removal (if vinyl chloride is present), to provide potable water and to assist in management of the contamination plume. Each activated carbon treatment unit installed pursuant to this paragraph shall be operated on a 24-hour basis, and shall be monitored, operated and maintained by Respondent as EPA determines to be necessary;

23. The Work Plan also shall include, among other things, the following:

a. Selection of contractors, subcontractors, consultants and other professionals followed by notification to EPA of the contractors, subcontractors consultants and

other professionals selected, their respective responsibilities with respect to the project, and their qualifications to perform such work;

b. Obtaining the consent of property owners for access for the purpose of installing and maintaining groundwater treatment units;

c. Preparation and submittal to EPA of all design, construction, operation and maintenance plans and design specifications for all work required under this Order (with copies to NYSDEC, NYSDOH, and DCHD), and identification of all equipment, to be utilized during the activities required by this Order;

d. Installation of the extraction wells and groundwater treatment units following EPA approval of the design plans and specifications;

e. A detailed time schedule for the performance of the work required hereunder and for submitting plans and reports to EPA, consistent with this Order; and a detailed description of how these tasks will be accomplished.

f. A Quality Assurance/Quality Control ("QA/QC") Plan and a description of Chain of Custody Procedures to be followed, which shall satisfy the following requirements:

   i. The QA/QC Plan shall be completed in accordance with Section 10 of Test Methods for Evaluating Solid Waste (SW-846) (November 1986, or as updated), and "Guidance for Preparation of Combined Work/Quality Assurance Project Plans for Environmental Monitoring" (U.S. EPA, Office of Water Regulations and Standards, May, 1984);

   ii. The Respondent shall use QA/QC procedures in accordance with the QA/QC Plan submitted and approved by EPA pursuant to this Order and shall use standard EPA Chain of Custody procedures, as set forth in the National Enforcement Investigations Center Policies and Procedures Manual, as revised in May 1986 and the National Enforcement Investigations Center Manual for the Evidence Audit, published in September, 1981, and SW-846, for all sample collection and analysis activities conducted pursuant to this Order;

   iii. If performance of any subsequent phase of the work required by this Order requires alteration of the

QA/QC Plan, the Respondent shall submit to EPA for review and approval proposed amendments to the QA/QC Plan.

g. A Health and Safety Plan, which shall satisfy the requirements of 29 CFR Part 1910.120, Hazardous Waste Operations Standards, 29 CFR Part 1910.134, Respiratory Protection Standards, 29 CFR Part 1910.1001, General Industry Standards, 29 CFR Part 1926.58, Construction. Standards, and EPA's "Standard Operating Safety Guides" (OSWER, 1988). If performance of any subsequent phase of the work required by this Order requires alteration of the Health and Safety Plan, the Respondent shall submit to EPA for review and approval proposed amendments to the Health and Safety Plan.

24. EPA either will approve the Work Plan, or will require modifications thereto pursuant to Paragraphs 45-47, below. Upon its approval by EPA, the Work Plan shall be deemed to be incorporated into and an enforceable part of this Order.

25. Within five (5) business days of Respondent's receipt of EPA's approval of the Work Plan, the Respondent shall commence implementation of the EPA-approved Work Plan. Respondent shall fully implement the EPA-approved Work Plan in accordance with the implementation schedule therein.

26. Respondent shall not commence construction or actual operation of the groundwater treatment and distribution system until the respective design, construction, operation and maintenance plans and specifications are approved by EPA, and EPA notifies Respondent that construction or actual operation of the system may begin. Respondent shall conduct operation and maintenance in accordance with the EPA-approved operation and maintenance plan(s) prepared and finalized pursuant to this Order.

Designated Coordinator, Other Personnel

27. Within seven (7) days of the effective date of this Order, Respondent shall select a coordinator, to be known as the Designated Coordinator, and submit the name, address, and telephone number of the Designated Coordinator to EPA. The Designated Coordinator shall be responsible for oversight of the implementation of this Order. He or she shall have technical expertise sufficient to adequately oversee all aspects of the work contemplated by this Order. EPA correspondence to the Respondent will be sent to the Designated Coordinator. Respondent shall have the right to change its Designated Coordinator. However, Respondent shall notify EPA in writing at least seven (7) days prior to any such change.

28. Respondent shall provide a copy of this Order to each contractor and subcontractor retained to perform the work required by this Order. Respondent shall include in all contracts or subcontracts entered into for work required under this Order provisions stating that such contractors or subcontractors, including their agents and employees, shall perform activities required by such contracts or subcontracts in compliance with this Order and all applicable laws and regulations. Respondent shall be responsible for ensuring that its contractors and subcontractors perform the work contemplated herein in accordance with this Order.

29. All activities required of Respondent under the terms of this Order shall be performed only by well-qualified persons possessing all necessary permits, licenses, and other authorizations required by federal, state, and local governments, and all work conducted pursuant to this Order shall be performed in accordance with prevailing professional standards.

Insurance/Financial Responsibility

30. Prior to commencing any on-Site work, Respondent shall secure and shall maintain for the duration of the work under this Order general liability and automobile insurance with limits of three (3) million dollars, combined single limit, naming as insured the United States. In addition, for the duration of the work under this Order, Respondent shall satisfy all applicable laws and regulations regarding the provision of workmen's compensation insurance. Such insurance shall name as insured all contractors and subcontractors acting on behalf or under the control of Respondent in connection with any work at the Site. Prior to the commencement of work under this Order, Respondent shall provide EPA with a certificate of insurance and a copy of the insurance policy or policies for approval. If Respondent demonstrates by evidence satisfactory to EPA that any contractor or subcontractor maintains insurance equivalent to that described above, or insurance covering the same risks but in a lesser amount, Respondent needs only provide that portion of the insurance described above which is not maintained by such contractor or subcontractor.

Reporting Requirements

31. All reports and other documents submitted by Respondent to EPA (other than the biweekly progress reports referred to below) which purport to document Respondent's compliance with the terms of this Order shall be signed by Respondent or by Respondent's Designated Coordinator, provided that the Designated Coordinator has been authorized to sign the reports and other documents by Respondent and EPA has received notification of that authorization prior to Respondent's submittal of the reports and documents to EPA.

32. During the implementation of this Order, Respondent shall provide written progress reports to EPA which fully describe all actions and activities undertaken pursuant to this Order. Respondent shall submit the progress reports to EPA every two weeks, unless EPA notifies Respondent that less frequent submission of such progress reports is acceptable. Such progress reports shall, among other things, (a) describe the actions taken toward achieving compliance with this Order during the previous two-week period, (b) include all results of sampling and tests and all other data received by Respondent during that period in the implementation of the work required hereunder, (c) describe all actions which are scheduled for the next two-week period, (d) provide other information relating to the progress of work as is customary in the industry, (e) and include information regarding percentage of completion, all delays encountered or anticipated that may affect the future schedule for completion of the work required hereunder, and a description of all efforts made to mitigate those delays or anticipated delays.

33. All work plans, reports, notices and other documents required to be submitted to EPA under this Order shall be sent to the following addressees:

2 copies to:

Robert Cobiella, On-Scene Coordinator
Removal Action Branch
Emergency and Remedial Response Division
U.S. Environmental Protection Agency
Woodbridge Avenue
Edison, New Jersey 08837

1 copy to:

Chief, New York/Caribbean Superfund Branch
Office of Regional Counsel
United States Environmental Protection Agency
26 Federal Plaza, Room 437
New York, New York 10278

Attention: Apple Valley Shopping Center Site Attorney

7 copies to:

Michael O'Toole, P.E.
Director, Hazardous Waste Remediation
New York State Department of Environmental Conservation
50 Wolf Road, Room 212
Albany, New York 12233-7010

34. Upon the occurrence of any event during performance of the work required hereunder which, pursuant to Section 103 of CERCLA, requires reporting to the National Response Center, Respondent shall immediately orally notify the EPA On-Scene Coordinator at (908) 321-6646 (or, in the event of the unavailability of the EPA On-Scene Cccrdinator, the Chief of the Remcval Action Branch of the Emergency and Remedial Response Division of EPA, Region II at (908) 321-6621), in addition to the reporting required by Section 103. Within twenty (20) days of the onset of such an event, Respondent shall furnish EPA with a written report setting forth the events which occurred and the measures taken, and to be taken, in response thereto.

35. As appropriate during the course of implementing the actions required of Respondent pursuant to this Order, Respondent or its consultant(s) or contractor(s), acting through the Designated Coordinator, may confer with EPA concerning the required actions. Based on new circumstances or new information not in the possession of EPA on the date of issuance of this Order, the Designated Coordinator may submit a request to the EPA On-Scene Coordinator, in writing, for approval of a modification to the EPA-approved Work Plan. If approved by EPA in writing, such modification shall be deemed incorporated into this Order.

36. In the event of a significant change in conditions at the Site, or in the event of emergency circumstances relating to public health, welfare or the environment associated with contamination at the Site, Respondent shall immediately notify the EPA On-Scene Coordinator at (908) 321-6646 (or, in the event of the unavailability of the EPA On-Scene Coordinator, the Chief of the Removal Action Branch of EPA's Emergency and Remedial Response Division at (908) 321-6621). In the event that EPA determines that (a) the activities performed pursuant to this Order, (b) significant changes in conditions at the Site, or (c) emergency circumstances occurring at the Site pose a threat to human health or the environment, EPA may direct Respondent to stop further implementation of any actions pursuant to this Order or to take other and further actions reasonably necessary to abate the threat. This provision is not to be construed so as to limit any powers EPA has under the National Contingency Plan ("NCP") or under any other applicable law or regulation.

37. Respondent shall include in the written progress reports required in Paragraph 32, above, a schedule for the field activities which are expected to occur pursuant to this Order during the upcoming month. Respondent shall, in addition, provide EPA with at least one week advance notice of any change in that schedule.

Oversight

38. During the implementation of the requirements of this Order, Respondent and its contractor(s) and subcontractors shall be available for such conferences with EPA and inspections by EPA at and around the Site and at laboratories where analytical work is being done hereunder as EPA may determine are necessary to adequately oversee the work being carried out or to be carried out by Respondent.

39. Respondent and its employees, agents, contractor(s) and consultant(s) shall cooperate with EPA in its efforts to oversee Respondent's implementation of this Order.

Access and Availability of Data

40. To the extent that any area where Work is to be performed hereunder presently is owned by parties other than Respondent, Respondent shall use its best efforts to obtain access agreements from the present owners within thirty (30) days of the effective date of this Order for purposes of implementing the requirements of this Order. Such agreements shall provide access not only for Respondent, but also for EPA and its authorized representatives or agents, as well as DEC and its authorized representatives or agents. Such agreements shall specify that Respondent is not EPA's representative with respect to liability associated with Site activities. If such access agreements are not obtained by Respondent within the time period specified herein, Respondent shall immediately notify EPA of its failure to obtain access, and shall include in that notification a summary of the steps Respondent has taken to attempt to obtain access. Subject to the United States' non-reviewable discretion, EPA may use its legal authorities to obtain access for Respondent, may perform those response actions with EPA contractors at the property in question, or may terminate the Order if Respondent cannot obtain access agreements. If EPA performs those tasks or activities with EPA contractors and does not terminate the Order, Respondent shall perform all other activities not requiring access to that property. Respondent shall integrate the results of any such tasks undertaken by EPA into its reports and deliverables.

41. EPA and its designated representatives, including but not limited to employees, agents, contractor(s) and consultant(s) thereof, shall be permitted to observe the work carried out pursuant to this Order. Respondent shall permit EPA and its designated representatives full access to and freedom of movement at the Site and any other premises where work under this Order is to be performed, at all times, including, but not limited to, any time that work under this Order is being performed, for purposes of inspecting or observing Respondent's progress in implementing the requirements of this Order, verifying the information submitted to EPA by Respondent, conducting investigations

relating to contamination at the Site, or for any other purpose EPA determines to be reasonably related to EPA oversight of the implementation of this Order.

42. All data, information and records created, maintained or received by Respondent or its contractor(s) or consultant(s) in connection with implementation of the work under this Order, including but not limited to contractual documents, invoices, receipts, work orders and disposal records, shall, without delay, be made available to EPA upon request. EPA shall be permitted to copy all such documents. No such data, information, or records shall be destroyed for six (6) years after completion of the work required by this Order without either the express written approval of EPA or a written offer by Respondent to provide such material to EPA, followed by EPA's written rejection of that offer. Following said six-year period, Respondent shall notify EPA at least thirty (30) days prior to the destruction of any such documents.

43. Upon request by EPA, Respondent shall provide EPA or its designated representatives with duplicate and/or split samples of any material sampled in connection with the implementation of this Order.

44. Notwithstanding any other provision of this Order, EPA hereby retains all of its information gathering, access, and inspection authority under CERCLA, the Resource Conservation and Recovery Act ("RCRA"), 42 U.S.C. §§ 6901-6991, and any other applicable statute or regulations.

Plans and Reports Requiring EPA Approval

45. If EPA disapproves or otherwise requires any modifications to any plan, report or other item required to be submitted to EPA for approval pursuant to this Order, Respondent shall have fifteen (15) business days from the receipt of notice of such disapproval or the required modifications to correct any deficiencies and resubmit the plan, report, or other written document to EPA for approval, unless a shorter or longer period is specified in the notice. Any notice of disapproval will include an explanation of why the plan, report, or other item is being disapproved. Respondent shall address each of the comments and resubmit the plan, report, or other item with the required changes within the time stated above. At such time as EPA determines that the plan, report, or other item is acceptable, EPA will transmit to Respondent a written statement to that effect.

46. If any plan, report, or other item required to be submitted to EPA for approval pursuant to this Order is disapproved by EPA, even after being resubmitted following Respondent's receipt of EPA's comments on the initial submittal, Respondent shall be

deemed to be out of compliance with this Order. If any resubmitted plan, report, or other item, or portion thereof, is disapproved by EPA, EPA may again direct Respondent to make the necessary modifications thereto, and/or EPA may amend or develop the item(s) and recover the costs from Respondent of doing so. Respondent shall implement any such item(s) as amended or developed by EPA.

47. EPA shall be the final arbiter in any dispute regarding the sufficiency or acceptability of all documents submitted and all activities performed pursuant to this Order. EPA may modify those documents and/or perform or require the performance of additional work unilaterally.

Community Relations

48. Respondent shall cooperate with EPA in providing information relating to the work required hereunder to the public. As requested by EPA, Respondent shall participate in the preparation of all appropriate information disseminated to the public and in public meetings which may be held or sponsored by EPA to explain activities at or concerning the Site.

General Provisions

49. This Order shall apply to and be binding upon Respondent and Respondent's officers, directors, employees, agents, contractors, consultants, receivers, trustees, successors, and assigns.

50. All actions and activities carried out by Respondent pursuant to this Order shall be performed in accordance with all applicable federal, state, and local laws, regulations, and requirements, including the NCP and any amendments thereto that are promulgated while this Order is in effect.

51. Notwithstanding any other provision in this Order, and in accordance with Section 121(e)(1) of CERCLA, no federal, state, or local permits shall be required for any portion of the work required hereunder that is conducted entirely on-Site, although Respondent must comply with the substantive requirements that would otherwise be included in such a permit. Respondent shall obtain all permits necessary for off-Site work under federal, state, or local laws and shall submit timely applications and requests for any such permits. This Order is not, nor shall it act as, a permit issued pursuant to any federal or state statute or regulation.

52. All plans, reports and other submittals required to be submitted to EPA pursuant to this Order shall, upon approval by EPA, be deemed to be incorporated in and an enforceable part of this Order.

53. All waste disposal conducted by Respondent pursuant to this Order shall be performed in compliance with all requirements of CERCLA, including Section 121(d)(3), 42 U.S.C. § 9621(d)(3), RCRA, the Toxic Substances Control Act ("TSCA"), 15 U.S.C. §§ 2601-2629, and all regulations promulgated pursuant thereto, and all other applicable federal and state laws and regulations. In addition, all waste disposal conducted by Respondent pursuant to this Order shall be carried out in compliance with all applicable EPA policies and guidance documents, including the EPA guidance document entitled, "Superfund Removal Procedures" (OSWER, 1988). In addition, if hazardous substances from the Site are to be shipped to a waste management facility outside of New York State, Respondent shall insure that the environmental agency of the accepting state is notified of the following: (a) the name and location of the facility to which the wastes are to be shipped; (b) the type and quantity of waste to be shipped; (c) the expected schedule for the waste shipments; and (d) the method of transportation. Respondent shall provide such notification to the affected state in writing as soon as practicable, but in any event at least five (5) business days prior to the said shipments.

54. At the time of completion of all activities required by this Order, demobilization shall include sampling and proper disposal or decontamination of protective clothing, remaining laboratory samples, and any equipment or structures constructed to facilitate the work hereunder.

55. All documents submitted by Respondent to EPA in the course of implementing this Order shall be available to the public unless identified as confidential by Respondent pursuant to 40 CFR Part 2, Subpart B, and determined by EPA to merit treatment as confidential business information in accordance with applicable law. In addition, EPA may release all such documents to NYSDEC, and NYSDEC may make those documents available to the public unless Respondent conforms with applicable New York law and regulations regarding confidentiality. Respondent shall not assert a claim of confidentiality regarding any monitoring or hydrogeologic data, any information specified under Section 104(e)(7)(F) of CERCLA, or any other chemical, scientific or engineering data relating to the work performed hereunder.

56. Neither EPA nor the United States, by issuance of this Order, assumes any liability for any injuries or damages to persons or property resulting from acts or omissions by Respondent or Respondent's employees, agents, contractor(s), or consultant(s) in carrying out any action or activity pursuant to this Order, nor shall EPA or the United States be held as or be held out to be a party to any contract entered into by Respondent or Respondent's officers, employees, agents, contractor(s), or consultant(s) in carrying out any action or activity pursuant to this Order.

57. Respondent agrees to indemnify and hold harmless EPA and the United States Government, its agencies, departments, agents, and employees, from all claims, causes of action, damages, and costs of any type or description by third parties for any injuries or damages to persons or property resulting from acts or omissions of Respondent, its officers, directors, officials, agents, servants, receivers, trustees, successors, or assigns as a result of the fulfillment or attempted fulfillment of the terms and conditions of this Order by Respondent.

58. Nothing contained in this Order shall affect any right, claim, interest, defense, or cause of action of any party hereto with respect to third parties.

59. Nothing in this Order shall be construed to constitute preauthorization under Section 111(a)(2) of CERCLA, 42 U.S.C. § 9611(a)(2), and 40 CFR § 300.700(d).

