REPORT

Design Report

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Hazardous Waste Remediation
NYSDEC Region 1

Off-Site Interim Remedial Measure
Former Unisys Facility
Great Neck, New York

NYSDEC Site ID# 130045

March 2006

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

Statement of Certification

On behalf of Lockheed Martin Corporation, I hereby certify and attest that the enclosed Design Report for the Off-Site Interim Remedial Measure was prepared in accordance with the NYSDEC Administrative Order on Consent No. W-1-0527-91-02, referencing the Former Unisys Corporation Site (Code No. 1-30-045) and dated December 13, 1991.

SIGNED:____________________

Lowell W. McBurney, P.E.
License Number 066776, New York
Blasland, Bouck & Lee, Inc.

STATE OF NEW YORK
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LICENSED PROFESSIONAL ENGINEER

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Acronyms and Abbreviations

AOC	Administrative Order on Consent
AEANY	Arcadis Engineers & Architects of New York
AG&M	ARCADIS G&M, Inc.
BBLES	BBL Environmental Services, Inc.
bls	Below land surface
BTU	British Thermal Unit
CFM	Cubic Feet Per Minute
DAR-1	NYSDEC Air Guide 1
ECU	Emission Control Unit
ft	Feet
FS	Feasibility Study
Great Neck UFSD	Great Neck Union Free School District
gpm	Gallons per minute
HDPE	High Density Polyethylene
HP	Horse Power
i.park	i.park, Lake Success, LLP
IRM	Interim Remedial Measure
Lockheed Martin	Lockheed Martin Corporation
LSXH	Level Switch Extreme High
LSXL	Level Switch Extreme Low
MCC	Motor Control Center
MCP	Main Control Panel
MLWD	Manhasset-Lakeville Water District
μg/L	Micrograms per Liter

NYSDEC	New York State Department of Environmental Conservation
NYSDOT	New York State Department of Transportation
OM&M	Operation, Maintenance, and Monitoring
OU-1	Operable Unit 1
OU-2	Operable Unit 2
PADM	Performance Analysis and Design Modification Plan
Parkway Plant	Parkway Treatment System
PLC	Programmable Logic Controller
lbs	Pounds
PPZ	Potassium Permanganate – Impregnated Zeolite
PVC	Polyvinyl chloride
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Revolutions per Minute
SCADA	Supervisory Control and Data Acquisition
SDR	Side-Wall Dimension Ratio
SCFM	Standard Cubic Feet per Minute
SGPA	Special Groundwater Protection Area
SVE	Soil Vapor Extraction
SPDES	State Pollutant Discharge Elimination System
TDH	Total Discharge Head
TVOC	Total Volatile Organic Compounds
TVSS	Transient Voltage Surge Suppression
Unisys	Unisys Corporation

UPS	Uninterrupted Power Supply
VPGAC	Vapor-Phase Granular Activated Carbon
VFD	Variable Frequency Drive
VOCs	Volatile Organic Compounds
VOVs	Variable Orifice Valves

1. Introduction

1.1 General

ARCADIS G&M, Inc. (AG&M) and ARCADIS Engineers & Architects of New York, P.C. (AEANY) originally prepared this Design Report on behalf of Lockheed Martin Corporation (Lockheed Martin) for the Off-Site Interim Remedial Measure (IRM) for Operable Unit 2 (OU-2) associated with the Former Unisys Corporation (Unisys) facility located in Great Neck, New York (see Figure 1). This design report was subsequently revised by BBL Environmental Services, Inc. (BBLES), in conjunction with Blasland, Bouck, & Lee, Inc. The former Unisys site, located at 365 Lakeville Road, Great Neck, New York, is classified by the New York State Department of Environmental Conservation (NYSDEC) as a Class 2 Site in the Registry of Inactive Hazardous Waste Disposal Sites in New York State (Site No. 130045) due to the presence of volatile organic compounds (VOCs) in soil and groundwater. The former Unisys site, which is currently owned by i.park, Lake Success, LLP (i.park) is designated as Operable Unit 1 (OU-1), whereas the OU-2 addresses Off-Site areas.

An OU-2 Remedial Investigation (RI) is in progress and is being conducted under NYSDEC Administrative Order on Consent (AOC) No. W-1-0527-91-02, dated December 13, 1991. Based on the results of the OU-2 RI obtained to date, an IRM is being implemented for the OU-2 area. The NYSDEC approved Off-Site IRM was installed between the Northern State Parkway and the Long Island Expressway (see Figure 2). The goals of the Off-Site IRM are to help protect public drinking water wells and retard further contaminant migration into the North Hills Special Groundwater Protection Area (SGPA).

The conceptual Off-Site IRM is documented in the NYSDEC-approved OU-2 IRM South System Groundwater Remediation Work Plan, dated May 29, 2003. The Off-Site IRM consists of one groundwater recovery well, two air strippers, a vapor-phase treatment system, and three diffusion wells. This Design Report summarizes the background, objectives, design parameters, and preliminary conceptual operations of the Off-Site IRM. Additional illustrative and technical details of the design are provided on the accompanying project documents: Record Drawings; Operation, Maintenance, and Monitoring (OM&M) Manual; and the Performance Analysis and Design Modification (PADM) Plan.

1.2 Design Report Organization

In addition to this introduction (Section 1), this Design Report is organized as outlined below.

- Section 2 (Project Background) provides a brief summary of project information.
- Section 3 (Project Objective and Design Criteria) includes the objective and design criteria for the Off-Site IRM.
- Section 4 (Off-Site IRM Design) describes design details for each remedial system component.
- Section 5 (Permitting) includes air and water permitting information.
- Section 6 (Security) outlines security measure in place at the Off-Site IRM.

2. Project Background

This section provides a brief summary of project background information. A more detailed discussion of site description, site history, and project history is provided in Section 2 of the OM&M Manual.

In 1991, Unisys Corporation (a previous facility owner) entered into AOC No. W-1-0527-91-02 with the NYSDEC for the Great Neck site. This AOC required completion of a Remedial Investigation/Feasibility Study (RI/FS) and implementation of IRMs for soil and groundwater. The initial on-site groundwater IRM was initiated in April 1993. In 1995, the NYSDEC divided the site into two operable units. OU-1 includes the 94-acre subject facility, while OU-2 consists of the off-site areas. The Record of Decision (ROD) detailing the selected remedies for OU-1 was signed by the NYSDEC on March 31, 1997. Lockheed Martin and the NYSDEC entered into an AOC (No. W1-0787-96-12) in 1997 for OU-1.

Lockheed Martin completed and submitted a detailed design for the OU-1 treatment system in June 1998. Subsequent to this submittal, additional ground water modeling was conducted in response to comments raised by the NYSDEC. This modeling demonstrated that the proposed system, while successfully capturing a portion of the downgradient VOC plume, would require pumping a large quantity of water and spread the plume in the upgradient direction. Based on this analysis, additional options were analyzed in an effort to develop a more efficient approach to remediate on-site groundwater. The modeling indicated that the requirements of the ROD could be achieved by pumping a smaller quantity of water if the diffusion wells, that are designed to re-inject water into the aquifer, were situated off-site, away from the pumping wells. The on-site pumping/off-site re-injection arrangement would also result in a smaller treatment system that could be constructed more quickly and occupy less space on the i.park property than the larger one originally envisioned in the ROD.

The OU-1 Final Remedy groundwater remediation system went into operation in August 2002 and consists of three groundwater recovery wells, two air strippers, and four emission control units (ECUs). Treated water is discharged to off-site groundwater via four diffusion wells located off-site, south of the Northern State Parkway.

Since 2000, the OU-1 soil vapor extraction (SVE) system has been upgraded three times. In 2000, the SVE system was expanded to remove perched water and to remediate shallow soil above the confining later. In 2001, the SVE system was: expanded (by the addition of another SVE well), relocated (above ground SVE system equipment was moved to the OU-1 groundwater treatment plant property), and upgraded (the catalytic oxidizer vapor treatment system was replaced by three ECUs, specifically two vapor-phase granular activated carbon [VPGAC] ECUs and one potassium permanganate-impregnated zeolite [PPZ] ECU). In 2005, the SVE system was upgraded with two additional VPGAC ECUs and one additional PPZ ECU.

Construction of the Off-Site IRM consisting of one groundwater recovery well, two air strippers and four ECUs was completed in June 2004. Initial testing of the Off-Site IRM was conducted from July to October 2004. Following initial testing, a 90-Day Test was conducted from December 2004 through March 2005. Trace levels of vinyl chloride were detected in the air discharge at levels slightly above the Non-Detect Performance Standards required by the Remediation Access and Licensing Agreement between Lockheed Martin and the Great Neck Union Free School District (Great Neck UFSD), dated April 14, 2003 (Access Agreement). As a result of the detection of vinyl chloride, the fourth, and smallest, VPGAC unit was taken out of service and two PPZ units were installed downstream of the three VPGAC units. The PPZ units, which are arranged in a series configuration, were installed to reduce the concentration of trace vinyl chloride within the vapor stream to non-detect concentrations via chemical oxidation. Following installation of the PPZ units, a change out of the carbon in the lead VPGAC unit and some additional improvements to system controls, a 30-Day Test was conducted in August 2005. Data obtained from the 30-Day Test indicated that all of the VOCs previously detected were efficiently removed from the water by the air strippers and the water being reinjected into the ground via the diffusion wells contained no detectable concentration of VOCs, thus meeting the Non-Detect Performance Standards in accordance with the Access Agreement between Lockheed Martin and the Great Neck UFSD.

Trace VOCs (e.g., chloromethane, methylene chloride, Freon 12, and Freon 22) were intermittently detected in the air discharge during the testing phase and may continue to be detected during normal system operations; however, calculations demonstrated these concentrations were below NYSDEC Division of Air Resources Air Guide 1 (DAR-1) requirements, dated December 22, 2003. Vinyl chloride was not detected in the vapor discharge during the 30-Day Test.

3. Project Objective and Design Criteria

To accomplish the objective outlined in the following subsection, the Off-Site IRM includes pumping of groundwater from an off-site recovery well located on property belonging to the Great Neck UFSD. The recovered groundwater is treated and discharged to diffusion wells screened in the Magothy aquifer on property owned by the New York State Department of Transportation (NYSDOT), northeast of the site. The Off-Site IRM removes and treats groundwater in the Magothy aquifer off-site where high concentrations of VOCs were found, thereby retarding further migration of the Total VOC (TVOC) plume and reducing off-site groundwater concentrations over time.

3.1 Project Objective

The objective of the Off-Site IRM is to effectively capture the off-site area of highest contaminant concentrations, in order to:

1. Help protect public drinking water wells.
2. Retard further contaminant intrusion into the North Hills SGPA.

3.2 Design Criteria

To accomplish the Project Objective specified in Section 3.1, VOC-impacted groundwater is pumped from one recovery well (RW-100), treated (using air strippers to remove VOCs in the water), and returned to the off-site groundwater system via one or more of the three diffusion wells (DW-100, DW-101, and DW-102) located on the NYSDOT Property (see Figure 3). Furthermore, as described below, the Off-Site IRM was specifically designed to complement the performance of the existing OU-1 Groundwater Final Remedy.

Figures FS1-UG, FS1-UM, FS1-MM, and FS1-BM (Appendix A) show simulated captures zones on April 19, 2001 expected under OU-1 System operation in the upper Glacial, upper, middle, and basal Magothy aquifer horizons, respectively. The shaded capture zones clearly extend to or beyond the site boundaries in all horizons. Figures A-1, A-2, A-3, and A-4 (Appendix A) show the potentiometric surface configurations for the upper Glacial, upper, middle, and basal Magothy aquifer horizons, respectively, during operation of the OU-1 System on September 22, 2003. Figures FS2-UG, FS2-UM, FS2-MM, and FS2-BM (Appendix A) show simulated captures zones on April 19, 2001 expected under the combined OU-1 System and the Off-Site IRM operation, in the upper Glacial, upper, middle, and basal Magothy aquifer horizons, respectively. When the FS1 series of figures are compared to the FS2 series of figures, it is clear that additional capture has been achieved north (downgradient) of the site in the area where elevated concentrations of VOCs have been observed. Just as important is the fact that operation of the Off-Site IRM has had no detrimental impacts on the hydraulic effectiveness of the OU-1 System. It can be seen that capture zones under the combined pumping scenario still cover the entire on-site area, and therefore, the OU-1 System effectiveness should not be compromised by simultaneous operation of the Off-Site IRM. Potentiometric surface configurations and capture zone analysis will be updated and revised as part of the OU-2 RI/FS under combined OU-1 System and Off-Site IRM System operation.

Under normal operating conditions, a total of 500 gallons per minute (gpm) will be pumped by the Off-Site IRM. The dissolved VOC concentrations used in the design of the system are presented in Table 1. The design

VOC concentrations were based on recent groundwater analytical data from nearby groundwater monitoring wells and from recovery well RW-100. Additional design goals/parameters are described below.

- Treatment and conveyance systems are designed to handle a maximum of 600 gpm as a safety factor to the design.

- Water treatment will meet the Non-Detect Performance Standards in accordance with the Access Agreement between Lockheed Martin and the Great Neck UFSD (see Table 1).

- Operation of the groundwater recovery and treatment system will allow for ease of visual monitoring, testing, and maintenance, with automatic control of the principal equipment units and interlocks so that only treated water will be discharged from the system.

- Piping connections and valving will provide flexibility in operation of the treatment and discharge system. However, the entire system is designed to operate at a steady-state condition where the flow throughout the system is constant (i.e., pumps are not cycling on and off).

- Off-gas treatment will achieve the Non-Detect Performance Standards in accordance with the Access Agreement between Lockheed Martin and the Great Neck UFSD (see Table 2). In doing so, the Off-Site IRM will be below the NYSDEC DAR-1 requirements.

4. Off-Site IRM Design

The Off-Site IRM consists of the following major components:

- A groundwater recovery well located and designed to efficiently capture and contain off-site VOC-impacted groundwater. The recovery well pump extracts the groundwater and pumps it to the air stripper system via an influent pipeline.

- An air stripper system designed to reduce the concentration of VOCs in the recovered groundwater to the Non-Detect Performance Standards in accordance with the Access Agreement between Lockheed Martin and Great Neck UFSD prior to reinjection into the Magothy aquifer via the diffusion wells.

- A treated water reinjection system designed to reintroduce treated water back into the Magothy aquifer, including a discharge pump, a pipeline, and three diffusion wells designed and located to reinject treated water and prevent further migration of off-site VOC-impacted groundwater.

- An emission control system designed to reduce the concentration of VOCs in the air stripper off-gas to the Non-Detect Performance Standards in accordance with the Access Agreement between Lockheed Martin and Great Neck UFSD prior to atmospheric discharge.

- Process and controls to provide necessary safeties and interlocks to ensure that the Off-Site IRM operates smoothly, efficiently, and safely.

- A treatment building to house the majority of the process equipment.

- Utility services such as electrical, natural gas, and telephone in order to operate the system.

The following subsections of this Design Report identify primary components of the Off-Site IRM, discuss design considerations, and present descriptions of the recovery well and influent pipeline, the treatment equipment, the treatment building, treated water discharge, and process controls and operation. Table 3 contains a summary of the pumps and blower described in this section.

4.1 Recovery Well, Pump, and Influent Pipeline

The off-site remediation groundwater recovery system consists of one recovery well (RW-100), pump, and the influent pipeline.

4.1.1 Recovery Well and Pump

The recovery well (RW-100) was installed on the Great Neck UFSD property at a location selected to capture groundwater in the off-site area where VOC concentrations are highest (see Figure 3 or Drawing C-1 of the

Record Drawings). Well RW-100 was installed to total depth of 335 feet (ft) below land surface (bls), and has three screened intervals in the middle horizon of the Magothy Aquifer. Specifically, the screens are located between 190 and 210 ft bls, 238 and 260 ft bls, and 276 to 324 ft bls. The exact intervals screened were selected after a vertical profile boring was drilled to better define the local hydrogeologic, groundwater conditions, and contaminant concentrations. The Recovery Well Construction Log is included in Appendix D of the OM&M Manual.

The groundwater recovery pump in RW-100 (P-101) is designed to pump groundwater from the recovery well to the first air stripper. P-101 is a 40 horsepower (HP), Grundfos Model No. 625S400-2 submersible pump with a Franklin 460V, 3450 RPM motor designed to pump 600 gpm at a total discharge head (TDH) of 200 ft. Head loss calculations were completed using standard equations for pipe friction and losses due to valves and fittings. Total head required for the design maximum flow rate (600 gpm) was determined from these losses and the change in elevation head. The calculations are presented in Appendix B. Additional information associated with the pipe location, pipe size, valve orientation, valve sizing, and process arrangement is provided on the Record Drawings.

The RW-100 wellhead is enclosed in a below-grade, locked vault along with associated piping, valves, and instrumentation that include an air release valve, Cla-Val™/check valve combination, an analog card at the programmable logic controller (PLC) to monitor flow rate, a digital flow indicator, pressure indicator, sample tap, strainer (single basket), and a flow meter readout panel.

The remaining flow controls, electrical devices, and accessories associated with the recovery well are housed in the treatment plant influent well vault and the treatment building. The recovery well vault has a level switch to shut the entire system down on a high alarm to prevent release of untreated groundwater to the surrounding soils, should a leak in the piping in the vault occur. Fiber optic cable is installed between the recovery well and the treatment plant to reduce the risk of transmitting lightening strikes to the treatment plant. In addition, a sump and sump pump are installed in the recovery well vault to pump accumulated water into the influent water line.

4.1.2 Influent Pipeline

The influent pipeline, used to convey the groundwater recovered in RW-100 to the Treatment Plant, is approximately 1,700 linear ft long and is located as shown on Figure 3 or Drawing C-1 in the Record Drawings. The influent pipeline consists of a double-walled or dual containment-type pipe in which the primary or "carrier" pipe is "contained" within a secondary pipe, for added protection against release of fluid out of the pipeline. Specifically, the carrier pipe is an 8-inch-diameter high density polyethylene (HDPE) pipe, with a side-wall dimension ratio of 11 (SDR-11) installed inside a 12-inch-diameter HDPE SDR-17 pipe (manufacturer-supplied information on the dual containment pipe is provided in Appendix E of the OM&M Manual). The carrier pipe and the containment pipe are equipped with leak detection devices to shut the system down in case of a pipeline failure.

Prior to entering the treatment building, the influent pipeline enters the treatment plant influent vault, where the dual-containment pipeline transitions to single-walled pipe. Inside the vault, the influent pipeline includes a check valve, butterfly valve, propeller-type flow meter, pressure indicator, and sample tap. Upon exiting the treatment plant influent vault, untreated groundwater enters the treatment building and into the first of two, packed-column tower air strippers (AS-1).

4.2 Groundwater Treatment System

Twin, series-arranged air stripper towers are used to remove VOCs from the recovered groundwater. The following subsections include a description of the air stripper process, design criteria and parameters, and information on the system components (the air stripping towers, the transfer pump and the blower).

The Off-Site IRM groundwater treatment system is a modified version of the pre-existing Manhasset-Lakeville Water District (MLWD) Parkway Treatment System (Parkway Plant). The Parkway Plant was designed, built and operated to treat extracted groundwater, which had been impacted by similar VOCs to the Off-Site IRM VOCs, prior to use as a public drinking water source. However, due to the significant differences between the off-site design criteria (e.g., influent groundwater quality and quantity; the need for off-gas treatment; reinjection of treated groundwater, etc.) significant renovations to the Parkway Plant, including modification, removal, or replacement of equipment were required for use as the Off-Site IRM. In the following subsections, information concerning these changes, especially with regards to the status of equipment that was not removed or replaced is provided for continuity.

4.2.1 Air Stripper Process Description

Air stripping is a mass transfer process. In a packed-column aeration system, like the Off-Site IRM System, air and water are run counter-current through a randomly packed media in a tower structure. The media enhances air/liquid contact by breaking the water into a thin film and exposing a large amount of the liquid surface area to the counter-flowing air. The more surface area exposed, the greater the opportunity for transfer of the VOCs out of the water into the passing air. The media also serves to continually mix the water so that the stripping process is not limited by diffusion of the VOCs through the water.

Specifically, in the Off-Site IRM groundwater system (refer to Figure 4), the following occurs:

- Pump P-101 pumps untreated groundwater from recovery well RW-100 to the first air stripper (AS-1);
- Water flows down through Air Stripper AS-1 and into Clear Well No. 1, while Blower B-310 blows air (actually the off-gas from Air Stripper AS-2) up through Air Stripper AS-1 column and out to the emission control system; and
- Transfer Pump P-211 pumps the partially treated groundwater from Clear Well No. 1 to the top of Air Stripper AS-2, where it drains into Clear Well No. 2, while Blower B-310 pulls ambient air up through Air Stripper AS-2 column and ultimately into the blower.

4.2.2 Air Stripper System Design Criteria and Parameters

The design criteria for the Off-Site IRM influent and effluent groundwater are listed below.

Maximum Water Flow Rate	600 gpm
Typical Water Flow Rate	500 gpm
Minimum Water Temperature	50 degrees Fahrenheit
Influent VOC Concentrations	see Table 1
Effluent VOC Concentrations	Non-Detect Performance Standards in accordance with the Access Agreement between Lockheed Martin and the Great Neck UFSD

Based on the above-listed design criteria and the pre-existing equipment at the Parkway Plant, the resulting Off-Site IRM design parameters are:

Number of Tower Air Strippers	2
Design Air to Water Ratio	60:1
Packed Tower Diameter	108-inch-diameter
Column Material	Aluminum
Packing Media Size	2-inch-diameter
Packing Media Type	Polypropylene Jaeger Tripacks
Packed Bed Depth	24 ft
Overall Tower Height (per tower)	30 ft
Removal Efficiency	>99.98%

4.2.3 Air Stripper System Components

The Off-Site IRM consists of the following primary components: two air stripping towers with associated clear wells, one transfer pump and one blower.

4.2.3.1 Air Stripper Towers, Internals, and Clear Wells

For use in the Off-Site IRM groundwater treatment system, the pre-existing twin, series-arranged air stripper towers (Hydro Group Inc. Model PCS-108-24) were modified as follows:

- Water distribution trays were replaced because the hydraulic loading changed from the original design rate of 1,000 to 3,000 gpm to 500 to 600 gpm; and
- Caps were specially manufactured to allow ductwork to be attached directly to the air strippers. Duct had to be added due to the need for an emission control system to reduce the VOC levels in the air stripper off-gas.

Specifics of the tower column and internal details summarized above are provided in Appendix E of OM&M Manual. The tower internal equipment, including the packing, has never been replaced and appears to be in good condition, with no apparent signs of iron fouling.

Each air stripper contains a concrete clear well underneath it to help equalize water flow through the system. The clear wells are approximately 30 ft x 30 ft x 8 ft in depth, resulting in a 90 minute retention time, if completely full, at the design flow rate of 600 gpm. Under normal operating conditions, the clear well water level is maintained at a depth of 4-ft from the clear well bottom and the effective water retention time is 45 minutes at water flow rate of 600 gpm (design) and 54 minutes at water flow rate of 500 gpm (normal). The level switch extreme low (LSXL) and the level switch extreme high (LSXH) are set at depths of 15 inches and 63 inches, as measured from clear well bottom, respectively. Clear well normal operating and switch levels are shown on Drawing P-4 of the Record Drawings. Initially, the normal operating level will be set at 4 ft above the clear well bottom but may be altered in the future based on operating requirements.

4.2.3.2 Transfer Pump and Ancillary Piping

Transfer pump (P-211) pumps partially treated water from Clear Well No. 1 to the top of Air Stripper No. 2 for final treatment. To maintain the design criteria of a constant, continuous flow throughout the system, the pump is controlled with a flow control valve (FCV-211) equipped with a motor-operated valve (MOV-211). The valve continuously and automatically adjusts the pump flow rate to maintain a constant level in the clear well (initially set at 4.0 ft above the clear well bottom), thus the flow out of Clear Well No. 1 is equal to the flow into the clear well.

The original flow control valve in this location had to be replaced due to the significant reduction in flow rate (from 1,000 to 3,000 gpm to 500 to 600 gpm). The original valve was too large to properly maintain a constant flow rate throughout the system. To install the properly sized 4-inch-diameter flow control valve, the pre-existing 8-inch-diameter line was reduced. A reducer was also installed downstream of the valve to transition back to exiting piping. The rate of flow can be checked using a pitot-tube and differential pressure gauge flow indicator (FI/FE-211) installed on the influent pipe to Air Stripper No. 2.

Pump P-211 is a Christensen Model 11CLC, single-stage pump with an 10 HP, 460V, 1,800 revolutions per minute (rpm) motor (Hitachi Model S12931H) rated for 600 gpm at 53 ft TDH. Head loss calculations were completed using standard equations for pipe friction and losses due to valves and fittings. Total head required for the design maximum flow rate (600 gpm) was determined from these losses and the change in elevation head. The calculations are presented in Appendix B. Additional information associated with pipe sizing, pipe layout, valve location and sizing is provided in the Record Drawings and Appendix E of the OM&M Manual.

4.2.3.3 Blower

The air stripper Blower (B-310) is installed in a push/pull configuration. Blower B-310 is designed to pull ambient air through Air Stripper AS-2, and pushes the Air Stripper AS-2 off-gas through Stripper AS-1 and the five ECUs.

Blower B-310 was sized in a two-step process. First, the required air flow rate was determined to provide the required treatment efficiency in the air strippers, and then, the vacuum and pressure requirements for the entire system were calculated.

An air stripper model (based on the Onda Correlation) was used to determine the design air flow rate. A series of modeling runs were performed for the project VOCs (i.e., cis-1,2-dichloroethene, tetrachloroethene, trichloroethene, and freons Freon 113). Based on the results of the model, an air flow rate of 5,000 cubic ft per minute (CFM) is required to reduce the design concentration of cis-1,2-dichloroethene at 600 gpm to less than 0.5 micrograms per liter (μg/L). Similar modeling runs using 5,000 CFM were performed for the other VOCs and in each case the effluent concentration is less than 0.5 μg/L. Copies of the modeling runs for four project VOCs using 5,000 CFM is provided in Appendix C.

Head loss calculations were completed using standard equations for duct friction and minor losses due to valves and fittings. Total head required for the design flow rate (5,000 CFM) was determined from these losses and the predicted head loss through the ECUs, which was provided by the ECU supplier. The calculations are presented in Appendix D. As shown, the total combined pressure needed is 49 inches of water gauge. Ducting is 18-inch nominal diameter, schedule 10 (~1/8-inch thick), aluminum. Duct was sized to balance limiting the duct size (for cost of duct purposes) versus limiting pressure drop (for blower sizing and operating considerations).

Additional information about duct work sizing, configuration and process instrumentation is provided in the Record Drawings and Appendix E of the OM&M Manual.

Blower (B-310) is a Northern Blower backward inclined centrifugal fan, design 6640, size 40-2663 with a Baldor 75 hp, 3,600 rpm, 460V motor rated for 5,000 standard cubic feet per minute (SCFM) at 49 inches static pressure to address worst case conditions (see design criteria and parameters above). Since expected VOC loading is considerably less than worst case, a variable frequency drive (VFD) unit was installed to allow manual control of the system flow rate. The VFD not only allows efficient operation of Blower B-310 but also improves effectiveness of the ECUs to remove VOCs from the stripper off-gas.

Originally, there were four air stripper blowers (B-310 through B-340), two per air stripper, in the MLWD Parkway Plant. With the selected push/pull configuration, only one blower is needed for the Off-Site IRM. A new Blower B-310 replaced the former Blower B-310. Blowers B-320 and B-330 were removed and their intakes were covered with an air-tight steel plate and with an inlet screen, respectively. B-340 was left in-place but will not be used as part of the Off-Site IRM.

4.3 Discharge Pump, Pipeline, and Diffusion Wells

Once the raw groundwater has been treated, it will be reinjected into the Magothy aquifier. Primary components associated with the discharge system are as follows:

- One discharge pump located in Clear Well No. 2 to reinject the treated water back into the Magothy aquifier via one or more of the three diffusion wells;
- Two bag filters located between Clear Well No. 2 and the discharge pipeline to remove particulate matter prior to discharge to the diffusion wells;
- The discharge pipeline for the conveyance of the treated water from the Plant to the diffusion wells;
- Three Variable Orifice Valves (VOVs), one located at the bottom of each of the drop pipes in each of the diffusion wells, to improve overall discharge system performance; and
- Three diffusion wells to be used to reinject the treated groundwater back into the Magothy aquifier.

4.3.1 Discharge Pump and Ancillary Piping

Discharge pump (P-225) is designed to pump treated water from Clear Well No. 2 thru bag filters and discharge pipeline to the diffusion wells. To maintain a constant, continuous flow of treated water to the diffusion wells, which is desired when using VOVs to reinject water into the subsurface, a variable speed drive is used to control/maintain the pump flow rate. The drive adjusts pump speed to maintain a constant level in Clear Well No. 2 (initially set at 4.0 ft above the clear well bottom).

Original Clear Well No. 2 transfer pumps (P-224 and P-225) at MLWD's Parkway Plant were not sized appropriately for efficient operation for proposed application and were removed.

Discharge pump (P-225) is a Christensen Model 11CLC, double-staged pump with an 25 HP, 460V, 1,800 rpm motor (Hitachi Model S15931H) rated for 600 gpm at 100 ft TDH (see manufacturer-supplied equipment information in Appendix E of the OM&M Manual). Head loss calculations were completed using standard equations for pipe friction and losses due to valves and fittings. Total head required for the design maximum flow rate (600 gpm) was determined from these losses and the change in elevation head. The calculations are presented in Appendix B. Additional information associated with pipe sizing, pipe layout, valve location and sizing is provided in the following sub-sections, the Record Drawings, and Appendix E of the OM&M Manual.