60. Respondent hereby waives any rights it may have to seek reimbursement pursuant to Sections 106(b)(2), 111 and/or 112 of CERCLA, 42 U.S.C. §§ 9606(b)(2), 9611, 9612, or any other provision of law, either directly or indirectly, from the Hazardous Substance Superfund of costs incurred by Respondent in complying with this Order.

61. Nothing herein shall constitute or be construed as a satisfaction or release from liability for Respondent or Respondent's officers, directors, employees, agents, contractor(s), consultant(s), receivers, trustees, successors, or assigns, or for any other individual or entity. Nothing herein shall constitute a finding that Respondent is the sole responsible party with respect to the release and threatened release of hazardous substances at and from the Site.

62. No informal advice, guidance, suggestions or comments by EPA shall be construed to relieve Respondent of any of it obligations under this Order.

63. Respondent's activities under this Order shall be performed within the time limits set forth herein, or otherwise established or approved by EPA, unless performance is delayed by events which constitute a force majeure. For purposes of this Order, "force majeure" is defined as any event arising from causes beyond Respondent's control. "Force majeure" shall not include inability of Respondent to pay the costs or expenses associated with complying with this Order or increases in such costs or expenses. When an event constituting a force majeure occurs, Respondent shall perform the affected activities within a time period which shall not exceed the time provided in this Order together with the period of delay attributed to the force majeure; provided, however, that no deadline shall be extended beyond a period of time that is reasonably necessary. Respondent

shall use its best efforts to avoid or minimize any delay or prevention of performance of their obligations under this Order.

64. Respondent shall verbally notify the EPA On-Scene Coordinator if circumstances have occurred or are likely to occur which may delay or prevent the performance of any activity required by this Order, regardless of whether those circumstances constitute a force majeure. If the On-Scene Coordinator cannot be reached, Respondent shall leave a message at his or her office. In addition, Respondent shall notify EPA in writing within seven (7) calendar days after the date when Respondent first becomes aware of the circumstances which may delay or prevent performance. Such written notice shall be accompanied by all available and pertinent documentation, including third-party correspondence, and shall contain the following: (a) a description of the circumstances, and Respondent's rationale for interpreting such circumstances as being beyond their control (should that be Respondent's claim); (b) the actions (including pertinent dates) that Respondent has taken and/or plans to take to minimize any delay; and (c) the date by which or the time period within which Respondent proposes to complete the delayed activities. Such notification shall not relieve Respondent of any of its obligations under this Order. Respondent's failure to timely and properly notify EPA as required by this paragraph shall constitute a waiver of Respondent's right to claim an event of force majeure. The burden of proving that an event constituting a force majeure has occurred shall rest with Respondent.

65. This Order may be amended by mutual agreement of EPA and Respondent. Such amendments shall be in writing and shall have as their effective date that date on which such amendments are signed by EPA.

66. Except where expressly stated otherwise herein, all time periods specified in this Order shall be construed as calendar days rather than business days.

Enforcement

67. Failure of Respondent to expeditiously and completely carry out the terms of this Order may result in EPA conducting the required actions, pursuant to Section 104(a) of CERCLA, 42 U.S.C. § 9604(a).

68. If Respondent fails, without prior EPA approval, to comply with any of the requirements or time limits set forth in or established pursuant to this Order, and such failure is not excused under the terms of Paragraphs 63 and 64, above, Respondent shall, upon demand by EPA, pay a stipulated penalty to EPA in the amount indicated below for each day of noncompliance:

Days After Required Date	Stipulated Penalty
1 to 7 days	$ 500.00/day
8 to 15 days	$ 1,000.00/day
16 to 25 days	$ 1,500.00/day
26 to 40 days	$ 2,500.00/day

Any such penalty shall accrue as of the first day after the applicable deadline has passed, and shall continue to accrue until the noncompliance is corrected, through the 40th day of such noncompliance. Such penalties shall be due and payable ten (10) days following receipt of a written demand from EPA. Payment of any such penalty to EPA shall be made by cashier's or certified check made payable to the "Hazardous Substance Superfund," with a notation of the index number of this Order, and shall be mailed to:

EPA-Region II
Attn: Superfund Accounting
P.O. Box 360188M
Pittsburgh, PA 15251

A letter stating the basis for the penalties, the name and address of the Respondent, the name of the Site, and the EPA Region number shall accompany each such payment; a copy of the letter and the check shall be mailed to the EPA addressees listed in Paragraph 33, above.

69. Notwithstanding any other provision of this Order, failure of Respondent to comply with any provision of this Order may result in the initiation of an enforcement action against Respondent, including enforcement actions pursuant to, Sections 106(b)(1) and/or 107(c)(3) of CERCLA, 42 U.S.C. §§ 9606(b)(1), 9607(c)(3), which may result in the assessment of fines of up to $25,000 for each day of such noncompliance and/or the assessment of punitive damages.

70. Notwithstanding any other provision of this Order, EPA reserves its right to bring an action against Respondent (or any other responsible party) pursuant to Section 107(a) of CERCLA, 42 U.S.C. § 9607(a), for recovery of any costs which have been or may be incurred by the United States Government with respect to the Site, including, but not limited to, the costs of installation of water mains and residential hookups at the Site.

71. Nothing herein shall preclude EPA from taking any additional enforcement actions and/or other actions, outside of this Order, as it may deem necessary or appropriate for any purpose, including, the investigation, prevention, or abatement of a threat to the public health, welfare, or the environment arising from conditions at the Site. For example, and without limitation, EPA reserves the right to install water mains and

residential hookups at the Site or to take action to require Respondent and/or any other persons or entities to install such water mains and hookups.

Termination and Satisfaction

72. When Respondent is satisfied that the work required by this Order has been completed, Respondent shall submit a written report to EPA specifically setting forth how Respondent has complied with this Order and has satisfactorily implemented the requirements set forth herein. This report shall be accompanied by appropriate documentation which substantiates to EPA's satisfaction Respondent's assertion that the work required hereunder has been satisfactorily completed. The report shall further include a sworn statement by Respondent setting forth the following:

> "To the best of my knowledge, after thorough investigation, I certify that the information contained in or accompanying this submission is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Upon a determination by EPA, following its receipt of the aforesaid sworn statement and report, that the work required pursuant to this Order has been fully carried out in accordance with this Order, EPA will so notify Respondent in writing.

Effective Date and Effect of Consent

73. This Order shall become effective on the date of its receipt by counsel for Respondent. All times for performance of actions or activities required herein will be calculated from said effective date.

74. By signing and taking actions under this Order, Respondent does not necessarily agree with the Findings of Fact and Conclusions of Law contained herein. Respondent does not admit any legal liability or waive any defenses or causes of action with respect to issues addressed in this Order, except as otherwise provided in this Order. However, Respondent agrees not to contest the authority or jurisdiction of the Regional Administrator of EPA Region II to issue this Order, and Respondent also agrees not to contest the validity or terms of this Order in any action to enforce its provisions.

U.S. ENVIRONMENTAL PROTECTION AGENCY

CONSTANTINE SIDAMON-ERISTOFF
Regional Administrator
U.S. Environmental Protection Agency
Region

9/30/91
Date of Issuance

Respondent, James A. Klein, has had an opportunity to confer with EPA to discuss the terms and the issuance of this Order. The Respondent hereby consents to the issuance of this Order and to its terms. Furthermore, the individual signing this Order on behalf of Respondent certifies that he or she is fully and legally authorized to agree to the terms and conditions of this Order and to bind Respondent.

(signature)

September 27, 1991
DATE

James A. Klein
(printed name of signatory)

(title of signatory)

APPENDIX B

HEALTH AND SAFETY PLAN

HEALTH AND SAFETY PLAN

Interim Remedial Action
Apple Valley Shopping Center Superfund Site
Town of LaGrange, New York
NYSDEC Site No. 3-14-084

Prepared by: _____ Date: _____

Approved by: _____ Date: _____
Health and Safety Manager

Approved by: _____ Date: _____
Project Manager

Table of Contents

1. Introduction

1.1 HASP Applicability

This site-specific Health and Safety Plan (HASP) has been developed by Upstate HydroTech Consulting, LLC (UHTC) and Sterling Environmental Engineering, P.C. (STERLING). It establishes the health and safety procedures to minimize potential risks to personnel involved with the subsurface exploration activities, sampling and interim remedial action at the Apple Valley Shopping Center Superfund Site (the Site) located in the Town of LaGrange, Dutchess County, New York. This HASP applies to all personnel potentially exposed to safety and/or health hazards related to the activities described in Section 3.0 of this document.

This HASP has been prepared to comply with the applicable requirements of the Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120). Activities covered by this HASP must be conducted in complete compliance with this HASP and with all applicable Federal, State, and local health and safety regulations. Personnel covered by this HASP who cannot or will not comply will be excluded from site activities.

This HASP will be distributed to each person involved with investigative activities at the site. Each person must sign a copy of the attached HASP Receipt and Acceptance Form (see Attachment A).

1.2 Organization/Responsibilities

The implementation of health and safety at this project location will be the shared responsibility of the Project Manager (PM), the Health and Safety Manager (HSM), the Project Site Safety Officer (SSO) and all other personnel who conduct activities at the site.

1.2.1 Project Manager (PM)

The Project Manager (PM) has the primary responsibility for ensuring the overall health and safety of this project. As such, the PM is responsible for ensuring that the requirements of this HASP are implemented. Some of the PM's specific responsibilities include:

- Ensuring that all personnel to whom this HASP applies have received a copy of it;
- Providing the SSO with updated information regarding environmental conditions at the site and the scope of site work;
- Providing adequate authority and resources to the on-site SSO to allow for the successful implementation of all necessary safety procedures;
- Supporting the decisions made by the SSO;
- Maintaining regular communications with the SSO; and
- Coordinating the activities of all subcontractors and ensuring that they are aware of the pertinent health and safety requirements for this project.

1.2.2 Health and Safety Manager (HSM)

The Health and Safety Manager (HSM) is responsible for the preparation, interpretation and modification of this HASP. Modifications to this HASP which may result in less stringent precautions cannot be undertaken by the SSO without the approval of the HSM. Specific duties of the HSM include:

- Writing, approving and amending the HASP for this project;
- Advising the SSO on matters relating to health and safety on this site;
- Recommending appropriate personal protective equipment (PPE) and air monitoring instrumentation to protect personnel from potential site hazards;
- Conducting accident investigations; and,
- Maintaining regular contact with the SSO to evaluate site conditions and new information which might require modifications to the HASP.

1.2.3 Site Safety Officer (SSO)

All field technicians are responsible for implementing the safety requirements specified in this HASP. One (1) technician will be designated to serve as the Site Safety Officer (SSO). The SSO will be appointed by the PM. The SSO will be on-site during all activities covered by this HASP. The SSO is responsible for enforcing the requirements of this HASP once work begins. The SSO has the authority to immediately correct all situations where non-compliance with this HASP is noted and to immediately stop work in cases where an immediate danger is perceived. Some of the SSO's specific responsibilities include:

- Ensuring that all personnel to whom this HASP applies have submitted a completed copy of the HASP Receipt and Acceptance Form (see Attachment A);
- Ensuring that all personnel to whom this HASP applies have attended a pre-entry briefing prior to entering an exclusion zone;
- Maintaining a high level of health and safety consciousness among employees at the work site;
- Procuring and distributing the PPE needed for personnel involved with this project;
- Procuring the air monitoring instrumentation required and performing air monitoring for field activities;
- Verifying that all PPE and health and safety equipment is in good working order;
- Setting up and maintaining the work zones and ensuring proper cleanup of all site personnel;
- Notifying the PM of all non-compliance situations and stopping work in the event that an immediate danger situation is perceived;
- Monitoring and controlling the safety performance of all personnel within the established restricted areas to ensure that required safety and health procedures are being followed;
- Conducting accident/incident investigations and preparing accident/incident investigation reports;
- Conducting the pre-entry briefing as required by Section 10.3 of this HASP; and
- Initiating emergency response procedures in accordance with Section 11.0 of this HASP.

1.2.4 Field Personnel and Covered Subcontractor Personnel

All field personnel covered by this HASP are responsible for following the health and safety procedures specified in this HASP and for performing their work in a safe and responsible manner. Some of the specific responsibilities of the field personnel are as follows:

- Reading this HASP in its entirety prior to the start of on-site work;
- Submitting a completed HASP Receipt and Acceptance Form (see Attachment A) and documentation of medical surveillance and training to the PM prior to the start of work;
- Attending the required pre-entry briefing prior to beginning on-site work;
- Bringing forth any questions or concerns regarding the content of this HASP to the PM or the SSO prior to the start of work;
- Reporting all accidents, injuries and illnesses, regardless of their severity, to the SSO; and
- Complying with the requirements of this HASP and the requests of the SSO.

1.2.5 Contractors

In addition to other requirements referenced in this HASP, all contractors are required to:

- Provide appropriate PPE for their employees;
- Ensure, via daily inspections, that their equipment is maintained in good working condition;
- Operate their equipment in a safe manner; and
- Appoint an on-site safety coordinator to interface with the SSO.

1.3 Modification of this HASP

The procedures in this HASP have been developed based on information from previous investigations at the site. Should additional information become available regarding potential on-site hazards, it may be necessary to modify this HASP. All proposed modifications to this HASP must be reviewed and approved by the HSM before such modifications are implemented.

Any significant modifications must be incorporated into the written document as addenda and the HASP must be re-issued. The PM will ensure that all personnel covered by this HASP receive copies of all issued addenda. Sign-off forms will accompany each addendum and must be signed by all personnel covered by the addendum. Sign-off forms will be submitted to the PM. The HASP addenda will be distributed during the regularly scheduled meetings so that they can be reviewed and discussed. Attendance forms will be collected during the meeting.

2. Site Description and History

2.1 Site Description

The Apple Valley Shopping Center Superfund Site is located in the Town of LaGrange, Dutchess County, New York, approximately seven (7) miles east of the City of Poughkeepsie (see Figure 1, Site Location). The Site consists of the Apple Valley Shopping Center (AVSC), located at the southwest corner of the junction of State Route 55 and Titusville Road. The AVSC was constructed in 1967 – 1968, and contains a number of businesses including the former Apple Valley Dry Cleaners (AVDC) currently Absolute Pizza, the Norgetown Laundromat (NL) currently Apple Valley Laundromat, and a Grand Union supermarket (GU) currently Foodtown.

The Site is owned by Apple Valley Corporation; the previous owner was James A. Klein Enterprises (JAK). JAK is subject to Administrative Order On Consent (Order) No. II-CERCLA-10224 entered on October 4, 1991 between JAK and the United States Environmental Protection Agency (USEPA) with respect to the Site. The Order requires JAK to undertake an Emergency Removal Action at the Site. Such Emergency Removal Action has been ongoing since 1992. The principal contaminant at the Site as demonstrated by groundwater sampling, soil gas sampling and soil testing is tetrachloroethene (also perchloroethene or PCE); lesser quantities of trichloroethene (TCE) and other chlorinated solvents have also been detected.

Southwest of the AVSC are the residences of the Woodbridge Estates Subdivision, several of which are impacted by the terms of the Order.

2.2 Site History

In 1988, prompted by a homeowner's complaint regarding odor and septic discharge from the Grand Union trash compactor, the Dutchess County Department of Health (DCDOH) collected and analyzed samples of groundwater from several residential supply wells located in the Woodbridge Estates Subdivision[1]. The samples were found to contain PCE and its breakdown products including TCE and isomers of dichloroethene (DCE). The DCDOH also sampled the AVSC's supply wells, well AV-1 (abandoned due to poor yield) and its replacement, well AV-2. Concentrations of the same chlorinated compounds were detected, with greater than 5,000 parts per billion (ppb) of PCE in well AV-1. Chlorinated hydrocarbons were also found in the discharge from the sump at the base of the Grand Union loading dock. A point-of-entry (POE) granular activated carbon (GAC) filter system was installed by JAK to treat the AVSC's well water and, in 1989, a third supply well (AV-3) was installed in a presumed upgradient location on the AVSC property.

In 1989, the New York State Department of Environmental Conservation (NYSDEC) prepared a preliminary justification report for listing the AVSC as a potential Hazardous Waste Site.

In 1990, the DCDOH conducted more extensive sampling of the water supply wells in the Subdivision, and found that a number of wells were contaminated with chlorinated compounds at levels above the NYS standards for public drinking water supplies. In September 1990, the NYSDEC requested the

[1] See tabulated analytical results and analytical reports included in *Work Plan, Apple Valley Shopping Center Superfund Site, LaGrange, New York, Superfund Emergency Removal Action* prepared by TRC Environmental Consultants, Inc.

intervention of the USEPA to initiate actions under CERCLA's emergency removal authorities to provide potable water supplies to the affected residents.

2.2.1 Regulatory and Legal Framework

In December 1990, the NYSDEC first notified JAK that the AVSC had been included in the State Register of Potential Hazardous Waste Sites, and that JAK was considered a potentially responsible party (PRP) by reason of ownership of the Site. Immediately thereafter, JAK began the provision of bottled water to the affected residences in the Woodbridge Estates Subdivision pending further negotiations with the NYSDEC. On December 21, 1990, the USEPA notified counsel for JAK that it would assume primacy for the Site and would be initiating actions under the emergency removal authorities, and that the USEPA viewed JAK as a PRP.

An agreement was reached between the USEPA and JAK in late September 1991, and the Order was issued with an effective date of October 4, 1991. The Order focuses on the primary objectives of providing users of groundwater at the Site a potable source of drinking water and protecting other currently unaffected users of groundwater in the area.

2.2.2 Emergency Removal Action

In 1992, JAK installed point-of-entry (POE) granular activated carbon (GAC) filters on the wells of eight (8) residences in the Woodbridge Estates Subdivision. A groundwater withdrawal and treatment program was also initiated to control migration of contaminated groundwater from the Site and to effect a collapse of the off-site contaminant plume. This program involved the installation of two (2) low-profile air strippers. The first air stripper (AVS) serviced AVSC well AV-2. This well was pumped continuously at 20 gallons per minute (gpm). Treated water from AV-2 was distributed for use by AVSC tenants and excess water was discharged to an adjacent wetland. In early 1999, the AVSC was placed on municipal water. Now the entire treated discharge of the AVS is discharged to the wetland.

The second air stripper (LRS) serviced two (2) wells on Locust Crest Court (Lot Nos. 10 and 11). These wells were pumped intermittently for a combined continuous discharge of 10 gpm. Treated water from these wells was distributed for use by the residents of Lots 10 and 11, and excess water was discharged to an adjacent wetland. JAK also retained responsibility for operation and maintenance of the GAC filters and air strippers.

In 1996, five (5) of the original eight (8) POE GAC filters were decommissioned as the water at these locations had been cleaned to levels below the standards for treatment cessation. In 1999, a sixth residence was removed from the program. The two (2) remaining GAC systems service Lots 10 and 11.

In 2001, the air stripper servicing Lots 10 and 11 of the Woodbridge Estates Subdivision was permanently decommissioned. The same year, the AVSC air stripper, AVS, was replaced with an off-the-shelf unit manufactured by QED Environmental.

3. Scope of Work

3.1 Purpose of IRM

This Interim Remedial Action (IRM) is proposed to supplement the ongoing Removal Action undertaken by JAK. This IRM targets source areas previously identified at the Site, including the primary source area, or "hot spot," located approximately 15 to 20 feet behind the former location of the AVDC. The primary goal is to accelerate the rate of contaminant removal in this area of the Site. The scope of work includes subsurface explorations to install groundwater extraction wells and monitoring wells, installation of a groundwater treatment system and subsequent periodic environmental sampling events.

3.2 Subsurface Explorations

Subsurface operations include the installation of recovery wells and the installation of boundary monitoring wells.

3.2.1 Recovery Well Installation

Specific field tasks include:

- Advancing three (3) borings using hollow stem augers through the overburden and employing continuous split-spoon sampling.
- Advancing these borings through the bedrock using smooth core boring methods.
- Screening the soil and bedrock samples for volatile organic compounds (VOCs) using a photoionization detector (PID).
- Opening the bedrock core boring to six (6) inches diameter using water rotary techniques.
- Testing intervals of the bedrock boring using packers to determine potentiometric head and yield, and to collect samples of groundwater from various zones in the bedrock.
- Analyzing groundwater samples collected during packer testing for chlorinated compounds using an on-site, portable gas chromatograph.
- Designing and installing well screens.
- Completing the well installations.
- Installing pumps in the wells and plumbing these pumps into the treatment system.

3.2.2 Boundary Well Installation

Specific field tasks include:

- Advancing four (4) borings using water rotary techniques through the overburden and bedrock.
- Completing the well installations with casing installed five (5) feet into bedrock.
- Install dedicated submersible pumps in the wells to facilitate the collection of groundwater samples.

3.3 Groundwater Treatment System

The installation of the groundwater treatment system involves the receipt on-site of off-the-shelf, low-profile air stripping technology, its installation in the existing site building, and its hookup to electricity and plumbing. The installation will be performed by various skilled subcontractors. When the system has been installed, the

groundwater extraction will be brought on-line, with samples of influent and effluent collected for analysis by an approved laboratory once operating parameters have been maximized.

3.4 Environmental Sampling

Groundwater samples will be collected on a periodic basis, initially quarterly, for analysis by an approved laboratory for VOCs. They will be collected from influent and effluent ports on the two (2) air strippers, from the boundary and other site monitoring wells using dedicated submersible pumps, and from taps in various residences in the adjoining Woodbridge Estates Subdivision.

The indoor air quality at the AVSC will also be monitored periodically to assess potential impacts.

4. Chemical Hazard Assessment and Controls

4.1 Chemical Hazards

The predominant chlorinated organic solvents detected in the groundwater include tetrachloroethene (also perchloroethene or PCE), trichloroethene (TCE), and cis-1,2-dichloroethene (cis-DCE). Overexposure to the chlorinated organic solvents likely to be present in the groundwater may result in depression of the central nervous system, symptoms of which include dizziness, headache, giddiness, intoxication and nausea. Chronic overexposures can result in liver, kidney and central nervous system damage.

The OSHA Permissible Exposure Limit (PEL) for PCE and TCE is 100 ppm as an 8-hour time-weighted average (TWA). OSHA does not regulate DCE but the American Conference of Governmental Industrial Hygienists (ACGIH) recommends a Threshold Limit Value (TLV) of 200 ppm as an 8-hour TWA.

4.2 Chemical Exposure and Control

4.2.1 Chemical Exposure Potential

Although the concentrations of chlorinated solvents in groundwater exceed NY standards, the reported concentrations are in the part per billion to low part per million range and therefore should not present a vapor hazard to site workers. As described above, the primary route of exposure during site activities in areas contaminated with chlorinated solvents is direct dermal contact.

4.2.2 Chemical Exposure Control

The following chemical exposure control measures will be implemented during the proposed investigations:

- The SSO will perform air monitoring (see Section 6.1) in the worker's breathing zone to determine exposure to VOC vapors during the subsurface explorations and sampling activities. If exposures exceed the action levels, respiratory protection as discussed in Section 7.2, will be donned.
- To avoid direct dermal contact with potentially contaminated media, chemical protective clothing, as described in Section 7.1, will be required when collecting samples and decontaminating sampling equipment.
- Although highly unlikely, exposure to all of the contaminants of concern may occur via ingestion (hand-to-mouth transfer). The decontamination procedures described in Section 9.0 address personal hygiene issues that will limit the potential for contaminant ingestion.

5. Physical Hazards and Controls

5.1 Facility Requirements

The AVSC has no particular requirements for personal protective equipment (PPE). The SSO will interface with the facility representatives as necessary to ensure that site personnel activities do not interfere with plant operations at both interior and exterior locations.

5.2 Utility Hazards

5.2.1 Underground Utilities

New York law requires that, at least 48 hours prior to initiation of any subsurface work, a utility clearance be performed at the site. The driller will contact Dig Safely New York (1-800-962-7962) to request a mark-out of underground utilities in the proposed sampling areas. Work will not begin until the required utility clearances have been performed. Public utility clearance organizations typically do not mark-out underground utility lines that are located on private property. As such, the driller must exercise due diligence and try to identify the location of any private utilities on the properties being investigated. This requirement can be fulfilled in several ways, including:

- obtaining as-built drawings for the areas being investigated from the property owner;
- visually reviewing each proposed excavation location with the property owner or knowledgeable site representative;
- performing a geophysical survey to locate utilities or hiring a private line locating firm to determine the location of utility lines that are present at the property;
- identifying a no-drilling/digging zone; or
- hand digging in the proposed drilling/excavation locations if insufficient data is available to accurately determine the location of the utility lines.

5.2.2 Overhead Utilities

Be particularly aware of overhead power lines in the work area. Any vehicle or mechanical equipment capable of having parts of its structure elevated (drill rig, crane, etc.) near energized overhead lines shall be operated so that a clearance of at least ten (10) feet is maintained. If the voltage is higher than 50kV, the clearance shall be increased four (4) inches for every 10kV over that voltage.

5.3 Traffic Concerns

Work is being performed at exterior locations where traffic is a concern (i.e. parking lot, shipping/receiving area, loading dock). The following precautions should be followed. All are designed to draw attention to the work and to warn other people of the activities.

- Notify the property owner of your work location, dates of work and the anticipated work times. Suggest the possibility of a detour around the work area.
- Wear an orange safety vest. If work is being performed at dawn, dusk or evening, the vests must have reflective tape.

- Set up traffic cones 50 feet in front of the work area. "Work Zone" signs should also be placed in a conspicuous area to warn others of your presence.

5.4 Drilling Hazards

Use of a drill rig to install monitoring wells will require all personnel in the vicinity of the operating rig to wear steel-toed boots, hardhats, hearing protection and safety eyewear. Personnel shall not remain in the vicinity of operating equipment unless it is required for their work responsibilities. Additionally, the following safety requirements must be adhered to:

- All drill rigs and other machinery with exposed moving parts must be equipped with an operational emergency stop device. Drillers and geologists must be aware of the location of this device. This device must be tested prior to job initiation and periodically thereafter. The driller and helper shall not simultaneously handle augers unless there is a standby person to activate the emergency stop.
- The driller must never leave the controls while the tools are rotating unless all personnel are kept clear of rotating equipment.
- A long-handled shovel or equivalent must be used to clear drill cuttings away from the hole and from rotating tools. Hands and/or feet are not to be used for this purpose.
- A remote sampling device must be used to sample drill cuttings if the tools are rotating or if the tools are readily capable of rotating. Samplers must not reach into or near the rotating equipment. If personnel must work near any tools that could rotate, the driller must shut down the rig prior to initiating such work.
- Drillers, helpers and geologists must secure all loose clothing when in the vicinity of drilling operations.
- Only equipment that has been approved by the manufacturer may be used in conjunction with site equipment and specifically to attach sections of drilling tools together. Pins that protrude excessively from augers shall not be allowed.
- No person shall climb the drill mast while tools are rotating.
- No person shall climb the drill mast without the use of ANSI-approved fall protection (approved belts, lanyards and a fall protection slide rail) or portable ladder which meets the requirements of OSHA standards.

5.5 Noise Exposure

Due to facility activities, hearing protection must be worn by employees. Furthermore, the use of the drilling rig will generate noise levels that will require the use of hearing protection in the immediate vicinity. Appropriate earmuffs or earplugs (i.e., with an NRR greater than 25 dB) should be worn to prevent overexposure. The general rule of thumb is that if you have to raise your voice to be understood by someone who is standing 3 to 5 feet away from you, the noise levels are likely to be above 85 dB and therefore require the use of hearing protection.

5.6 Back Safety

Using the proper techniques to lift and move heavy pieces of equipment, such as drums of investigation-derived wastes, is important to reduce the potential for back injury. The following precautions should be implemented when lifting or moving heavy objects.

- Use mechanical devices to move objects, such as drums of investigation derived wastes or generators, that are too heavy to be moved manually.

- If mechanical devices are not available, ask another person to assist you.
- Bend at the knees, not the waist. Let your legs do the lifting.
- Do not twist while lifting.
- Bring the load as close to you as possible before lifting.
- Be sure the path you are taking while carrying a heavy object is free of obstructions and slip, trip and fall hazards.

5.7 Electrical Safety

If using portable tools that are electrically powered, follow the safety precautions listed below:

- Check to see that electrical outlets used to supply power during field operations is of the three (3) wire grounding type.
- Extension cords used for field operations should be of the three (3) wire grounding type and designed for hard or extra-hard usage. This type of cord uses insulated wires within an inner insulated sleeve and will be marked S, ST, STO, SJ, SJO or SJTO.
- NEVER remove the ground plug blade to accommodate ungrounded outlets.
- Do not use extension cords as a substitute for fixed or permanent wiring. Do not run extension cords through openings in walls, ceilings or floors.
- Protect the cord from becoming damaged if the cord is run through doorways, windows or across pinch points.
- Examine extension and equipment cords and plugs prior to each use. Damaged cords with frayed insulation or exposed wiring and damaged plugs with missing ground blades must be removed from service immediately.
- All portable or temporary wiring which is used outdoors or in other potentially wet or damp locations must be connected to a circuit that is protected by a ground fault circuit interrupter (GFCI). GFCI's are available as permanently installed outlets, as plug-in adapters and as extension cord outlet boxes. Do not continue to use a piece of equipment or extension cord that causes a GFCI to trip.
- When working in flammable atmospheres, be sure that the electrical equipment being used is approved for use in Class I, Division I atmospheres.
- Do not touch a victim who is still in contact with current. Separate the victim from the source using a dry, non-metallic item such as a broom stick or cardboard box. Be sure your hands are dry and you are standing on a dry surface. Turn off the main electrical power switch and then begin rescue efforts.

5.8 Thermal Stress

Although the majority of the work is being conducted in the summer, periodic groundwater sampling will be conducted over a three (3) year period. Therefore, the hazards of both heat and cold stress are addressed in this HASP.

5.8.1 Heat Stress

Types of Heat Stress

Heat related problems include heat rash, fainting, heat cramps, heat exhaustion and heat stroke. Heat rash can occur when sweat isn't allowed to evaporate, leaving the skin wet most of the time and making it subject to irritation. Fainting may occur when blood pools to lower parts of the body and as a result, does

not return to the heart to be pumped to the brain. Heat related fainting often occurs during activities that require standing erect and immobile in the heat for long periods of time. Heat cramps are painful spasms of the muscles due to excessive salt loss associated with profuse sweating. Heat exhaustion results from the loss of large amounts of fluid and excessive loss of salt from profuse sweating. The skin will be clammy and moist and the affected individual may exhibit giddiness, nausea and headache.

Heat stroke occurs when the body's temperature regulatory system has failed. The skin is hot, dry, red and spotted. The affected person may be mentally confused and delirious. Convulsions could occur. Early recognition and treatment of heat stroke are the only means of preventing brain damage or death. A person exhibiting signs of heat stroke should be removed from the work area to a shaded area. The person should be soaked with water to promote evaporation. Fan the person's body to increase cooling. Immediate medical assistance is needed in case of heat stroke. Dial 911 to request an ambulance.

Increased body temperature and physical discomfort also promote irritability and a decreased attention to the performance of hazardous tasks.

Early Symptoms of Heat-Related Health Problems:

- decline in task performance
- incoordination
- decline in alertness
- unsteady walk
- excessive fatigue
- reduced vigilance
- muscle cramps
- dizziness

Susceptibility to Heat Stress Increases due to:

- lack of physical fitness
- lack of acclimation
- increased age
- dehydration
- obesity
- drug or alcohol use
- sunburn
- infection

People unaccustomed to heat are particularly susceptible to heat fatigue. First timers in PPE need to gradually adjust to the heat.

The Effect of Personal Protective Equipment

Sweating normally cools the body as moisture is removed from the skin by evaporation. However, the wearing of certain personal protective equipment (PPE), particularly chemical protective coveralls (e.g., Tyvek), reduces the body's ability to evaporate sweat and thereby regulate heat buildup. The body's efforts to maintain an acceptable temperature can therefore become significantly impaired by the wearing of PPE.

Measures to Avoid Heat Stress:

The following guidelines should be adhered to when working in hot environments:

- Establish work-rest cycles (short and frequent are more beneficial than long and seldom).
- Identify a shaded, cool rest area.
- Rotate personnel, alternate job functions.

- Water intake should be equal to the sweat produced. Most workers exposed to hot conditions drink less fluids than needed because of an insufficient thirst. Do not depend on thirst to signal when and how much to drink. For an 8-hour work day, 50 ounces of fluids should be consumed.
- Eat lightly salted foods or drink salted drinks such as Gatorade to replace lost salt.
- Save most strenuous tasks for non-peak heat hours such as the early morning or at night.
- Avoid alcohol during prolonged periods of heat. Alcohol will cause additional dehydration.
- Avoid double shifts and/or overtime.

The implementation and enforcement of the above-mentioned measures will be the joint responsibility of the PM and SSO. Potable water and fruit juices should be made available each day for the field team.

Heat Stress Monitoring Techniques

Site personnel should regularly monitor their heart rate as an indicator of heat strain by the following method:

Check radial pulse rates by using fore- and middle fingers and applying light pressure to the pulse in the wrist for one (1) minute at the beginning of each rest cycle. If the pulse rate exceeds 110 beats/minute, shorten the next work cycle by one-third and keep the rest period the same. If, after the next rest period, the pulse rate still exceeds 110 beats/minute, shorten the work cycle again by one-third.

5.8.2 Cold Stress

Types of Cold Stress

Cold injury is classified as either localized, as in frostbite, frostnip or chilblain; or generalized, as in hypothermia. The main factors contributing to cold injury are exposure to humidity and high winds, contact with wetness and inadequate clothing.

The likelihood of developing frostbite occurs when the face or extremities are exposed to a cold wind in addition to cold temperatures. The freezing point of the skin is about 30°F. The fluids around the cells of the body tissue freeze, causing the skin to turn white. This freezing is due to exposure to extremely low temperatures. As wind velocity increases, heat loss is greater and frostbite will occur more rapidly.

Symptoms of Cold Stress

The first symptom of frostbite is usually an uncomfortable sensation of coldness, followed by numbness. There may be a tingling, stinging or aching feeling in the effected area. The most vulnerable parts of the body are the nose, cheeks, ears, fingers and toes.

Symptoms of hypothermia, a condition of abnormally low body temperature, include uncontrollable shivering and sensations of cold. The heartbeat slows and may become irregular, the pulse weakens and the blood pressure changes. Pain in the extremities and severe shivering can be the first warning of dangerous exposure to cold.

Maximum severe shivering develops when the body temperature has fallen to 95°F. This must be taken as a sign of danger and exposure to cold must be immediately terminated. Productive physical and mental work is limited when severe shivering occurs.

Methods to Prevent Cold Stress

When the ambient temperature, or a wind chill equivalent, falls to below 40°F (American Conference of Governmental Industrial Hygienists recommendation), site personnel who must remain outdoors should wear insulated coveralls, insulated boot liners, hard hat helmet liners and insulated hand protection. Wool mittens are more efficient insulators than gloves. Keeping the head covered is very important, since 40% of body heat can be lost when the head is exposed. If it is not necessary to wear a hard hat, a wool knit cap provides the best head protection. A face mask may also be worn.

Persons should dress in several layers rather than one single heavy outer garment. The outer piece of clothing should ideally be wind and water proof. Clothing made of thin cotton fabric or synthetic fabrics such as polypropylene is ideal since it helps to evaporate sweat. Polypropylene is best at wicking away moisture while still retaining its insulating properties. Loosely fitting clothing also aids in sweat evaporation. Denim is not a good protective fabric. It is loosely woven which allows moisture to penetrate. Socks with a high wool content are best. If two pairs of socks are worn, the inner sock should be smaller and made of cotton, polypropylene or a similar type of synthetic material that wicks away moisture. If clothing becomes wet, it should be taken off immediately and a dry set of clothing put on.

If wind conditions become severe, it may become necessary to shield the work area temporarily. The SSO and the PM will determine if this type of action is necessary. Heated break trailers or a designated area that is heated should be available if work is performed continuously in the cold at temperatures, or equivalent wind chill temperatures, of 20°F.

Dehydration occurs in the cold environment and may increase the susceptibility of the worker to cold injury due to significant change in blood flow to the extremities. Drink plenty of fluids, but limit the intake of caffeine.

6. Air Monitoring

6.1 Direct Reading Instruments

Instrument 1 – RaeSystems MiniRae 2000 (PID) equipped with a 10.6 ev lamp

A photoionization detector (PID) will be used by the SSO to identify the presence of chlorinated hydrocarbon vapors in site personnel's breathing zone during subsurface investigations. If the PID indicates sustained (i.e. 15-minute) readings of total organic vapors in the site personnel's breathing zone of 50 units or more, Level C respiratory protection will be worn by all personnel working.

The PID will also be used during the subsurface investigations to collect periodic air quality readings along the boundary of the property adjacent to Woodbridge Estates Subdivision, and at the designated boundary of the work zone to protect community health.