4.3.2 Bag Filters

A dual bag filter system (two housing units that contain eight bags per unit) with motor-actuated control valves is used to remove particulate matter before discharge to diffusion wells. The filter bags used are 25 micron size. Only one filter housing is kept on-line at a time. The actuators are controlled based on the differential pressure across the filter bed in use. Once the differential pressure reaches the filter system changeover set point (initially set at 10 pounds per square inch), the actuator opens the valve for the unit which is on "stand-by" and at the same time initiates an advisory condition, then closes the valve for the unit which has been "in service," redirecting the flow into the fresh filter units. When the operator replaces the filter bags in the unit that was just taken off line with new filter bags, the unit is placed in stand-by mode by the operator acknowledging the advisory condition. Should the differential pressure reach the high set point (initially set at 15 pounds per square inch), the entire system will automatically and immediately shut down.

4.3.3 Discharge Pipeline

The discharge pipeline is designed to convey the treated groundwater to the diffusion wells. The discharge pipeline consists of the following components: part of the former MLWD Well No. 2 influent pipeline, part of the former MLWD Well N5710 ductile iron, cement-lined influent pipeline, and an 8-inch-diameter polyvinyl chloride (PVC) line.

Specifically, as shown on Drawings C-1 thru C-4, C-9 and C-10 of the Record Drawings, the discharge system is as follows:

- The former discharge lines that emptied into the on-site reservoir were cut and capped on the downstream/reservoir side of the cut such that no water from the Off-Site IRM, including both the Entrance Vault and Exit Vault, can enter the MLWD reservoir;
- The former Well No. 2 and Well N5710 influent lines were reconfigured such that approximately the first 750 ft of the discharge pipeline is a combination of existing lines. At that point, the Well N5710 line was cut, the line going towards the well was capped and an elbow was installed so that the discharge pipeline could be directed towards the diffusion well area;
- The remaining portion of the pipeline is constructed with approximately 1,000 ft of 8-inch-diameter PVC Blue Brute pipe; and
- The discharge pipeline contains two air release valves at high points in the line, and three gate valves off the discharge main line, one for each diffusion well. An additional tee was also installed, approximately 40 ft north of the DW-101 tee for a future diffusion well, if needed.

4.3.4 Diffusion Wells

Three diffusion wells (DW-100, DW-101 and DW-102) are used to reinject the treated groundwater into the Magothy aquifer. The wells were installed at the locations shown on Figure 3 for the following reasons:

- They are not located within the dissolved VOC plume. This is desirable so that the groundwater mounding: a) does not "push" the dissolved VOC plume out further to the east where it currently does not exist, and b) creates a hydraulic barrier which hinders further migration of the dissolved VOC plume to the east; and
- They are located far enough from the recovery well so as to eliminate the possibility of short-circuiting of the treated water readily being recovered by the recovery well. This design maintains the effectiveness of the recovery well.

The diffusion wells range from approximately 424 to 434 ft in depth. Well casings are 12-inch-diameter, schedule 80 PVC. The well screens are 40 slot, 10-inch-diameter, 304 stainless steel, wire wrapped, high flow Johnson screens. The wells are reduced down from 12-inch-diameter casings to 10-inch-diameter screens because the 10-inch-diameter-screens have comparable intake area (in square ft) of well opening per length of screen as a 12-inch-diameter-screen and were determined to be more cost effective.

Well construction logs for diffusion wells DW-100, DW-101 and DW-102 are included in Appendix D of the OM&M Manual. The wells were screened towards the bottom of wells, corresponding to deeper portions of the middle and deep Magothy formations.

Each diffusion well includes a flow meter, a sampling port, a pressure gauge and a combination vacuum breaker/air release valve on the drop pipe as well as the well casing. The well and the above-listed instrumentation are located in locked, underground vaults as shown on drawing C-9 of the Record Drawings.

A 4-inch VOV is installed at the base of each drop pipe, approximately 110-ft bls. The 4-inch valves allow the entire flow at a design rate of 600 gpm to be directed to one diffusion well, if the well and surrounding formation can handle the entire flow.

4.4 Emission Control System

The emission control system is designed to reduce the concentration of VOCs in the air stripper off-gas to the Non-Detect Performance Standards in accordance with the Access Agreement between Lockheed Martin and Great Neck UFSD prior to atmospheric discharge. The emission control system uses VPGAC and PPZ to remove VOCs from the air stripper off-gas prior to discharge to the atmosphere. The following subsections include a description of the VPGAC and PPZ processes, design criteria and parameters, and information on the system components.

4.4.1 VPGAC and PPZ Process Description

VPGAC adsorbs the VOC molecules forming a physical bond via Van der Waal forces with the molecule. VPGAC is manufactured to ensure an extensive natural surface area that is available for the adsorption process. The surface area of granular carbons can range up to 1,400 square meters per gram of material. The physical adsorption of VOCs on, and into VPGAC is concentration gradient driven. Thus, the adsorption capacity of the VPGAC is dependent on the concentration of VOCs in the off-gas. For example, as VOC concentration increases, additional pounds of VOCs per pound of VPGAC can be adsorbed. The three VPGAC units are arranged in series configuration.

Due to the need for direct contact between the VOC molecule and the VPGAC surface, the presence of moisture in the air stream will impact the rate of adsorption. The capacity of the activated carbon declines rapidly as the relative humidity of the air increases above 60%. In order to optimize the carbon usage rate, the air stream is heated to lower the relative humidity of the air to the 40% to 60% range.

The PPZ units, which are arranged in series configuration, were installed to reduce the concentration of vinyl chloride within the vapor stream to a non-detect concentration via chemical oxidation.

4.4.2 Emission Control System Design Criteria and Parameters

The emission control system design parameters are listed below:

Maximum Air Flow Rate	5,000 SCFM (for 60:1 air:water ratio)
Typical Air Flow Rate	4,200 SFCM (assuming 500 gpm)
VOC loading	See Table 1, assume 100% of VOCs removed from recovered groundwater
Relative Humidity	100% from the air strippers
Influent (raw) Temperature	50 degrees Fahrenheit
Required Increase in Temperature to reduce Relative Humidity below 50%	45 degrees Fahrenheit
Effluent VOC Concentrations	Non-Detect Performance Standards in accordance with the Access Agreement between Lockheed Martin and the Great Neck UFSD
Expected VPGAC Changeout Frequency	60 days
Expected PPZ Changeout Frequency	To be determined

4.4.3 Emission Control System Components

4.4.3.1 Emission Control Units

The sizing and configuration of the VPGAC and PPZ ECUs were determined based on expected air flow rates, VOC characteristics and loadings. In summary, the ECUs beds and the media were selected to allow for a minimum changeout frequency of 60 days based on the maximum design flow rate of 600 gpm and the design concentrations (see Table 1). The following ECUs with VPGAC type, PPZ type, and mass media loadings were selected:

- Primary Units: Three (3) TIGG Model NB-20 ECUs, each filled with 28,000 pounds (lbs) of TIGG 5CC 6X12 virgin vapor-phase coconut shell carbon (for a total of 84,000 pounds of VPGAC); and
- Secondary Units: Two (2) T1GG Model NB-15 ECUs, each filled with 28,000 lbs of Hydrosil 600 PPZ.

The ECUs are configured in a series arrangement, with the air stripper gas passing through the three primary, VPGAC-filled ECUs first, then into the two PPZ-filled ECUs. The carbon will be changed out in the first bed when VOCs are detected in the discharge from the first VPGAC unit. The PPZ in the first PPZ ECU will be changed out when vinyl chloride is detected in the discharge from the first PPZ unit. These changeout criteria may be modified based on operating experience and only with prior NYSDEC approval.

All five of the ECUs are insulated with 2-inch thick, rigid Styrofoam boards to help maintain desired temperature and relative humidity conditions throughout the vapor-phase treatment system. The insulation is finished with stucco embossed aluminum jacketing. The insulation is applied to the top of the ECUs to withstand mild personnel traffic. The ECUs also have safety railings, sampling ports, and access ladders. Manufacturer-supplied information on the VPGAC and PPZ ECUs and the two different media are provided in Appendix E of this Design Report.

4.4.3.2 Duct and Insulation

Duct is 18-inch-diameter, schedule 10 (~1/8-inch thick), aluminum. The exterior duct has a 2-inch thick, 370 Melamine foam insulation with brown PVC coating. Condensate traps have been installed in duct low points to collect condensation from various locations in the duct. Collected condensate is transferred into Clear Well No. 1. The condensate lines are heat traced to prevent freezing.

4.4.3.3 Duct Heater

Prior to entering the ECUs, a duct heater (DH-500) was installed to decrease the relative humidity of the vapor stream by increasing the temperature, which improves the effectiveness of the VPGAC to remove the VOCs from the vapor stream. The duct heater was selected based on the increase in temperature required to reduce the humidity of the air flow to the desired value. A 350,000 British Thermal Unit (BTU) output heater can raise the temperature 45 degrees Fahrenheit, reducing the relative humidity to 45% at flow rates up to 5,000 CFM; natural gas usage at lower flow rates will be automatically adjusted by the heater. A Reznor model RP 350 exterior use duct furnace, with a power-vented burner duct, a stainless steel heat exchanger and burner, and electronic modulation control of temperature was selected. Manufacturer-supplied equipment information on duct heater DH-500 is provided in Appendix E of the OM&M Manual.

The heater is instrumented and controlled to prevent overheating of the duct heater or underheating of the off-gas. In the event alarm temperatures are reached in the duct heaters, the entire Off-Site IRM will automatically and immediately shut down. Prior to the heaters, the ducts are equipped with condensate collection traps to capture excess moisture and reduce the moisture content of the air entering the duct heaters.

4.5 Process Controls and Operation

The process control system is designed to provide the necessary safeties and interlocks to ensure that the recovery well, piping, and treatment system operate smoothly, efficiently, and as one unit. Additionally, the system includes the capability of allowing local or remote operator(s) to observe and control the operation of the system from a single computer workstation.

Controls and instrumentation are interconnected via serial network, utilizing network wiring installed in exposed conduit. The actual network and control connection layout is presented on drawings I-1 through I-5 and E-2 through E-5 of the Record Drawings. The main control panel (MCP), located in the air-conditioned control room of the Treatment Plant, includes a primary PLC which monitors and integrates the operation of the recovery well and clear well pumps, air stripping system, emission control system, and all treatment system interlocks. This panel serves as the node through which remote control and communication with the control system takes place. The primary PLC is integrated with the Supervisory Control and Data Acquisition (SCADA) system, including an operator interface station. The primary PLC is also supported with a secondary PLC that utilizes fail-safe logic to automatically and immediately shut down the entire treatment system in the event of a critical alarm input or a failure of either the primary or secondary PLCs. An audible alarm notifies the operator of any critical alarms. If operating personnel are not on-site, project team members will be alerted of the shut down by a dedicated autodialer. The dedicated autodialer will also notify project team members of power loss.

The power supplies for both PLCs, system instrumentation, and process control devices are protected with transient voltage surge suppression (TVSS) systems to limit voltage spikes to the systems. Both PLCs, system instrumentation, and process control devices are also protected by separate uninterrupted power supplies (UPS) which maintain power to these devices in case of a power outage. The primary PLC is supported with PC ANYWHERE software, which is used with a cable modem to allow remote access and control of the system. However, since the secondary PLC is the back-up, fail-safe system, it cannot be interfaced with remotely.

4.5.1 Operation and Programmable Logic Controllers

Operation of the Off-Site IRM is controlled and integrated through the primary PLC located in the system's MCP. The primary PLC provides the necessary control logic to coordinate signals from the remote switches and instrumentation throughout the treatment system. These interlocks ensure proper operating conditions are maintained within the treatment system.

Under normal operating conditions, the control system has the following functions:

- Monitors and automatically maintains the operating water levels within both clear wells. This ensures that the pumping rates are synchronized throughout the system;
- Monitors the line pressure and annulus pressure on the influent and the line pressure on the effluent pipelines to ensure that the pipes maintain structural integrity and there are no leaks;
- Monitors the air stream flow rate to ensure that it is adequate to treat the VOC-laden water stream;
- Monitors and maintains design temperature of the ECU system influent air stream in order to ensure VOC adsorption efficiency within the VPGAC- and PPZ-filled ECUs;
- Monitors filter bag differential pressures which controls the bag filter sequencing;
- Maintains fail-safes and alarm interlocks to maintain safe and effective operation of the system. Fail-safes and alarm interlocks are described in the Section 4.5.2, including calling project team members when plant shut downs occur due to either a primary (via a network internet connection) or critical (via an autodialer) alarm; and
- Ensures that once the Plant is shut down, regardless of whether it is due to a power failure or an alarm condition, the Plant does not automatically restart. The Plant has to be manually restarted. Manual restart is required so that the cause of the alarm is investigated and the problem can be addressed prior to restart.

Major instrument operational controls are listed below.

- A hand/off/auto switch provided within the MCP is used to operate Blower B-310.

- Blower B-310 discharge includes a pressure transmitter with high and low pressure settings, a low-pressure switch, and a low-flow switch. These instruments are connected to alarm-indicating lights mounted on the MCP.

- The recovery well RW-100 pump (P-101) is operated with hand/off/auto switches mounted on the MCP. The recovery well pump switches will not operate unless the blower switch is in the "on" position and the blower is running.

- A motorized control valve (FCV-211) is installed on the discharge of the Clear Well No. 1 pump (P-211). This valve accommodates an analog signal from the MCP and modulates the flow from the associated clear well pump in order to maintain a constant pre-set water level in the associated clear well. Thus, a constant level is maintained in Clear Well No. 1.

- A variable speed drive is installed and connected to the Clear Well No. 2 pump (P-225) motor. The variable speed drive accommodates a similar analog signal from the MCP that modulates pump speed and thus controls the flow from Clear Well No. 2 pump in order to maintain a constant pre-set water level in the clear well. Thus, a constant level is maintained in Clear Well No. 2.

- As with the recovery well pump, the clear well pumps will not operate unless the blower is running. This ensures that groundwater is not pumped through the air stripping system without receiving treatment.

- Ultrasonic water level indicating transmitters are installed within the clear wells to measure the clear well water levels and transmit the signal to the MCP, control the downstream modulating valve for Clear Well No. 1, and control the variable speed drive for pump P-225 in Clear Well No. 2, as described above. The ultrasonic level signals also have high and low level alarm and advisory set points in the Primary PLC.

- In order to ensure that the air stream entering the ECU system is at proper temperature and relative humidity, the duct heater is controlled to maintain a set discharge temperature. If the duct heater cannot maintain the set air stream temperature, the operator will be notified via an advisory and if the temperature reaches the low alarm set point, the entire system will be automatically and immediately shut down.

- Differential pressure across the effluent bag filter unit in service is continuously monitored. Once the differential pressure measured reaches the low set point value, the primary PLC opens the valve for the stand-by unit and activates an advisory, and then closes the valve for the previously operating filter unit. Upon switching to the stand-by unit, an advisory is sent out to the project team members alerting them that a bag filter change out is required. If this advisory is not cleared, which can only be done manually at the site, before the differential pressure reaches a high differential pressure set point, the entire system will automatically and immediately shut down.

- Two UPS were installed. One is for the process control devices, including the primary PLC to enable these components to continue to operate in case of power failure and ensure that monitoring and control devices operate properly. If there is a power failure and the primary UPS also losses power, the system will shut down due to a critical alarm. A second UPS was installed for the secondary PLC. If the secondary UPS losses power, then the system will shut down due to fail-safe circuitry as described below in Section 4.5.2.

4.5.2 Alarms and Interlocks

The recovery well, air stripping, emission control, and treated water diffusion systems are interlocked and alarmed to ensure that water and air are properly treated, and for efficient system operation. Three types of interlocks and alarms are incorporated into the treatment system to prevent water from being discharged from the air stripper system in the event that an air stripper blower is not operating, a leak in either the influent or effluent conveyance lines, or a flooding condition in either of the Treatment Plant's clear wells. The three types of alarms and interlocks used are: primary alarms, secondary alarms, including the fail-safe circuitry, and advisories. Each type of alarm/interlock, including the fail-safe circuitry, is described below.

Primary alarms are alarms that are processed by the main PLC to shut the system down. The PLC is constantly receiving signals from the instrumentation listed below. When the PLC detects an alarm condition from one of these instruments, the primary PLC automatically and immediately sends a signal to relays which causes the starter coils for all the process equipment (pumps, blower, and duct heater) to open, thus causing all the process equipment to shut down. The one exception is that there is a 10-minute delay on the air stripper blower to allow for additional treatment of the water still in the air stripper towers when the alarm condition occurs. One example of a primary alarm condition is a voltage dip in the incoming power supply that causes pump P-211 to shut down, which causes the water level in Clear Well No. 1 to rise to its high-high condition, thus causing the PLC to initiate shut down of the Treatment Plant. A complete list of the primary alarms is provided below. The Primary PLC will alert project team members of the shut down via cell phone, text messages and computer e-mails when there is a primary alarm.

SHUT DOWN ALARMS IN PRIMARY PLC			
ALARM DESCRIPTION (ALARM SCREEN ON HMI)	**TAG NO.**	**DEVICE TYPE**	**LOCATION**
EMERGENCY STOP ENGAGED	-	PUSH BUTTON/TOUCH SCREEN	3 IN FIELD, 1 ON MCP AND 1 ON TOUCH SCREEN
RW-100 VAULT HIGH WATER LEVEL	LSH-111	FLOAT SWITCH	RECOVERY WELL VAULT
RW-100 CONTROL PANEL NETWORK COMM. LOSS	RW-100 PLC	PLC-001	MCP
TREATMENT PLANT INFLUENT LOW PRESSURE (SET POINT)	PT-131	PRESSURE TRANSMITTER	ENTRANCE VAULT
TREATMENT PLANT INFLUENT HIGH PRESSURE (SET POINT)	PT-131	PRESSURE TRANSMITTER	ENTRANCE VAULT
RW-100 CONVEYANCE PIPING ANNULUS HIGH PRESSURE (SET POINT)	PT-121	PRESSURE TRANSMITTER	ENTRANCE VAULT
RW-100 CONVEYANCE PIPING ANNULUS EXTREME HIGH PRESSURE	PSH-121	PRESSURE SWITCH	ENTRANCE VAULT
ENTRANCE VAULT HIGH-HIGH LEVEL	LSHH-142	FLOAT SWITCH	ENTRANCE VAULT
CLEAR WELL CW-210 EXTREME HIGH LEVEL	LSXH-212	CONDUCTANCE LEVEL SWITCH	CLEAR WELL #1
CLEAR WELL CW-210 HIGH-HIGH LEVEL (SET POINT)	LIT-211	LEVEL INDICATING TRANSMITTER	CLEAR WELL #1
CLEAR WELL CW-210 LOW-LOW LEVEL (SET POINT)	LIT-211	LEVEL INDICATING TRANSMITTER	CLEAR WELL #1
CLEAR WELL CW-210 EXTREME LOW LEVEL	LSXL-211	CONDUCTANCE LEVEL SWITCH	CLEAR WELL #1

SHUT DOWN ALARMS IN PRIMARY PLC			
ALARM DESCRIPTION (ALARM SCREEN ON HMI)	**TAG NO.**	**DEVICE TYPE**	**LOCATION**
CLEAR WELL CW-220 EXTREME HIGH LEVEL	LSXH-222	CONDUCTANCE LEVEL SWITCH	CLEAR WELL #2
CLEAR WELL CW-220 HIGH-HIGH LEVEL (SET POINT)	LIT-221	LEVEL INDICATING TRANSMITTER	CLEAR WELL #2
CLEAR WELL CW-220 LOW-LOW LEVEL (SET POINT)	LIT-221	LEVEL INDICATING TRANSMITTER	CLEAR WELL #2
CLEAR WELL CW-220 EXTREME LOW LEVEL	LSXL-221	CONDUCTANCE LEVEL SWITCH	CLEAR WELL #2
BAG FILTER HIGH DIFFERENTIAL PRESSURE	PT-401/PT-402	INLET PRESSURE TRANS./OUTLET PRES. TRANSMITTER	AT BAG FILTERS
TREATMENT PLANT EFFLUENT EXTREME LOW PRESSURE	PSL-404	PRESSURE SWITCH	EFFLUENT LINE IN BLDG.
TREATMENT PLANT EFFLUENT LOW PRESSURE (SET POINT)	PT-402	PRESSURE TRANSMITTER	EFFLUENT LINE IN BLDG.
TREATMENT PLANT EFFLUENT HIGH PRESSURE (SET POINT)	PT-402	PRESSURE TRANSMITTER	EFFLUENT LINE IN BLDG.
TREATMENT BUILDING FLOOD	LSH-201A	FLOAT SWITCH	ADJACENT TO EACH BLDG. ENTRANCE
TREATMENT BUILDING FLOOD	LSH-201B	FLOAT SWITCH	ADJACENT TO EACH BLDG. ENTRANCE
VPGAC INFLUENT EXTREME HIGH TEMPERATURE	TSH-503	TEMPERATURE SWITCH	DUCT HEATER EFFLUENT LINE
BLOWER EFFLUENT LOW AIR FLOW	FSL-642	THERMO DISPERSION FLOW SWITCH	BETWEEN PPZ UNITS
BLOWER EFFLUENT LOW AIR PRESSURE	PSL-313	PRESSURE SWITCH	BLOWER DISCHARGE
BLOWER LOW AIR FLOW (SET POINT)	FIT-641	THERMO DISPERSION FLOW INDICATING TRANSMITTER	BETWEEN PPZ UNITS
BLOWER LOW AIR PRESSURE (SET POINT)	PIT-312	PRESSURE INDICATING TRANSMITTER	BLOWER ROOM
BLOWER HIGH AIR PRESSURE (SET POINT)	PIT-312	PRESSURE INDICATING TRANSMITTER	BLOWER ROOM
VPGAC INFLUENT LOW TEMPERATURE (SETPOINT)	TT-502	TEMPERATURE TRANSMITTER	DUCT HEATER EFFLUENT LINE
VPGAC INFLUENT HIGH TEMPERATURE (SETPOINT)	TT-502	TEMPERATURE TRANSMITTER	DUCT HEATER EFFLUENT LINE

SHUT DOWN ALARMS IN PRIMARY PLC			
ALARM DESCRIPTION (ALARM SCREEN ON HMI)	**TAG NO.**	**DEVICE TYPE**	**LOCATION**
PUMP P-211 LOW PRESSURE (SETPOINT)	PT-211	PRESSURE TRANSMITTER	PUMP P-211 DISCHARGE
PUMP P-225 LOW PRESSURE (SETPOINT)	PT-225	PRESSURE TRANSMITTER	PUMP P-225 DISCHARGE
BLOWER VFD FAULT	VFD FAULT CONTACT	BLOWER VFD FAULT CONTACT	BLOWER ROOM
PUMP P-225 VFD FAULT	VFD FAULT CONTACT	PUMP P-225 VFD FAULT CONTACT	ELECTRICAL ROOM

Secondary, or critical, alarms are used to back-up key primary alarms or to shut the system down if either the primary PLC or the blower VFD fail. If a primary alarm instrument fails to appropriately respond to an alarm condition (or the primary PLC or the blower VFD fails), a hard-wired switch will send a signal directly to a relay. Relay contacts will then send inputs to the primary PLC, the secondary PLC, and the autodialer. The Treatment Plant will automatically and immediately shut down via either the Primary PLC or the Secondary PLC (both are capable of shutting the plant down as a redundant feature) and will notify project team members of the shut down. When the process equipment is shut down by the Secondary PLC, all the equipment, including the air stripper blower, is shut down immediately. All critical switches, when triggered, not only send a signal to the Secondary PLC but, for additional protection, send an alarm signal to the Primary PLC. Thus, if there were to be a failure within the secondary PLC, the alarm condition would be recognized by the primary PLC and shut the system down. However, as discussed below, due to the fail-safe logic incorporated in the system's wiring, if the Secondary PLC were to lose power, the system would shut down automatically and immediately. Thus, the need for the primary PLC to back-up the secondary PLC is redundant.

Fail-safe circuitry means the normal condition of a circuit is energized. If for some reason (e.g., loss of power, a broken wire or a relay burns out) the "switch" becomes de-energized and opens, the circuit is broken, which immediately cuts power to other devices on the circuit. These systems were implemented to make sure (fail-safe) that a circuit does not close, or remain closed, when the circuit/switch is de-energized. At the Off-Site IRM, this system is useful in many ways, but specifically a) shuts the treatment process down once the circuit is broken by any of these switches, and b) ensures that if there is a power failure or a key system component loses power, switches will open causing the entire system to shut down. For example, the secondary PLC acts as a fail-safe permissive switch wired in series with the starter coils associated with all the process equipment (pumps, blower, and duct heater) such that if a critical, hard-wired switch (i.e., a critical alarm) opens, the secondary PLC will cause the output relays to all process equipment to de-energize, thus shutting all the process equipment down. The secondary PLC is wired such that it has to be manually reset in the field before the process can be restarted and to prevent unwanted automatic restart.

A complete list of the critical alarms is provided below. Critical alarms also send a signal to the autodialer to call project team members.

CRITICAL ALARMS TO SECONDARY PLC			
ALARM DESCRIPTION (ALARM LIGHTS ON FRONT OF PLC)	TAG NO.	DEVICE TYPE	LOCATION
RW-100 VAULT HIGH WATER LEVEL	LSH-111	FLOAT SWITCH	RECOVERY WELL VAULT
RW-100 CONVEYANCE PIPING ANNULUS EXTREME HIGH PRESSURE SWITCH	PSH-121	PRESSURE SWITCH	ENTRANCE VAULT
ENTRANCE VAULT HIGH-HIGH LEVEL	LSHH-142	FLOAT SWITCH	ENTRANCE VAULT
CLEAR WELL CW-210 EXTREME HIGH LEVEL	LSXH-212	CONDUCTANCE LEVEL SWITCH	CLEAR WELL #1
CLEAR WELL CW-210 EXTREME LOW LEVEL	LSXL-211	CONDUCTANCE LEVEL SWITCH	CLEAR WELL #1
CLEAR WELL CW-220 EXTREME HIGH LEVEL	LSXH-222	CONDUCTANCE LEVEL SWITCH	CLEAR WELL #2
CLEAR WELL CW-220 EXTREME LOW LEVEL	LSXL-221	CONDUCTANCE LEVEL SWITCH	CLEAR WELL #2
TREATMENT PLANT EFFLUENT EXTREME LOW PRESSURE	PSL-404	PRESSURE SWITCH	EFFLUENT LINE IN BLDG.
TREATMENT BUILDING FLOOD	LSH-201A	FLOAT SWITCH	ADJACENT TO EACH BLDG. ENTRANCE
TREATMENT BUILDING FLOOD	LSH-201B	FLOAT SWITCH	ADJACENT TO EACH BLDG. ENTRANCE
VPGAC INFLUENT EXTREME HIGH TEMPERATURE	TSH-503	TEMPERATURE SWITCH	DUCT HEATER EFFLUENT LINE
BLOWER EFFLUENT LOW AIR FLOW	FSL-642	THERMO DISPERSION FLOW SWITCH	BETWEEN PPZ UNITS
BLOWER EFFLUENT LOW AIR PRESSURE	PSL-313	PRESSURE SWITCH	BLOWER DISCHARGE
PRIMARY PLC FAILURE	-	MCP	CONTROL ROOM
BLOWER VFD FAULT	VFD FAULT CONTACT	BLOWER VFD FAULT CONTACT	BLOWER ROOM

Advisory conditions occur when process variables are outside of their desired range, but do not require immediate shut down of the Treatment Plant. An advisory is programmed to allow operators to get an advanced warning of a possible problem. The advisories that were initially incorporated into the system are listed below.

ADVISORY CONDITIONS IN PRIMARY PLC			
ADVISORY DESCRIPTION (ADVISORY SCREEN ON HMI)	TAG NO.	DEVICE(S) TYPE	LOCATION
BAG FILTER PRESSURE ADVISORY FILTER SWITCH OCCURRED	PT-401 & PT-402	PRESSURE TRANSMITTER	AT BAG FILTERS
CLEAR WELL CW-210 HIGH LEVEL ADVISORY	LIT-211	LEVEL INDICATOR TRANSMITTER	CLEAR WELL #1
CLEAR WELL CW-220 HIGH LEVEL ADVISORY	LIT-221	LEVEL INDICATOR TRANSMITTER	CLEAR WELL #2

ADVISORY CONDITIONS IN PRIMARY PLC			
ADVISORY DESCRIPTION (ADVISORY SCREEN ON HMI)	TAG NO.	DEVICE(S) TYPE	LOCATION
CLEAR WELL CW-210 LOW LEVEL ADVISORY	LIT-211	LEVEL INDICATOR TRANSMITTER	CLEAR WELL #1
CLEAR WELL CW-220 LOW LEVEL ADVISORY	LIT-221	LEVEL INDICATOR TRANSMITTER	CLEAR WELL #2
VPGAC INFLUENT STREAM HIGH HUMIDITY ADVISORY	RHT-621	RELATIVE HUMIDITY TEMPERATURE TRANSMITTER	BETWEEN GAC UNITS
VPGAC INFLUENT STREAM LOW TEMPERATURE ADVISORY	TT-502	TEMPERATURE TRANSMITTER	DUCT HEATER EFFLUENT LINE
PLANT INFLUENT STREAM LOW WATER FLOW ADVISORY	FIT-131	FLOW INDICATOR TRANSMITTER	INFLUENT VAULT
RW-100 STRAINER HIGH DIFFERENTIAL PRESSURE HIGH ADVISORY	PT-101 & PT-102	PRESSURE TRANSMITTER	RECOVERY WELL VAULT
ENTRANCE VAULT HIGH WATER LEVEL ADVISORY	LSH-141	FLOAT SWITCH	ENTRANCE VAULT
PUMP P-211 HIGH PRESSURE ADVISORY	PT-211	PRESSURE TRANSMITTER	PUMP P-211 DISCHARGE
PUMP P-225 HIGH PRESSURE ADVISORY	PT-225	PRESSURE TRANSMITTER	PUMP P-225 DISCHARGE

4.6 Treatment Building

The former MLWD Parkway Station Treatment Building was modified for use as the Off-Site IRM. The existing plant houses two air strippers, blower, pumps, instrumentation and controls. Completed modifications and additions to the Treatment Plant are presented in the Record Drawings.