During sampling events, the PID will be used to monitor concentrations inside the well casing and also to determine breakthrough of the first vapor-phase carbon canister at the new air stripper.

6.2 Personal Air Sampling

OSHA does not require the collection of personal air sampling during the proposed activities. As such, this type of monitoring will not be conducted by personnel during any of the proposed tasks.

6.3 Calibration and Recordkeeping

Equipment used by on-site personnel will be calibrated in accordance with the quality assurance plan and standard operating procedures. A log of PID readings will be kept in the field notebook. Daily calibration information will also be recorded in the field notebook.

7. Personal Protective Equipment

Personal protective equipment (PPE) will be worn during site activities to prevent on-site personnel from being injured by the safety hazards posed by the site and/or the activities being performed. In addition, chemical protective clothing will be worn to prevent direct dermal contact with the site's chemical contaminants. The following table describes the PPE and chemical protective clothing to be worn for general site activities and for certain specific tasks.

7.1 Chemical Protective Clothing

PPE Item	Task 1	Task 2	Task 3
Hard Hat	✓	✓	
Steel Toed Safety Shoes	✓	✓	✓
Safety Glasses with Sideshields	✓	✓	✓
Traffic Vests	*		*
Inner PVC/Outer Nitrile Gloves	✓		✓
Hearing Protection	✓	✓	✓

Task 1 – Drilling and Well Installation
* - when working in streets or parking area

Task 2 – Groundwater Treatment System Installation and Start Up

Task 3 – Environmental Sampling
* - when working in streets or parking area

7.2 Respiratory Protection

A photoionization detector (PID) will be used by the SSO to identify the presence of any volatile organic vapors in the breathing zone during site activities. If the PID indicates sustained (i.e. 15-minute) readings of total organic vapors in the employee's breathing zone of 50 units or more, Level C respiratory protection will be worn.

Level C : Half-mask, air-purifying respirator equipped with organic vapor cartridges

Respiratory protection should also be worn if odors become objectionable at any time or if respiratory tract irritation is noticed. All on-site personnel who are expected to wear respiratory protection must have successfully passed a qualitative or quantitative fit-test within the past year for the brand, model and size respirator they plan to wear during the proposed activities.

7.3 Other Safety Equipment

The field team will bring the following additional safety items to the site for use as necessary:

- Portable, hand-held eyewash bottles
- First aid kit
- Portable communications equipment
- Fire Fxtinguisher

8. Site Control

8.1 Work Zones

To prevent both exposure of unprotected personnel and migration of contamination due to tracking by personnel or equipment, work areas along with personal protective equipment requirements will be clearly identified. Work areas or zones will be designated as suggested in the "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities," NIOSH/OSHA/USCG/EPA, November, 1985. They recommend the areas surrounding each of the work areas to be divided into three zones:

- Exclusion or "hot" Zone
- Contamination Reduction Zone (CRZ)
- Support Zone

8.1.1 Exclusion Zone

An exclusion zone will be established around each boring location. Zones will also be established at any groundwater sampling location that is in the path of traffic. This zone should be large enough (i.e. 20 foot radius) to protect unprotected personnel from contact with vapors or dusts that may arise from these operations as well as the physical hazards associated with the operation of heavy equipment. Traffic cones or tape will be used to demarcate the exclusion zone.

All personnel entering the exclusion zone must be trained in accordance with the requirements defined in Section 10.2 of this HASP and must wear the prescribed level of personal protective equipment.

8.1.2 Contamination Reduction Zone

The decontamination zone will be established adjacent to the exclusion zone. Personnel will remove contaminated gloves and other disposable items in this area and place them in a plastic bag until they can be properly disposed of.

8.1.3 Support Zone

At this site the support zone will include the area outside of the exclusion zone.

8.2 Safety Practices

The following measures are designed to augment the specific health and safety guidelines provided in this plan.

- The "buddy system" will be used at all times by any field personnel entering confined space. Standby team members must be intimately familiar with the procedures for initiating an emergency response.
- Eating, drinking, chewing gum or tobacco, smoking or any practice that increases the probability of hand-to-mouth transfer and ingestion of materials is prohibited in the immediate work area and the decontamination zone.
- Smoking is prohibited in all work areas. Matches and lighters are not allowed in these areas.

- Hands and face must be thoroughly washed upon leaving the work area and before eating, drinking or any other activities.
- Beards or other facial hair that interfere with respirator fit are prohibited.
- The use of alcohol or illicit drugs is prohibited during the conduct of field operations.
- All equipment must be decontaminated or properly discarded before leaving the site in accordance with the project work plan.

9. Decontamination

9.1 Personal Decontamination

Proper decontamination is required of all personnel before leaving the site. Decontamination will occur within the contamination reduction zone. Disposable PPE will be removed in the decontamination zone and placed in lined garbage bags.

If worn, respirators will be cleaned after each use with respirator wipe pads and will be stored in plastic bags after cleaning.

Regardless of the type of decontamination system required, a container of potable water and liquid soap will be made available so employees can wash their hands before leaving the site for lunch or for the day.

10. Medical Monitoring and Training Requirements

10.1 Medical Monitoring

All personnel performing activities covered by this HASP must be active participants in a medical monitoring program that complies with 29 CFR 1910.120(f). Each individual must have completed an annual surveillance physical examination and/or an initial baseline physical examination within the last year prior to performing any work on the site covered by this HASP.

10.2 Health and Safety Training

All personnel performing activities covered by this HASP must have completed the appropriate training requirements specified in 29 CFR 1910.120(e). Each individual must have completed an annual 8-hour refresher-training course and/or initial 40-hour training course within the last year prior to performing any work on the sites covered by this HASP.

10.3 Pre-Entry Briefing

The SSO will conduct a pre-entry briefing before site activities begin. HASP receipt and acceptance sheets will be collected at this meeting. Short safety refresher meetings will be conducted, as needed, throughout the duration of the project. Attendance of the pre-entry meeting is mandatory and will be documented by the SSO. An attendance form is presented in Attachment B.

11. Emergency Response

OSHA defines emergency response as any "response effort by employees from outside the immediate release area or by other designated responders (i.e., mutual-aid groups, local fire departments, etc.) to an occurrence which results, or is likely to result in an uncontrolled release of a hazardous substance." On-site personnel shall not participate in any emergency response where there are potential safety or health hazards (i.e., fire, explosion, or chemical exposure). Response actions will be limited to evacuation and medical/first aid as described within this section below. As such this section is written to comply with the requirements of 29 CFR 1910.38 (a).

The basic elements of an emergency evacuation plan include:

- employee training,
- alarm systems,
- escape routes,
- escape procedures,
- critical operations or equipment,
- rescue and medical duty assignments,
- designation of responsible parties,
- emergency reporting procedures and
- methods to account for all employees after evacuation.

11.1 Employee Training

Employees must be instructed in the site-specific aspects of emergency evacuation. On-site refresher or update training is required anytime escape routes or procedures are modified or personnel assignments are changed. The SSO must verify the specific evacuation procedures that the facility prefers contractors follow in the event of a facility-related emergency. This information will be communicated to the field team during the pre-entry briefing.

11.2 Alarm Systems/Emergency Signals

11.2.1 On-Site Personnel Emergency

An emergency communication system must be in effect at all sites. The most simple and effective emergency communication system in many situations will be direct verbal communication. Each site must be assessed at the time of initial site activity and periodically as the work progresses. Verbal communication must be supplemented anytime voices can not be clearly perceived above ambient noise levels (i.e., noise from heavy equipment; drilling rigs, backhoes, etc.) and anytime a clear line-of-sight can not be easily maintained among all personnel because of distance, terrain or other obstructions.

Verbal communication will be adequate to warn on-site personnel of hazards associated with the immediate work area. However, the two person sampling team may be split up during the day to expedite sampling. Each team member will be equipped with a cellular phone portable two-way radio to ensure immediate communication can occur between each other. These phones can also be used to contact local emergency responders. Phones are also located within the facility and can be used to call local emergency responders.

11.2.2 Facility-Related Emergency

The SSO must determine if the facility has an emergency signal system in place. If such a system is in place, the SSO will communicate this information to the field team during the pre-entry briefing.

11.3 Escape Routes and Procedures

The SSO will verify the escape routes from each work area with a facility representative. Assembly areas must also be identified. The escape routes and assembly areas will be reviewed during the pre-entry briefing. All personnel on site are responsible for knowing the escape route from the site and where to assemble after evacuation.

11.4 Rescue and Medical Duty Assignments

The phone numbers of the police and fire departments, ambulance service, local hospital, and project representatives are provided in the emergency reference sheet. This sheet will be posted in the site vehicle.

In the event an injury or illness requires more than first aid treatment, the SSO will accompany the injured person to the medical facility and will remain with the person until release or admittance is determined. The SSO will relay all appropriate medical information to the on-site project manager and the HSM.

If the injured employee can be moved from the accident area, he or she will be brought to the contamination reduction zone where their PPE will be removed. If the person is suffering from a back or neck injury the person will not be moved and the requirements for decontamination do not apply. The SSO must familiarize the responding emergency personnel about the nature of the site and the injury. If the responder feels that the PPE can be cut away from the injured person's body, this will be done on-site. If this not feasible, decontamination will be performed after the injured person has been stabilized.

11.5 Designation of Responsible Parties

The SSO is responsible for initiating emergency response. In the event the SSO can not fulfill this duty, the alternate SSO will take charge.

11.6 Employee Accounting Method

The SSO is responsible for identifying all personnel on-site at all times. On small, short duration jobs this can be done informally as long as accurate accounting is possible.

11.7 Accident Reporting and Investigation

Any incident (other than minor first aid treatment) resulting in injury, illness or property damage requires an accident investigation and report. The investigation should be conducted as soon as emergency conditions are under control. The purpose of the investigation is not to attribute blame but to determine the pertinent facts so that repeat or similar occurrences can be avoided. An accident investigation form is

presented in Attachment C of this HASP. The Supervisor of the injured personnel and the HSM should be notified immediately of the injury.

If a subcontractor personnel is injured, they are required to notify the SSO. Once the incident is under control, the subcontractor will submit a copy of their company's accident investigation report to the SSO.

EMERGENCY REFERENCES

Ambulance:	Notify 9-1-1
Fire:	Notify 9-1-1
Police:	Notify 9-1-1
Hospital - Poughkeepsie:	**845-483-5000** St. Francis Hospital 241 North Road Poughkeepsie, NY 12601
Directions to Hospital:	From site turn LEFT onto NY-55/Freedom Plains Road. Follow west for approximately 5.5 miles Stay straight to go onto Mill Street. Turn RIGHT onto Columbus Drive. Columbus Drive becomes Washington Street. Washington Street becomes North Road.

Project Representatives:

Theresa Beddoe (PM, HSM)	Office:	585-385-0609
UHTC	Cell:	585-455-9192
8 Mill Road	Home:	585-387-8996
Fairport, New York 14450		
Sterling Environmental Engineering, P.C.	Office:	518/456-4900
Mark P. Millspaugh, P.E.	Cell:	518/573-4796
Elizabeth Davis	Cell:	518/339-7964
1 Columbia Circle		
Albany, New York 12203		
Conrad Geoscience	Office:	845/454-2544
John Conrad	Cell:	914/475-2670
8 Raymond Avenue		
Poughkeepsie, New York 12603		
Craig Stiles (SSO)	Home:	585-467-9640
Independent Contractor	Cell:	585-750-9640

Apple Valley Corporation 845-897-4384

James A. Klein (Owner)
Ernie Henzler (Site Representative)

Attachment A

Health and Safety Plan Receipt and Acceptance Form

Health and Safety Plan Receipt and Acceptance Form

Interim Remedial Action
Apple Valley Shopping Center Superfund Site
Town of LaGrange, New York
NYSDEC Site No. 3-14-084

I have received a copy of the Health and Safety Plan prepared for the above-referenced site and activities. I have read and understood its contents and I agree that I will abide by its requirements.

Name (Print) _____

Signature _____

Date _____

Representing (Print) _____
Company Name

Attachment B

Health and Safety Plan Pre-Entry Briefing Attendance Form

Interim Remedial Action
Apple Valley Shopping Center Superfund Site
Town of LaGrange, New York
NYSDEC Site No. 3-14-084

Briefing Conducted By: _____

Date Performed: _____

Printed Name	Signature	Representing

Attachment C

Supervisor's Accident Investigation Report Form

SUPERVISOR'S ACCIDENT INVESTIGATION REPORT

Injured Employee _____ Job Title _____

Home Office _____ Division/Department _____

Date/Time of Accident _____

Location of Accident _____

Witnesses to the Accident _____

Injury Incurred? _____ Nature of Injury _____

_____

Engaged in What Task When Injured? _____

_____

Will Lost Time Occur? ____ How Long? _____ Date Lost Time Began _____

Were Other Persons Involved/Injured? _____

_____

How Did the Accident Occur? _____

_____

_____

_____

_____

What Could Be Done to Prevent Recurrence of the Accident? _____

_____

_____

What Actions Have You Taken Thus Far to Prevent Recurrence? _____

_____

_____

Supervisor's Signature _____ Title _____ Date _____

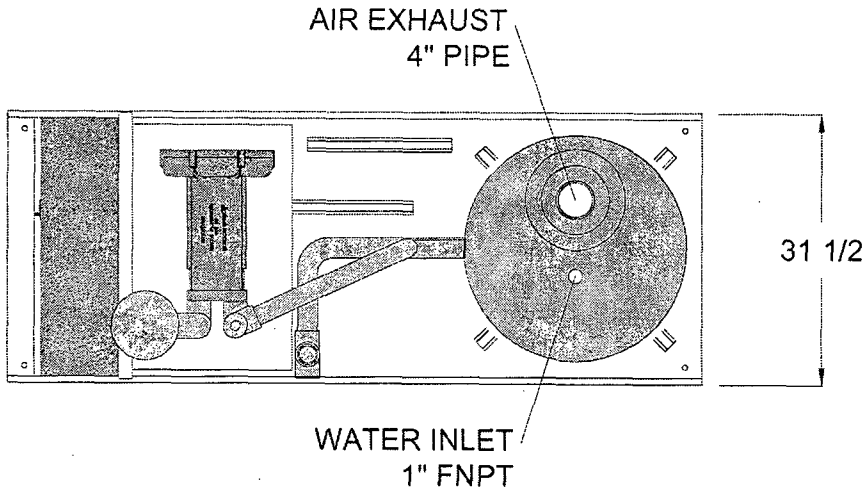
Reviewer's Signature _____ Title _____ Date _____

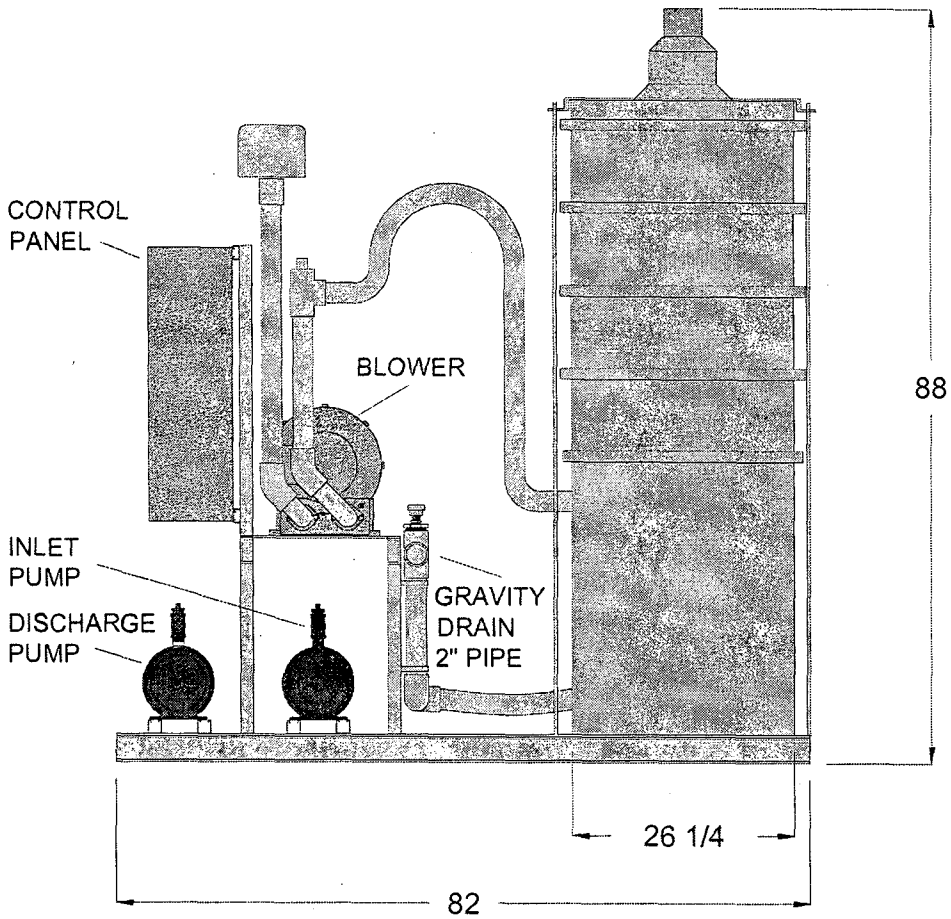
Note: If the space provided on this form is insufficient, provide additional information on a separate page and attach. The completed accident investigation report must be submitted to the Health and Safety Manager within two days of the occurrence of the accident.