4.7 Utility Services

Existing electric service available at the site was modified to provide an uninterruptible power supply and the connection between the MLWD Well No. 1 Building and the Treatment Plant was disconnected at the Well No. 1 Building. A new primary feed line (480/277V, 3 Phase, 4 wire, 600 Amp Main) was installed along the western and southern MLWD property boundary and connected to the new transformer installed south of the southwestern corner of the Treatment Plant building. A secondary feed line was installed from the new transformer to the circuit breaker in the motor control center (MCC), and the new metering panel; as shown on E-1, E-2, E-3 and E-5 of the Record Drawings. The incoming electrical service is protected by a TVSS and an external grounding grid provides supplemental grounding.

Controls and instrumentation for the operation of the treatment system and associated recovery well are installed within the Treatment Plant building. The networking enabled the control and monitoring of the entire system via a single serial node, which is monitored and controlled via a computer housed within the office and a remote dialup modem. The autodialer is connected to a dedicated telephone line.

A 2-inch-diameter natural gas line was connected to the main located at the end of Tanners Road with a gas meter. A ¾-inch-diameter line runs from the meter to the duct heater as shown on drawings C-1 and P-5 of the Record Drawings.

Existing potable water supply and sanitary sewer facilities were determined suitable for use and were not modified.

5. Permitting

A completed NYSDEC Air Facility Registration form is included as Appendix F. The proposed facility is exempt from registration pursuant to 6 NYCRR Part 201-3.3(c)(29).

A completed State Pollutant Discharge Elimination System (SPDES) industrial application form is included as Appendix G. Outfalls 001, 002, and 003 are identified in the SPDES application form for purposes of the design submittal as the off-site discharge option to the diffusion wells located on the NYSDOT property as described in Section 4.3.4.

6. Security

To reduce the risk of vandalism, the following security measures have been implemented:

- A 6-foot fence around the treatment building;
- A 6-foot fence around the recovery well vault area;
- Locking gate to prevent access to NYSDOT property where the diffusion wells are located;
- Locks on the building and the below grade structures, such as well and pipeline vaults;
- Recently upgraded exterior lighting around the treatment building; and
- Interior and exterior video and audio monitoring system for the treatment building.

The site is co-occupied with MLWD, which retains operational control of some facilities located on the grounds.

Tables

TABLE 1

FORMER UNISYS FACILITY
GREAT NECK, NEW YORK
OFF-SITE INTERIM REMEDIAL MEASURE

DESIGN INFLUENT AND EFFLUENT LIMITS FOR TREATED WATER

Parameter	Air Stripper Design Influent Concentration [(1)] (µg/L)	DEC Regulatory Effluent Concentration (µg/L)	Effluent Water Performance Standard [(2)] (µg/L)
Tetrachloroethene	300	5	ND
Trichloroethene	858	5	ND
cis-1,2-Dichloroethene	3,400	5	ND
Vinyl Chloride	10	2	ND
Freon 113	42	5	ND

Notes:
µg/L - micrograms per liter

(1) Design influent concentrations based on results of analytical results of groundwater samples collected after installation of Recovery Well RW-100.
(2) "ND" denotes analyte not detected in the sample at or above its minimum detection limit of 1 µg/L per USEPA SOW OLM04.2 per NYSDEC ASP 2000-1. The Non-Detect Performance Standards are specified in the Remediation Access and Licensing Agreement between Lockheed Martin Corporation and the Great Neck Union Free School District, dated April 14, 2003.

TABLE 2

FORMER UNISYS FACILITY
GREAT NECK, NEW YORK
OFF-SITE INTERIM REMEDIAL MEASURE

EFFLUENT LIMITS FOR TREATED AIR

Parameter	AGC (1,2) ($\mu g/m^3$)	SGC (1,2) ($\mu g/m^3$)	Effluent Air Performance Standard (3) ($\mu g/m^3$)
Tetrachloroethene	1	1,000	ND
Trichloroethene	0.5	54,000	ND
cis-1,2-Dichloroethene	1,900	190,000 (4)	ND
Vinyl Chloride	0.11	180,000	ND
Freon 113	180,000	960,000	ND

Notes:
$\mu g/m^3$ - micrograms per cubic meter

(1) Ambient air concentrations limits based on NYSDEC December 22, 2003 Air Guide No. 1 (DAR-1) AGCs and SGC, and NYSDEC recommendations.
(2) AGC refers to Annual Guidance Concentrations and SGC refers to Short-Term Guidance Concentrations.
(3) "ND" denotes analyte not detected in the sample at or above its minimum detection limit of 0.5 ppbV per USEPA Method TO-15. The Non-Detect Performance Standards are specified in the Remediation Access and Licensing Agreement between Lockheed Martin Corporation and the Great Neck Union Free School District, dated April 14, 2003.
(4) Since no SGC was provided in the DAR-1 AGC/AGC Tables, dated December 22, 2003, an interim SGC was developed based on guidance provided in Section IV.A.2.b.1 of the New York State DAR-1 Guidelines for the Control of Toxic Ambient Air Contaminants, 1991 edition. Specifically, for cis-1,2-Dichloroethene, which is not defined as a HIGH toxicity contaminant, the interim SGC = (smaller of TWA-TLV or TWA-REL)/4.2 or 793,000 $\mu g/m^3/4.2$ = 190,000 $\mu g/m^3$.

TABLE 3

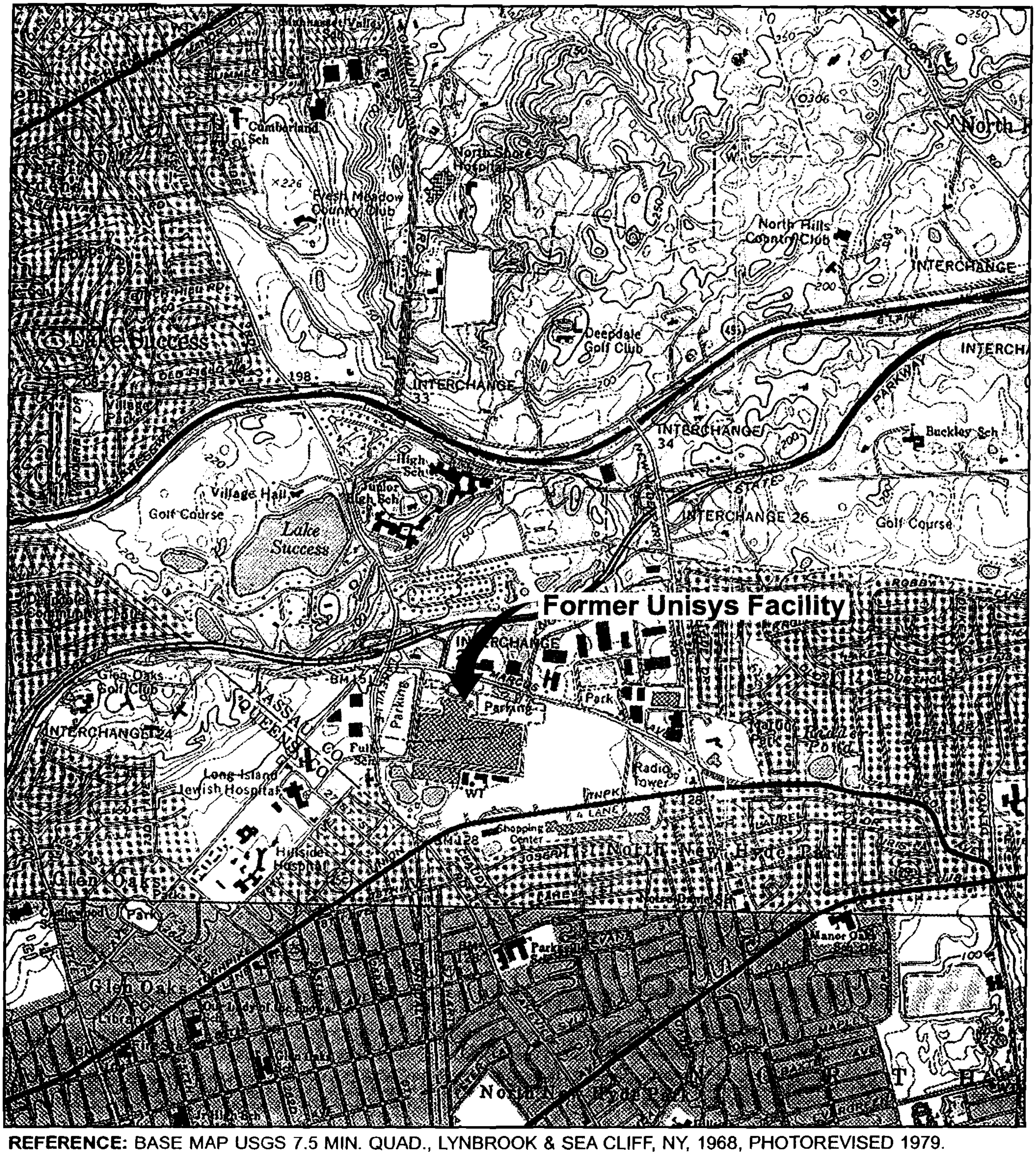
FORMER UNISYS FACILITY
GREAT NECK, NEW YORK
OFF-SITE INTERIM REMEDIAL MEASURE

PUMP AND BLOWER SUMMARY

Designation	Pump/Blower				Motor		
	Type	Make	Model	Rating	Make	Model	Rating
P-101	Submersible Turbine Pump	Grundfos	625S400-2	600 GPM/200 FT TDH	Franklin	6-inch	40HP, 460V, 3450 RPM
P-141	Sump Pump	TEEL	Grainger #3P511	38 GPM/20 FT TDH	TEEL	N/A	N/A
P-211	Submersible Turbine Pump	Christensen	11CLC - 1 STAGE	600 GPM/53 FT TDH	Hitachi	S12931H	10 HP, 460V, 1800 RPM
P-225	Submersible Turbine Pump	Christensen	11CLC - 2 STAGE	600 GPM/100 FT TDH	Hitachi	S15931H	25HP, 460V, 1800 RPM
B-310	Centrifugal Fan	Northern Blower	Blower Design 6440, Size 40-2663, Serial No. A51871-1	5,000 CFM/49 IN TDH	Baldor	EM4313T	75 HP, 460V, 3600 RPM

Notes:
GPM = Gallons per minute.
FT = Feet of water pressure.
IN = Inches of water pressure.
TDH = Total design head.
EFF = Efficiency.
N/A = Not available.
V = Volts.
HP = Horsepower.
RPM = Revolutions per minute.

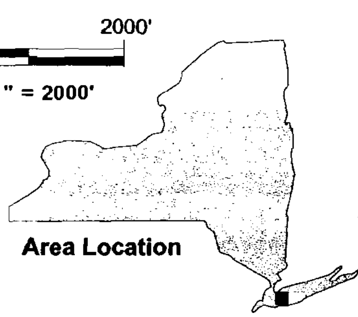
Figures



REFERENCE: BASE MAP USGS 7.5 MIN. QUAD., LYNBROOK & SEA CLIFF, NY, 1968, PHOTOREVISED 1979.

2000' 0 2000'

Approximate Scale: 1" = 2000'



Area Location

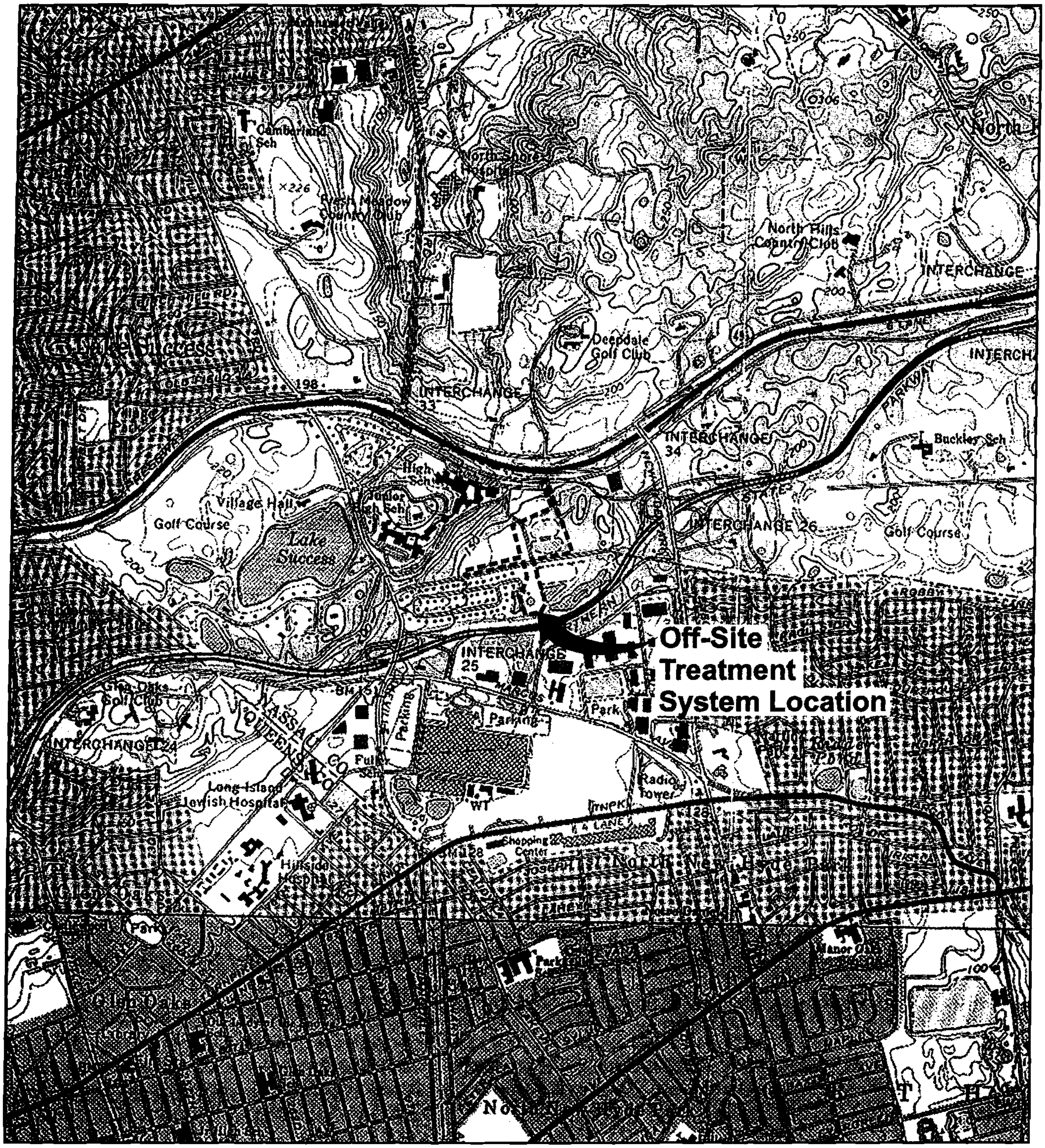
02/24/06 SYR-D85- DJH, KLS
38031004/38031n02.cdr

FORMER UNISYS FACILITY
OFF-SITE IRM
GREAT NECK, NEW YORK

SITE LOCATION MAP

BBL®
BLASLAND, BOUCK & LEE, INC.
engineers, scientists, economists

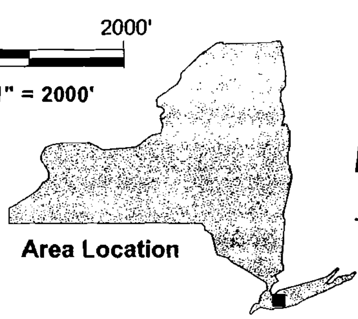
FIGURE
1



REFERENCE: BASE MAP USGS 7.5 MIN. QUAD., LYNBROOK & SEA CLIFF, NY, 1968, PHOTOREVISED 1979.

2000'   0   2000'

Approximate Scale: 1" = 2000'



Area Location

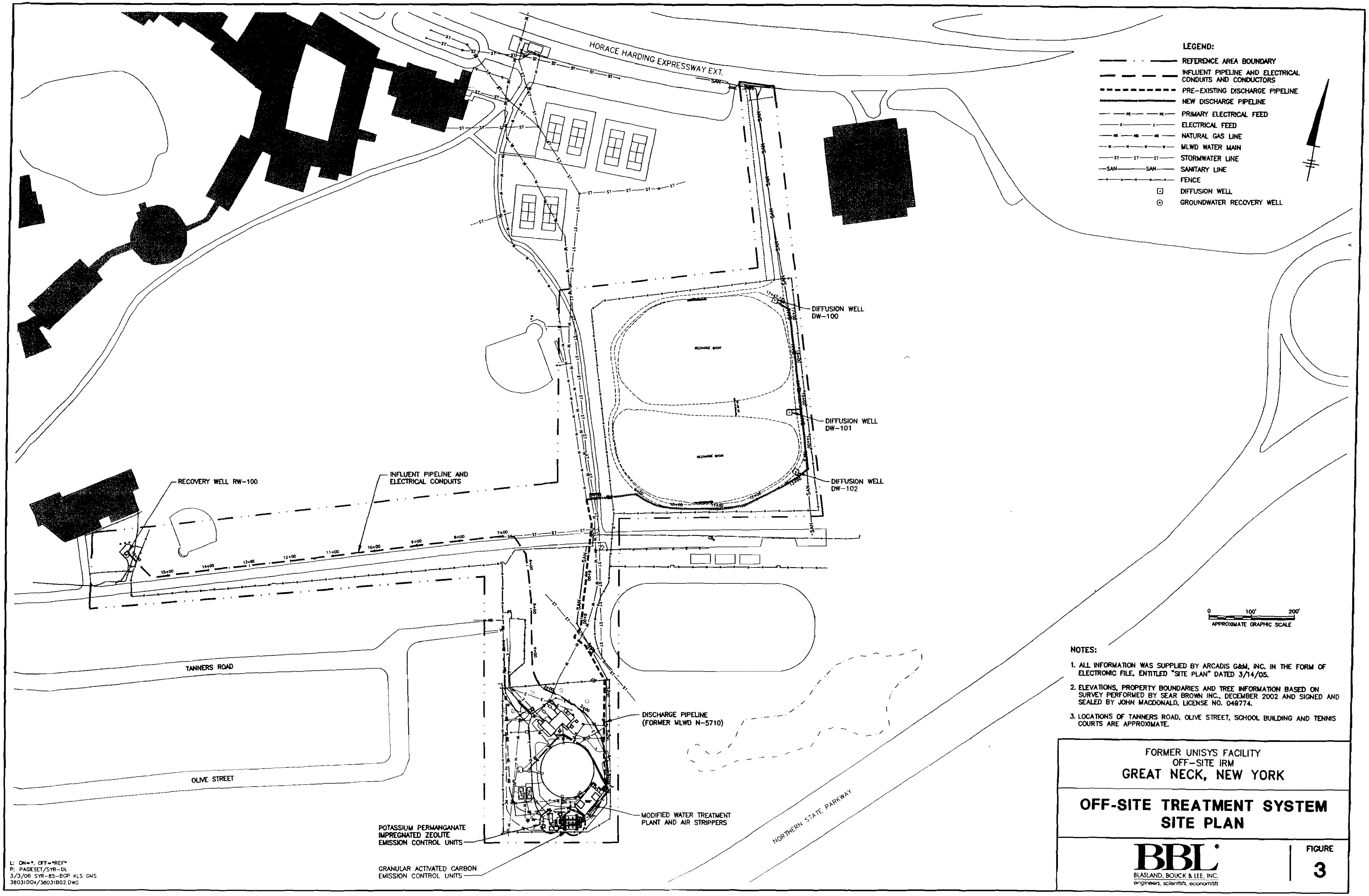
FORMER UNISYS FACILITY
OFF-SITE IRM
GREAT NECK, NEW YORK

OFF-SITE TREATMENT SYSTEM LOCATION MAP

BBL®
BLASLAND, BOUCK & LEE, INC.
engineers, scientists, economists

FIGURE
2

02/24/06 SYR-D85- DJH, KLS
38031004/38031n03.cdr



NOTES:

1. ALL INFORMATION WAS SUPPLIED BY ARCADIS G&M, INC. IN THE FORM OF ELECTRONIC FILE, ENTITLED "SITE PLAN" DATED 3/14/05.
2. ELEVATIONS, PROPERTY BOUNDARIES AND TREE INFORMATION BASED ON SURVEY PERFORMED BY SEAR BROWN INC., DECEMBER 2002 AND SIGNED AND SEALED BY JOHN MACDONALD, LICENSE NO. 049774.
3. LOCATIONS OF TANNERS ROAD, OLIVE STREET, SCHOOL BUILDING AND TENNIS COURTS ARE APPROXIMATE.

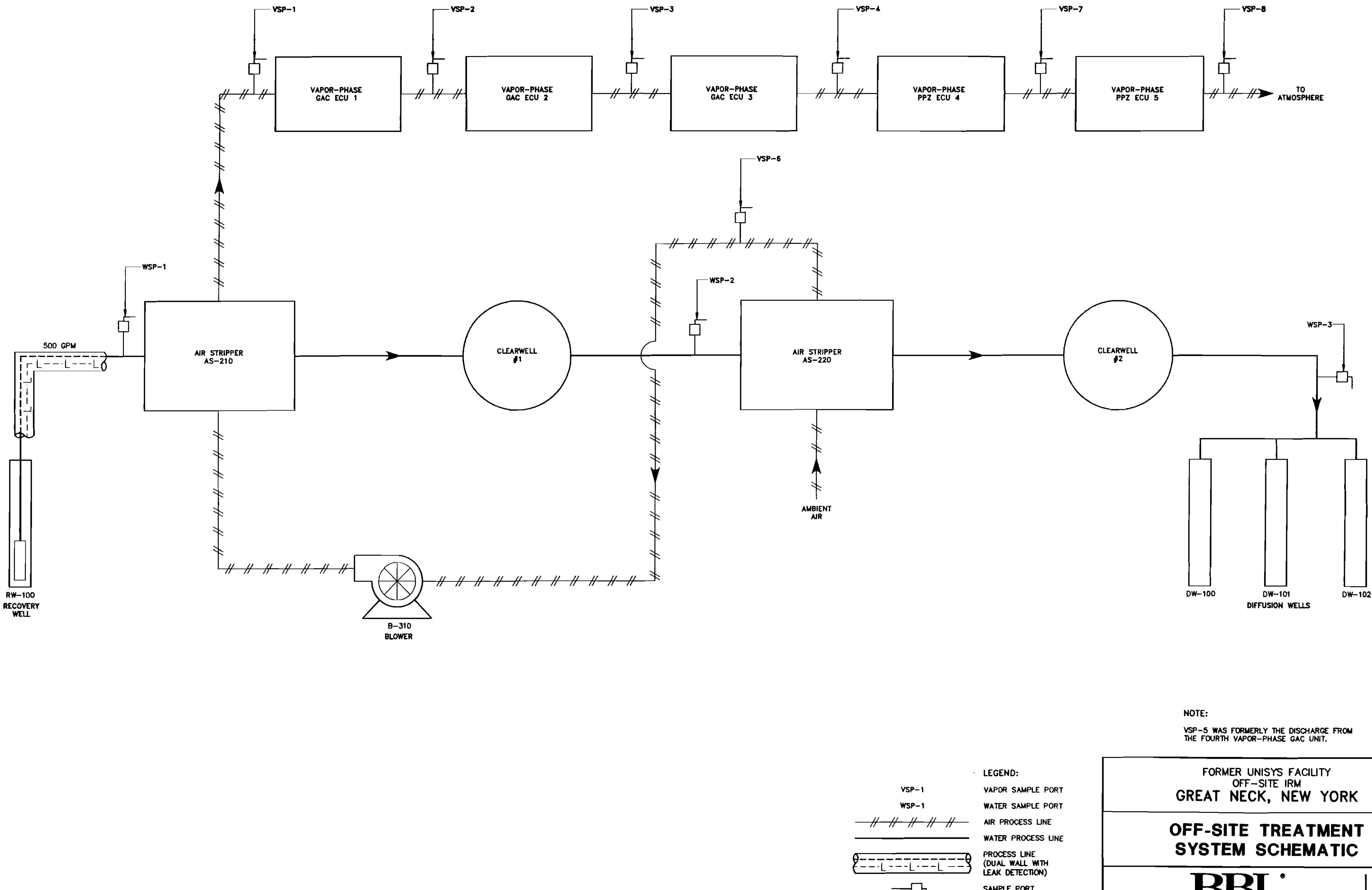
FORMER UNISYS FACILITY
OFF-SITE IRM
GREAT NECK, NEW YORK

OFF-SITE TREATMENT SYSTEM SITE PLAN

BBL
BLASLAND, BOUCK & LEE, INC.
engineers, scientists, economists

FIGURE 3

L: ON=*, OFF=*REF*
P: PAGESET/SYR-DL
3/3/06 SYR-85-BCP KLS GMS
38031004/38031B02.DWG



NOTE:

VSP-5 WAS FORMERLY THE DISCHARGE FROM THE FOURTH VAPOR-PHASE GAC UNIT.

FORMER UNISYS FACILITY
OFF-SITE IRM
GREAT NECK, NEW YORK

OFF-SITE TREATMENT SYSTEM SCHEMATIC

BBL
BLASLAND, BOUCK & LEE, INC.
engineers, scientists, economists

FIGURE 4

X: (XREF)
L: (LAYER)
P: PAGESET/PLT-DL
02/24/06 SYR-85-SDL BGP KLS
38031004/38031F01.DWG

Appendix A

Groundwater Treatment Systems (On-Site and Off-Site IRM) Simulated Capture Zones

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Remedial Management & Construction

APPENDIX A
GROUNDWATER TREATMENT SYSTEMS
(ON-SITE AND OFF-SITE INTERIM REMEDIAL MEASURE)
SIMULATED CAPTURE ZONES
FORMER UNISYS FACILITY
GREAT NECK, NEW YORK

Appendix A provides a clarification of the expected hydraulic effectiveness associated with operation of the OU-1 groundwater treatment system and a comparison to the OU-1 system operating simultaneously with the Off-Site Interim Remedial Measure (IRM) System.

Hydraulic containment as specified in the OU-1 Record of Decision (ROD) calls for capture of on-site groundwater to a depth of 270 feet below land surface (bls). Figures FS1-UG, FS1-UM, FS1-MM, and FS1-BM show simulated captures zones on April 19, 2001 expected under OU-1 System operation in the upper Glacial, upper, middle, and basal Magothy aquifer horizons, respectively. The shaded capture zones clearly extend to or beyond the site boundaries in all horizons. As the 270 ft depth corresponds to the uppermost portions of the middle Magothy horizon, capture in the remainder of the middle Magothy and in the basal Magothy horizons clearly exceeds the requirements of the ROD. Figures A-1, A-2, A-3, and A-4 show the potentiometric surface configurations for the upper Glacial, upper, middle, and basal Magothy aquifer horizons, respectively, during operation of the OU-1 System on September 22, 2003.

The primary objectives for the Off-Site IRM are to help protect public supply wells and minimize plume intrusion into the Special Groundwater Protection Area (SGPA), while removing contaminant mass from the aquifer. The Off-Site IRM was specifically designed to complement and perform in concert with the existing OU-1 System.

Figures FS2-UG, FS2-UM, FS2-MM, and FS2-BM show simulated captures zones on April 19, 2001 expected under the combined OU-1 System and Off-Site IRM System operation in the upper Glacial, upper, middle, and basal Magothy aquifer horizons, respectively. When compared to the FS1 series of figures, it is clear that additional capture has been achieved north (downgradient) of the site in the key area where elevated concentrations of volatile organic compounds (VOCs) have been observed. Just as important is the fact that operation of the Off-Site IRM system has had no detrimental impacts on the hydraulic effectiveness of the on-site OU-1 System. It can be seen that capture zones under the combined pumping scenario still cover the entire on-site area, and therefore, the OU-1 System effectiveness has not been compromised by simultaneous operation of the Off-Site IRM System.

Potentiometric surface configurations and capture zone analysis will be updated and revised as part of the OU-2 Remedial Investigation/Feasability Study (RI/FS) under combined OU-1 System and Off-Site IRM System operation.