APPENDIX C

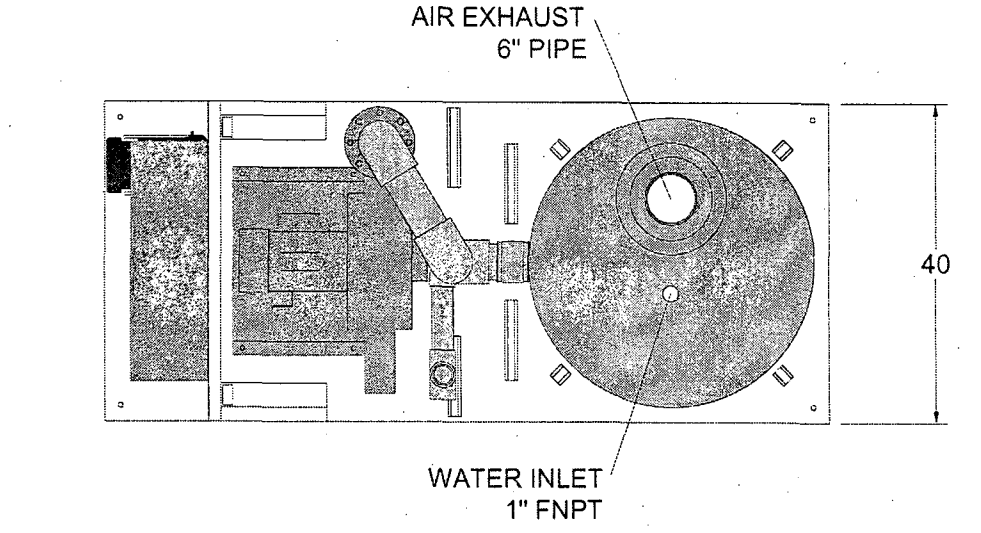
EXTRACTION AND TREATMENT SYSTEM SPECIFICATIONS AND OPERATION AND MAINTENANCE MANUAL

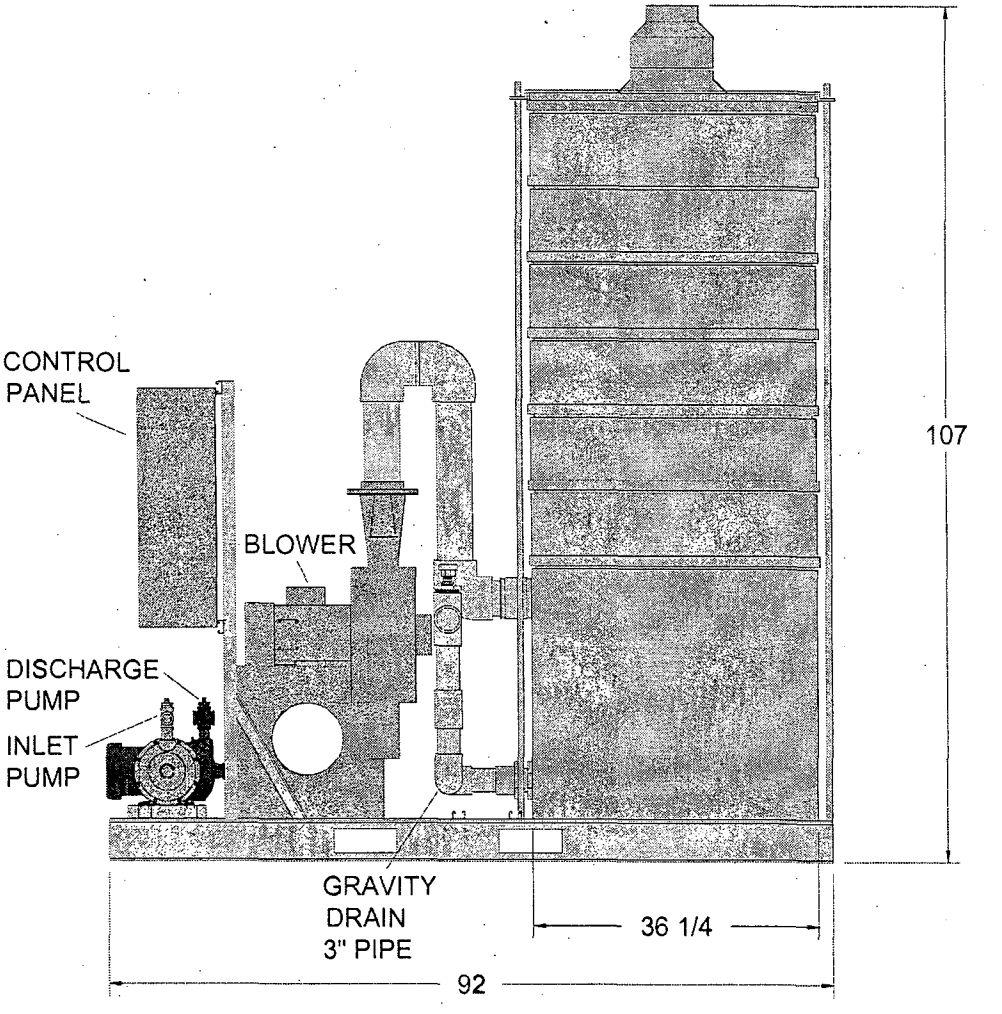
QED EZ-Stacker Model 2.4P





QED EZ-Stacker Model 4.6P





SECTION 1100
ENGINEERING SPECIFICATION: AIR STRIPPER (STACKABLE TRAY)

PART 1— GENERAL

1.1 SCOPE

1.1.1 The manufacturer shall furnish a low profile, multi-tray Air Stripper for removal of volatile organic compounds from water. System shall be manufactured by QED Environmental Systems, Inc. and represented by _____ or pre-approved equivalent.

1.2 PROCESS DESCRIPTION

1.2.1 The air stripper process must allow influent water to be piped to the air stripper inlet distribution port. The water is then allowed to flow over a weir and through a series of sieve/aeration trays as it descends to a sump at the bottom of the unit. Air forced up through the sieve holes in each tray forms a froth of bubbles, generating a large gas/liquid contact surface area. Depth of froth and unit air-to-water ratio are carefully controlled to optimize the contaminant removal process. This allows mass transfer of contaminants from the water into the rising air, which is exhausted at the top of the unit. A demister pad prevents release of water droplets in the exhaust.

1.3 SUBMITTALS

1.3.1 Manufacturer shall submit the following with the bid:

1.3.1.1 Product data for selected model, including rated flow capacity, dimensions, weights (dry and operating), accessories, and warranty coverage.

1.3.1.2 Drawings and/or data sheets containing all information necessary to relate the equipment to the specifications.

1.3.1.3 List of all instrumentation to be provided, with descriptive information for each component. See attached Air Stripper Data Sheet for list of required instrumentation.

PART 2 — PRODUCTS

2.1 GENERAL

2.1.1 The air stripper shall be an E-Z Stacker™ Stackable-Tray Air Stripper or pre-approved equivalent (low profile, stacking, multiple sieve tray design using pressure rather than vacuum to generate airflow). See Data Sheet for model number.

2.1.2 All components and options shall meet requirements specified on the Data Sheet attached to this specification.

2.2 EQUIPMENT DESIGN REQUIREMENTS

2.2.1 Standard product design shall comprise one low-profile aeration unit with the following specifications:

2.2.1.1 The air stripper dimension shall be no smaller than the size specified on the attached Data Sheet.

2.2.1.2 The air stripper shell consists of the outer walls of the sump, a series of stacking sieve trays, and the top.

2.2.1.3 The air stripper shall be equipped with a high efficiency demister, plus an external sump gauge to allow visual observation of water level. Demister shall effectively remove water droplets at air flow velocity greater than stripper blower maximum capacity. See Data Sheet for demister specifications.

2.2.1.4 When assembled, the air stripper shall be held together by a single 360 degree lockdown ring (to provide even clamping pressure downward around the entire circumference), held down by four or six tie rods (for easy disassembly and reassembly). Tie rod connectors shall have provision to maintain proper gasket seal tension over the rated life of the gasket material while allowing for tray expansion and contraction due to temperature changes or operating pressure variations. The stripper shall not be held together by latches from tray to tray.

2.2.1.5 To prevent leaks, tray to tray contact areas must be designed with the bottom of each tray below the seal, so that the drip pattern leads liquid away from the tray sealing surface.

2.2.1.6 Gaskets must be of heavy-duty, circular, one-piece construction; gaskets with glued seams are not allowed (because of potential leakage at the seams). Gaskets must be captured on both inboard and outboard edges to eliminate creeping. A continuous molded-in bead (no less than 1/16" high) on the tray sealing surface shall be provided to achieve concentrated compression of the gasket around its entire circumference.

2.2.1.7 Air stripper construction shall be of high density polyethylene (HDPE); see Data Sheet for specifications. Construction must be suitable for all loads placed on the unit, including but not limited to: loads resulting from internally supported parts, weight of operating liquid, piping, structural supports, internal or external pressure.

2.2.1.8 Shell design shall allow skid mounting by direct attachment of tie rods to skid, or floor mounting by attachment of tie rods to an optional bottom lock down ring.

2.2.2 Standard product design shall include stacking sieve trays with the following specifications:

2.2.2.1 Trays shall be constructed of rotationally-molded HDPE with a unibody construction that includes no welded seams or loose downcomers or seal pots. A continuous gasket compression bead shall be molded into the tray seal area. See Data Sheet for complete specifications.

2.2.2.2 Trays shall include a mechanical flow control device which will regulate water volume in each tray, preventing air short circuiting.

2.2.2.3 Trays shall be supplied with engineered perforations, sized and located to maintain not less than the specified active area of optimum mass transfer (not including seal pot or downcomer area). See Data Sheet for full specification.

2.2.3 Standard product design shall include piping connections.

2.3 OPERATION AND PERFORMANCE PARAMETERS

2.3.1 Stripper must fully disassemble for cleaning by removing no more than four connectors.

2.3.2 Dry weight of individual trays or other removable components must not exceed 75 pounds (to allow one-person cleaning).

2.3.3 Design shall require a maximum clearance not to exceed 4" at the rear and at least one side, to allow placement in a corner without interfering with operation or cleaning.

2.3.4 Air to water ratio shall be kept in accordance with generally accepted chemical engineering practice as defined in Perry's Handbook; see Data Sheet for exact specifications.

2.3.5 Design flow shall be as specified on attached Data Sheet or on Performance Model Run printout.

2.3.6 Design temperature (water and air) and site altitude shall be as specified on attached Data Sheet or on Performance Model Run printout.

2.3.7 Design influent and effluent concentrations shall be as specified on attached Data Sheet or on Performance Model Run printout.

2.3.8 Air stripper shall be installed in accordance with manufacturer's recommendations, including but not limited to the following:

2.3.8.1 If an exhaust stack is installed to provide venting of the stripped air, the size of the exhaust shall be in accordance with manufacturer's recommendations (see Data Sheet for specification).

2.3.8.2 If air stripper exhaust is to be passed through a subsequent treatment device (such as vapor phase activated carbon), back pressure shall not exceed manufacturer's recommendations (see Data Sheet for specification). If design post-treatment back pressure exceeds this level, a suitable auxiliary blower consistent with manufacturer's recommendations must be installed.

ENGINEERING DATA SHEET 1
AIR STRIPPER (STACKABLE TRAY)

GENERAL PRODUCT DATA

Model No.	Max. Flow (GPM)	Dry Weight (lbs)	Oper. Weight (lbs)	Shell Dimension ("DIA x H)	Trays (no x lbs)	Active area (sq ft)	Nom. airflow (cfm)	*Required Clearance (inches)
2.4P	1-25	103	483	27 x 83	4 x 16	2.6	140	4 x <27
2.6P	1-25	135	531	27 x 103	6 x 16	2.6	140	4 x <27
4.4P	1-40	155	1,004	37 x 83	4 x 24	5.8	210	4 x <37
4.6P	1-40	203	1,134	37 x 102	6 x 24	5.8	210	4 x <37

*Required clearances (back/sides by front, installed on standard skid)

INSTALLATION DATA

Model No.	Water Inlet (" FNPT)	Water Outlet + (" FNPT)	Blower Inlet (" FNPT)	Exhaust Outlet (" O.D. pipe)	Sump drain (" FNPT)	#Exhaust Stack size (inches)	*Max back pressure ("H2O)
2.4P	1 w/o pump 1 w/pump	2 w/o pump 1 w/pump	2	4.5	1	4	25
2.6P	1 w/o pump 1 w/pump	2 w/o pump 1 w/pump	2	4.5	1	4	17
4.4P	1 w/o pump 1 w/pump	3 w/o pump 2 w/pump	4	6.25	1	6	25
4.6P	1 w/o pump 1 w/pump	3 w/o pump 2 w/pump	4	6.25	1	6	17

+ Gravity drain if no pump is installed
# Minimum recommended nominal diameter of exhaust stack if added
* Maximum exhaust back-pressure allowed without auxiliary blower

ENGINEERING DATA SHEET 2
AIR STRIPPER (STACKABLE TRAY)

REF	ITEM	SPECIFICATION (S)	
1.3.1.3	Standard		
	Sump pressure gauge:	Differential pressure gauge, diaphragm-actuated dial type, 0-50" H_2O range	
	Sump sight gauge:	Clear tube connected to sump water drain for visual sump water level monitoring	
	Recommended options		
	Sump high level switch:	PVC jacketed SPST, 20VA	
	Sump low pressure switch:	SPST, 15VA, EXP	
	Options		
	High pressure switch:	SPST, 15VA, EXP	
	Air flow indicator:	Pitot tube	
	Air flow gauge:	Differential pressure gauge, diaphragm-actuated dial type: 0-0.25" H_2O range (2.XP models) 0-1" H_2O range (4.XP models)	
	Liquid flow meter:	Digital in-line or Check if included r mechanical brass nutating disk	
	Pump on/off switch:	PVC jacketed SPST, 20VA	
2.2.1.3	Demister:	High efficiency polypropylene (98% removal of droplets @ 10 microns)	
2.2.1.6	Shell/tray material:	UV-protected high-density polyethylene (HDPE)	
	Wall thickness:	0.25"	
2.2.2.1	Tray material:	304 stainless steel	
2.3.4	Minimum air/water ratio:	50:1	
2.3.5	Design flow for this spec:	_____ GPM	Or see attached
2.3.6	Design temperature for this spec:	_____ °F (water)	Or see attached
		_____ °F (air)	Or see attached
	Site altitude:	_____ feet above sea level	
2.3.7	Design concentrations for this spec:	_____ _____ _____	
		_____ _____ _____	
		_____ _____ _____	
		_____ _____ _____	
		_____ _____ _____	

SECTION 7200
ENGINEERING SPECIFICATION: AIR STRIPPER BLOWER

PART 1— GENERAL

1.1 SCOPE

1.1.1 The manufacturer shall furnish a blower for use with a low profile, multi-tray Air Stripper.

1.2 PROCESS DESCRIPTION

1.2.1 The blower impeller, driven by the direct-coupled motor, pressurizes air and supplies it to the stripper with sufficient flow and pressure to generate a froth of bubbles in the water contained by up to six stripper trays.

1.3 SUBMITTALS

1.3.1 Manufacturer shall submit the following with the bid:

1.3.1.1 Product data for selected model, including rated output capacity, electrical specifications, and warranty coverage. See attached Data Sheet for full specification.

PART 2 — PRODUCTS

2.1 GENERAL

2.1.1 The blower shall be a direct drive pressure blower (scroll type or a direct drive regenerative type blower. See Data Sheet for model number. Equipment shall be supplied by QED Environmental Systems, Inc. and represented by _____ or pre-approved equivalent.

2.1.2 Blower design and performance shall meet requirements specified on the Data Sheet attached to this specification.

2.2 EQUIPMENT DESIGN REQUIREMENTS-DIRECT DRIVE BLOWER

2.2.1 Standard product design shall include one pressure blower with all-welded steel housing and aluminum wheel, with the following specifications:

2.2.1.1 Blower shall be an industrial quality model rated for continuous duty, certified and licensed to bear the AMCA (Air Movement and Control Association, Inc.) Seal, in accordance with AMCA Publication 211.

2.2.1.2 Blower shall be factory balanced and motor-coupled.

2.2.1.3 Blower shall be supplied with an air flow throttle, factory installed preset to match stripper system requirements, and labeled to indicate settings for clean operation, turn-up range, and overload conditions.

2.2.1.4 Blower inlet shall be equipped with a 90° elbow serving as an inlet safety guard, ready for connection to an air inlet duct if desired.

2.2.1.5 Blower shall include a built-in water drain.

2.2.2 Standard product design shall include one industrial quality (such as Baldor, GE or preapproved equal) electric motor, with the following specifications:

2.2.2.1 Blower-motor unit shall be a compact, direct-drive arrangement with the blower wheel mounted directly on motorshaft, to minimize the number of moving parts and for ease of maintenance.

2.2.2.2 Motor must meet the system's electrical voltage/phase and explosion-proof requirements (if applicable). See attached Data Sheet for specifications.

2.2.3 Standard product design shall include outlet ducting to connect the blower outlet flange to the stripper inlet ducting. Duct size and design shall be sufficient to allow the blower to operate at full capacity. Duct design shall include a section routed high to prevent water from reaching the blower in the event of a system shutdown.

2.2.4 Blower/motor unit shall be primed and painted.

2.3 EQUIPMENT DESIGN REQUIREMENTS-REGENERATIVE BLOWER

2.3.1 Standard product design shall include one regenerative blower with cast rather than fabricated aluminum impeller (for ruggedness), housing and cover, meeting the following specifications:

2.3.1.1 Blower shall be an industrial quality model rated for continuous duty at the required workload.

2.3.1.2 Blower shall be factory balanced and motor-coupled. Blower shall be equipped with a Teflon shaft seal, final assembly leak tested to less than 1cc/sec @ 3 psi.

2.3.1.3 Blower shall be supplied with an air flow throttle, factory installed preset to match stripper system requirements, and labeled to indicate settings for clean operation, turn-up range, and overload conditions.

2.3.1.4 Blower shall be equipped with an inlet filter and integral intake and exhaust mufflers, held in place with a screen (spring or wire hold-down is not acceptable), to minimize operating noise levels.

2.3.1.5 Inlet and outlet flanges shall be of cast iron; soft metals, such as aluminum are not allowed.

2.3.2 Standard product design shall include one industrial quality UL and CSA approved electric motor, with the following specification:

2.3.2.1 Blower-motor unit shall be a maintenance-free, compact direct-drive arrangement.

2.3.2.2 Motor must meet the system's electrical voltage/phase and explosion-proof requirements (if applicable). See attached Data Sheet for specifications.

2.3.2.3 Motor must be rated for continuous duty and carry full rated load at temperatures below insulation limits; motor ball bearings shall be double sealed with a rated life of not less than 20,000 hours continuous duty at the maximum rated blower load.

2.3.3 Standard product design shall include outlet ducting to connect the blower outlet flange to the stripper inlet ducting. Duct size and design shall be sufficient to allow the blower to operate at full capacity. Duct design shall include a section routed high to prevent water from reaching the blower in the event of a system shutdown.

2.3.4 Blower/motor unit shall be primed and painted.

2.4 OPERATION AND PERFORMANCE PARAMETERS

2.4.1 Blower shall be sized to allow turn-up to overcome fouling of the stripper, extending the time between cleanings. See Data Sheet for output curves.