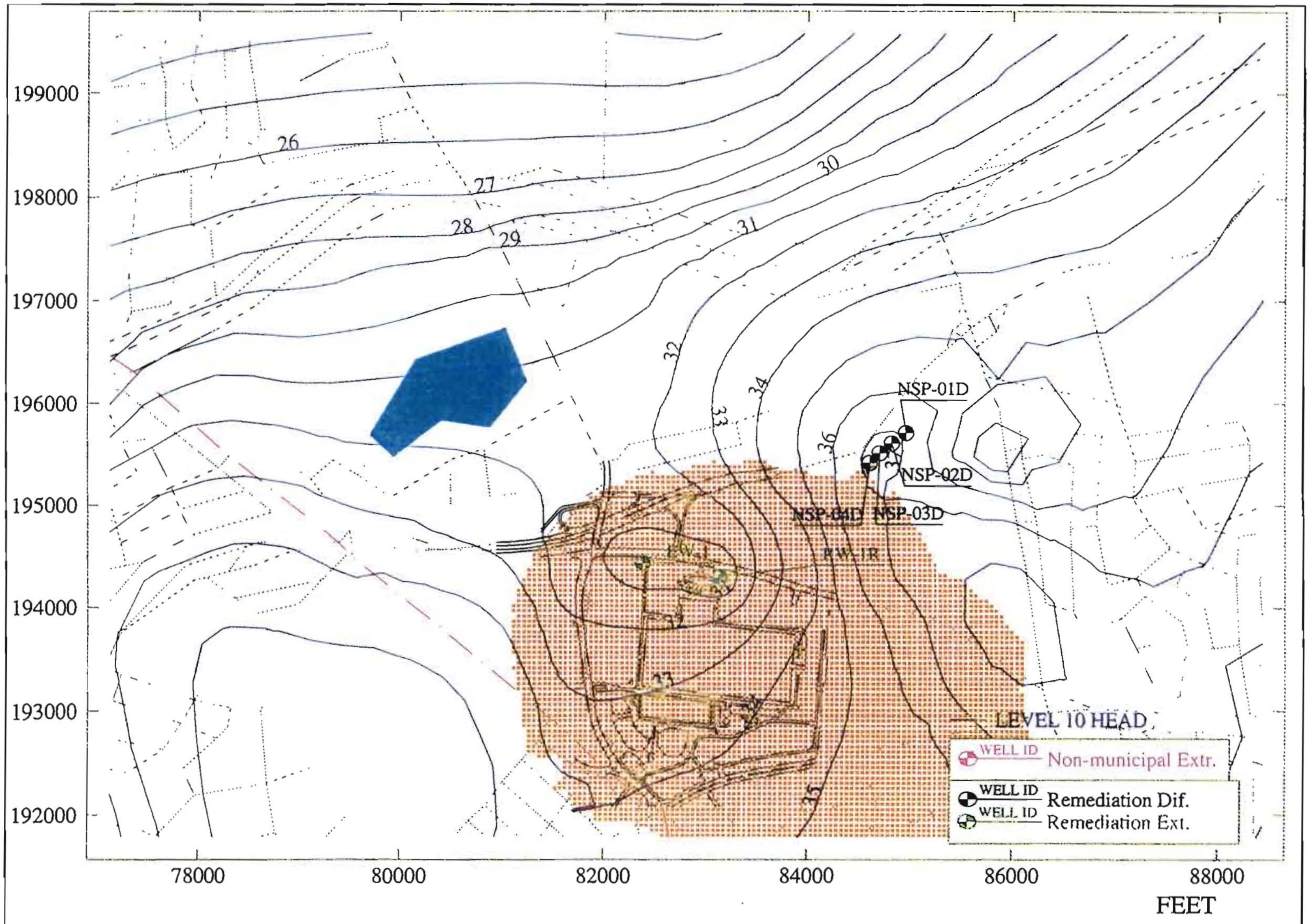


FIGURE
FS1-UG

Simulated Upper Glacial Capture Zone
Scenario FS1
Lockheed Martin - Great Neck, New York
April 19, 2001

consulting engineering construction operations
CDM

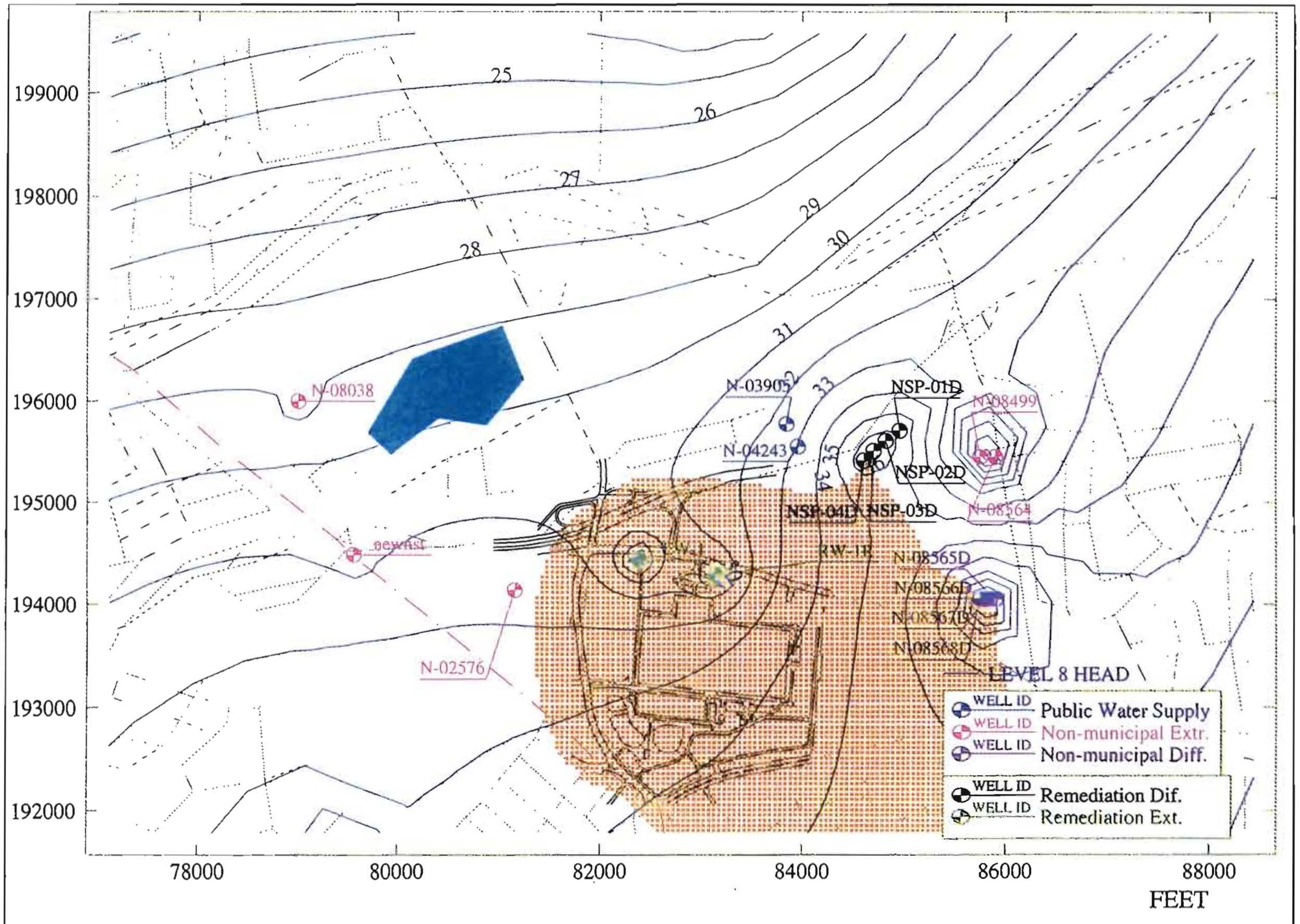


FIGURE FS1-UM	Simulated Upper Magothy Capture Zone Scenario FS1 Lockheed Martin - Great Neck, New York April 19, 2001	consulting engineering construction operations CDM

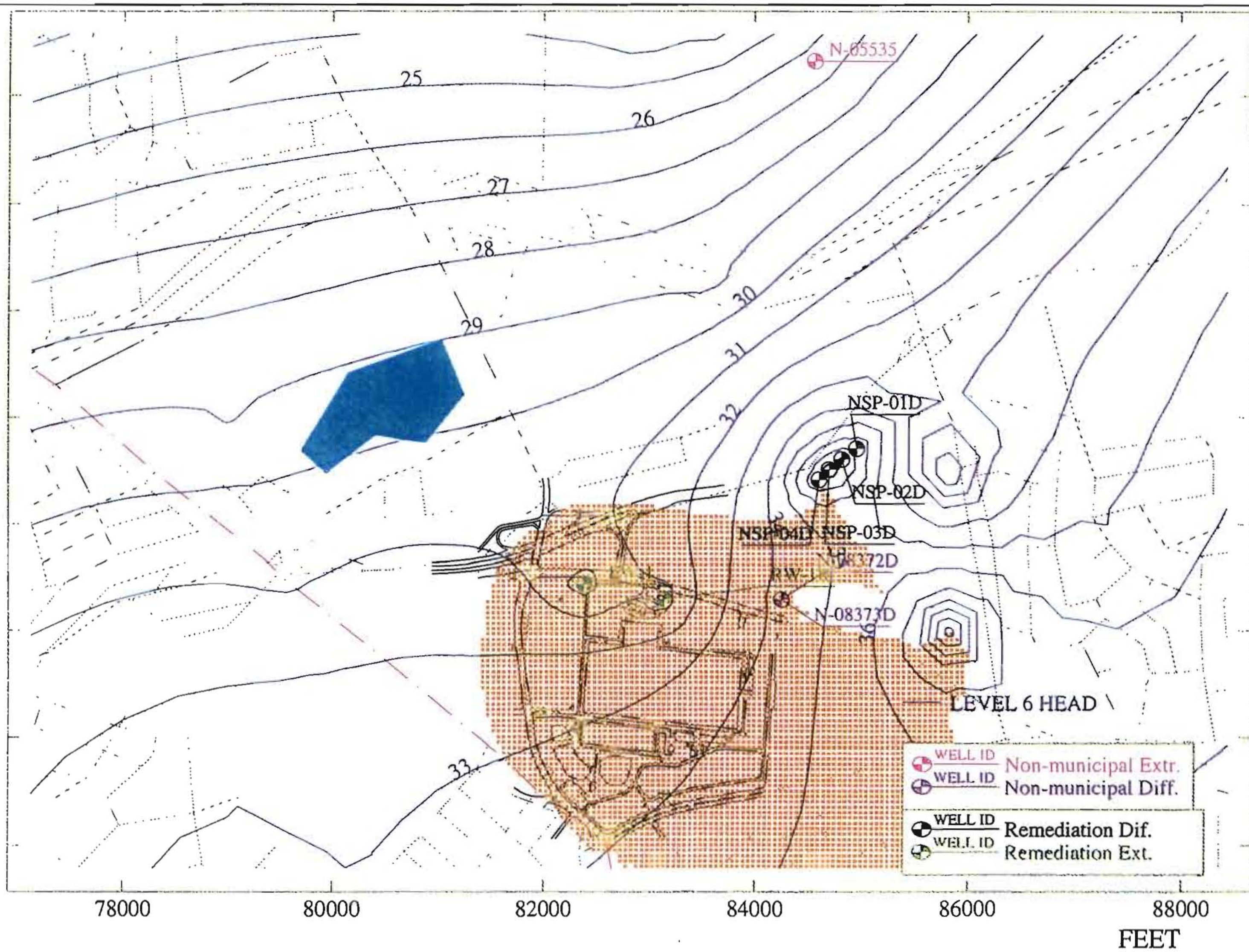


FIGURE FS1-MM	Simulated Middle Magothy Capture Zone Scenario FS1 Lockheed Martin - Great Neck, New York April 19, 2001	consulting engineering construction operations CDM

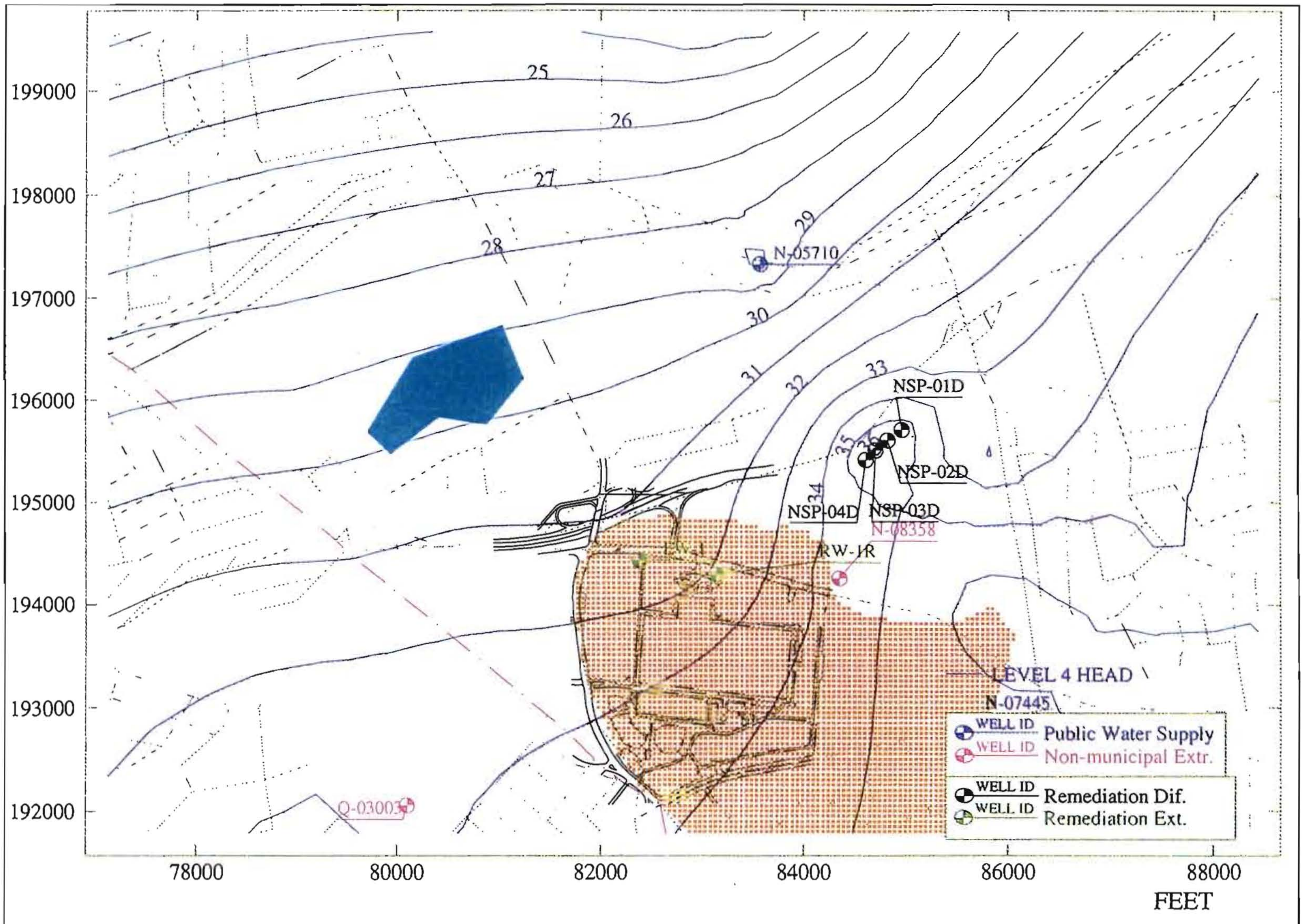


FIGURE FS1-BM	Simulated Basal Magothy Capture Zone Scenario FS1 Lockheed Martin - Great Neck, New York April 19, 2001	consulting engineering construction operations CDM

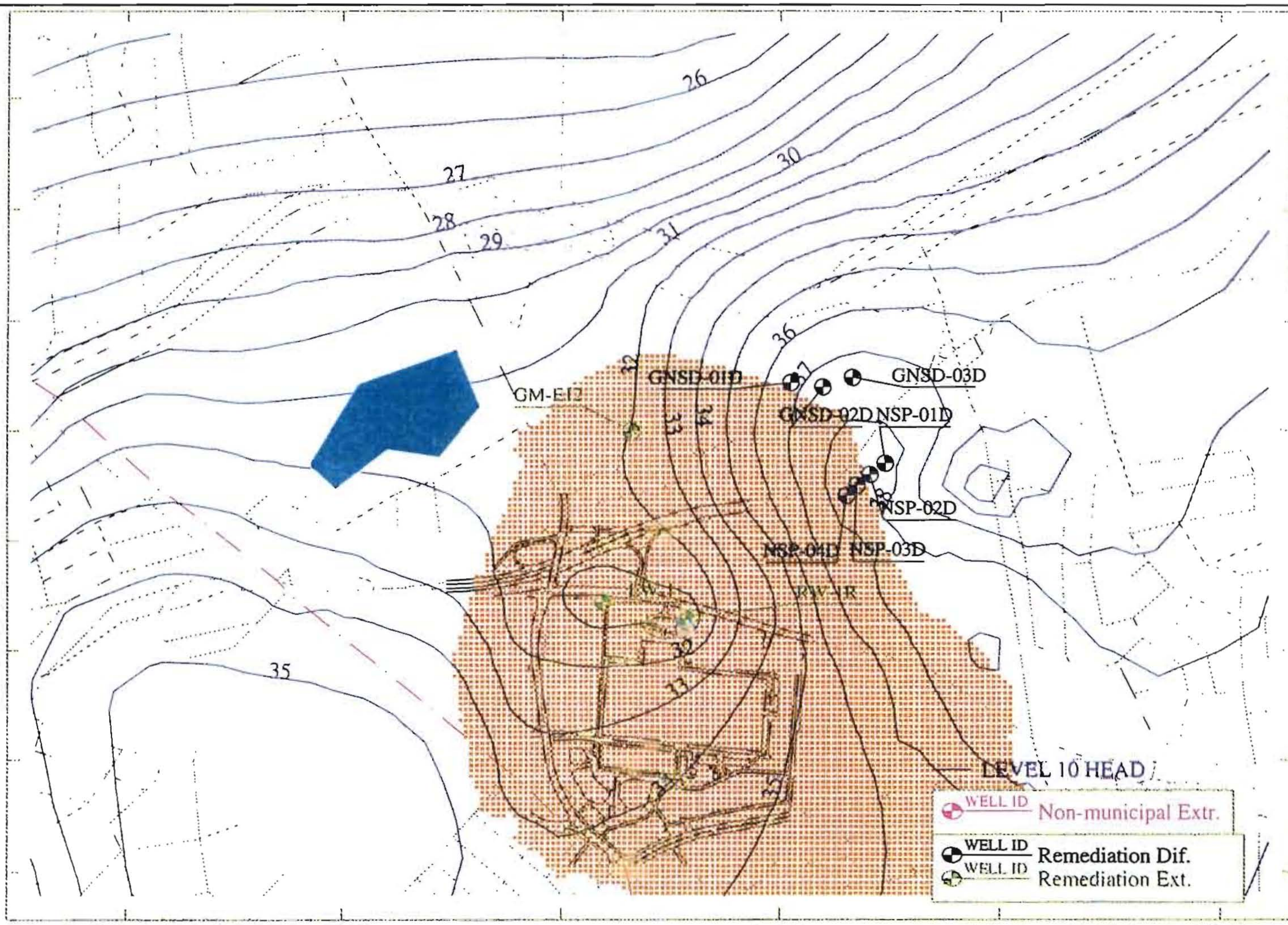


FIGURE FS2-UG	Simulated Upper Glacial Capture Zone Scenario FS2 Lockheed Martin - Great Neck, New York April 19, 2001	consulting engineering construction operations CDM

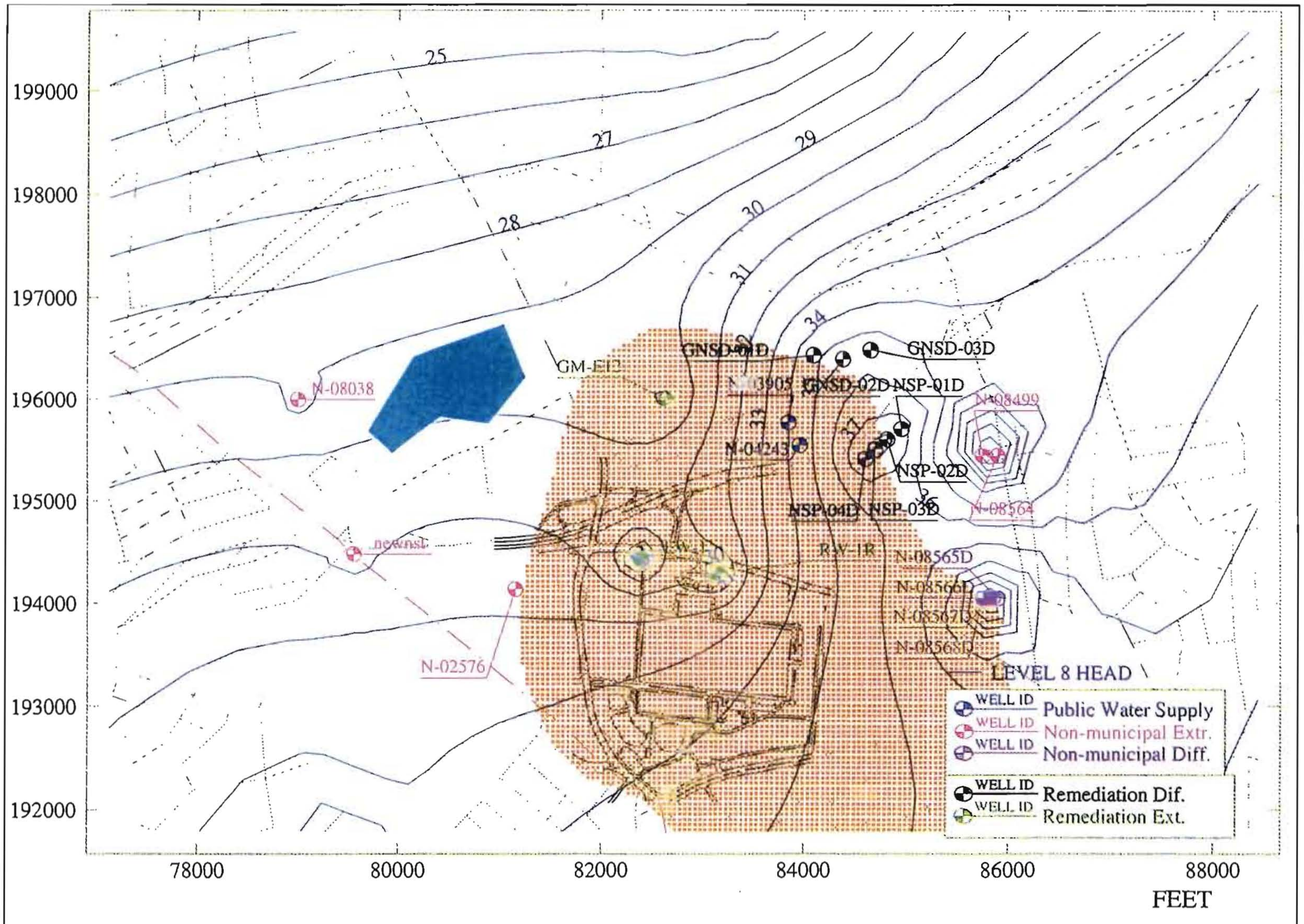


FIGURE FS2-UM	Simulated Upper Magothy Capture Zone Scenario FS2 Lockheed Martin - Great Neck, New York April 19, 2001	consulting engineering construction operations CDM

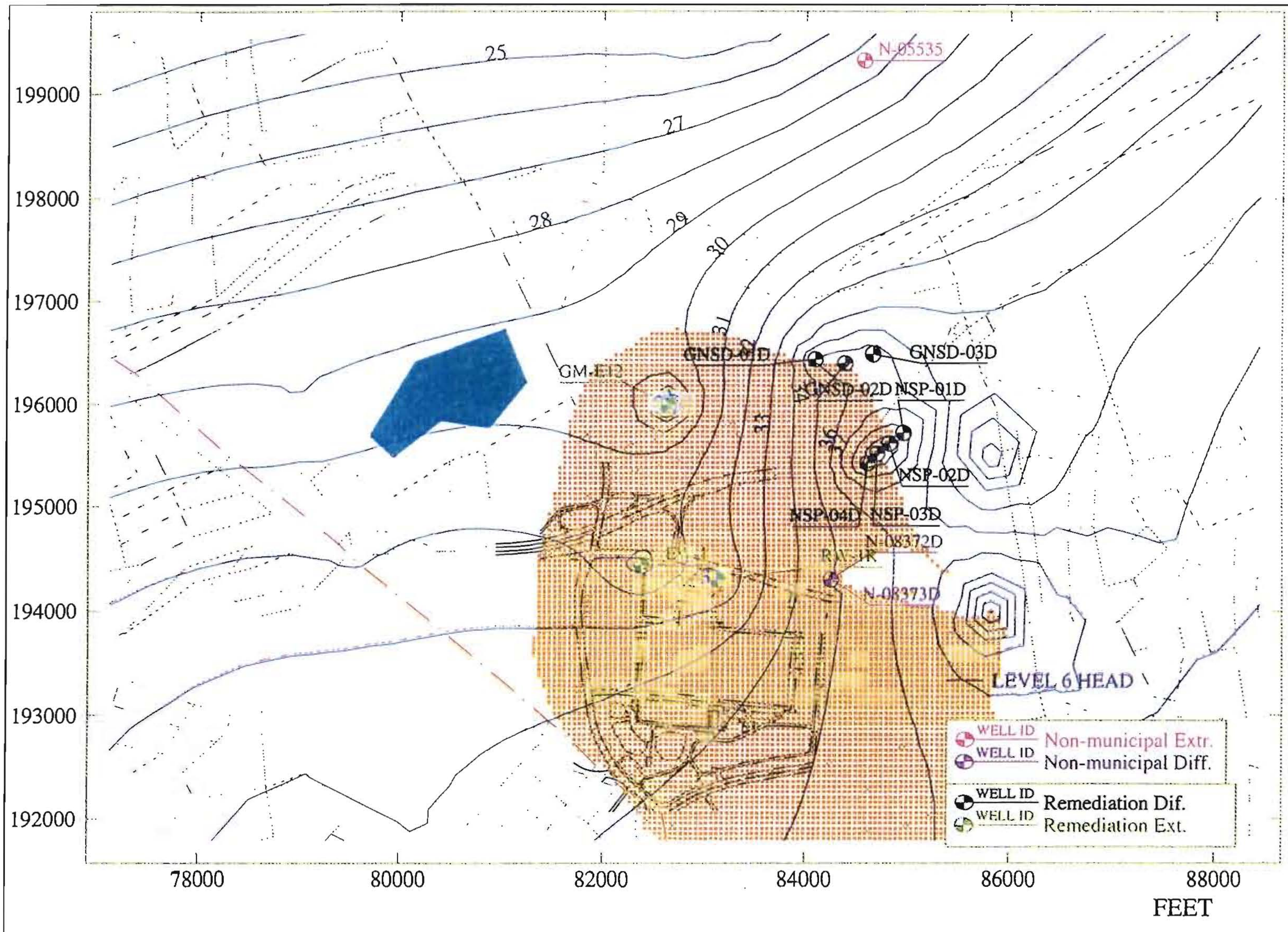


FIGURE FS2-MM	Simulated Middle Magothy Capture Zone Scenario FS2 Lockheed Martin - Great Neck, New York April 19, 2001	consulting engineering construction operations CDM

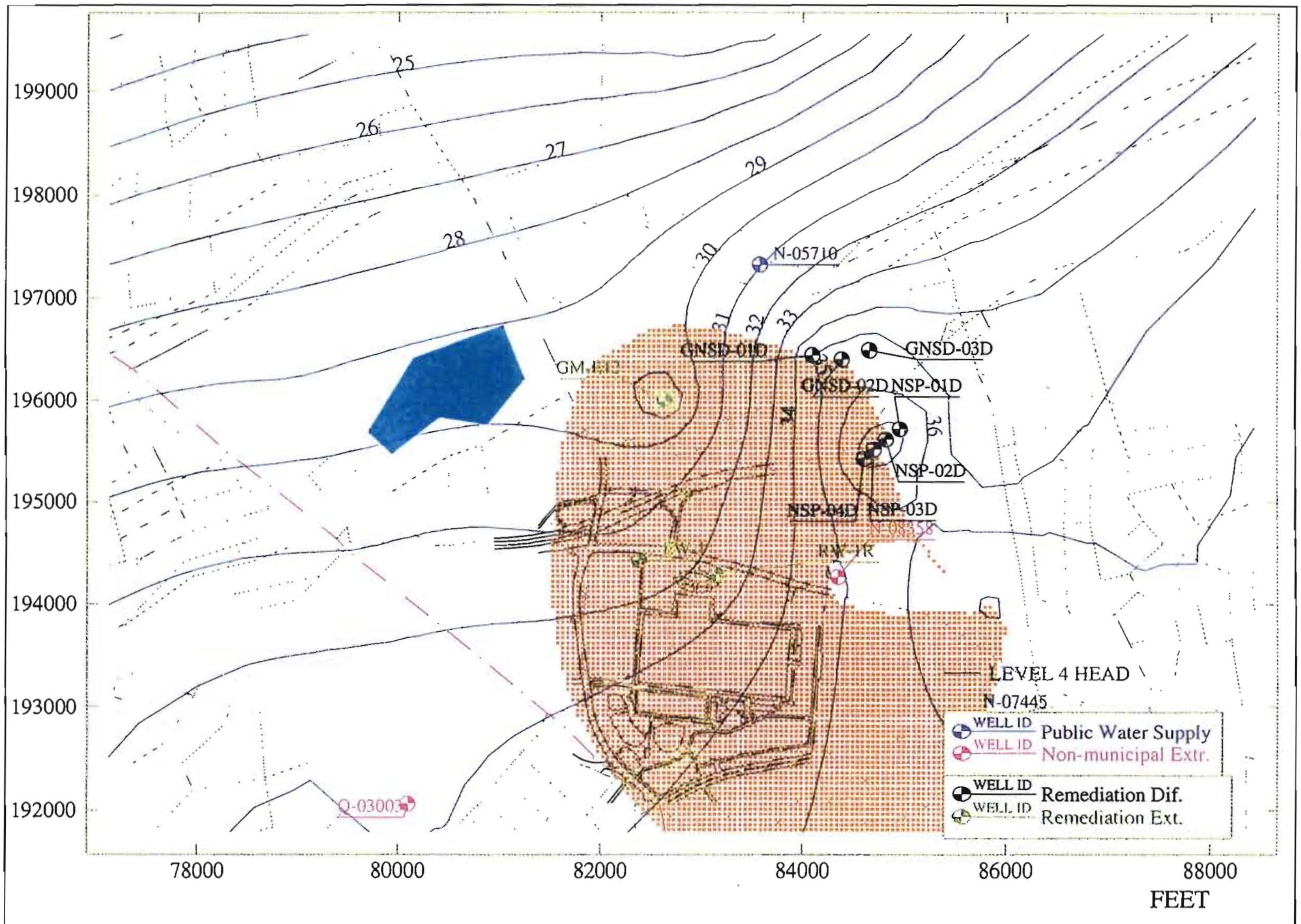
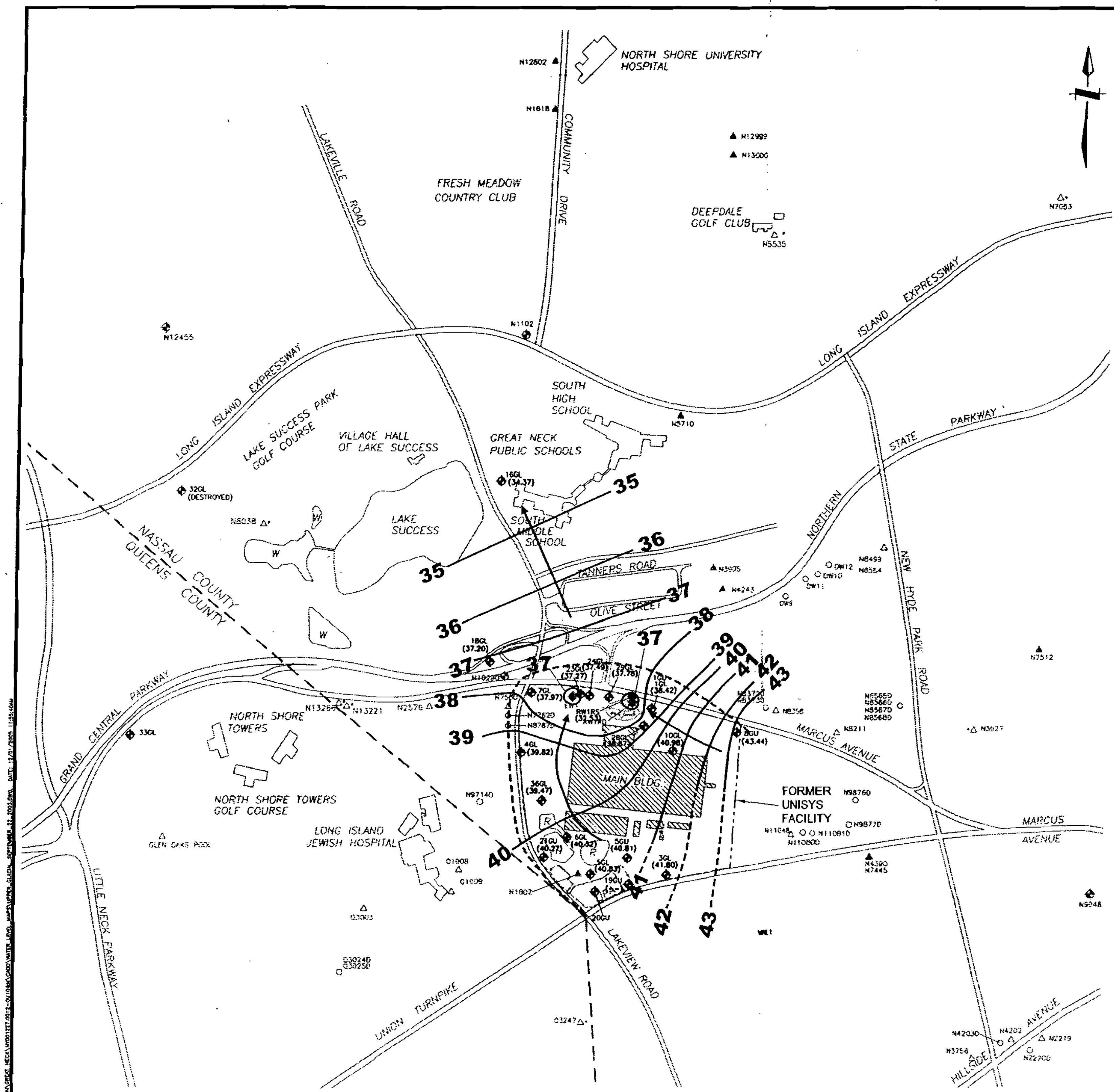