ENGINEERING DATA SHEET
BLOWERS: ALL MODELS FOR AIR STRIPPERS

REF — ITEMS and SPECIFICATIONS

2.1.1, 2.2.2.2, 2.3.2.2 — EZ-STACKER STRIPPER BLOWERS

Model No.	Type*	Used on Stripper	Electrical Specifications	Max CFM	Motor HP
805188	R	2.4P	115-230V/1PH/TEFC	145	2.0
805189	R	2.4P	115-230V/1PH/EXP	145	2.0
805190	R	2.4P	230/460V/3PH/TEFC	145	2.0
805191	R	2.4P	230/460V/3PH/EXP	145	2.0
805192	R	2.6P	115-230V/1PH/TEFC	180	3.0
805193	R	2.6P	115-230V/1PH/EXP	180	3.0
805194	R	2.6P	230/460V/3PH/TEFC	180	3.0
805195	R	2.6P	230/460V/3PH/EXP	180	3.0
807034	P	4.4P,4.6P	230/460V/3PH/TEFC	600	5.0
807035	P	4.4P,4.6P	230/1PH/TEFC	600	5.0
807036	P	4.4P,4.6P	230/460V/3PH/EXP	600	5.0

* R-Regenerative type, P-Pressure type

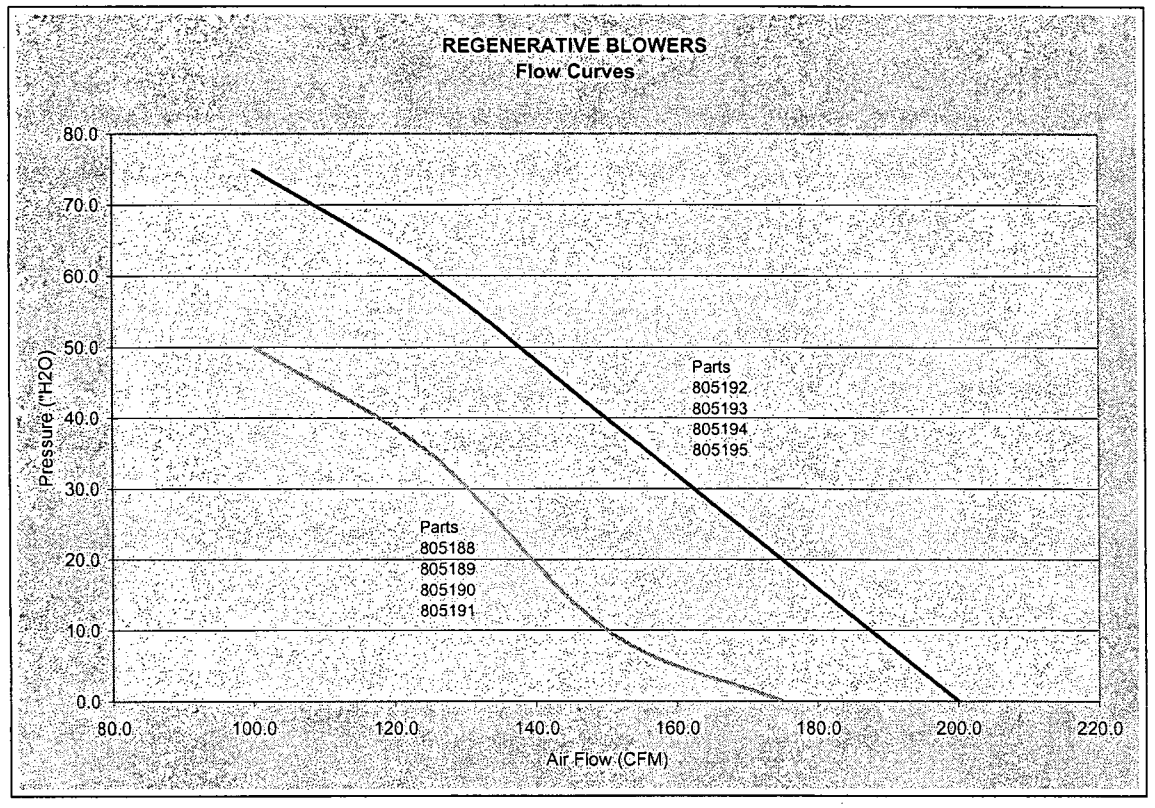
2.1.1, 2.2.2.2, 2.3.2.2 — EZ-TRAY STRIPPER BLOWERS

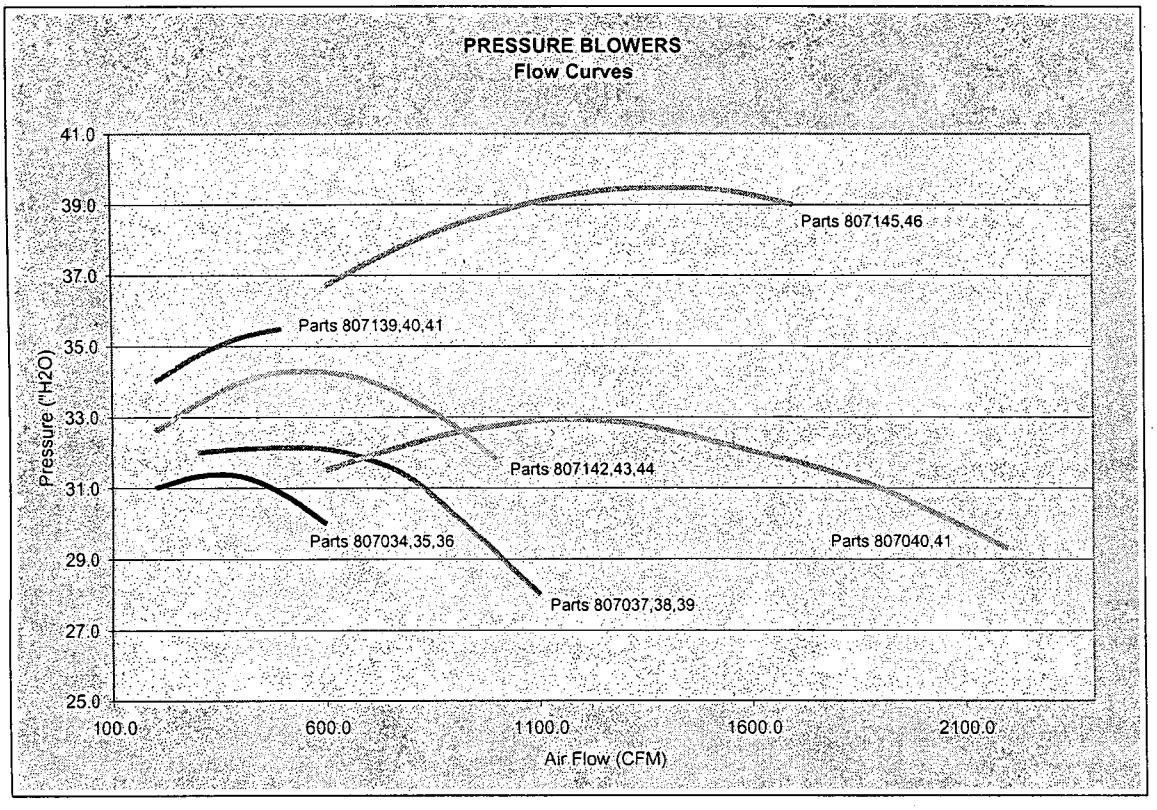
Model No.	Type*	Used on Stripper	Electrical Specifications	Max CFM	Motor HP
807034	P	4.4,6.4,8.4	230/460V/3PH/TEFC	600	5.0
807035	P	4.4,6.4,8.4	115-230V/1PH/TEFC	600	5.0
807036	P	4.4,6.4,8.4	230/460V/3PH/EXP	600	5.0
807037	P	12.4,16.4	230/460V/3PH/TEFC	1100	7.5
807038	P	12.4,16.4	230V/1PH/TEFC	1100	7.5
807039	P	12.4,16.4	230/460V/3PH/EXP	1100	7.5
807040	P	24.4	230/460V/3PH/TEFC	2200	15.0
807041	P	24.4	230/460V/3PH/EXP	2200	15.0
807139	P	4.6,6.6,8.6	230/460V/3PH/TEFC	500	5.0
807140	P	4.6,6.6,8.6	115-230V/1PH/TEFC	500	5.0
807141	P	4.6,6.6,8.6	230/460V/3PH/EXP	500	5.0
807142	P	12.6,16.6	230/460V/3PH/TEFC	1000	7.5
807143	P	12.6,16.6	230V/1PH/TEFC	1000	7.5
807144	P	12.6,16.6	230/460V/3PH/EXP	1000	7.5
807145	P	24.6	230/460V/3PH/TEFC	1700	15.0
807146	P	24.6	230/460V/3PH/EXP	1700	15.0

* P-Pressure type

(Note: To use this Data Sheet in a specification, either reproduce the whole table above and indicate which model number is being specified, or include only the data for the model selected.)

2.4.1 BLOWER OUTPUT CURVES





SECTION 0200
ENGINEERING SPECIFICATION: CONTROL PANEL

PART 1— GENERAL

1.1 SCOPE

1.1.1 Manufacturer shall furnish an industrial control panel for use with a ground water treatment system.

1.2 DESCRIPTION

1.2.1 The control panel controls all motor-driven and other electrically operated equipment comprising the remediation system. The various components are fully interlocked for fail-safe operation. The operation of all driven components can be manually overridden for equipment startup or troubleshooting. The status of all components and alarms is indicated via illuminated devices located on the door of the enclosure, or on the swing-out panel of dead-front panels.

1.3 SUBMITTALS

1.3.1 Manufacturer shall submit the following with the bid:

1.3.1.1 Product data for selected model, including standard features, options, and warranty coverage. See attached Data Sheet for full specification.

PART 2 — PRODUCTS

2.1 GENERAL

2.1.1 System shall be manufactured by QED Environmental Systems, Inc. and represented by _____ or pre-approved equivalent.

2.1.2 Control panel design and performance shall meet requirements specified on the attached Data Sheet.

2.2 EQUIPMENT DESIGN REQUIREMENTS

2.2.1 Control panel shall be designed and built to UL508 Industrial Control Panel requirements.

2.2.2 Control panel shall be manufactured in a listed Industrial Control Panel Manufacturing Facility.

2.2.3 Control panel enclosure shall be a Hoffman NEMA 4 as required for the application.

2.2.4 Control panel components shall be industrial quality from the following manufacturers:

Allen-Bradley — IEC style motor starters
Bussman — fuses
Hevi-Duty — transformers
Idec — timing relays
Pepperl and Fuchs — intrinsically safe components
Warrick — intrinsically safe components
Stahl — intrinsically safe components

2.2.5 Control panel shall include the following list of features as standard equipment:

Control panel transformer (if required)
Green illuminated selector switch for control and run indicator for each motor
Red pilot light for each alarm condition
Main disconnect switch, externally accessible
Allen-Bradley IEC-style motor starters
Mounting kit
Alarm interlock dry contacts
Intrinsically safe components and circuits if site conditions require

2.2.6 The following options shall be available (see Data Sheet for specifications):

Alarm beacon and/or horn
Blank front panel
Control interlocks for other on-site equipment
Lightning/surge protection
Motor elapsed-time meters
Panel heater

2.3 INSTALLATION

2.3.1 Control panel shall be installed in accordance with manufacturer's recommendations, including but not limited to the following:

2.3.1.1 The control panel shall be installed by a licensed electrician. The National Electrical Code and all applicable state and local codes shall be followed when installing this equipment. This includes but is not limited to any provisions for intrinsically safe or explosion-

proof wiring. The installation shall be executed in a neat and workmanlike manner.

2.3.1.2 At no time shall any individual tamper with or change any of the wiring in the control panel without the knowledge and consent of QED personnel. The installer shall only land wires on the field terminals provided and install or remove any jumpers as shown and indicated on the control schematics to achieve proper operation. Any changes made to the panel wiring other than those just mentioned or those approved by QED personnel, in writing, will result in the voiding of any warranty associated with the control panel or any of the connected equipment.

ENGINEERING DATA SHEET
CONTROL PANELS

REF	ITEM	SPECIFICATION(S)
1.3.1.1	GENERAL PRODUCT DATA	
	Model No.	None (each panel is custom manufactured)
	Panel size:	30"H x 30"W x 12"D to 48"H x 36"W x 12"D (approximate size of typical panel for stripper; panels for larger multi-pump systems can be larger)
	Site classification:	❒ Class I, Division 1 ❒ Class I, Division 2 ❒ Unclassified
	Site power:	_____ V _____ Hz _____ Ph
	Motors in system:	Qty HP Voltage Phase Where used (i.e. pump, blower)
	Interlock w/other equipment: (i.e., catalytic oxidizer, SVE, etc.)	❒ Yes ❒ No _____ Equipment type
	Remote mount:	❒ Yes ❒ No
2.2.6	Options:	Alarm beacon Check if included ❒ Alarm horn Check if included ❒ Blank front panel Check if included ❒ Lightning/surge protection Check if included ❒ Motor elapsed-time meter (_____ hours x _____) Check if included ❒ Panel heater (_____ watts, w/thermostat) Check if included ❒

SECTION 0401
ENGINEERING SPECIFICATION: PROCESS SENSORS (AIR STRIPPER SYSTEM)

PART 1— GENERAL

1.1 SCOPE

1.1.1 The manufacturer shall furnish process sensors for use in an air stripper system.

1.2 PROCESS DESCRIPTION

1.2.1 Differential pressure switches, gauges, liquid level sensors, liquid flow sensors, and air flow sensors are installed at appropriate points in the air stripper process and linked to a control panel to provide system monitoring capabilities and input for automatic control.

1.3 SUBMITTALS

1.3.1 Manufacturer shall submit the following with the bid:

1.3.1.1 Product data for selected models, including operating ranges, materials, electrical specifications, and warranty coverage. See attached Data Sheet for full specifications.

PART 2 — PRODUCTS

2.1 GENERAL

2.1.1 Equipment shall be supplied by QED Environmental Systems, Inc. and represented by _____ or pre-approved equivalent.

2.1.2 Design and performance of all process sensors shall meet requirements listed in this specification and on the attached Data Sheet.

2.2 EQUIPMENT DESIGN REQUIREMENTS

2.2.1 A sump differential pressure gauge shall be provided as standard equipment to monitor air stripper performance and indicate when cleaning is necessary due to fouling of stripper tray orifices. It shall meet the following specifications:

2.2.1.1 Gauge shall be diaphragm-actuated dial type, 4 3/4" O.D., with white dial, black graduations, and pointer zero adjustment. Case shall be die cut aluminum with anti-corrosion coating and break-resistant, clear plastic face. Gauge shall operate with an accuracy of plus or minus 2% of full scale over a temperature range of 20° to 140° F. See Data Sheet for working pressure range and other specifications

2.2.2 A sump sight gauge shall be provided as standard equipment, to meet the following specifications:

2.2.2.1 Gauge shall be constructed of clear plastic tube connected to the sump water drain to allow continuous visual sump water level monitoring. See Data Sheet for specifications.

2.2.3 Sump high level switch and discharge pump on/off switch shall be available separately or together as an air stripper system option. (Note: sump high level switch is highly recommended to prevent stripper overflow and blower damage in the event of a drain or discharge pump malfunction.) They shall meet the following specifications:

2.2.3.1 These switches shall be UL and CSA listed, capable of operating with an adjustable liquid level differential, from a minimum of plus or minus 12" or greater. Design shall prevent false tripping due to turbulence. PVC jacketing shall provide a resistance to chemical attack. Mercury switches shall not be used. See Data Sheet for full specifications.

2.2.4 Sump low pressure and high pressure switches shall be available as air stripper system options. (Note: low pressure switch is highly recommended to provide process system shutdown in the event of blower or gasket failure.) They shall meet the following specifications:

2.2.4.1 These switches shall be diaphragm operated, explosion-proof differential pressure switches, UL and CSA listed, approved for use in Class I Groups C and D, Class II Groups E, F and G, and Class III hazardous atmospheres. See Data Sheet for full specifications.

2.2.5 An air flow indicator shall be available as a system option, to meet the following specifications:

2.2.5.1 Air flow sensor shall be a Pitot Tube type. Design shall meet AMCA and ASHRAE codes and require no calibration. Construction shall be of type 304 stainless steel.

2.2.5.2 Air flow gauge shall be a differential pressure gauge, diaphragm-actuated dial type, 4-3/4" O.D., with white dial, black graduations, and pointer zero adjustment. Case shall be die cut aluminum with anti-corrosion coating and break-resistant, clear plastic face. Gauge shall operate with an accuracy of plus or minus 2% of full range over a temperature range of 20° to 140° F. See Data Sheet for working pressure range and other specifications.

2.2.6 A liquid flow meter shall be available as a system option. Liquid flow meter shall be either an in-line electronic meter with digital readout or a mechanical nutating disc meter, to meet the following specifications:

2.2.6.1 Electronic meter shall sense the rotation of an internal turbine and convert it into flow measurements via an on-board microprocessor. It must be capable of accuracy to within plus or minus 1.5%. Flow shall be displayed on a 6-digit LCD panel, with operation accessed via two buttons. See Data Sheet for specifications.

2.2.6.2 A nutating disc meter shall measure flow via positive displacement; it must be accurate to within plus or minus 1.5% over full range, with an extended 50:1 flow range. Housing shall be of bronze, with only three moving parts to simplify maintenance. See Data Sheet for full specifications.

ENGINEERING DATA SHEET
PROCESS SENSORS (AIR STRIPPER SYSTEM)

REF	ITEM	SPECIFICATION(S)
2.2.1.1	Pressure gauge	
	Model No.:	EZPGAUGE
	Operating pressure range:	0-50" H_2O
	Minor divisions:	1.0" H_2O
	Pressure connections:	1/8" NPT female
2.2.2.1	Sump site gauge:	
	Water drain connection:	1" NPT
2.2.3.1	Sump high level switch, pump on/off switch	
	Model No.:	800065
	Electrical contact capacity:	15A, 120/250 VAC, 50/60 Hz
	Wetted materials:	Body — polypropylene Electric power cable — PVC
2.2.4.1	Sump low pressure switch, sump high pressure switch	
	Model Nos.:	EZPLOW, EZPHIGH
	Operating pressure ranges:	Low = 0.4-1.6" H_2O High = 0.5-2.0 PSI
	Electrical rating:	15A, 125/250/480 VAC, 60 Hz
	Wiring connections:	3 screw type; common, norm. open, norm. closed
	Pressure connections:	1/8" NPT female
2.2.5.1	Air flow sensor	
	Model No.:	EZ-AIRFLOW; Pitot-type
	Tube diameter:	1/8"
	Insertion length:	variable
2.2.5.2	Air flow gauge	

Model Number	Used On Stripper	Nominal Air Flow (cfm)	Stack Diam. (in)	Nominal Air Velocity (fpm)	Range (" H_2O)
2000-00AV	2.XP	140	4	1604	0-0.25
2001AV	4.XP	260	4	2979	0-1
2000-0AV	4.X	210	4	2406	0-0.5
2000-00AV	6.X	320	6	1630	0-0.25
2000-0AV	8.X	420	6	2139	0-0.5
2001AV	12.X	600	6	3056	0-1
2002AV	16.X	850	6	4329	0-2
2001AV	24.X	1300	8	3724	0-1

(Note: indicate stripper model number for this specification.)

2.2.6.1 Electronic liquid flow meter:

Meter Model No.	Stripper GPM	Meter I.D.(in)	Meter connections	Power supply
CPFLOW50	3-50	1	NPT female	2 internal Lithium batteries*
CPFLOW300	30-300	2	NPT female	2 internal Lithium batteries*

*Minimum actual run time = 4,000 hours

2.2.6.2 Mechanical liquid flow meter

Meter Model No.	Meter Size (in)	Flow Range (GPM)	End Connections	Max. pressure Loss (PSI)
805011	5/8	1/2-25	1/2" NPT-male	15
805012	3/4	1/2-30	3/4" NPT-male	15

QED Environmental Systems

6155 Jackson Ave. Ann Arbor, MI 48103 Phone: 800-624-2026 Fax:734-995-1170

QED EZ-Stacker™ Air Stripper
Operations and Maintenance Manual

QED Treatment Equipment, P.O.Box 3726, Ann Arbor, MI 48106
Phone: (800)-624-2026, Fax: (734)-995-1170
QED p/n 95164 February 16, 1996 Rev 3/19/99

QED EZ-Stacker™ Operations and Maintenance Manual

Introduction

This manual contains instructions for installing, start-up and operation of a QED EZ-Stacker™ Air Stripper for the treatment of dissolved-VOC-contaminated waters. The EZ-Stacker™ Air Stripper is a sieve tray type of stripper which accomplishes mass transfer by creating a large amount of fine air bubbles into which volatile organics are stripped. Efficient stripping with this type of a unit is affected by:

- Water temperature-- higher temperature allows better stripping
- Specific compound being stripped--higher Henry's Law constant equals better stripping
- Air to water ratio--the higher the air to water ratio (air flow for a given water flow) the better the stripping
- Stripper efficiency--certain design elements, such as tray design affect stripping efficiency
- Surfactants (soaps, cleaning agents, etc.) and oil/grease can negatively impact stripping efficiency

From an operation standpoint the single most important factor is ensuring that the recommended amount of clean air is flowing through the stripper. Air flow is most affected by tray fouling (typically with precipitated iron oxides) which creates back pressure on the blower and causes it to operate at a lower air flow point on its curve. Maintaining clean trays and using the excess capacity on the blower can help control fouling conditions. Occasional gasket replacement can be anticipated depending on the frequency of stripper disassembly and reassembly. The stripper blowers and any transfer pumps should be regularly maintained based upon the manufacturer's maintenance schedule. All other stripper components are largely maintenance free. Please refer to Figure 1 at the end of this manual for understanding terminology.

Installation

Installing Skid Mounted Systems

Complete skid mounted systems arrive at your site as shown in Figure 1. A system of this type is mounted, piped and optionally wired at the factory. All components and functions are 100% wet checked.

> **Influent piping**. Connect system influent piping to the influent feed pump or directly to the stripper at the piping connection located on the top of the stripper. Factory piped influent feed pump systems use flexible pressure hose between the pump and the stripper influent piping connection and includes a check valve to prevent air backup into a transfer tanks or oil water separator. If the stripper

influent is plumbed directly on site, a flexible hose connection is recommended to ease stripper disassembly and reassembly during use.

Effluent piping. Factory piped effluent discharge pump systems use flexible pressure hose between the stripper discharge piping connection, located at the bottom of the stripper sump and the effluent discharge pump. Factory installed gravity discharge piping connects at the same discharge point on the stripper sump and utilizes a gravity drain kit which includes a siphon break and water head seal. If the stripper is plumbed on site connect the discharge pump to the stripper sump at the discharge connector. Gravity drain piping should be a minimum of 2-3" in diameter (depends on the model) and designed as shown in Figures 4 or 5.

Blower piping. *Important! Total sump pressures should never exceed 50" WC! This will void QED Warranty.* The blower piping that connects the blower to the air stripper are typically of an inverted-U shape, with a high leg to reduce the chance of flooding the blower in the event of an unforeseen flood condition.

On EZ-2.xP models, QED typically use regenerative blowers sized so that they do not require much, if any, throttling of the airflow. Regenerative blowers are limited in the amount of throttling that can be applied, since added backpressures may cause the blower motor to run above full-load-amp condition and cause the blower motor to overheat. If customer is installing their own piping kit on an oversized regenerative blower, it is recommended that an air dilution/bleed valve be installed in the blower piping to provide flexibility in controlling airflow.

Stripper Air Discharge Stack. The stripper discharge pipe is located on top of the air stripper and is 4"or 6" in diameter (depending upon model). The wider section of the discharge porting contains the demister element which removes entrained water droplets from the air exiting the stripper. Coalesced water droplets collect on the demister and then fall back into the stripper top tray. Piping or ducting for the stripper discharge stack should be of equal diameter or larger to avoid creating excess back pressure on the stripper blower. A flexible coupling, such as a Fernco brand, is recommended to connect the discharge pipe to the stripper air discharge stack to ease unit disassembly for cleaning. It is also important to pipe the air stripper air discharge such that it is not in proximity with the air stripper blower inlet; this minimizes the risk of sending already-contaminated air back into the air stripper and reducing stripper performance.

Sensors. Normal sensors used with this type of air stripper include a sump high level alarm float sensor, sump low air pressure sensor and optional discharge pump on-off float sensor. If these sensors are supplied with the stripper they will be installed in the stripper sump and piping. Often the system control panel must be mounted in a remote location from the stripper (in cases where the location is classified as an explosion hazard area.) If the panel is to be remotely-mounted a licensed electrician should hook the stripper sensors up to the panel. It is

important that these sensors be tested prior to operating the stripper. A frequent cause of improperly operating systems are float sensors which act in the opposite sense of that which the control panel expects (normally-open vs. normally-closed). It is also important to conform to electrical code requirements for classified areas; sensors may require intrinsically safe barriers.

Installing Bare Stripper Sump and Tray Systems

Bare stripper sump and tray systems are provided in cases where the contractor will mount the stripper to a user supplied skid or concrete pad. These systems are supplied with a second gasket compression ring that anchors the gasket compression rods at the bottom of the stripper. The bottom gasket compression ring has tabs protruding around its circumference which allow mounting of the ring to a skid or concrete pad.

If the blower is purchased from the factory it is recommended that the blower piping package also be purchased. If the contractor is supplying their own blower it must meet the typical performance specifications listed below to achieve the desired contaminant removals. If the air stripper is built to non-standard parameters, the performance specifications below may not apply.

Air Flow:	140 cfm (for EZ-2.xP) or 280 cfm (for EZ-4.xP) at maximum system back pressure
Pressure:	Sufficient to over come tray, piping and air treatment process back pressures at a flow rate of 140cfm. *Important! Total sump pressures should never exceed 50" WC! This will void QED Warranty.*
Tray Back Pressures	16-20"H_2O for 4-trays; 24-30"H_2O for 6-trays (assuming no add'l pressure from equipment downstream of air stack).

The blower piping should include a high leg which acts to reduce the risk of flooding the blower if the high sump level sensor was to malfunction in the stripper sump. See Figures 2 and 3 (for models EZ-2.xP and EZ-4.xP, respectively) for examples of proper blower piping configurations.

The EZ-2.xP models typically use regenerative blowers sized so that they do not require much, if any, throttling of the airflow. Regenerative blowers are limited in the amount of throttling that can be applied, since added backpressures can cause the blower motor to run above full-load-amp conditions and overheat. If customer is installing their own piping kit on an oversized regenerative blower, it is recommended that an air dilution/bleed valve be installed in the blower piping to provide flexibility in controlling airflow. A throttle valve is shown in Figure 1; a dilution/bleed valve is not shown.

Influent and effluent piping and sensor hook-up should be as described in the section on skid mounted systems, above.

Startup

The EZ-Stacker™ stripper is designed to start up dry without priming the sealpot or throttling the blower. The stripper blower should be running before water is introduced to the stripper. Water flows into the top tray and proceeds tray by tray to the stripper sump. Stripper seal pots fill with water and allow complete start up during intermittent operation. IMPORTANT: Before starting the system verify correct blower motor rotation (plus any other motors within the treatment system).

Verify that the sump air pressure is 16-20" H_2O for 4-tray systems or 24-30" H_2O for 6-tray systems (it is normal to see lower sump pressures at the very start of operation before the seal pots and trays fill with water.) Sump pressures lower than these values may indicate either a blower throttle which is not sufficiently open or insufficiently-compressed tray seal gaskets. *If the system configuration includes additional backpressure (from vapor phase carbon, for example), the sump pressures will be greater than these values. it is important that the blower is sized to accommodate the added pressures, being careful that air stripper sump pressures never exceed 50" WC. Total sump pressures exceeding 50" WC will void QED Warranty!* Check the blower piping throttle valve and make sure the hold-down rods are tightened firmly, but not over tightened. The hold-down tensioning springs should be compressed to a length of 3-1/2 inches for proper gasket sealing.

Step by step startup includes:

1. Power the main control panel on.
2. Turn the blower on. For QED supplied control panels set the motor operation switch to AUTO.
3. Turn the stripper feed pump on (allow water to enter the stripper for gravity feed systems.) For QED supplied control panels set the motor operation switch to AUTO (some systems have a delay timer on the feed pump--check control panel documentation for details.)
4. Turn the discharge pump on. For QED supplied control panels set the motor operation switch to AUTO.
5. Open or close the blower air flow throttle and air dilution valve (if required) to produce a sump pressure reading of 16-20"H_2O for 4-tray systems or 24-30"H_2O for 6-tray systems (these are typical values, but these may differ depending whether any other pressures need to be accounted for. NOTE: It is normal to see

lower sump pressures at the very start of operation due to sealpots and trays filling with water.

Operation

Stripper operation is normally automatic. One option for QED supplied control panels is a blower time-out relay which continues to run the blower for several minutes after the feed pump stops. Continued blower operation insures that any residual water left on the stripper trays has sufficient time to strip before the blower shuts down. A time of at least 15 minutes is recommended. Strippers with start-stop cycles of more than 2-4 times per hour should be set to run continuously.

For sites with high dissolved iron content stripper cleaning may be required. Tray fouling is evidenced by increasing sump back pressure. Opening the blower air flow throttle will allow continued operation in some situations and will lengthen the time between tray cleanings. It is most important to maintain an air flow of 140cfm through the unit. If the stripper air flow decreases the stripping efficiency decreases. Below 100 cfm air flow the stripper will start begin to "weep" water through the tray holes from upper trays to lower trays before the water has had sufficient residence time for removal. If stripper performance falls off, check for tray fouling or a blower air flow throttle that is not opened sufficiently.

Maintenance

Tray fouling due to iron precipitation, solids loading, or bio-fouling is evidenced by increased sump pressures, decreased stripper performance (removal rates not being met) or noticeable discoloration on the trays. Stripper cleaning is required when trays are fouled.

Step by step cleaning includes:

1. Before working on any equipment lock-out power to the unit.
2. Disconnect the stripper discharge pipe from the stripper exhaust stack piping.
3. Unscrew the hold-down rod nuts (cranks) and remove the gasket hold-down ring.
4. Remove the stripper trays. Please note the tray seal pots will have some water remaining in them.
5. Using a pressure washer and medium bristle brush clean any residue from the trays surfaces, concentrating on the sieve holes. DO NOT USE SOAP or cleaning agents unless they will be thoroughly rinsed from the trays; soap residue can affect stripper performance.

6. For hard to remove scales and precipitates a dilute (5%-10%) muriatic acid and water solution can be used to rinse or soak the trays. Be certain to completely rinse the solution off the trays before reassembling the unit.
7. Reassemble the trays--note that they are numbered and that a mark is used to assist in proper alignment of the trays during reassembly. Check to make sure the gasket is still seated correctly and undamaged.
8. Reinstall the gasket hold-down ring and retension the hold-down rod nuts (cranks.) The hold-down tensioning springs should be compressed to a length of 3-1/2 inches for proper gasket sealing.
9. Reattach any pipe and exhaust stack connections.
10. Follow Start-Up instructions, above.

Other stripper maintenance items include:

1. Periodically check blower for vibration. Bearings may require eventual service or conditions of excessive motor start / stop cycles may lead to premature motor or blower failure.
2. Check gasket condition during disassembly for cleaning. The gasket is designed to allow numerous assembly and disassemblies before requiring replacement. Contact QED for information and pricing about gasket replacement kits.
3. The stripper demister element is essentially maintenance free, although dried inorganic residue can build up within the demister and affect demister operation. This condition is evidenced in water droplets not being removed by the demister and blowing out of the stripper exhaust stack--occasionally on start-up water is discharged from the stripper stack, which is normal. The demister may be cleaned with a dilute muriatic and water solution (5%-10%) as instructed for tray cleaning.
4. Solids may build up in the sump. These solids can be suctioned out during tray cleaning operations.
5. Periodically check the structural integrity of the stripper sump, trays and top. Check bulkhead nuts for snugness. Cracks or loose fittings will normally be evidenced by water leakage.

Troubleshooting

Some common problems include:

1. *Leaks*. Leaks around trays or at the sump indicate an insufficiently compressed tray gasket. Make sure the hold-down tensioning springs are compressed to a length of 3-1/2 inches for proper gasket sealing. Also check for damaged gaskets (over compressed gaskets, cut gaskets, loose gaskets, etc.) Damaged gaskets

should be replaced with new gaskets. Contact QED for information and pricing about gasket replacement kits. For leaks at fittings, check for fitting tightness.

2. *Stripper not meeting removal requirements.* Contaminated stripper air is the most common reason for poor stripping performance within the low-ppb concentration range--make sure that the stripper blower intake is drawing in clean, uncontaminated air. Check for sufficient air flow through the stripper. Check that trays are clean. Check that demister is not clogged or causing increased blower back pressure. Check any stripper air discharge treatment units for increased back pressure. Check that stripper influent flow or concentration has not increased beyond the design basis used to predict stripper performance. Make sure that the influent does not have surfactants (soaps, etc.), oils, grease, or other immiscible phases in the influent stream. Surfactants are evidenced by increased foaming through the stripper unit.

3. *Sump pressure not at recommended levels.* Check sump pressure gauge tubing for accumulated water that could impair gauge performance. Check gaskets for damage and proper seating. Check for proper hold-down spring tensioning. Check blower piping connections for leakage. Check blower for proper rotation. Check design of gravity drain piping if piping is not QED-supplied. Check blower intake filter / silencer (if included) for clogging. Order new filter elements from QED.

4. *Stripper cleaning frequency seems excessive.* At sites with high iron loading, consider iron sequestering agents or other technology which will reduce/prevent iron precipitation or allow for easier cleaning.

Please investigate all the above-mentioned items while troubleshooting. For additional problem solving assistance contact QED Service at:

Phone:	**1-800-624-2026**
FAX:	**1-734-995-1170**
24 Hour Service Hot Line:	**1-800-272-9559**

Please have the following information ready for the QED Service person:

1. Identify the product or system involved by QED order number.
2. Specify where, when, and from whom the product was purchased.
3. Describe the nature of the defect or malfunction.

QED TREATMENT EQUIPMENT WARRANTY

QED Environmental Systems Inc. (QED) warrants to the original purchaser of its products that, subject to the limitations and conditions provided below, the products, materials and/or workmanship shall reasonably conform to descriptions of the products and shall be free of defects in materials and workmanship. Any failure of the products to conform to this warranty will be remedied by QED in the manner provided herein.

QED warrants the equipment components of its manufacture for a period of one (1) year from date of delivery. Our sole obligation during this warranty will be to repair or replace (at our option) the defective components. We are not responsible for consequential damages. Labor costs are not included.

Purchaser's exclusive remedy for breach of said warranty shall be as follows: if, and only if, QED is notified in writing within the applicable warranty period of the existence of any such defects in the said products, and QED upon examination of any such defects, shall find the same to be within the term of and covered by the warranty running from QED to Purchaser, QED will, at its option, as soon as reasonably possible, replace or repair any such product, without charge to Purchaser. If QED for any reason, cannot repair a product covered hereby within four (4) weeks after receipt of the original Purchaser's notification of a warranty claim, then QED's sole responsibility shall be, at its option, either to replace the defective product with a comparable new unit at no charge to the Purchaser, or to refund the full purchase price. In no event shall such allegedly defective products be returned to QED without its consent, and QED's obligations of repair, replacement or refund are conditioned upon the Purchaser's return of the defective product to QED.

IN NO EVENT SHALL QED ENVIRONMENTAL SYSTEMS INC. BE LIABLE FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES FOR BREACH OF SAID WARRANTY.

The foregoing warranty does not apply to major subassemblies and other equipment, accessories, and other parts manufactured by others, and such other parts, accessories, and equipment are subject only to the warranties supplied by their respective manufacturers. In the event of failure of any such product or accessory, QED will give assistance to Purchaser in obtaining from the respective manufacturer whatever adjustment is reasonable in light of the manufacturer's own warranty.

THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED OR STATUTORY (INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANT ABILITY AND FITNESS FOR A PARTICULAR PURPOSE), WHICH OTHER WARRANTIES ARE EXPRESSLY EXCLUDED HEREBY, and of any other obligations or liabilities on the part of QED, and QED neither assumes nor authorizes any person to assume for it any other obligation or liability in connection with said products, materials and/or workmanship.

It is understood and agreed that QED shall in no event be liable for incidental or consequential damages resulting from its breach of any of the terms of this agreement, nor for special damages, nor for improper selection of any product described or referred to for a particular application.

This warranty will be void in the event of unauthorized disassembly of component assemblies. Defects in any equipment that result from abuse, operation in any manner outside the recommended procedures, use and applications other than for intended use, or exposure to chemical or physical environment beyond the designated limits of materials and construction will also void this warranty.

The equipment is warranted to perform as specified under the conditions specified here and within the air stripper model or QED will make the necessary changes at no cost to the owner. Some restrictions apply. Requirements for warranty consideration include, (but are not limited to):

1. Current operating conditions do not differ from the previously-modeled conditions.
2. The system should be cleaned regularly to maintain system performance.