FIGURE
FS2-BM

Simulated Basal Magothy Capture Zone
Scenario FS2
Lockheed Martin - Great Neck, New York
April 19, 2001

consulting
engineering
construction
operations
CDM



EXPLANATION:

W — BODY OF WATER

R — RETENTION BASIN

8GU — LOCATION AND DESIGNATION OF MONITORING WELL SCREENED IN THE UPPER GLACIAL AQUIFER

EW1 — LOCATION AND DESIGNATION OF SITE EXTRACTION OR RECOVERY WELL

N7512 — LOCATION AND DESIGNATION OF MUNICIPAL SUPPLY WELL

N6073 — LOCATION AND DESIGNATION OF NON-MUNICIPAL SUPPLY WELL

N2576 — LOCATION AND DESIGNATION OF NON-MUNICIPAL IRRIGATION WELL

N83720 — LOCATION AND DESIGNATION OF NON-MUNICIPAL DIFFUSION WELL

FORMER UNISYS FACILITY PROPERTY BOUNDARY

(43.44) — WATER LEVEL ELEVATION IN FEET ABOVE SEA LEVEL (NAVD 88)

41 — LINE OF EQUAL WATER-LEVEL ELEVATION IN FEET ABOVE MEAN SEA LEVEL (DASHED WHERE INFERRED)

DIRECTION OF HORIZONTAL COMPONENT OF GROUNDWATER FLOW

HORIZONTAL EXTENT OF GROUNDWATER TREATMENT SYSTEM CAPTURE ZONE – REPRESENTED BY LIMITING FLOW LINE

NOTES:

1. THE UPPER GLACIAL AQUIFER EXTENDS FROM APPROXIMATELY LAND SURFACE TO-24 FEET RELATIVE TO MEAN SEA LEVEL.
2. THE FOLLOWING ON-SITE EXTRACTION AND RECOVERY WELLS WERE PUMPING FROM THE INDICATED AQUIFERS:
   - UPPER GLACIAL AND UPPER PORTION OF THE MAGOTHY – RW1RS PUMPING AT 270 GALLONS PER MINUTE (GPM)
   - UPPER AND MIDDLE PORTION OF THE MAGOTHY – RW1RD PUMPING AT 108 GPM
   - UPPER PORTION OF THE MAGOTHY – EW1 PUMPING AT 359 GPM
3. THE FOLLOWING OFF-SITE MUNICIPAL SUPPLY WELLS WHEN PUMPING WITHDRAW FROM THE INDICATED AQUIFERS:
   - UPPER PORTION OF THE MAGOTHY – N3905, N4243, AND N12999
   - UPPER AND MIDDLE PORTION OF THE MAGOTHY – N13000
   - MIDDLE PORTION OF THE MAGOTHY – N4390
   - MIDDLE AND BASAL PORTION OF THE MAGOTHY – N5710
   - BASAL PORTION OF THE MAGOTHY – N7445 AND N7512
4. THE FOLLOWING OFF-SITE NON-MUNICIPAL SUPPLY WELLS WITHDRAW FROM THE INDICATED AQUIFERS WHEN PUMPING:
   - UPPER GLACIAL – GLEN OAKS POOL, N2219, N3756, N3927, N4202, N13266 AND Q3247
   - UPPER GLACIAL AND UPPER PORTION OF THE MAGOTHY – N13221 AND Q1908
   - UPPER GLACIAL AND UPPER AND MIDDLE PORTION OF THE MAGOTHY – N8499 AND N8564
   - UPPER PORTION OF THE MAGOTHY – N2576, N7053, N7560, N8038, N8211, AND Q1909
   - UPPER AND MIDDLE PORTION OF THE MAGOTHY – N5535 AND N6073
   - MIDDLE PORTION OF THE MAGOTHY – N11048 AND Q3003
   - BASAL PORTION OF THE MAGOTHY – N8358
5. THE FOLLOWING OFF-SITE NON-MUNICIPAL DIFFUSION WELLS RECHARGE TO THE INDICATED AQUIFER WHEN OPERATING:
   - UPPER GLACIAL – N22200, N42030, N61090, N77620, N8787D AND N9714D
   - UPPER GLACIAL AND UPPER PORTION OF THE MAGOTHY – Q3024D
   - UPPER PORTION OF THE MAGOTHY – Q30250
   - UPPER AND MIDDLE PORTION OF THE MAGOTHY – N8565D, N85660, N85670 AND N8568D
   - MIDDLE PORTION OF THE MAGOTHY – DW9, DW10, N9876D, N9877D, N110800 AND N11081D
   - MIDDLE AND BASAL PORTION OF THE MAGOTHY – DW11, DW12, N83720 AND N83730
5. MONITORING WELL 19GU WAS DRY.

0 800
SCALE IN FEET

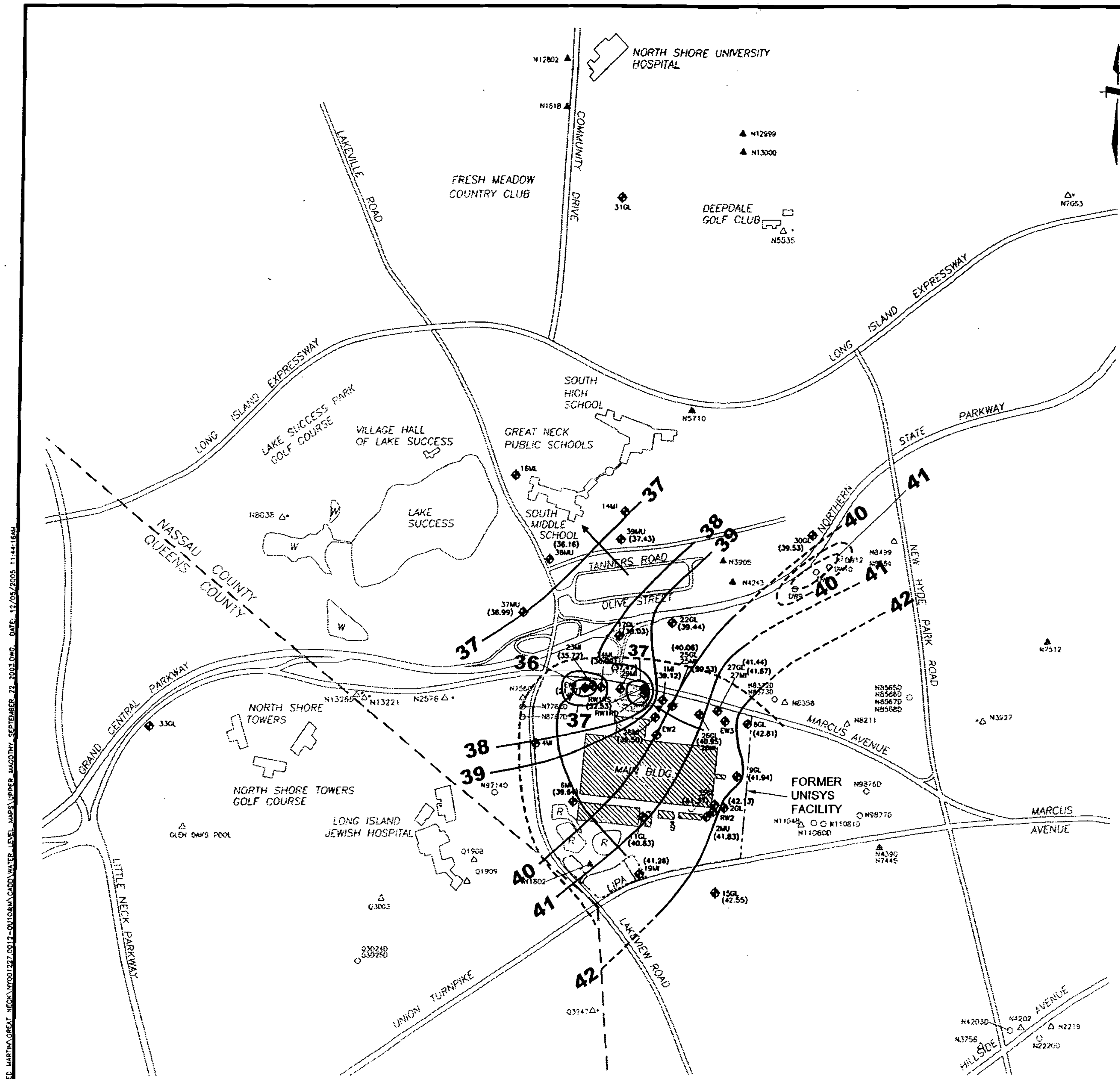
NO.	DATE	REVISION DESCRIPTION	BY	CKD

ARCADIS GERAGHTY&MILLER

POTENTIOMETRIC SURFACE CONFIGURATION OF THE UPPER GLACIAL AQUIFER ON SEPTEMBER 22, 2003

FORMER UNISYS FACILITY
GREAT NECK, NEW YORK

DRAWN LMC	DATE 2/03	PROJECT MANAGER C. SAN GIOVANNI	DEPARTMENT MANAGER
		LEAD DESIGN PROF.	CHECKED
CLIENT: LOCKHEED MARTIN COPRPORATION		PROJECT NUMBER NY12270012	DRAWING NUMBER A-1



EXPLANATION:

W — BODY OF WATER

R — RETENTION BASIN

9GL — LOCATION AND DESIGNATION OF MONITORING WELL SCREENED IN THE UPPER PORTION OF THE MAGOTHY AQUIFER

EW1 — LOCATION AND DESIGNATION OF SITE EXTRACTION OR RECOVERY WELL

N7512 — LOCATION AND DESIGNATION OF MUNICIPAL SUPPLY WELL

N6073 — LOCATION AND DESIGNATION OF NON-MUNICIPAL SUPPLY WELL

N2576 — LOCATION AND DESIGNATION OF NON-MUNICIPAL IRRIGATION WELL

N83720 — LOCATION AND DESIGNATION OF NON-MUNICIPAL DIFFUSION WELL

FORMER UNISYS FACILITY PROPERTY BOUNDARY

(42.81) — WATER LEVEL ELEVATION IN FEET ABOVE SEA LEVEL (NAVD 88)

40 — LINE OF EQUAL WATER-LEVEL ELEVATION IN FEET ABOVE MEAN SEA LEVEL (DASHED WHERE INFERRED)

DIRECTION OF HORIZONTAL COMPONENT OF GROUNDWATER FLOW

HORIZONTAL EXTENT OF GROUNDWATER TREATMENT SYSTEM CAPTURE ZONE - REPRESENTED BY LIMITING FLOW LINE

NOTES:

1. THE UPPER MAGOTHY AQUIFER EXTENDS FROM APPROXIMATELY -24 TO -113 FEET RELATIVE TO MEAN SEA LEVEL.
2. THE FOLLOWING ON-SITE EXTRACTION AND RECOVERY WELLS WERE PUMPING FROM THE INDICATED AQUIFERS:
   - UPPER GLACIAL AND UPPER PORTION OF THE MAGOTHY - RW1RS PUMPING AT 270 GALLONS PER MINUTE (GPM)
   - UPPER AND MIDDLE PORTION OF THE MAGOTHY - RW1RD PUMPING AT 108 GPM
   - UPPER PORTION OF THE MAGOTHY - EW1 PUMPING AT 359 GPM
3. THE FOLLOWING OFF-SITE MUNICIPAL SUPPLY WELLS WHEN PUMPING WITHDRAW FROM THE INDICATED AQUIFERS:
   - UPPER PORTION OF THE MAGOTHY - N3905, N4243, AND N12999
   - UPPER AND MIDDLE PORTION OF THE MAGOTHY - N13000
   - MIDDLE PORTION OF THE MAGOTHY - N4390
   - MIDDLE AND BASAL PORTION OF THE MAGOTHY - N5710
   - BASAL PORTION OF THE MAGOTHY - N7445 AND N7512
4. THE FOLLOWING OFF-SITE NON-MUNICIPAL SUPPLY WELLS WITHDRAW FROM THE INDICATED AQUIFERS WHEN PUMPING:
   - UPPER GLACIAL - GLEN OAKS POOL, N2219, N3756, N3927, N4202, N13266 AND 03247
   - UPPER GLACIAL AND UPPER PORTION OF THE MAGOTHY - N13221 AND Q1908
   - UPPER GLACIAL AND UPPER AND MIDDLE PORTION OF THE MAGOTHY - N8499 AND N8564
   - UPPER PORTION OF THE MAGOTHY - N2576, N7053, N7560, N8038, N8211, AND Q1909
   - UPPER AND MIDDLE PORTION OF THE MAGOTHY - N5535 AND N6073
   - MIDDLE PORTION OF THE MAGOTHY - N11048 AND Q3003
   - BASAL PORTION OF THE MAGOTHY - N8358
5. THE FOLLOWING OFF-SITE NON-MUNICIPAL DIFFUSION WELLS RECHARGE TO THE INDICATED AQUIFER WHEN OPERATING:
   - UPPER GLACIAL - N22200, N42030, N61090, N77620, N87870 AND N97140
   - UPPER GLACIAL AND UPPER PORTION OF THE MAGOTHY - Q30240
   - UPPER PORTION OF THE MAGOTHY - Q30250
   - UPPER AND MIDDLE PORTION OF THE MAGOTHY - N85650, N85660, N85670 AND N85680
   - MIDDLE PORTION OF THE MAGOTHY - DW9, DW10, N98760, N98770, N110800 AND N110810
   - MIDDLE AND BASAL PORTION OF THE MAGOTHY - DW11, DW12, N83720 AND N83730
6. THE WATER-LEVEL ELEVATION FOR MONITORING WELL 4MI APPEARS TO BE ANAMOLOUS AND WAS NOT USED.

0 800
SCALE IN FEET

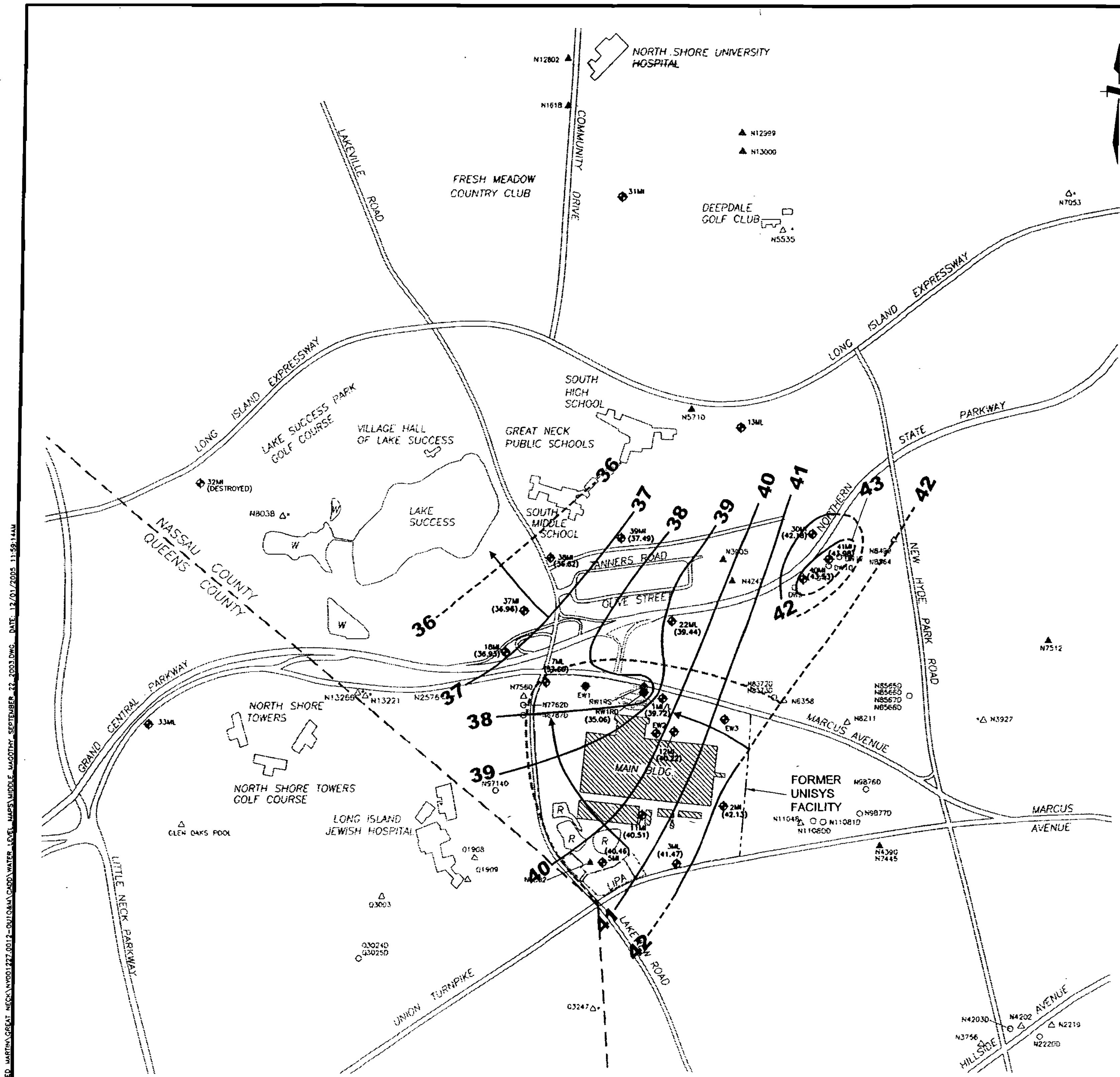
NO.	DATE	REVISION DESCRIPTION	BY	CKD

ARCADIS GERAGHTY&MILLER

PONTENTIOMETRIC SURFACE CONFIGURATION OF THE UPPER PORTION OF THE MAGOTHY AQUIFER ON SEPTEMBER 22, 2003

FORMER UNISYS FACILITY
GREAT NECK, NEW YORK

DRAWN LMC 11/02	DATE 2/03	PROJECT MANAGER C. SAN GIOVANNI 11/02	DEPARTMENT MANAGER
		LEAD DESIGN PROF.	CHECKED
CLIENT: LOCKHEED MARTIN COPRPORATION		PROJECT NUMBER NY12270012	DRAWING NUMBER A-2



EXPLANATION:

(W) BODY OF WATER

(R) RETENTION BASIN

30MI — LOCATION AND DESIGNATION OF MONITORING WELL SCREENED IN THE MIDDLE PORTION OF THE MAGOTHY AQUIFER

EW1 — LOCATION AND DESIGNATION OF SITE EXTRACTION OR RECOVERY WELL

N7512 — LOCATION AND DESIGNATION OF MUNICIPAL SUPPLY WELL

N6073 — LOCATION AND DESIGNATION OF NON-MUNICIPAL SUPPLY WELL

N2576 — LOCATION AND DESIGNATION OF NON-MUNICIPAL IRRIGATION WELL

N8372D — LOCATION AND DESIGNATION OF NON-MUNICIPAL DIFFUSION WELL

FORMER UNISYS FACILITY PROPERTY BOUNDARY

(43.98) WATER LEVEL ELEVATION IN FEET ABOVE SEA LEVEL (NAVD 88)

41 — LINE OF EQUAL WATER-LEVEL ELEVATION IN FEET ABOVE MEAN SEA LEVEL (DASHED WHERE INFERRED)

DIRECTION OF HORIZONTAL COMPONENT OF GROUNDWATER FLOW

DIRECTION OF HORIZONTAL COMPONENT OF GROUNDWATER FLOW

HORIZONTAL EXTENT OF GROUNDWATER TREATMENT SYSTEM CAPTURE ZONE – REPRESENTED BY LIMITING FLOW LINE

NOTES:

1. THE MIDDLE MAGOTHY AQUIFER EXTENDS FROM APPROXIMATELY -113 TO -204 FEET RELATIVE TO MEAN SEA LEVEL.
2. THE FOLLOWING ON-SITE EXTRACTION AND RECOVERY WELLS WERE PUMPING FROM THE INDICATED AQUIFERS:
   - UPPER GLACIAL AND UPPER PORTION OF THE MAGOTHY – RW1RS PUMPING AT 270 GALLONS PER MINUTE (GPM)
   - UPPER AND MIDDLE PORTION OF THE MAGOTHY – RW1RD PUMPING AT 108 GPM
   - UPPER PORTION OF THE MAGOTHY – EW1 PUMPING AT 359 GPM.
3. THE FOLLOWING OFF-SITE MUNICIPAL SUPPLY WELLS WHEN PUMPING WITHDRAW FROM THE INDICATED AQUIFERS:
   - UPPER PORTION OF THE MAGOTHY – N3905, N4243, AND N12999
   - UPPER AND MIDDLE PORTION OF THE MAGOTHY – N13000
   - MIDDLE PORTION OF THE MAGOTHY – N4390
   - MIDDLE AND BASAL PORTION OF THE MAGOTHY – N5710
   - BASAL PORTION OF THE MAGOTHY – N7445 AND N7512
4. THE FOLLOWING OFF-SITE NON-MUNICIPAL SUPPLY WELLS WITHDRAW FROM THE INDICATED AQUIFERS WHEN PUMPING:
   - UPPER GLACIAL – GLEN OAKS POOL, N2219, N3756, N3927, N4202, N13266 AND 03247
   - UPPER GLACIAL AND UPPER PORTION OF THE MAGOTHY – N13221 AND 01908
   - UPPER GLACIAL AND UPPER AND MIDDLE PORTION OF THE MAGOTHY – N8499 AND N8564
   - UPPER PORTION OF THE MAGOTHY – N2576, N7053, N7560, N8038, N8211, AND 01909
   - UPPER AND MIDDLE PORTION OF THE MAGOTHY – N5535 AND N6073
   - MIDDLE PORTION OF THE MAGOTHY – N11048 AND 03003
   - BASAL PORTION OF THE MAGOTHY – N8358
5. THE FOLLOWING OFF-SITE NON-MUNICIPAL DIFFUSION WELLS RECHARGE TO THE INDICATED AQUIFER WHEN OPERATING:
   - UPPER GLACIAL – N2220D, N4203D, N6109D, N7762D, N8787D AND N9714D
   - UPPER GLACIAL AND UPPER PORTION OF THE MAGOTHY – 03024D
   - UPPER PORTION OF THE MAGOTHY – 03025D
   - UPPER AND MIDDLE PORTION OF THE MAGOTHY – N8565D, N8566D, N8567D AND N8568D
   - MIDDLE PORTION OF THE MAGOTHY – DW9, DW10, N9876D, N9877D, N11080D AND N11081D
   - MIDDLE AND BASAL PORTION OF THE MAGOTHY – DW11, DW12, N8372D AND N8373D

0 800
SCALE IN FEET

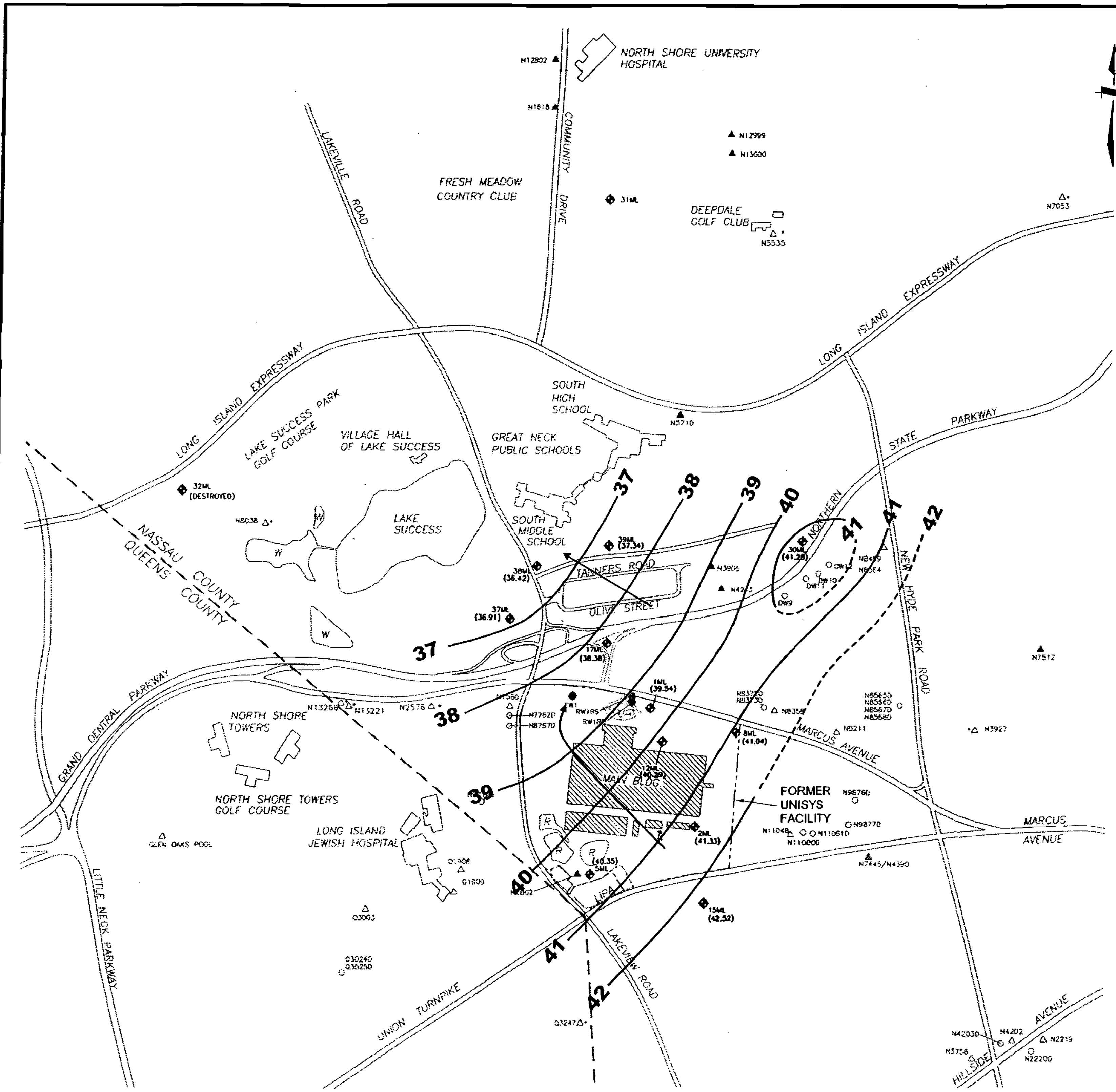
NO.	DATE	REVISION DESCRIPTION	BY	CKD

ARCADIS GERAGHTY & MILLER

POTENTIOMETRIC SURFACE CONFIGURATION OF THE MIDDLE MAGOTHY AQUIFER ON SEPTEMBER 22, 2003

FORMER UNISYS FACILITY
GREAT NECK, NEW YORK

DRAWN LMC	DATE 2/02	PROJECT MANAGER C. SAN GIOVANNI	DEPARTMENT MANAGER
		LEAD DESIGN PROF.	CHECKED
CLIENT: LOCKHEED MARTIN COPRPORATION		PROJECT NUMBER NY12270012	DRAWING NUMBER A-3



EXPLANATION:

- W — BODY OF WATER
- R — RETENTION BASIN
- 30ML — LOCATION AND DESIGNATION OF MONITORING WELL SCREENED IN THE BASAL PORTION OF THE MAGOTHY AQUIFER
- EW1 — LOCATION AND DESIGNATION OF SITE EXTRACTION OR RECOVERY WELL
- N7512 — LOCATION AND DESIGNATION OF MUNICIPAL SUPPLY WELL
- N6073 — LOCATION AND DESIGNATION OF NON-MUNICIPAL SUPPLY WELL
- N2576 — LOCATION AND DESIGNATION OF NON-MUNICIPAL IRRIGATION WELL
- N8372D — LOCATION AND DESIGNATION OF NON-MUNICIPAL DIFFUSION WELL
- FORMER UNISYS FACILITY PROPERTY BOUNDARY
- (42.28) — WATER LEVEL ELEVATION IN FEET ABOVE SEA LEVEL (NAVD 88)
- 41 — LINE OF EQUAL WATER-LEVEL ELEVATION IN FEET ABOVE MEAN SEA LEVEL (DASHED WHERE INFERRED)
- DIRECTION OF HORIZONTAL COMPONENT OF GROUNDWATER FLOW

NOTES:

1. THE BASAL MAGOTHY AQUIFER EXTENDS FROM APPROXIMATELY -204 TO -270 FEET RELATIVE TO MEAN SEA LEVEL.
2. THE FOLLOWING ON-SITE EXTRACTION AND RECOVERY WELLS WERE PUMPING FROM THE INDICATED AQUIFERS:

   UPPER GLACIAL AND UPPER PORTION OF THE MAGOTHY - RW1RS PUMPING AT 270 GALLONS PER MINUTE (GPM)

   UPPER AND MIDDLE PORTION OF THE MAGOTHY - RW1RD PUMPING AT 108 GPM

   UPPER PORTION OF THE MAGOTHY - EW1 PUMPING AT 359 GPM.
3. THE FOLLOWING OFF-SITE MUNICIPAL SUPPLY WELLS WHEN PUMPING WITHDRAW FROM THE INDICATED AQUIFERS:

   UPPER PORTION OF THE MAGOTHY - N3905, N4243, AND N12999

   UPPER AND MIDDLE PORTION OF THE MAGOTHY - N13000

   MIDDLE PORTION OF THE MAGOTHY - N4390

   MIDDLE AND BASAL PORTION OF THE MAGOTHY - N5710

   BASAL PORTION OF THE MAGOTHY - N7445 AND N7512
4. THE FOLLOWING OFF-SITE NON-MUNICIPAL SUPPLY WELLS WITHDRAW FROM THE INDICATED AQUIFERS WHEN PUMPING:

   UPPER GLACIAL - GLEN OAKS POOL, N2219, N3756, N3927, N4202, N13266 AND 03247

   UPPER GLACIAL AND UPPER PORTION OF THE MAGOTHY - N13221 AND 01908

   UPPER GLACIAL AND UPPER AND MIDDLE PORTION OF THE MAGOTHY - N8499 AND N8564

   UPPER PORTION OF THE MAGOTHY - N2576, N7053, N7560, N8038, N8211, AND 01909

   UPPER AND MIDDLE PORTION OF THE MAGOTHY - N5535 AND N6073

   MIDDLE PORTION OF THE MAGOTHY - N11048 AND Q3003

   BASAL PORTION OF THE MAGOTHY - N8358
5. THE FOLLOWING OFF-SITE NON-MUNICIPAL DIFFUSION WELLS RECHARGE TO THE INDICATED AQUIFER WHEN OPERATING:

   UPPER GLACIAL - N2220D, N4203D, N6109D, N7762D, N8787D AND N9714D

   UPPER GLACIAL AND UPPER PORTION OF THE MAGOTHY - Q3024D

   UPPER PORTION OF THE MAGOTHY - Q3025D

   UPPER AND MIDDLE PORTION OF THE MAGOTHY - N8565D, N8566D, N8567D AND N8568D

   MIDDLE PORTION OF THE MAGOTHY - DW9, DW10, N9876D, N9877D, N11080D AND N11081D

   MIDDLE AND BASAL PORTION OF THE MAGOTHY - DW11, DW12, N8372D AND N8373D

0 800
SCALE IN FEET

NO.	DATE	REVISION DESCRIPTION	BY / CKD

ARCADIS GERAGHTY & MILLER

POTENTIOMETRIC SURFACE CONFIGURATION OF THE BASIL MAGOTHY PORTION OF THE MAGOTHY AQUIFER ON SEPTEMBER 22, 2003
FORMER UNISYS FACILITY
GREAT NECK, NEW YORK

DRAWN: LMC	DATE: 2/03	PROJECT MANAGER: C. SAN GIOVANNI	DEPARTMENT MANAGER
		LEAD DESIGN PROF	CHECKED
CLIENT: LOCKHEED MARTIN COPRPORATION		PROJECT NUMBER: NY12270012	DRAWING NUMBER: A-4

Appendix B

Total Discharge Head Calculations - Recovery Well, Clear Well, and Discharge Pumps

BBL®
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

Head Loss Calculations for Discharge from Recovery Well to Treatment Plant at Steady State Conditions,
Off-Site IRM, Great Neck, New York.

By:	K. Kuc	
Chkd:	D. Falatko	6/25/03
Rev:	W. Wittek	6/27/03

System Flow = **600** **gpm**

Description	DP (psi)	DH (feet)	Design Flow (gpm)	Design Flow (cfs)	Inside Diameter (inches)	Velocity (fps)	Pipe Length (feet)	Fitting Valve Quantity	Fitting/valve Coefficient (K') (Cv for Valves)	Friction Factor (f)	Pipe C Value	Elevation (ft, MSL)	Elevation change (feet)	Pressure Loss (psi)	Pipeline Pressure (psi)
Static Head		130.74													
From entrance vault to top of air stripper:															
Elbow (90 deg.)		--	600	1.34	9.85	2.53	--	1	30	0.0225	--	157	17	0.03	-0.07
Piping (10" Ductile Iron)			600	1.34	9.85	2.53	16	--	--	0.0225	130			0.02	7.32
Elbow (90 deg.)			600	1.34	9.85	2.53	--	1	30	0.0225	--	140	9	0.03	7.34
Butterfly valve (V2) (2)		--	600	1.34	11.75	1.78	--	--	9000	0.02	--			0.00	11.27
Piping (12" Ductile Iron)		--	600	1.34	11.75	1.78	3	--	--	0.0215	130			0.00	11.28
Elbow (90 deg.)		--	600	1.34	11.75	1.78	--	1	30	0.0215	--			0.01	11.28
Piping (12" Ductile Iron)		--	600	1.34	11.75	1.78	6	--	--	0.0215	130			0.00	11.29
Butterfly valve (V1) (2)			600	1.34	11.75	1.78	--	--	9000	0.02	--			0.00	11.29
Piping (12" Ductile Iron)		--	600	1.34	11.75	1.78	3	--	--	0.0215	130			0.00	11.30
Elbow (90 deg.)		--	600	1.34	11.75	1.78	--	1	30	0.0215	--	131	6	0.01	11.30
Piping (12" Ductile Iron)			600	1.34	11.75	1.78	4	--	--	0.0215	130			0.00	13.92
Elbow (90 deg.)			600	1.34	11.75	1.78	--	1	30	0.0215	--			0.01	13.92
Piping (12" Ductile Iron)		--	600	1.34	11.75	1.78	6	--	--	0.0215	130			0.00	13.93
Elbow (90 deg.)		--	600	1.34	6.07	6.66	--	1	30	0.0215	--			0.19	13.93
Butterfly Isolation Valve			600	1.34	6.07	6.66	--	1	1600	0.02	--			0.14	14.13
Check valve			600	1.34	6.07	6.66	--	1	40	0.02	--			0.24	14.27
Flowmeter			600	1.34	6.07	6.66	--	1	1000	0.02	--			0.36	14.51
Butterfly Isolation Valve			600	1.34	6.07	6.66	--	1	1600	0.02	--	125	-1	0.14	14.87
Recovery Well to Entrance Vault:															
Reducer 8"x6"			600	1.34	7.98	3.85	--	2	50	0.02	--	126	0	0.20	14.57
Piping (8" HDPE)		--	600	1.34	7.98	3.85	20	--	--	0.02	130			0.06	14.77
Elbow (45 deg.)		--	600	1.34	7.98	3.85	0	1	60	0.02	--	126	-28	0.12	14.83
Piping (8" HDPE)		--	600	1.34	7.98	3.85	1750	--	--	0.02	130	154	0	5.45	2.82
Expansion 6"x8"			600	1.34	7.98	3.85	--	2	50	0.02	--			0.20	8.27
Flowmeter			600	1.34	6.07	6.66	--	1	500	0.02	--			1.44	8.47
Cla-Val control valve			600	1.34	6.07	6.66	--	1	440	0.02	--			6.50	9.91
Mesh strainer			600	1.34	6.07	6.66	--	1	550	0.02	--			1.19	16.41
Butterfly Isolation Valve			600	1.34	6.07	6.66	--	1	1600	0.02	--			0.14	17.60
Tee (run/branch) (6")			600	1.34	6.07	6.67	--	1	60	0.02	--	154	128	0.36	17.74
Check valve			600	1.34	6.07	6.66	--	1	40	0.02	--			0.24	73.47
Piping (6" SS)			600	1.34	6.07	6.67	150	--	0	0.0175	130	26.26	0	1.78	75.49
							1770								

Head Loss Calculations for Discharge from Recovery Well to Treatment Plant at Steady State Conditions,
Off-Site IRM, Great Neck, New York.

By:	K. Kuc	
Chkd:	D. Falatko	6/25/03
Rev:	W. Wittek	6/27/03

System Flow = **600** **gpm**

Description	DP (psi)	DH (feet)	Design Flow (gpm)	Design Flow (cfs)	Inside Diameter (inches)	Velocity (fps)	Pipe Length (feet)	Fitting Valve Quantity	Fitting/valve Coefficient (K') (Cv for Valves)	Friction Factor (f)	Pipe C Value	Elevation (ft, MSL)	Elevation change (feet)	Pressure Loss (psi)	Pipeline Pressure (psi)
										total elevation change:			130.74		
		--	--	--	--	--					psi:		56.671001	18.89071402	
											feet		130.74	43.58	
Total Static Head (psi):														**56.60**	**psi**
Total Losses (psi)														**18.89**	**psi**
Influent Vault Pressure (psi):														**14.57**	**psi**
Total Static Head plus Losses with Safety Factor (1.15)														**86.81**	**psi**
Total Static Head plus Losses with Safety Factor (1.0)														**75.49**	**psi**
Total Discharge Head (feet) with 15% Safety Factor														200.44	**feet**
Total Discharge Head (feet) with 10% Safety Factor														174.30	**feet**
Pump Hydraulic Horsepower:														30.40	**HP**
Pump Efficiency:														80%	
Pump Electrical Horsepower:														**38**	**HP**
Flow:	**600 gpm**			**TDH:**	**200**	**feet**									

Notes:

These calculations are for discharge from the off-site extraction well to the stripper tower.

Unless notes otherwise, friction factors and resistance coefficient formulas for steel pipe and fittings taken from *Flow of Fluids Through Valves, Fittings, and Pipe*, Crane Co., 1978

Friction loss formula taken from *Flow of Fluids Through Valves, Fittings, and Pipe*, Crane Co., 1978

Headloss through valves assumes valves are in fully open position.

130.74 ft. ft.

Static head determined as follows: (Highest Point in the System) - (Water level at Recovery Well) + 10 ' drawdown= (155) - (36.26) +10 =

Ground elevation at the monitoring/recovery well	158	
Depth to GW w/drawdown:	131.74	
GW elevation:	26.26	
	130	
Stripper:	27	
Highest Point in the System:	157	36.26
Difference from GW drawdown to top of stripper:	**130.74**	

Based on 4th Quarter Groundwater Report, Depths to water at surrounding monitoring wells are as follows:

39 MU	121.67
39 MI	121.41
39 ML	122.14
Average:	121.74

Ground elevation difference between above MWs and the recovery well was neglected.

Head Loss Calculations for Clearwell #1 Pump,
Off-Site IRM, Great Neck, New York.

By:	K. Kuc	
Chkd:	D. Falatko	6/25/03
Rev:	W. Wittek	6/27/03

System Flow = **600** **gpm**

Description	DP (psi)	DH (feet)	Design Flow (gpm)	Design Flow (cfs)	Inside Diameter (inches)	Velocity (fps)	Pipe Length (feet)	Fitting Valve Quantity	Fitting/valve Coefficient (K') (Cv for Valves)	Friction Factor (f)	Pipe C Value	Elevation (ft, MSL)	Elevation change (feet)	Pressure Loss (psi)	Pipeline Pressure (psi)
Static Head		35													
From CW pump inlet to air stripper:															23.17
Piping (8" Ductile Iron)		--	600	1.34	7.98	3.85	12	--	--	--	130	125	0	0.04	23.13
Elbow (90 deg.)		--	600	1.34	7.98	3.85	--	1	24	0.024	--			0.06	23.07
Cla-Val control valve			600	1.34	7.98	3.85	--	1	440	0.02	--			1.86	21.21
Elbow (90 deg.)		--	600	1.34	7.98	3.85	--	1	24	0.024	--			0.06	21.15
Contraction 8"x4"			600	1.34	3.98	15.48	--	1	0.22		--			0.35	22.77
4" Butterfly Flow Control Valve			600	1.34	3.98	15.48	--	1	600	0.02	--			1.00	21.77
Expansion 4"x8"			600	1.34	7.98	3.85	--	1	0.56		--			0.06	21.72
Tee (run/branch) (8")			600	1.34	7.98	3.85	--	1	60	0.024	--	130	5	0.14	19.41
Piping (8" Ductile Iron)		--	600	1.34	7.98	3.85	8	1	--	0.024	130			0.02	21.13
Elbow (90 deg.)		--	600	1.34	7.98	3.85	--	1	24	0.024	--			0.06	21.07
Expansion 8"x10"			600	1.34	7.98	3.85	--	2	50	0.02	--			0.20	20.87
Tee (run/branch) (10")		--	600	1.34	9.85	2.53	--	1	60	0.024	--			0.06	20.81
10" Butterfly Isolation Valve			600	1.34	9.85	2.53	--	2	3400	0.02	--			0.03	20.78
Elbow (90 deg.)			600	1.34	9.85	2.53	--	1	24	0.024	--			0.02	20.75
Piping (10" Ductile Iron)		--	600	1.34	9.85	2.53	20	1	--	0.024	130			0.02	20.73
Elbow (90 deg.)			600	1.34	9.85	2.53	--	1	24	0.024	--			0.02	20.71
Tee (run/branch) (10")		--	600	1.34	9.85	2.53	--	1	60	0.024	--			0.06	20.65
Elbow (90 deg.)			600	1.34	9.85	2.53	--	1	24	0.024	--			0.02	20.62
Piping (10" Ductile Iron)		--	600	1.34	9.85	2.53	30	--	--	0.0225	130	160	30	0.03	7.58
							70								
						total length of pipe:	70	feet			feet	35	35		
		--	--	--	--	--					psi:	15.17	15.17	4.13	psi
														9.54	feet

Head Loss Calculations for Clearwell #1 Pump,
Off-Site IRM, Great Neck, New York.

By:	K. Kuc	
Chkd:	D. Falatko	6/25/03
Rev:	W. Wittek	6/27/03

System Flow = **600** **gpm**

Description	DP (psi)	DH (feet)	Design Flow (gpm)	Design Flow (cfs)	Inside Diameter (inches)	Velocity (fps)	Pipe Length (feet)	Fitting Valve Quantity	Fitting/valve Coefficient (K') (Cv for Valves)	Friction Factor (f)	Pipe C Value	Elevation (ft, MSL)	Elevation change (feet)	Pressure Loss (psi)	Pipeline Pressure (psi)
Total Static Head (psi)														**15.17**	**psi**
Total Friction Losses (psi)														**4.13**	**psi**
Total Static Head with Losses (psi)														**19.31**	**psi**
Total Static Head with Losses with Safety Factor (1.20)														**23.17**	**psi**
Total Discharge Head (feet) with 25% Safety Factor														**53.49**	**feet**
Pump Hydraulic Horsepower:														8.11	**HP**
Pump Efficiency:														84%	
Pump Electrical Horsepower:														**10**	**HP**
Flow: 600 gpm TDH: 53 feet															

Notes:

Unless notes otherwise, friction factors and resistance coefficient formulas for steel pipe and fittings taken from *Flow of Fluids Through Valves, Fittings, and Pipe*, Crane Co., 1978

Friction loss formula taken from *Flow of Fluids Through Valves, Fittings, and Pipe*, Crane Co., 1978

Headloss through valves assumes valves are in fully open position.

Head Loss Calculations for Discharge from Treatment System to Diffusion Wells (Two Wells) at Steady State Conditions,
Off-Site IRM, Great Neck, New York.

By:	K. Kuc	
Chkd:	D. Falatko	6/25/03
Rev:	W. Wittek	6/27/03

System Flow = **600** **gpm**

Description	DP (psi)	DH (feet)	Design Flow (gpm)	Design Flow (cfs)	Inside Diameter (inches)	Velocity (fps)	Pipe Length (feet)	Fitting Valve Quantity	Fitting/valve Coefficient (K') (Cv for Valves)	Friction Factor (f)	Pipe C Value	Elevation (ft, MSL)	Elevation change (feet)	Pressure Loss (psi)	Pipeline Pressure (psi)
Static Head		0													
From CW pump inlet to effluent vault:															40.93
Piping (8" Ductile Iron)		--	600	1.34	7.98	3.85	18	--	--	--	130	125	0	0.06	40.88
Tee (run/branch) (8")			600	1.34	7.98	3.85	--	1	60	0.024	--	133	8	0.14	37.27
Cla-Val control valve			600	1.34	7.98	3.85	--	1	440	0.02	--			1.86	35.41
Piping (8" Ductile Iron)		--	600	1.34	7.98	3.85	8.5	--	--	0.024	130			0.03	35.38
Elbow (90 deg.)		--	600	1.34	7.98	3.85	--	1	24	0.024	--			0.06	35.32
Piping (8" Ductile Iron)		--	600	1.34	7.98	3.85	5.5	1	--	0.024	130			0.02	35.31
Elbow (90 deg.)		--	600	1.34	7.98	3.85	--	1	24	0.024	--			0.06	35.25
Piping (8" Ductile Iron)			600	1.34	7.98	3.85	15	1	--	0.024	130			0.05	35.20
8" Butterfly Isolation Valve			600	1.34	7.98	3.85	--	1	3400	0.02	--			0.03	35.17
Tee (run/branch) (8")		--	600	1.34	7.98	3.85	--	1	60	0.024	--			0.14	35.03
6" Motorized Butterfly Valve			600	1.34	5.98	6.86	--	1	1600	0.02	--			0.14	34.89
Expansion 6"x8"			600	1.34	6.98	5.03	--	2	50	0.02	--			0.34	34.55
Bag Filters (maximum)			600	1.34	7.98		1	--	--					20.00	14.55
8" Butterfly Isolation Valve			600	1.34	7.98	3.85	--	2	3400	0.02	--			0.03	14.52
6" Swing Check valve			600	1.34	5.98	6.86	--	1	1200	0.02	--			0.25	14.27
6" Flowmeter			600	1.34	5.98	6.86	--	1	1000	0.02	--			0.36	13.91
4" Butterfly Flow Control Valve			600	1.34	3.98	15.48	--	1	600	0.02	--			1.00	12.91
Expansion 4"x8"			600	1.34	4.98	9.89	--	2	50	0.02	--			1.32	11.59
Piping (8" Ductile Iron)			600	1.34	7.98	3.85	12	--	--	0.024	130			0.04	11.55
Elbow (90 deg.)			600	1.34	7.98	3.85	--	1	24	0.024	--			0.06	11.49
Piping (8" Ductile Iron)		--	600	1.34	7.98	3.85	6	1	--	0.024	130			0.02	11.48
Tee (run/branch) (10")		--	600	1.34	9.85	2.53	--	1	60	0.024	--			0.06	11.41
Piping (10" Ductile Iron)		--	600	1.34	9.85	2.53	8	--	--	0.0225	130	125	-8	0.01	14.87
							74								
Effluent Vault through 5710 Pipeline Connection:															
Piping (10" Ductile Iron)		--	600	1.34	9.85	2.53	43	1	--	0.0225	130			0.05	14.82
Elbow (90 deg.)		--	600	1.34	9.85	2.53	--	1	24	0.0225	--			0.02	14.80
Piping (10" Ductile Iron)			600	1.34	9.85	2.53	25	--	--	0.0225	130			0.03	14.77
Gate Valve (10")			600	1.34	9.85	2.53	6	1	eq. Length	0.0225	130			0.01	14.77
Elbow (90 deg.)		--	600	1.34	9.85	2.53	--	1	24	0.0225	--			0.02	14.74
Piping (10" Ductile Iron)		--	600	1.34	9.85	2.53	5	1	--	0.0225	130			0.01	14.74
Elbow (45 deg.) (10" X 12")			600	1.34	9.85	2.53	--	1	12	0.0225	--			0.01	14.73
							73	feet							
5710 Pipeline through New Pipeline:															
Piping (12" Ductile Iron)		--	600	1.34	11.75	1.78	225	--	--	0.0215	130	123	-2	0.11	15.49
Elbow (22.5 deg.)		--	600	1.34	11.75	1.78	--	1	6	0.0215	--			0.00	15.48
Piping (12" Ductile Iron)			600	1.34	11.75	1.78	20	--	--	0.0215	130			0.01	15.47
Elbow (11.5 deg.)			600	1.34	11.75	1.78	--	1	4	0.0215	--			0.00	15.47
Venturi Flowmeter [1]			600	1.34	11.75	1.78	--	1		0.0215	--			0.30	15.17
Piping (12" Ductile Iron)			600	1.34	11.75	1.78	75	1	--	0.0215	130			0.04	15.14
Elbow (22.5 deg.)			600	1.34	11.75	1.78	--	1	6	0.0215	--			0.00	15.13

Head Loss Calculations for Discharge from Treatment System to Diffusion Wells (Two Wells) at Steady State Conditions,
Off-Site IRM, Great Neck, New York.

By:	K. Kuc	
Chkd:	D. Falatko	6/25/03
Rev:	W. Wittek	6/27/03

System Flow = **600** **gpm**

Description	DP (psi)	DH (feet)	Design Flow (gpm)	Design Flow (cfs)	Inside Diameter (inches)	Velocity (fps)	Pipe Length (feet)	Fitting Valve Quantity	Fitting/valve Coefficient (K') (Cv for Valves)	Friction Factor (f)	Pipe C Value	Elevation (ft, MSL)	Elevation change (feet)	Pressure Loss (psi)	Pipeline Pressure (psi)
Piping (12" Ductile Iron)			600	1.34	11.75	1.78	50	--	--	0.0215	130			0.02	15.11
Elbow (90 deg.)		--	600	1.34	11.75	1.78	--	1	24	0.0215	--			0.01	15.10
Piping (12" Ductile Iron)		--	600	1.34	11.75	1.78	25	1	--	0.0215	130			0.01	15.09
Elbow (45 deg.)		--	600	1.34	11.75	1.78	--	1	12	0.0215	--			0.01	15.08
Piping (12" Ductile Iron)		--	600	1.34	11.75	1.78	250	1	--	0.0215	130			0.12	14.96
Elbow (11.5 deg.)		--	600	1.34	11.75	1.78	--	1	4	0.0215	--			0.00	14.96
Piping (12" Ductile Iron)			600	1.34	11.75	1.78	40	1	--	0.0215	130			0.02	14.94
							685	feet							
							0	feet							
Into Diffusion well DW-100/101:															
Piping (8" PVC Bluebrute)			600	1.34	7.98	3.85	943	--	--	0.02	150			2.25	12.69
Tee (run/branch) (8")		--	600	1.34	7.98	3.85	--	1	60	0.02	--			0.12	12.57
Gate Valve (8") [4]			600	1.34	7.98	3.85	8	1	eq. Length	0.0225	150			0.02	12.55
Piping (8" PVC Bluebrute)		--	600	1.34	7.98	3.85	25	--	--	0.02	150			0.06	12.49
Elbow (45 deg.)		--	600	1.34	7.98	3.85	--	6	16	0.02	--			0.19	12.30
Piping (8" PVC Bluebrute)			600	1.34	7.98	3.85	0	--	--	0.02	150			0.00	12.30
Elbow (90 deg.)			600	1.34	7.98	3.85	--	1	30	0.02	--			0.06	12.24
Tee (run/run) (8")			600	1.34	7.98	3.85	--	2	20	0.02	--			0.08	12.16
Gate Valve (6")			600	1.34	5.98	6.86	8	1	eq. Length	0.0225	150			0.08	12.08
Flowmeter			600	1.34	5.98	6.86	--	1	1000	0.02	--	123.5	-3.50	0.36	13.24
6" Butterfly Isolation Valve			600	1.34	5.98	6.86	--	1	1600	0.02	--			0.14	13.10
Elbow (90 deg.)			600	1.34	5.98	6.86	--	1	30	0.02	--			0.19	12.91
Piping (6" steel well drop pipe)			600	1.34	5.98	6.86	100	--	--	0.02	150			0.97	11.93
Injection water level in well			600				--	1	600		--	82	-41.5	1.00	28.92
VOV backpressure at DWs [5]	20	psi												0.00	28.92
							1068	feet							
						total with drop pipe in well:	1827	feet			feet	-43	-2		
		--	--	--	--	--					psi:	-18.64	-0.65	32.39	psi
														74.72	feet
Total Static Head (psi)														**-18.64**	**psi**
Total Friction Losses (psi)														**31.39**	**psi**
VOV Backpressure Required (psi)														**20.00**	**psi**
Total Static Head with VOV and Losses (psi)														**32.75**	**psi**
Total Static Head with VOV and Losses with Safety Factor (1.25)														**40.93**	**psi**
Total Discharge Head (feet) with 25% Safety Factor														**94.52**	**feet**
Pump Hydraulic Horsepower														**14.34**	**HP**
Pump Efficiency														**84%**	
Pump Electrical Horsepower														**17**	**HP**
Flow: 600 gpm TDH: 95 feet															

Notes:

These calculations are for discharge to off-site diffusion wells

Unless notes otherwise, friction factors and resistance coefficient formulas for steel pipe and fittings taken from *Flow of Fluids Through Valves, Fittings, and Pipe*, Crane Co., 1978

Friction loss formula taken from *Flow of Fluids Through Valves, Fittings, and Pipe*, Crane Co., 1978

Headloss through valves assumes valves are in fully open position.

Head Loss Calculations for Discharge from Treatment System to Diffusion Wells (Two Wells) at Steady State Conditions,
Off-Site IRM, Great Neck, New York.

By:	K. Kuc	
Chkd:	D. Falatko	6/25/03
Rev:	W. Wittek	6/27/03

System Flow = **600** **gpm**

Description	DP (psi)	DH (feet)	Design Flow (gpm)	Design Flow (cfs)	Inside Diameter (inches)	Velocity (fps)	Pipe Length (feet)	Fitting Valve Quantity	Fitting/valve Coefficient (K') (Cv for Valves)	Friction Factor (f)	Pipe C Value	Elevation (ft, MSL)	Elevation change (feet)	Pressure Loss (psi)	Pipeline Pressure (psi)

Static head determined as follows: (Highest Point in the System) - (Clearwell Level)
Highest point in system = 134 ft

Clearwell water level = (Elevation of building slab) - (Distance to water surface) (130) - (5) 125 ft

Minimum static head: 9

Head Loss Calculations for Discharge from Treatment System to Diffusion Wells at Steady State Conditions (3 Wells), Off-Site IRM, Great Neck, New York.