3. The equipment is installed, operated and maintained according to QED's instruction or non-QED manufactured subassembly manufacturer's instructions.
4. Air stripper influent air is not "dirty" (does not contain VOC's, etc.).
5. No surfactants, oils, greases, or other immiscible phases are present in the water.
6. Each influent contaminant does not exceed 25% of its maximum solubility under modeled conditions.

QED shall be released from all obligations under all warranties if any product covered hereby is repaired or modified by persons other than QED's service personnel unless such repair by others is made with the consent of QED. If any product covered hereby is actually defective within the terms of this warranty, Purchaser must contact QED for determination of warranty coverage. If the return of a component is determined to be necessary, QED will authorize the return of the component, at owner's expense. If the product proves not to be defective within the terms of this warranty, then all costs and expenses in connection with the processing of the Purchaser's claim and all costs for repair, parts and labor as authorized by owner hereunder shall be borne by the Purchaser.

In the event of air stripper performance issues, QED may require customer to conduct a variety of troubleshooting steps. These include, but are not limited to, modifying operational parameters, cleaning air stripper system, modifying (temporarily or permanently) process piping, and obtaining reasonable and necessary influent/effluent samples. These steps are the responsibility of the customer and will be conducted by customer prior to consideration by QED for a site visit. These steps and the associated costs incurred are the responsibility of the customer, regardless of future action. Should customer request a site visit by QED or accept a site visit offer by a QED-trained technician, the visit and associated costs: a) will be the responsibility of the customer at $500/day, plus travel, lodging, and meals, if the visit finds improper sampling, process piping installation, or equipment operation inconsistent with QED's Operation and Maintenance Manual; or b) will be the responsibility of QED if the visit finds QED responsible for the performance issue(s) raised.

The original Purchaser's sole responsibility in the instance of a warranty claim shall be to notify QED of the defect, malfunction, or other manner in which the terms of this warranty are believed to be violated. You may secure performance of obligations hereunder by contacting the Customer Service Department of QED and:

1. Identify the product or system involved by QED order number.
2. Specify where, when, and from whom the product was purchased.
3. Describe the nature of the defect or malfunction covered by this warranty.
4. If applicable, send the malfunctioning component, ***after receiving a Return Authorization Code (RAC) Number by the QED Service Department, to:***

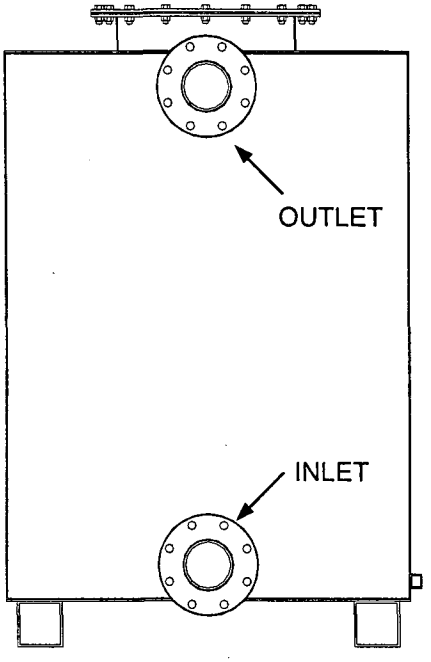
QED Environmental Systems Inc.
6241 Jackson Road
Ann Arbor, MI 48103

Attn: ***R.A.C. No.****(Return Authorization Code Number provided by QED Service Dept.)*

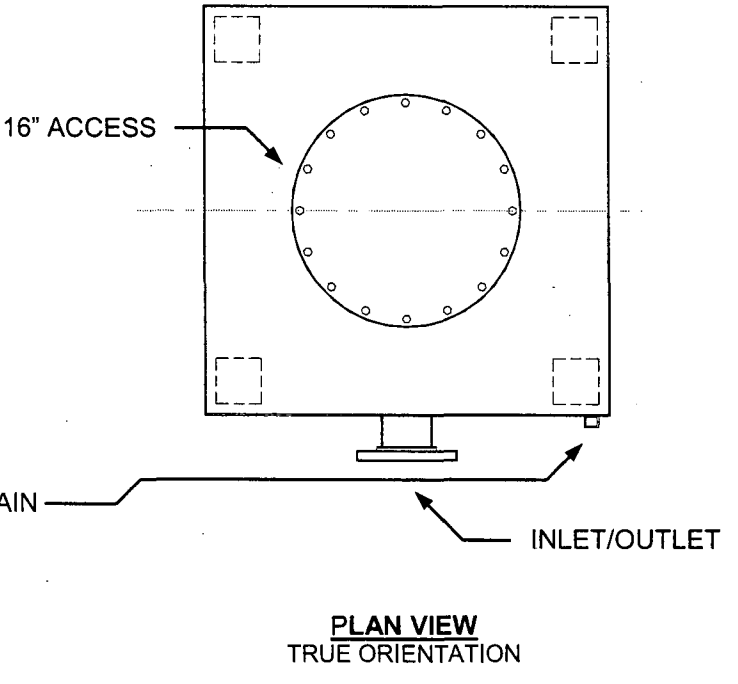
rev 12/21/98

Tetrasolv Filtration

PRODUCT DIMENSIONS
VF SERIES FILTERS



ELEVATION VIEW
NOT TRUE ORIENTATION



PLAN VIEW
TRUE ORIENTATION

DETAILED DRAWINGS AVAILABLE FOR INDIVIDUAL PRODUCTS

VF SERIES STANDARD DIMENSIONS

Model # (VF-) ⇨	500	1000	2000	3000	5000	10000
Overall Height	4' 8"	4' 8"	6' 8"	6' 8"	6' 8"	7' 8"
Footprint	3' x 3'	4' x 4'	4' x 4'	5' x 5'	6' x 8'	8' x 10'
Inlet/Outlet (150# FLNG)	4"	6"	6"	8"	10"	12"
Drain (FNPT)	½"	½"	½"	¾"	¾"	¾"
GAC Fill (Lbs)	500	1,000	2,000	3,000	5,000	10,000
Shipping Weight (Lbs)	900	1,450	2,650	4,500	7,100	14,500
Operational Weight (Lbs)	1,025	1,600	3,200	5,150	8,200	17,000

Rev. 10/17/2000

1200 E. 26th Street · Anderson, Indiana 46016
Phn: 765-643-3941 Fax: 765-643-3949 Email: info@tetrasolv.com

Tetrasolv Filtration

PRODUCT DATA SHEET
VF SERIES FILTERS
MODEL VF-500

GENERAL DESCRIPTION

The VF-500 filter is a media filter vessel designed to treat vapor streams where pressure drop is a strong concern. While the typical design application is a activated carbon adsorbtion unit, the filter can easily accommodate many medias. The sturdy construction makes these filter vessels ideal for long term treatment units. Some applications include:

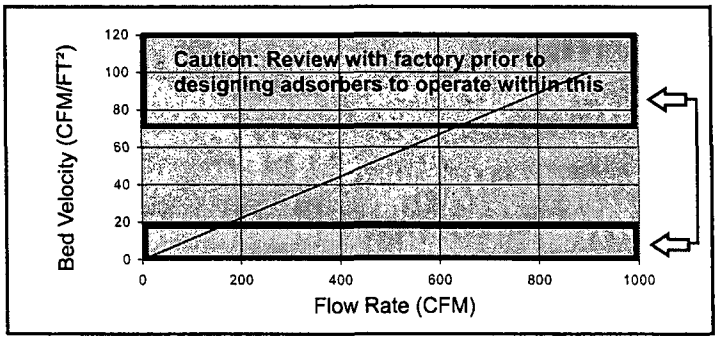
- Soil Vapor Extraction Treatment
- Air Stripper Off Gas Treatment
- Odor Removal System
- Storage Tank Purge Vapor Treatment
- Pilot Study
- Industrial Process Treatment

VF-500 STANDARD SPECIFICATIONS

Specification	Specification Value	Options
Materials (Vessel)	Carbon Steel	Stainless Steel
Materials (False Floor)	Carbon Steel	Polypropylene, PVC, 304SS, 316SS
Internal Coating	Polyamide Epoxy Resin	Vinyl Ester, PVC
External Coating	Epoxy Mastic (Light Gray)	Any available coating
Maximum Pressure	3 PSIG	Specials Designs Available
Maximum Temperature	250° F	Up to 650° F
Cross Sectional Bed Area	9 FT^2	Special Sizes Available
Bed Depth	2 FT (Using 500 Lbs. 4*10 GAC)	Dependent upon supplied media
Bed Volume	18 FT^3 (Using 500 Lbs. 4*10 GAC)	NA

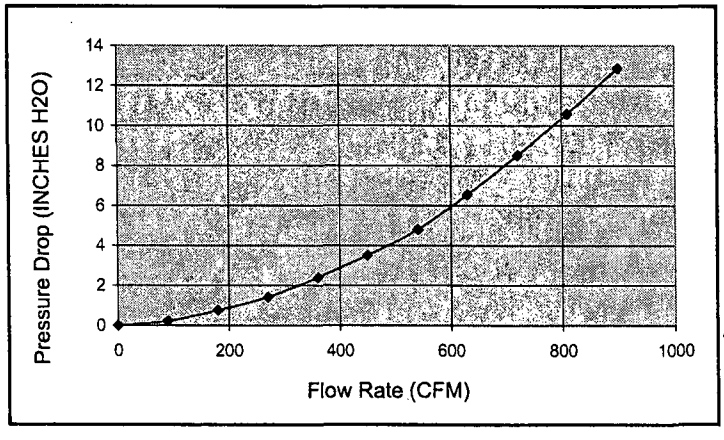
BED VELOCITY GRAPH

(Line Indicates Flow to Velocity Relationship)



PRESSURE DROP GRAPH

(As Filled - 4x10 GAC)



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Tetrasolv Filtration

Operation & Maintenance Manual

VFD • VFV • VF • VR SERIES

Tetrasolv Filtration Vapor Filters

Liquid & Vapor Filtration
Remedial • Industrial • Municipal

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1.0 GENERAL DESCRIPTION

The liquid series filters utilize fixed bed filtration to treat vapor. The filters employ a variety of medias to remove or catalyze contaminants. Flow through the filter may be either up flow or down flow depending upon the media supplied and the operation parameters. Generally inlet and outlet locations are indicated on the filter and or the filter drawings.

The most common application utilizes activated carbon as the adsorption media. Typically vapor which contains low levels of organic contaminants flows upward through the column of activated carbon where the larger organic molecules adhere to the porous structure of the activated carbon granules. This adsorption begins at the bottom of the "bed" and continues upward as the original adsorptive area becomes saturated.

Complete saturation of the carbon is dependent upon many factors such as contaminant levels, temperature, compounds being adsorbed, humidity, etc. Typically a carbon isotherm has been run on the influent stream to determine the expected rate of consumption of the activated carbon media. When monitoring has determined discharge air no longer meets discharge requirements the carbon will have to be removed and replaced ***(refer to section 5.0)***.

2.0 SAFETY CONSIDERATIONS

It is important that the entire O&M manual be read prior to set up and operation of the carbon system. If you have any questions please contact Tetrasolv Filtration at the number listed below or support@tetrasolv.com.

- ***WARNING: Where system pressure may exceed design pressure we strongly recommend the use of a relief device. Exceeding the maximum pressure of the filter could result in catastrophic failure***

of the vessel.

- Always adhere to "lockout/tagout" procedures when servicing the system.

- Wear appropriate safety equipment when operating system.

- ***WARNING: Wet or dry activated carbon preferentially removes oxygen from air. In closed or partially closed containers, oxygen depletion may reach hazardous levels. If workers must enter a container containing carbon, appropriate sampling and work procedures should be followed for potentially low-oxygen spaces - including all applicable federal and state requirements.***

- ***WARNING: High concentrations of certain compounds such as BETX and low concentrations such as ketones, aldehydes, organic acids and sulphur may cause severe temperature rises.***

- Understand the potential hazards of the stream being treated by the system. The activated carbon may contain higher concentrations of the contaminants being adsorbed than is in the influent stream. In addition the carbon may be considered hazardous material and therefore may require specific handling precautions unknown to Tetrasolv Filtration.

3.0 INSTALLATION

3.1 Shipment

Typically filters are shipped with media installed. However, in certain instances media is shipped to the site to be installed after installation. In very large systems it may be advisable to not install the media until adsorbers have been placed into final position and secured.

3.2 Unloading

Refer to the product data sheet for weight information for appropriate sizing information for the equipment to be used.

All components should be lifted either by crane or forklift as designated by the model.

- ***WARNING: Failure to follow the procedures outlined below can result In catastrophic damage to the system.***

Crane Lift - If a crane lift is to be used we recommend the following method. A "spreader" equaling 75% of the distance between the opposing lifting eyes on each adsorber should be used to insure proper lifting force direction. Attach an appropriately sized spreader beam and lifting cables to each lift eye of the component. The use of an experienced crane operator and quality equipment is highly recommended.

Fork-Lift - When using a forklift we recommend that the fork tubes on the filter be used or a pallet if the unit was shipped on a pallet.

3.3 Inspection

Perform the following inspections after un-loading the system. Note any discrepancies and contact TetraSolv immediately.

- Check the vessel exterior for damage which may have occurred during shipment. Inspect the support structures and piping support for damage.

- Inspect the piping system for damage. Insure the valves operate properly. Check installed instruments and instrument installation points for damage.

- If the filters are shipped without carbon visually inspect the interior of the vessel for damaged internals.

- Inspect the carbon discharge, drain and vent valves for damage

3.4 Set Up

The filter should be placed on a level concrete pad of appropriate thickness to support the system at it's maximum operational weight. The filter should be secured to the pad using appropriately sized anchor bolts.

Connect the site piping to the filter inlet and outlet connection points. It is important that all piping connected to the filter should be self supported. We also recommend in hard pipe installation that a flexible joint be used to further insulate the filter from vibration and stress.

Connect any gauges and instrumentation shipped

loose with the system.

The outlet piping if connected to a stack or vent should be designed to prevent the introduction of water or debris into the adsorber piping. Discharge piping should be sized equal to or greater than the diameter of the system piping or back pressure could occur creating excess pressure drop on the system.

Flowrates greater than 60 cfm / sq ft can produce bed fluidization in vapor phase filters. When this occurs carbon granules can be lifted and propelled out of the carbon bed in up-flow applications. In extreme cases large amounts of carbon can be expelled. If the system will be operating near or greater than the amount stated above please contact Tetrasolv for recommendations.

Carbon filters can be manifold in parallel operation for higher flowrates. Series operation is the preferred method of operation as it provides for the greatest degree of bed utilization.

Vapor conditions such as high humidity and high temperature (> 125° F) can cause inefficient adsorbtion to occur. If these conditions exist contact Tetrasolv for support. Also, any free water or product and debris should be eliminated with a knockout filter prior to the vapor stream entering the system. Many other vapor issues may effect Adsorber operation and we therefore recommend you discuss your specific installation with a representative.

4.0 OPERATION

4.1 Modes of Operation

With certain applications (2) filters in series flow are utilized. Listed below are typical operational modes.

- Shutdown - Both filters completely off-line and isolated.
- Series Flow - Influent enters primary filter and exits through secondary adsorber (this is the preferred method of operation)
- Isolation Flow - Only one filter is receiving influent. This mode is typically used when the operator is maintaining the off-line filter.
- Parallel Flow - Both filters are receiving the influent as the primary. Flow is split equally between the filters. This mode is used when higher flow rates need to be achieved and contact times are not critical.

4.3 Monitoring

Adsorber units only require periodic monitoring if properly installed. The following items may be monitored:

Pressure: Check inlet and outlet pressure. Increase in pressure differential may indicate media breakdown or presence of high moisture. Rapid increase in pressure drop could indicate adsorber failure.

Samples: Inlet and outlet sample points if provided for vapor analysis to determine system performance.

5.0 ADSORBER SERVICING

The Adsorber may be serviced on-site using a vacuum removal method. Prior to servicing the unit should be closed off from influent and effluent lines and any electrical devices or connections should be tagged off.

After removal of the spent carbon is complete, it is recommended that the inside of the Adsorber be checked thoroughly and any minor maintenance conducted.

5.1 Carbon Loading - Bulk Bag

- ***WARNING - Dry activated carbon generates considerable dust. While activated carbon poses no health risk the dust can cause respiratory irritation and occasional skin rash. Therefore we recommended the use of proper clothing and dust mask during filling operation.***

Hoist the bag over the manway and untie the outer bag exposing the inner chute. Untie the inner chute while clasping it shut. Remain holding the chute and carefully lower the chute into the manway. Un-clasp the chute and allow the carbon to discharge from the sack. The carbon should flow out very quickly and completely. When finished shake the bag and invert the chute into the bag.

If at any time you wish to stop the flow of carbon simply re-grasp the chute up high and cinch. Re-tie the bag.

5.2 Carbon Loading - Vacuum Method

In this method dry-activated carbon will be loaded into to the adsorbers using a vacuum rig. To add the carbon to the filters use the following method:

WARNING: Due to the low vacuum rating of the VF series adsorbers (< 60" H_20) only experienced change-out personnel should attempt this method of re-filling. Exceeding the recommend vacuum rating could lead to failure of the superstructure of the vessel.

1. Connect a 3" vacuum source to the auxiliary connection of the adsorber to be filled.

2. Install a 16" bolted transfer lid onto the manway opening of the adsorber to be filled.

3. Turn on the vacuum and check for good flow of air through the adsorber. Connect the fill line to the transfer lid and lead enough hose to reach the fresh carbon source (Note: This should be as short of a distance as possible).

4. Begin vacuuming carbon into the adsorber. It is important to note that the loading method is actually conveying and not true vacuum. The hose should contain 1/3 air with the carbon. Closely view the adsorber being filled. If the adsorber is collasping in excessively take less carbon and more air. This is something from experience and cannot be adequately explained here.

5. When transfer is complete the transfer lid should be removed and the carbon in the adsorber should be leveled out to insure even pressure drop across the bed.

6. Close the manway and turn the adsorber back on.

> ***Note: When the system if first started up small amounts of fines may be present in the discharge stream. This is normal and should discontinue within a short period of time.***

6.0 MAINTENANCE

6.1 Extended Shutdown

If the system is to be shutdown for extended period of time it is recommended that the valve be placed in shutdown mode and the system water drain valve be left open.

Monitor the system closely after extended shutdown for signs of potential problems such as interior manifold failure or leaking valves and gaskets.