By:	K. Kuc	
Chkd:	D. Falatko	6/25/03
Rev:	D. Falatko	6/27/03

System Flow = **600** **gpm**

Description	DP (psi)	DH (feet)	Design Flow (gpm)	Design Flow (cfs)	Inside Diameter (inches)	Velocity (fps)	Pipe Length (feet)	Fitting Valve Quantity	Fitting/valve Coefficient (K') (Cv for Valves)	Friction Factor (f)	Pipe C Value	Elevation (ft, MSL)	Elevation change	Pressure Loss (psi)	Pipeline Pressure (psi)
Static Head		0													
From CW pump inlet to effluent vault:															39.39
Piping (8" Ductile Iron)		--	600	1.34	7.98	3.85	18	--	--	--	130	125	0	0.06	39.33
Tee (run/branch) (8")			600	1.34	7.98	3.85	--	1	60	0.024	--	133	8	0.14	35.72
Cla-Val control valve			600	1.34	7.98	3.85	--	1	440	0.02	--			1.86	33.86
Piping (8" Ductile Iron)		--	600	1.34	7.98	3.85	8.5	--	--	0.024	130			0.03	33.84
Elbow (90 deg.)		--	600	1.34	7.98	3.85	--	1	24	0.024	--			0.06	33.78
Piping (8" Ductile Iron)		--	600	1.34	7.98	3.85	5.5	1	--	0.024	130			0.02	33.76
Elbow (90 deg.)		--	600	1.34	7.98	3.85	--	1	24	0.024	--			0.06	33.70
Piping (8" Ductile Iron)			600	1.34	7.98	3.85	15	1	--	0.024	130			0.05	33.66
8" Butterfly Isolation Valve			600	1.34	7.98	3.85	--	1	3400	0.02	--			0.03	33.63
Tee (run/branch) (8")		--	600	1.34	7.98	3.85	--	1	60	0.024	--			0.14	33.48
6" Motorized Butterfly Valve			600	1.34	5.98	6.86	--	1	1600	0.02	--			0.14	33.34
Expansion 6"x8"			600	1.34	6.98	5.03	--	2	50	0.02	--			0.34	33.00
Bag Filters (maximum)			600	1.34	7.98		1	--	--					20.00	13.00
8" Butterfly Isolation Valve			600	1.34	7.98	3.85	--	2	3400	0.02	--			0.03	12.97
6" Swing Check valve			600	1.34	5.98	6.86	--	1	1200	0.02	--			0.25	12.72
6" Flowmeter			600	1.34	5.98	6.86	--	1	1000	0.02	--			0.36	12.36
4" Butterfly Flow Control Valve			600	1.34	3.98	15.48	--	1	600	0.02	--			1.00	11.36
Expansion 4"x8"			600	1.34	4.98	9.89	--	2	50	0.02	--			1.32	10.04
Piping (8" Ductile Iron)			600	1.34	7.98	3.85	12	--	--	0.024	130			0.04	10.01
Elbow (90 deg.)			600	1.34	7.98	3.85	--	1	24	0.024	--			0.06	9.95
Piping (8" Ductile Iron)		--	600	1.34	7.98	3.85	6	1	--	0.024	130			0.02	9.93
Tee (run/branch) (10")		--	600	1.34	9.85	2.53	--	1	60	0.024	--			0.06	9.87
Piping (10" Ductile Iron)		--	600	1.34	9.85	2.53	8	--	--	0.0225	130	125	-8	0.01	13.33
Effluent Vault through 5710 Pipeline Connection:															
Piping (10" Ductile Iron)		--	600	1.34	9.85	2.53	43	1	--	0.0225	130			0.05	13.28
Elbow (90 deg.)		--	600	1.34	9.85	2.53	--	1	24	0.0225	--			0.02	13.26
Piping (10" Ductile Iron)			600	1.34	9.85	2.53	25	--	--	0.0225	130			0.03	13.23
Gate Valve (10")			600	1.34	9.85	2.53	6	1	eq. Length	0.0225	130			0.01	13.22
Elbow (90 deg.)		--	600	1.34	9.85	2.53	--	1	24	0.0225	--			0.02	13.20
Piping (10" Ductile Iron)		--	600	1.34	9.85	2.53	5	1	--	0.0225	130			0.01	13.19
Elbow (45 deg.) (10" X 12")			600	1.34	9.85	2.53	--	1	12	0.0225	--			0.01	13.18
							79	feet							

Head Loss Calculations for Discharge from Treatment System to Diffusion Wells at Steady State Conditions (3 Wells),
Off-Site IRM, Great Neck, New York.

By:	K. Kuc	
Chkd:	D. Falatko	6/25/03
Rev:	D. Falatko	6/27/03

System Flow = **600** **gpm**

Description	DP (psi)	DH (feet)	Design Flow (gpm)	Design Flow (cfs)	Inside Diameter (inches)	Velocity (fps)	Pipe Length (feet)	Fitting Valve Quantity	Fitting/valve Coefficient (K') (Cv for Valves)	Friction Factor (f)	Pipe C Value	Elevation (ft, MSL)	Elevation change	Pressure Loss (psi)	Pipeline Pressure (psi)
5710 Pipeline through New Pipeline:															
Piping (12" Ductile Iron)		--	600	1.34	11.75	1.78	255	--	--	0.0215	130	123	-2	0.12	13.93
Elbow (22.5 deg.)		--	600	1.34	11.75	1.78	--	1	6	0.0215	--			0.00	13.92
Piping (12" Ductile Iron)			600	1.34	11.75	1.78	20	--	--	0.0215	130			0.01	13.91
Elbow (11.5 deg.)			600	1.34	11.75	1.78	--	1	4	0.0215	--			0.00	13.91
Venturi Flowmeter [1]			600	1.34	11.75	1.78	--	1		0.0215	--			0.30	13.61
Piping (12" Ductile Iron)			600	1.34	11.75	1.78	55	1	--	0.0215	130			0.03	13.59
Elbow (22.5 deg.)			600	1.34	11.75	1.78	--	1	6	0.0215	--			0.00	13.58
Piping (12" Ductile Iron)			600	1.34	11.75	1.78	35	--	--	0.0215	130			0.02	13.57
Elbow (90 deg.)		--	600	1.34	11.75	1.78	--	1	24	0.0215	--			0.01	13.56
Piping (12" Ductile Iron)		--	600	1.34	11.75	1.78	25	1	--	0.0215	130			0.01	13.54
Elbow (45 deg.)		--	600	1.34	11.75	1.78	--	1	12	0.0215	--			0.01	13.54
Piping (12" Ductile Iron)		--	600	1.34	11.75	1.78	240	1	--	0.0215	130			0.11	13.43
Elbow (11.5 deg.)		--	600	1.34	11.75	1.78	--	1	4	0.0215	--			0.00	13.42
Piping (12" Ductile Iron)			600	1.34	11.75	1.78	40	1	--	0.0215	130			0.02	13.40
							670	feet							
New effluent pipeline to diffusion well DW-103:															
Tee (run/branch) (8")		--	600	1.34	7.98	3.85	--	1	60	0.02	--	127	4.00	0.12	11.55
Butterfly Valve (8") [4]			600	1.34	7.98	3.85	8	1	eq. Length	0.0225	150			0.02	11.53
Piping (8" PVC Bluebrute)		--	600	1.34	7.98	3.85	40	--	--	0.02	150			0.10	11.44
Elbow (45 deg.)		--	600	1.34	7.98	3.85	--	1	16	0.02	--			0.03	11.40
Piping (8" PVC Bluebrute)			600	1.34	7.98	3.85	80	--	--	0.02	150			0.19	11.21
Elbow (90 deg.)			600	1.34	7.98	3.85	--	1	30	0.02	--			0.06	11.15
Piping (8" PVC Bluebrute)			600	1.34	7.98	3.85	416	--	--	0.02	150			0.99	10.16
Tee (run/run) (8")			200	0.45	7.98	1.28	--	2	20	0.02	--			0.01	10.15
Gate Valve (4")			200	0.45	3.98	5.16	8	1	eq. Length	0.0225	150			0.07	10.08
Flowmeter			200	0.45	3.98	5.16	--	1	1000	0.02	--	122	-5.00	0.04	12.20
Butterfly Isolation Valve			200	0.45	3.98	5.16	--	1	600	0.02	--			0.11	12.09
Elbow (90 deg.)			200	0.45	3.98	5.16	--	1	30	0.02	--			0.11	11.98
Injection water level in well			200				--	1	600		--	82	-40	0.11	29.21
VOV backpressure at DWs [5]	15	psi												0.00	29.21
							544	feet							

Head Loss Calculations for Discharge from Treatment System to Diffusion Wells at Steady State Conditions (3 Wells),
Off-Site IRM, Great Neck, New York.

By:	K. Kuc	
Chkd:	D. Falatko	6/25/03
Rev:	D. Falatko	6/27/03

System Flow = **600** **gpm**

Description	DP (psi)	DH (feet)	Design Flow (gpm)	Design Flow (cfs)	Inside Diameter (inches)	Velocity (fps)	Pipe Length (feet)	Fitting Valve Quantity	Fitting/valve Coefficient (K') (Cv for Valves)	Friction Factor (f)	Pipe C Value	Elevation (ft, MSL)	Elevation change	Pressure Loss (psi)	Pipeline Pressure (psi)
Diffusion well DW-103 to DW-102:															
Tee (run/branch) (8")		--	400	0.89	7.98	2.56	--	1	60	0.02	--			0.05	10.11
Gate Valve (8") [4]			400	0.89	7.98	2.56	8	1	eq. Length	0.0225	150			0.01	10.10
Piping (8" PVC Bluebrute)		--	400	0.89	7.98	2.56	40	--	--	0.02	150			0.05	10.05
Elbow (45 deg.)		--	400	0.89	7.98	2.56	--	1	16	0.02	--			0.01	10.04
Piping (8" PVC Bluebrute)			400	0.89	7.98	2.56	40	--	--	0.02	150			0.05	9.99
Elbow (90 deg.)			400	0.89	7.98	2.56	--	1	30	0.02	--			0.03	9.97
Piping (8" PVC Bluebrute)			400	0.89	7.98	2.56	116	--	--	0.02	150			0.13	9.83
Tee (run/run) (8")			200	0.45	7.98	1.28	--	2	20	0.02	--			0.01	9.83
Gate Valve (4")			200	0.45	3.98	5.16	8	1	eq. Length	0.0225	150			0.07	9.75
Flowmeter			200	0.45	3.98	5.16	--	1	1000	0.02	--	123.5	-3.50	0.04	11.23
4" Butterfly Isolation Valve			200	0.45	3.98	5.16	--	1	600	0.02	--			0.11	11.12
Elbow (90 deg.)			200	0.45	3.98	5.16	--	1	30	0.02	--			0.11	11.01
Injection water level in well			200				--	1	600		--	82	-41.5	0.11	28.89
VOV backpressure at DWs [5]	15	psi												0.00	28.89
							212	feet							
Diffusion well DW-102 to DW-101:															
Tee (run/branch) (8")		--	200	0.45	7.98	1.28	--	1	60	0.02	--			0.01	10.15
Gate Valve (8") [4]			200	0.45	7.98	1.28	8	1	eq. Length	0.0225	150			0.00	10.14
Piping (8" PVC Bluebrute)		--	200	0.45	7.98	1.28	220	--	--	0.02	150			0.07	10.07
Elbow (45 deg.)		--	200	0.45	7.98	1.28	--	1	16	0.02	--			0.00	10.07
Piping (8" PVC Bluebrute)		--	200	0.45	7.98	1.28	62	--	--	0.02	150			0.02	10.05
Tee (run/run) (8")			200	0.45	7.98	1.28	--	2	20	0.02	--			0.01	10.04
Flowmeter			200	0.45	3.98	5.16	--	1	1000	0.02	--	129	2	0.04	9.14
4" Butterfly Isolation Valve			200	0.45	3.98	5.16	--	1	600	0.02	--			0.11	9.02
Gate Valve (4")			200	0.45	3.98	5.16	8	1	eq. Length	0.0225	150			0.07	8.95
Elbow (90 deg.)			200	0.45	3.98	5.16	--	1	30	0.02	--			0.11	8.84
Injection water level in well			200				--	1	600		--	82	-47	0.11	29.11
VOV backpressure at DWs [5]	15	psi												0.00	29.11
							298	feet			feet	-43	4		
		--	--	--	--	--					psi:	-18.64	1.73	30.15	psi
														69.56	feet

Head Loss Calculations for Discharge from Treatment System to Diffusion Wells at Steady State Conditions (3 Wells),
Off-Site IRM, Great Neck, New York.

By:	K. Kuc	
Chkd:	D. Falatko	6/25/03
Rev:	D. Falatko	6/27/03

System Flow = **600** **gpm**

Description	DP (psi)	DH (feet)	Design Flow (gpm)	Design Flow (cfs)	Inside Diameter (inches)	Velocity (fps)	Pipe Length (feet)	Fitting Valve Quantity	Fitting/valve Coefficient (K') (Cv for Valves)	Friction Factor (f)	Pipe C Value	Elevation (ft, MSL)	Elevation change	Pressure Loss (psi)	Pipeline Pressure (psi)
Total Static Head (psi)														**18.64**	**psi**
Total Friction Losses (psi)														**30.15**	**psi**
VOV Backpressure Required (psi)														**20.00**	**psi**
Total Static Head with VOV and Losses (psi)														**31.51**	**psi**
Total Static Head with VOV and Losses with Safety Factor (1.25)														**39.39**	**psi**
Total Discharge Head (feet) with 25% Safety Factor														**90.95**	**feet**
Pump Hydraulic Horsepower														**13.79**	**HP**
Pump Efficiency														**84%**	
Pump Electrical Horsepower														**16**	**HP**
Flow: 600 gpm TDH: 91 feet															

Notes:

These calculations are for discharge to off-site diffusion wells

Unless notes otherwise, friction factors and resistance coefficient formulas for steel pipe and fittings taken from *Flow of Fluids Through Valves, Fittings, and Pipe*, Crane Co., 1978

Friction loss formula taken from *Flow of Fluids Through Valves, Fittings, and Pipe*, Crane Co., 1978

Headloss through valves assumes valves are in fully open position.

Static head determined as follows: (Highest Point in the System) - (Clearwell Level)

Highest point in system = 134 ft

Clearwell water level = (Elevation of building slab) - (Distance to water surface) (130) - (5) 125 ft

Minimum static head: 9

Appendix C

Air Stripper Modeling

BBL®
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

Table C-1: Air Stripper DCE Removal, Off-Site IRM, Great Neck, New York

AIR STRIPPER INPUT		
COMPOUND ID#	18	select from "data"
COMPOUND NAME	CIS-12-DCE	
AIR TO WATER	62.5	Input
DIAMETER (ft)	9.0	Input
WATERFLOW (gpm)	600	Input
INFLUENT (ug/l)	3400	Input
PACKING ID#	1	select from "data"
PACKING	2" TRIPACKS	
ONDA SAFETY FACT	1.1	Input
WATER TEMP (F)	50	Input
WATER TEMP (C)	10.00	

ONDA PACKED BED

COMPOUND	CIS-12-DCE
PACKING	2" TRIPACKS
AIR TO WATER	62.5
DIAMETER (ft)	9
WATERFLOW (gpm)	600
WATER TEMP (F)	50
KLA (/sec)	0.00556
HENRY'S(atm)	91.5
LLR (gpm/sf)	9.4
AIRFLOW (cfm)	5000
R	4.44
STATIC (in/ft)	0.01
SAFETY FACTOR	1.10

BED DEPTH (feet)	EFFLUENT (ug/l)	% REMOVAL	STATIC LOSS	BHP	
0	3400.00	0.00%	1.50	1.69	
1	2688.32	20.93%	1.51	1.70	
2	2146.80	36.86%	1.52	1.71	
3	1727.47	49.19%	1.53	1.72	
4	1398.33	58.87%	1.54	1.73	
5	1137.21	66.55%	1.54	1.74	
6	928.32	72.70%	1.55	1.75	
7	760.07	77.65%	1.56	1.76	
8	623.82	81.65%	1.57	1.77	
9	513.00	84.91%	1.58	1.78	
10	422.54	87.57%	1.59	1.79	
11	348.49	89.75%	1.60	1.80	
12	287.73	91.54%	1.61	1.81	
13	237.77	93.01%	1.62	1.82	
14	196.63	94.22%	1.63	1.83	
15	162.70	95.21%	1.63	1.84	
16	134.69	96.04%	1.64	1.85	
17	111.55	96.72%	1.65	1.86	
18	92.42	97.28%	1.66	1.87	
19	76.59	97.75%	1.67	1.88	
20	63.48	98.13%	1.68	1.89	
21	52.63	98.45%	1.69	1.90	
22	43.64	98.72%	1.70	1.91	
23	36.19	98.94%	1.71	1.92	
24	30.02	99.12%	1.72	1.93	first stripper
25	24.90	99.27%	1.72	1.94	
26	20.65	99.39%	1.73	1.95	
27	17.13	99.50%	1.74	1.96	
28	14.21	99.58%	1.75	1.97	
29	11.79	99.65%	1.76	1.98	
30	9.78	99.71%	1.77	1.99	
31	8.12	99.76%	1.78	2.00	
32	6.74	99.80%	1.79	2.01	
33	5.59	99.84%	1.80	2.02	
34	4.64	99.86%	1.81	2.03	
35	3.85	99.89%	1.81	2.04	
36	3.19	99.91%	1.82	2.05	
37	2.65	99.92%	1.83	2.06	
38	2.20	99.94%	1.84	2.07	
39	1.82	99.95%	1.85	2.08	
40	1.51	99.96%	1.86	2.09	
41	1.26	99.96%	1.87	2.10	
42	1.04	99.97%	1.88	2.11	
43	0.87	99.97%	1.89	2.12	
44	0.72	99.98%	1.90	2.13	
45	0.60	99.98%	1.90	2.14	
46	0.49	99.99%	1.91	2.15	
47	0.41	99.99%	1.92	2.16	
48	0.34	99.99%	1.93	2.17	2nd stripper
49	0.28	99.99%	1.94	2.18	
50	0.23	99.99%	1.95	2.19	
51	0.19	99.99%	1.96	2.20	
52	0.16	100.00%	1.97	2.21	
53	0.13	100.00%	1.98	2.22	
54	0.11	100.00%	1.99	2.23	
55	0.09	100.00%	1.99	2.24	

ONDA PACKED BED

COMPOUND	CIS-12-DCE
PACKING	2" TRIPACKS
AIR TO WATER	62.5
DIAMETER (ft)	9
WATERFLOW (gpm)	500
WATER TEMP (F)	50
KLA (/sec)	0.00478
HENRY'S(atm)	91.5
LLR (gpm/sf)	7.9
AIRFLOW (cfm)	4166.666667
R	4.44
STATIC (in/ft)	0.01
SAFETY FACTOR	1.10

BED DEPTH (feet)	EFFLUENT (ug/l)	% REMOVAL	STATIC LOSS
0	30.02	0.00%	1.50
1	23.56	21.51%	1.51
2	18.69	37.74%	1.51
3	14.94	50.22%	1.52
4	12.02	59.96%	1.53
5	9.72	67.63%	1.53
6	7.89	73.73%	1.54
7	6.42	78.62%	1.54
8	5.24	82.55%	1.55
9	4.28	85.73%	1.56
10	3.51	88.32%	1.56
11	2.88	90.42%	1.57
12	2.36	92.14%	1.58
13	1.94	93.54%	1.58
14	1.59	94.69%	1.59
15	1.31	95.63%	1.60
16	1.08	96.40%	1.60
17	0.89	97.04%	1.61
18	0.73	97.56%	1.62
19	0.60	97.99%	1.62
20	0.50	98.34%	1.63
21	0.41	98.63%	1.63
22	0.34	98.87%	1.64
23	0.28	99.07%	1.65
24	0.23	99.24%	1.65
25	0.19	99.37%	1.66
26	0.16	99.48%	1.67
27	0.13	99.57%	1.67
28	0.11	99.65%	1.68
29	0.09	99.71%	1.69
30	0.07	99.76%	1.69
31	0.06	99.80%	1.70
32	0.05	99.84%	1.70
33	0.04	99.86%	1.71
34	0.03	99.89%	1.72
35	0.03	99.91%	1.72
36	0.02	99.92%	1.73
37	0.02	99.94%	1.74
38	0.02	99.95%	1.74
39	0.01	99.96%	1.75
40	0.01	99.96%	1.76

SELECT THE COMPOUND TO BE EVALUATED AND INPUT THE DATA REQUIRED IN THE TABLE BELOW

ID NO	COMPOUND		PACKING SIZE (inches nom diam)
1	VINYL CHLORIDE	2" TRIPACKS	2
2	PCE	3.5" TRIPACKS	3.5
3	TCE	2" HIFLOW	2
4	111 TCA	3.5" LANPAC	3.5
5	11 DCE	1" TRIPACKS	1
6	trans-12 DCE	1" GLITSCH	1
7	11 DCA	1" (A) GLITSCH	1
8	12 DCA	2" GLITSCH	2
9	METHYLENE CHLORIDE	2" (A) GLITSCH	2
10	BENZENE	3.5 (A) GLITSCH	3.5
11	TOLUENE	3.5" LANPAC	3.5
12	ETHYLBENZENE	2.3" LANPAC	2.3
13	o-XYLENE	1" NORPAC	1
14	CARBON TETRACHLORIDE	1.5" NORPAC	1.5
15	CHLOROFORM	2" NORPAC	2
16	MTBE		
17	RADON		
18	CIS-12-DCE		
19	DIPE		
20	CARBON DIOXIDE		
21	AMMONIA		
22	METHANE		
23	HYDROGEN SULFIDE		
24	TERTIARY BUTYL ALCOHOL		
25	1,1,2,2 TETRACHLOROETHANE		
26	1,1,2,-TCA		
27	1,2,4-TRICHLOROBENZENE		
28	1,2-DIBROMO-3-CHLOROPROPANE		
29	1,2-DICHLOROPROPANE		
30	2,4-DINITROTOLUENE		
31	BROMOBENZENE		
32	BROMODICHLOROMETHANE		

Table C-2: Air Stripper TCE Removal, Off-Site IRM, Great Neck, New York

AIR STRIPPER INPUT		
COMPOUND ID#	3	select from "data"
COMPOUND NAME	TCE	
AIR TO WATER	62.5	Input
DIAMETER (ft)	9.0	Input
WATERFLOW (gpm)	600	Input
INFLUENT (ug/l)	858	Input
PACKING ID#	1	select from "data"
PACKING	2" TRIPACKS	
ONDA SAFETY FACT	1.1	Input
WATER TEMP (F)	50	Input
WATER TEMP (C)	10.00	

ONDA PACKED BED

COMPOUND	TCE
PACKING	2" TRIPACKS
AIR TO WATER	62.5
DIAMETER (ft)	9
WATERFLOW (gpm)	600
WATER TEMP (F)	50
KLA (/sec)	0.00628
HENRY'S(atm)	327.5
LLR (gpm/sf)	9.4
AIRFLOW (cfm)	5000
R	15.89
STATIC (in/ft)	0.01
SAFETY FACTOR	1.10

BED DEPTH (feet)	EFFLUENT (ug/l)	% REMOVAL	STATIC LOSS	BHP	
0	858.00	0.00%	1.50	1.69	
1	655.02	23.66%	1.51	1.70	
2	501.83	41.51%	1.52	1.71	
3	385.50	55.07%	1.53	1.72	
4	296.73	65.42%	1.54	1.73	
5	228.76	73.34%	1.54	1.74	
6	176.57	79.42%	1.55	1.75	
7	136.41	84.10%	1.56	1.76	
8	105.46	87.71%	1.57	1.77	
9	81.58	90.49%	1.58	1.78	
10	63.13	92.64%	1.59	1.79	
11	48.87	94.30%	1.60	1.80	
12	37.84	95.59%	1.61	1.81	
13	29.31	96.58%	1.62	1.82	
14	22.70	97.35%	1.63	1.83	
15	17.58	97.95%	1.63	1.84	
16	13.62	98.41%	1.64	1.85	
17	10.55	98.77%	1.65	1.86	
18	8.18	99.05%	1.66	1.87	
19	6.34	99.26%	1.67	1.88	
20	4.91	99.43%	1.68	1.89	
21	3.80	99.56%	1.69	1.90	
22	2.95	99.66%	1.70	1.91	
23	2.28	99.73%	1.71	1.92	
24	1.77	99.79%	1.72	1.93	first stripper
25	1.37	99.84%	1.72	1.94	
26	1.06	99.88%	1.73	1.95	
27	0.82	99.90%	1.74	1.96	
28	0.64	99.93%	1.75	1.97	
29	0.49	99.94%	1.76	1.98	
30	0.38	99.96%	1.77	1.99	
31	0.30	99.97%	1.78	2.00	
32	0.23	99.97%	1.79	2.01	
33	0.18	99.98%	1.80	2.02	
34	0.14	99.98%	1.81	2.03	
35	0.11	99.99%	1.81	2.04	
36	0.08	99.99%	1.82	2.05	
37	0.06	99.99%	1.83	2.06	
38	0.05	99.99%	1.84	2.07	
39	0.04	100.00%	1.85	2.08	
40	0.03	100.00%	1.86	2.09	
41	0.02	100.00%	1.87	2.10	
42	0.02	100.00%	1.88	2.11	
43	0.01	100.00%	1.89	2.12	
44	0.01	100.00%	1.90	2.13	
45	0.01	100.00%	1.90	2.14	
46	0.01	100.00%	1.91	2.15	
47	0.01	100.00%	1.92	2.16	
48	0.00	100.00%	1.93	2.17	2nd stripper
49	0.00	100.00%	1.94	2.18	
50	0.00	100.00%	1.95	2.19	
51	0.00	100.00%	1.96	2.20	
52	0.00	100.00%	1.97	2.21	
53	0.00	100.00%	1.98	2.22	
54	0.00	100.00%	1.99	2.23	
55	0.00	100.00%	1.99	2.24	

ONDA PACKED BED

COMPOUND	TCE
PACKING	2" TRIPACKS
AIR TO WATER	62.5
DIAMETER (ft)	9
WATERFLOW (gpm)	500
WATER TEMP (F)	50
KLA (/sec)	0.00544
HENRY'S(atm)	327.5
LLR (gpm/sf)	7.9
AIRFLOW (cfm)	4166.666667
R	15.89
STATIC (in/ft)	0.01
SAFETY FACTOR	1.10

BED DEPTH (feet)	EFFLUENT (ug/l)	% REMOVAL	STATIC LOSS
0	1.77	0.00%	1.50
1	1.34	24.45%	1.51
2	1.01	42.71%	1.51
3	0.77	56.43%	1.52
4	0.59	66.80%	1.53
5	0.45	74.66%	1.53
6	0.34	80.63%	1.54
7	0.26	85.18%	1.54
8	0.20	88.66%	1.55
9	0.15	91.31%	1.56
10	0.12	93.34%	1.56
11	0.09	94.90%	1.57
12	0.07	96.09%	1.58
13	0.05	97.00%	1.58
14	0.04	97.70%	1.59
15	0.03	98.24%	1.60
16	0.02	98.65%	1.60
17	0.02	98.96%	1.61
18	0.01	99.20%	1.62
19	0.01	99.39%	1.62
20	0.01	99.53%	1.63
21	0.01	99.64%	1.63
22	0.00	99.72%	1.64
23	0.00	99.79%	1.65
24	0.00	99.84%	1.65
25	0.00	99.88%	1.66
26	0.00	99.90%	1.67
27	0.00	99.93%	1.67
28	0.00	99.94%	1.68
29	0.00	99.96%	1.69
30	0.00	99.97%	1.69
31	0.00	99.97%	1.70
32	0.00	99.98%	1.70
33	0.00	99.99%	1.71
34	0.00	99.99%	1.72
35	0.00	99.99%	1.72
36	0.00	99.99%	1.73
37	0.00	99.99%	1.74
38	0.00	100.00%	1.74
39	0.00	100.00%	1.75
40	0.00	100.00%	1.76

SELECT THE COMPOUND TO BE EVALUATED AND INPUT THE DATA REQUIRED IN THE TABLE BELOW

ID NO	COMPOUND		PACKING SIZE (inches nom diam)
1	VINYL CHLORIDE	2" TRIPACKS	2
2	PCE	3.5" TRIPACKS	3.5
3	TCE	2" HIFLOW	2
4	111 TCA	3.5" LANPAC	3.5
5	11 DCE	1" TRIPACKS	1
6	trans-12 DCE	1" GLITSCH	1
7	11 DCA	1" (A) GLITSCH	1
8	12 DCA	2" GLITSCH	2
9	METHYLENE CHLORIDE	2" (A) GLITSCH	2
10	BENZENE	3.5 (A) GLITSCH	3.5
11	TOLUENE	3.5" LANPAC	3.5
12	ETHYLBENZENE	2.3" LANPAC	2.3
13	o-XYLENE	1" NORPAC	1
14	CARBON TETRACHLORIDE	1.5" NORPAC	1.5
15	CHLOROFORM	2" NORPAC	2
16	MTBE		
17	RADON		
18	CIS-12-DCE		
19	DIPE		
20	CARBON DIOXIDE		
21	AMMONIA		
22	METHANE		
23	HYDROGEN SULFIDE		
24	TERTIARY BUTYL ALCOHOL		
25	1,1,2,2 TETRACHLOROETHANE		
26	1,1,2,-TCA		
27	1,2,4-TRICHLOROBENZENE		
28	1,2-DIBROMO-3-CHLOROPROPANE		
29	1,2-DICHLOROPROPANE		
30	2,4-DINITROTOLUENE		
31	BROMOBENZENE		
32	BROMODICHLOROMETHANE		

Table C-3: Air Stripper PCE Removal, Off-Site IRM, Great Neck, New York

AIR STRIPPER INPUT		
COMPOUND ID#	2	select from "data"
COMPOUND NAME	PCE	
AIR TO WATER	62.5	Input
DIAMETER (ft)	9.0	Input
WATERFLOW (gpm)	600	Input
INFLUENT (ug/l)	300	Input
PACKING ID#	1	select from "data"
PACKING	2" TRIPACKS	
ONDA SAFETY FACT	1.1	Input
WATER TEMP (F)	50	Input
WATER TEMP (C)	10.00	

ONDA PACKED BED

COMPOUND	PCE
PACKING	2" TRIPACKS
AIR TO WATER	62.5
DIAMETER (ft)	9
WATERFLOW (gpm)	600
WATER TEMP (F)	50
KLA (/sec)	0.00616
HENRY'S(atm)	550.5
LLR (gpm/sf)	9 4
AIRFLOW (cfm)	5000
R	26.70
STATIC (in/ft)	0.01
SAFETY FACTOR	1.10

BED DEPTH (feet)	EFFLUENT (ug/l)	% REMOVAL	STATIC LOSS	BHP	
0	300.00	0.00%	1.50	1.69	
1	230.09	23.30%	1.51	1.70	
2	176.84	41.05%	1.52	1.71	
3	136.12	54.63%	1.53	1.72	
4	104.90	65.03%	1.54	1.73	
5	80.92	73.03%	1.54	1.74	
6	62.46	79.18%	1.55	1.75	
7	48.24	83.92%	1.56	1.76	
8	37.27	87.58%	1.57	1.77	
9	28 81	90.40%	1.58	1.78	
10	22.27	92.58%	1.59	1.79	
11	17.22	94.26%	1.60	1.80	
12	13.32	95.56%	1.61	1.81	
13	10.30	96.57%	1.62	1.82	
14	7 97	97.34%	1.63	1.83	
15	6.16	97.95%	1.63	1.84	
16	4.77	98.41%	1.64	1.85	
17	3.69	98.77%	1.65	1.86	
18	2.85	99.05%	1.66	1.87	
19	2.21	99.26%	1.67	1.88	
20	1.71	99.43%	1.68	1.89	
21	1.32	99.56%	1.69	1.90	
22	1.02	99.66%	1.70	1.91	
23	0.79	99.74%	1.71	1.92	
24	0.61	99.80%	1.72	1.93	first stripper
25	0.47	99.84%	1.72	1.94	
26	0.37	99.88%	1.73	1.95	
27	0.28	99.91%	1.74	1.96	
28	0.22	99.93%	1.75	1.97	
29	0.17	99.94%	1.76	1.98	
30	0.13	99.96%	1.77	1.99	
31	0.10	99.97%	1.78	2.00	
32	0.08	99.97%	1.79	2.01	
33	0.06	99.98%	1.80	2.02	
34	0.05	99.98%	1.81	2.03	
35	0.04	99.99%	1.81	2.04	
36	0.03	99.99%	1.82	2.05	
37	0.02	99.99%	1.83	2.06	
38	0.02	99.99%	1.84	2.07	
39	0.01	100.00%	1.85	2.08	
40	0.01	100.00%	1.86	2.09	
41	0.01	100.00%	1.87	2.10	
42	0.01	100.00%	1.88	2.11	
43	0.00	100.00%	1.89	2.12	
44	0.00	100.00%	1.90	2.13	
45	0.00	100.00%	1.90	2.14	
46	0.00	100.00%	1.91	2.15	
47	0.00	100.00%	1.92	2.16	
48	0.00	100.00%	1.93	2.17	2nd stripper
49	0.00	100.00%	1.94	2.18	
50	0.00	100.00%	1.95	2.19	
51	0.00	100.00%	1.96	2.20	
52	0.00	100.00%	1.97	2.21	
53	0.00	100.00%	1.98	2.22	
54	0.00	100.00%	1.99	2.23	
55	0.00	100.00%	1.99	2.24	

ONDA PACKED BED

COMPOUND	PCE
PACKING	2" TRIPACKS
AIR TO WATER	62.5
DIAMETER (ft)	9
WATERFLOW (gpm)	500
WATER TEMP (F)	50
KLA (/sec)	0.00534
HENRY'S(atm)	550.5
LLR (gpm/sf)	7.9
AIRFLOW (cfm)	4166.666667
R	26.70
STATIC (in/ft)	0.01
SAFETY FACTOR	1.10

BED DEPTH (feet)	EFFLUENT (ug/l)	% REMOVAL	STATIC LOSS
0	0.61	0.00%	1.50
1	0.46	24.12%	1.51
2	0.35	42.29%	1.51
3	0.27	56.04%	1.52
4	0.21	66.48%	1.53
5	0.16	74.41%	1.53
6	0.12	80.45%	1.54
7	0.09	85.06%	1.54
8	0.07	88.57%	1.55
9	0.05	91.26%	1.56
10	0.04	93.31%	1.56
11	0.03	94.88%	1.57
12	0.02	96.08%	1.58
13	0.02	97.00%	1.58
14	0.01	97.70%	1.59
15	0.01	98.24%	1.60
16	0.01	98.65%	1.60
17	0.01	98.97%	1.61
18	0.00	99.21%	1.62
19	0.00	99.40%	1.62
20	0.00	99.54%	1.63
21	0.00	99.65%	1.63
22	0.00	99.73%	1.64
23	0.00	99.79%	1.65
24	0.00	99.84%	1.65
25	0.00	99.88%	1.66
26	0.00	99.91%	1.67
27	0.00	99.93%	1.67
28	0.00	99.95%	1.68
29	0.00	99.96%	1.69
30	0.00	99.97%	1.69
31	0.00	99.98%	1.70
32	0.00	99.98%	1.70
33	0.00	99.99%	1.71
34	0.00	99.99%	1.72
35	0.00	99.99%	1.72
36	0.00	99.99%	1.73
37	0.00	100.00%	1.74
38	0.00	100.00%	1.74
39	0.00	100.00%	1.75
40	0.00	100.00%	1.76

SELECT THE COMPOUND TO BE EVALUATED AND INPUT THE DATA REQUIRED IN THE TABLE BELOW

ID NO	COMPOUND		PACKING SIZE (inches nom diam)
1	VINYL CHLORIDE	2" TRIPACKS	2
2	PCE	3.5" TRIPACKS	3.5
3	TCE	2" HIFLOW	2
4	111 TCA	3.5" LANPAC	3.5
5	11 DCE	1" TRIPACKS	1
6	trans-12 DCE	1" GLITSCH	1
7	11 DCA	1" (A) GLITSCH	1
8	12 DCA	2" GLITSCH	2
9	METHYLENE CHLORIDE	2" (A) GLITSCH	2
10	BENZENE	3.5 (A) GLITSCH	3.5
11	TOLUENE	3.5" LANPAC	3.5
12	ETHYLBENZENE	2.3" LANPAC	2.3
13	o-XYLENE	1" NORPAC	1
14	CARBON TETRACHLORIDE	1.5" NORPAC	1.5
15	CHLOROFORM	2" NORPAC	2
16	MTBE		
17	RADON		
18	CIS-12-DCE		
19	DIPE		
20	CARBON DIOXIDE		
21	AMMONIA		
22	METHANE		
23	HYDROGEN SULFIDE		
24	TERTIARY BUTYL ALCOHOL		
25	1,1,2,2 TETRACHLOROETHANE		
26	1,1,2,-TCA		
27	1,2,4-TRICHLOROBENZENE		
28	1,2-DIBROMO-3-CHLOROPROPANE		
29	1,2-DICHLOROPROPANE		
30	2,4-DINITROTOLUENE		
31	BROMOBENZENE		
32	BROMODICHLOROMETHANE		

Table C-4: Air Stripper Freon 113 Removal, Off-Site IRM, Great Neck, New York

AIR STRIPPER INPUT		
COMPOUND ID#	41	select from "data"
COMPOUND NAME	DICHLORODIFLUOROMETHANE	
AIR TO WATER	62.5	Input
DIAMETER (ft)	9.0	Input
WATERFLOW (gpm)	600	Input
INFLUENT (ug/l)	42	Input
PACKING ID#	1	select from "data"
PACKING	2" TRIPACKS	
ONDA SAFETY FACT	1.1	Input
WATER TEMP (F)	50	Input
WATER TEMP (C)	10.00	

ONDA PACKED BED

COMPOUND	DICHLORODIFLUOROMETHANE
PACKING	2" TRIPACKS
AIR TO WATER	62.5
DIAMETER (ft)	9
WATERFLOW (gpm)	600
WATER TEMP (F)	50
KLA (/sec)	0.00741
HENRY'S(atm)	9615.3
LLR (gpm/sf)	9.4
AIRFLOW (cfm)	5000
R	466.43
STATIC (in/ft)	0.01
SAFETY FACTOR	1.10

BED DEPTH (feet)	EFFLUENT (ug/l)	% REMOVAL	STATIC LOSS	BHP	
0	42.00	0.00%	1.50	1.69	
1	30.47	27.44%	1.51	1.70	
2	22.12	47.34%	1.52	1.71	
3	16.05	61.78%	1.53	1.72	
4	11.65	72.26%	1.54	1.73	
5	8.46	79.86%	1.54	1.74	
6	6.14	85.38%	1.55	1.75	
7	4.46	89.39%	1.56	1.76	
8	3.24	92.30%	1.57	1.77	
9	2.35	94.41%	1.58	1.78	
10	1.71	95.94%	1.59	1.79	
11	1.24	97.05%	1.60	1.80	
12	0.90	97.86%	1.61	1.81	
13	0.65	98.45%	1.62	1.82	
14	0.47	98.87%	1.63	1.83	
15	0.34	99.18%	1.63	1.84	
16	0.25	99.41%	1.64	1.85	
17	0.18	99.57%	1.65	1.86	
18	0.13	99.69%	1.66	1.87	
19	0.10	99.77%	1.67	1.88	
20	0.07	99.83%	1.68	1.89	
21	0.05	99.88%	1.69	1.90	
22	0.04	99.91%	1.70	1.91	
23	0.03	99.94%	1.71	1.92	
24	0.02	99.95%	1.72	1.93	first stripper
25	0.01	99.97%	1.72	1.94	
26	0.01	99.98%	1.73	1.95	
27	0.01	99.98%	1.74	1.96	
28	0.01	99.99%	1.75	1.97	
29	0.00	99.99%	1.76	1.98	
30	0.00	99.99%	1.77	1.99	
31	0.00	100.00%	1.78	2.00	
32	0.00	100.00%	1.79	2.01	
33	0.00	100.00%	1.80	2.02	
34	0.00	100.00%	1.81	2.03	
35	0.00	100.00%	1.81	2.04	
36	0.00	100.00%	1.82	2.05	
37	0.00	100.00%	1.83	2.06	
38	0.00	100.00%	1.84	2.07	
39	0.00	100.00%	1.85	2.08	
40	0.00	100.00%	1.86	2.09	
41	0.00	100.00%	1.87	2.10	
42	0.00	100.00%	1.88	2.11	
43	0.00	100.00%	1.89	2.12	
44	0.00	100.00%	1.90	2.13	
45	0.00	100.00%	1.90	2.14	
46	0.00	100.00%	1.91	2.15	
47	0.00	100.00%	1.92	2.16	
48	0.00	100.00%	1.93	2.17	2nd stripper
49	0.00	100.00%	1.94	2.18	
50	0.00	100.00%	1.95	2.19	
51	0.00	100.00%	1.96	2.20	
52	0.00	100.00%	1.97	2.21	
53	0.00	100.00%	1.98	2.22	
54	0.00	100.00%	1.99	2.23	
55	0.00	100.00%	1.99	2.24	

F:\USERS\VRU\SS\CA2000\3496\IRM.xls

ONDA PACKED BED

COMPOUND	DICHLORODIFLUOROMETHANE
PACKING	2" TRIPACKS
AIR TO WATER	62.5
DIAMETER (ft)	9
WATERFLOW (gpm)	500
WATER TEMP (F)	50
KLA (/sec)	0.00644
HENRY'S(atm)	9615.3
LLR (gpm/sf)	7.9
AIRFLOW (cfm)	4166.666667
R	466.43
STATIC (in/ft)	0.01
SAFETY FACTOR	1.10

BED DEPTH (feet)	EFFLUENT (ug/l)	% REMOVAL	STATIC LOSS
0	0.02	0.00%	1.50
1	0.01	28.43%	1.51
2	0.01	48.77%	1.51
3	0.01	63.32%	1.52
4	0.01	73.74%	1.53
5	0.00	81.20%	1.53
6	0.00	86.54%	1.54
7	0.00	90.36%	1.54
8	0.00	93.10%	1.55
9	0.00	95.06%	1.56
10	0.00	96.46%	1.56
11	0.00	97.46%	1.57
12	0.00	98.18%	1.58
13	0.00	98.70%	1.58
14	0.00	99.07%	1.59
15	0.00	99.33%	1.60
16	0.00	99.52%	1.60
17	0.00	99.66%	1.61
18	0.00	99.76%	1.62
19	0.00	99.82%	1.62
20	0.00	99.87%	1.63
21	0.00	99.91%	1.63
22	0.00	99.94%	1.64
23	0.00	99.95%	1.65
24	0.00	99.97%	1.65
25	0.00	99.98%	1.66
26	0.00	99.98%	1.67
27	0.00	99.99%	1.67
28	0.00	99.99%	1.68
29	0.00	99.99%	1.69
30	0.00	100.00%	1.69
31	0.00	100.00%	1.70
32	0.00	100.00%	1.70
33	0.00	100.00%	1.71
34	0.00	100.00%	1.72
35	0.00	100.00%	1.72
36	0.00	100.00%	1.73
37	0.00	100.00%	1.74
38	0.00	100.00%	1.74
39	0.00	100.00%	1.75
40	0.00	100.00%	1.76

SELECT THE COMPOUND TO BE EVALUATED AND INPUT THE DATA REQUIRED IN THE TABLE BELOW

ID NO	COMPOUND		PACKING SIZE (inches nom diam)
1	VINYL CHLORIDE	2" TRIPACKS	2
2	PCE	3.5" TRIPACKS	3.5
3	TCE	2" HIFLOW	2
4	111 TCA	3.5" LANPAC	3.5
5	11 DCE	1" TRIPACKS	1
6	trans-12 DCE	1" GLITSCH	1
7	11 DCA	1" (A) GLITSCH	1
8	12 DCA	2" GLITSCH	2
9	METHYLENE CHLORIDE	2" (A) GLITSCH	2
10	BENZENE	3.5 (A) GLITSCH	3.5
11	TOLUENE	3.5" LANPAC	3.5
12	ETHYLBENZENE	2.3" LANPAC	2.3
13	o-XYLENE	1" NORPAC	1
14	CARBON TETRACHLORIDE	1.5" NORPAC	1.5
15	CHLOROFORM	2" NORPAC	2
16	MTBE		
17	RADON		
18	CIS-12-DCE		
19	DIPE		
20	CARBON DIOXIDE		
21	AMMONIA		
22	METHANE		
23	HYDROGEN SULFIDE		
24	TERTIARY BUTYL ALCOHOL		
25	1,1,2,2 TETRACHLOROETHANE		
26	1,1,2,-TCA		
27	1,2,4-TRICHLOROBENZENE		
28	1,2-DIBROMO-3-CHLOROPROPANE		
29	1,2-DICHLOROPROPANE		
30	2,4-DINITROTOLUENE		
31	BROMOBENZENE		
32	BROMODICHLOROMETHANE		

Appendix D

Total Discharge Pressure Calculations – Air Stripper Blower

Head Loss Calculations for Air Stripper Off-Gas
Off-Site IRM,
Great Neck, New York.

Pressure Loss [illegible]
[illegible]
f = friction factor [illegible]
V = velocity of air through pipe, feet per minute
D = inside diameter of pipe in [illegible]
L = length of pipe [illegible]
[illegible]

1) Marks' Standard Handbook for Mechanical Engineers, Avallone, E.A. and T. Baumeister, editors, 1996, page 12-88.
2) Flow of Fluids Through Pipe, Valves and Fittings, Crane Engineering, Tech. Note #410, 1986

Blower Design Criteria:

Flowrate **5000 cfm**
Total Design Head **0.00 inches of water column with 1.20 SF**

Description		Design Flow Rate (acfm/min.)	Effective Inside Diameter (feet)	Effective area (sq. feet)	Pipe Length (feet)	Fitting/Valve Equivalent Length (2) (feet)	Velocity (ft/min)	Fitting Valve Quantity	Pressure Loss (in. water)	Back Pressure (in. water)
Design Head										
Air filter inlets to stripper:										
Ambient air inlet filters		5000	NA	3.1416			1592	1	**0.50**	
Through #2 air stripper:										
Entrances		5000	1.5	1.767		75	2829	2	0.799	
Air stripper		--	--		--	--	--	--	1.75	
Cap/cover		5000	1.5	1.767		75	2829	1	0.399	
									2.95	
From air stripper #2 to blower intake:										
18" Alum. Sch 10 pipe		5000	1.5	1.767	50		2829	1	0.266	
Sweep Elbow (45)		5000	1.5	1.767		17	2829	1	0.091	
Sweep Elbow (90)		5000	1.5	1.767		30	2829	6	0.958	
Mitered Elbow (90)		5000	1.5	1.767		120	2829	1	0.639	
									1.954	
Blower intake negative pressure:			**5.40**						**5.40**	
Through #1 air stripper:										
Entrance		5000	1.5	1.767		75	2829	2	0.799	34.69
Air stripper		--	--		--	--	--	--	1.75	32.94
Cap/cover		5000	1.5	1.767		75	2829	1	0.399	32.54
									2.948	
From air stripper #1 to VPGAC Vessels:										
18" Alum. Sch 10 pipe		5000	1.5	1.767	85		2829	1	0.453	32.09
Sweep Elbow (45)		5000	1.5	1.767		17	2829	1	0.091	32.00
Duct Heater		5000	1.5	1.767			2829	1	0.580	31.42
Isolation valve		5000	1.5	1.767			2829	2	0.100	31.32
Tee		2500	1.5	1.767		100	1415	2	0.266	31.05
18" Alum. Sch 10 pipe		5000	1.5	1.767	10		2829	1	0.053	31.37
									1.542	
Through #1 GAC Vessel to #2 GAC:										
Tigg NB-20 Unit		5000						1	5.900	25.47
Tee		2500	1.5	1.767		100	1415	2	0.266	25.20
18" Alum. Sch 10 pipe		2500	1.5	1.767	12		1415	1	0.016	25.18
18" Alum. Sch 10 pipe		5000	1.5	1.767	33.5		2829	1	0.178	25.01
Tee		5000	1.5	1.767		100	2829	1	0.532	24.47
Elbow (90)		5000	1.5	1.767		30	2829	2	0.319	24.15
Isolation valve		5000	1.5	1.767			2829	1	0.050	24.10
									7.262	
Through #2 GAC Vessel to #3 GAC:										
Tigg NB-20 Unit		5000						1	5.900	18.20
Elbow (90)		2500	1.5	1.767		30	1415	1	0.040	18.16
Tee		2500	1.5	1.767		100	1415	1	0.133	18.03
18" Alum. Sch 10 pipe		2500	1.5	1.767	10		1415	1	0.013	18.02
18" Alum. Sch 10 pipe		5000	1.5	1.767	34		2829	1	0.181	17.84
Elbow (90)		5000	1.5	1.767		30	2829	2	0.319	17.52
Tee		5000	1.5	1.767		100	2829	2	1.065	16.45
Isolation valve		5000	1.5	1.767			2829	1	0.050	16.40
									7.702	

Head Loss Calculations for Air Stripper Off-Gas
Off-Site IRM,
Great Neck, New York.

Pressure Loss Formula [illegible]

1) Marks' Standard Handbook for Mechanical Engineers, Avallone, E.A. and T. Baumeister, editors, 1996, page 12-88.
2) Flow of Fluids Through Pipe, Valves and Fittings, Crane Engineering, Tech. Note #410, 1986

Blower Design Criteria:

Flowrate **5000 cfm**
Total Design Head **0.00 inches of water column with 1.20 SF**

Description		Design Flow Rate (acfm/min.)	Effective Inside Diameter (feet)	Effective area (sq. feet)	Pipe Length (feet)	Fitting/Valve Equivalent Length[2] (feet)	Velocity (ft/min)	Fitting Valve Quantity	Pressure Loss (in. water)	Back Pressure (in. water)
[illegible]										
Through #3 GAC Vessel to #1 PPZ:										
Tigg NB-20 Unit		5000						1	5.900	10.50
18" Alum. Sch 10 pipe		2500	1.5	1.767	24		1415	1	0.032	10.47
Tee		2500	1.5	1.767		100	1415	2	0.266	10.20
18" Alum. Sch 10 pipe		5000	1.5	1.767	44		2829	1	0.234	9.97
Isolation valve		5000	1.5	1.767			2829	1	0.050	9.92
Tee		5000	1.5	1.767		100	2829	2	1.065	8.86
Elbow (90)		5000	1.5	1.767		30	2829	3	0.479	8.38
									8.026	
From #1 PPZ to Stacks: (pressure drop thru PPZ vessels based on empircal data)										
Tigg NB-15 Units		5000						2	8.000	0.38
18" Alum. Sch 10 pipe		5000	1.5	1.767	2		2829	1	0.011	0.37
									8.011	
[illegible]									[illegible]	

By:	K. Kuc	
Chkd:	D. Falatko	06/27/03
Rev:	K. Kuc	10/27/03

Appendix E

Additional Information - Emission Control Units

ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

VPGAC Units

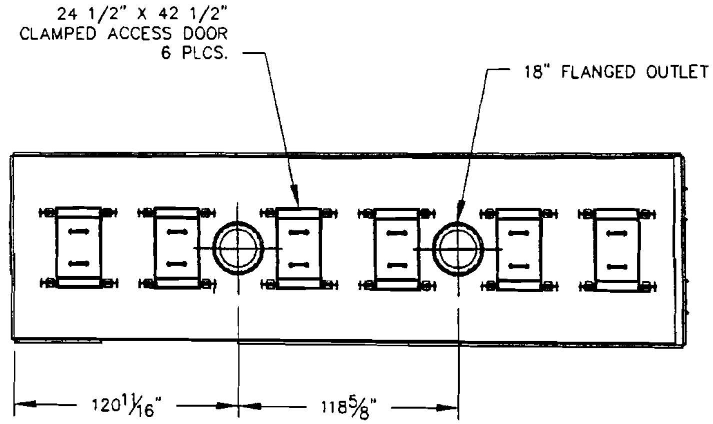
NOTES: CONTAMINATED AIR SHALL ENTER UNIT THROUGH THE INLETS AND MUST EXIT USING BOTH OUTLETS.

PROTECTIVE COATING SYSTEM

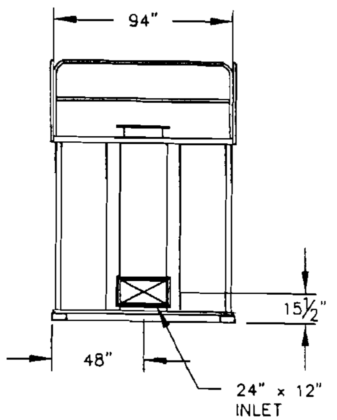
INTERIOR : SHERWIN WILLIAMS DURAPLATE 235(WHITE) DFT 7-14 MILS.

EXTERIOR : ANCHOR HIGH SOLIDS EPOXY #3950 TOP COATED WITH #4900 ANCOTHANE ACRYLIC URETHANE (BLACK)DFT 7-14 MILS.

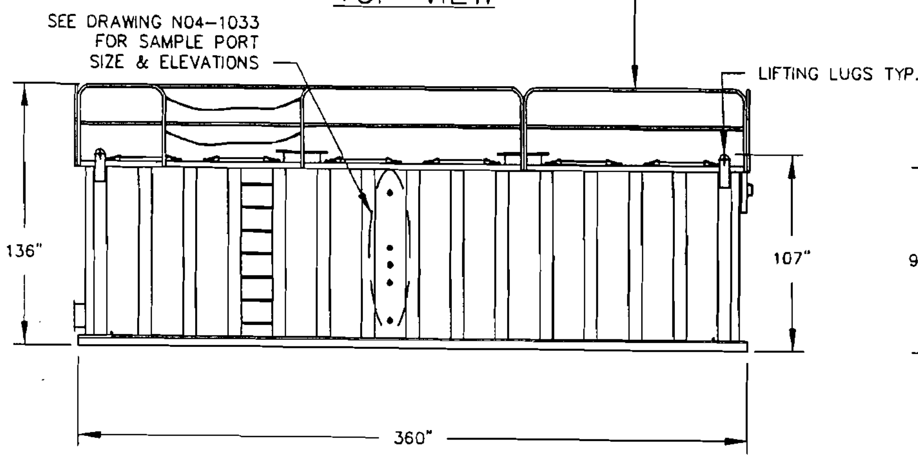
* SAFETY RAIL-
1 1/4"ø A-53 PIPE CONSTRUCTION. SHERWIN WILLIAMS SAFETY YELLOW DURA-PLATE EPOXY 235



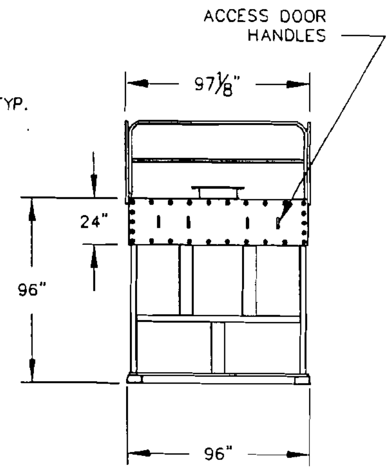
TOP VIEW



LEFT SIDE



FRONT VIEW



RIGHT SIDE

NO.	REVISION	BY	DATE
4	REVISE INLET ELEVATION	JB	2/17/04
3	SAFETY RAIL NOTES	JB	2/4/04
2	REVISE HEIGHT OF INLET & CARBON BED	JB	1/30/04
1	REVISE SAMPLE PORTS	JB	1/29/04

VESSEL STANDARDS

VESSEL MATERIALS : CARBON STEEL A-36	BED VOLUME STD/MAX : 640 FT³ / 780 FT³
LINING : HIGH SOLIDS EPOXY	CARBON FILL : 28,000 LBS
EXTERIOR PAINT : HIGH SOLIDS EPOXY	SHIP WT. EMPTY/MAX.FILL : 15,000 LBS/43,000 LBS
WALL THICKNESS : 12 GAUGE STD.	CARBON TYPE : TIGG 5CC 0612 VAPOR PHASE
FLOOR THICKNESS : 3/16" STD.	MAX. OPERATING PRESSURE : 40"H,0
INTERNALS : CARBON STEEL & POLYETHYLENE	MAX. OPERATING TEMP. : 140F
ADSORBENT OUTLET ASSEMBLY : 24" X 42" CLAMPED ACCESS AND 86" X 16" BOLTED DOORS	

PROJECT

ARCADIS
OU-2 SOUTH IRM

G: \LOGO\TIGGLOGO.GIF

PROJ. NO.	NY001227.0015.0002
P.O. NO.	E03-064-JK

DRAWN BY	JB
DESIGN BY	BB
CHKD. BY	BB
DATE	1/12/04
SCALE	NTS

ECU-1,2,3

DWG. NO. N04-1009 REV. 4

Granular Activated Carbon Specifications

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

TIGG 5CC 0612
VIRGIN VAPOR PHASE ACTIVATED CARBON

DESCRIPTION

TIGG 5CC 0612 is a granular activated carbon made from coconut shell. The combination of high activity level with a selection of transport and adsorption pores that accommodate adsorbates of varied molecular size. This carbon also contains the high energy adsorption pores which are vital to attaining ultra high removal of low molecular weight volatile organic compounds.

TYPICAL PROPERTIES

U.S Sieve, 90 wt% min	6 x 12
CCl_4 Number, min (Butane Activity)	40 (15.6)
Apparent Density, min (dense packing)	
g/cc lbs/ft^3	.48 30
Moisture - % max (as packed)	3
Hardness No. - % min	98

TYPICAL APPLICATIONS

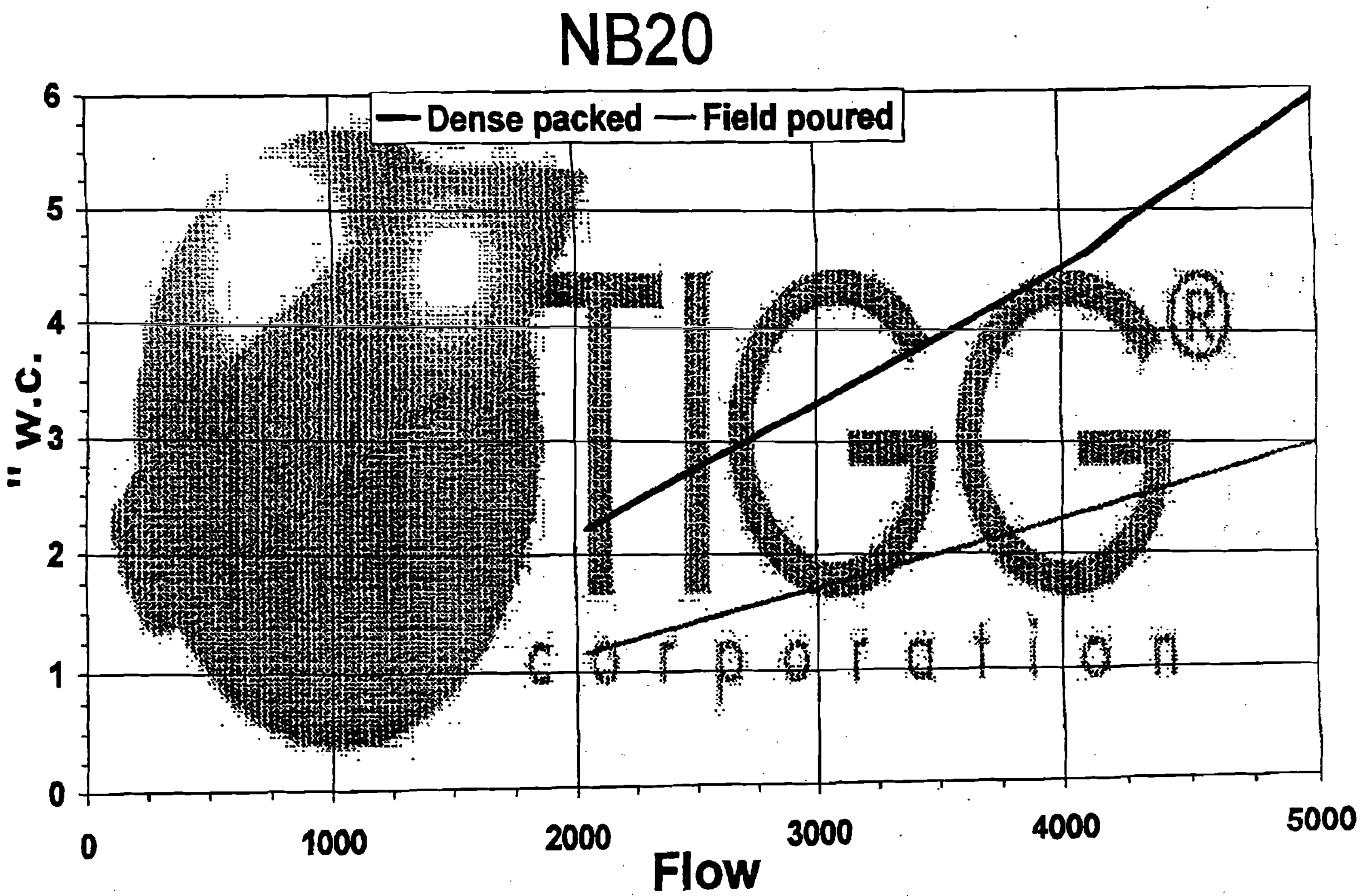
This carbon can be used to:

- Recover solvents
- Remove VOC's from air from:
    - Tank vents
    - Air stripper offgas
    - Soil venting
    - Remediation of excavated soil

Standard packaging is in 1000 pound supersaks.

Wet drained activated carbon adsorbs oxygen from the air. Therefore, when workers need to enter a vessel containing wet activated carbon, they should follow confined space/low oxygen level procedures. Activated carbon dust does not present an explosion hazard. 10/02

800 Old Pond Road
Suite 706
Bridgeville, PA 15017
800-925-0011
412-257-9580 phone
412-257-8520 fax
www.tigg.com

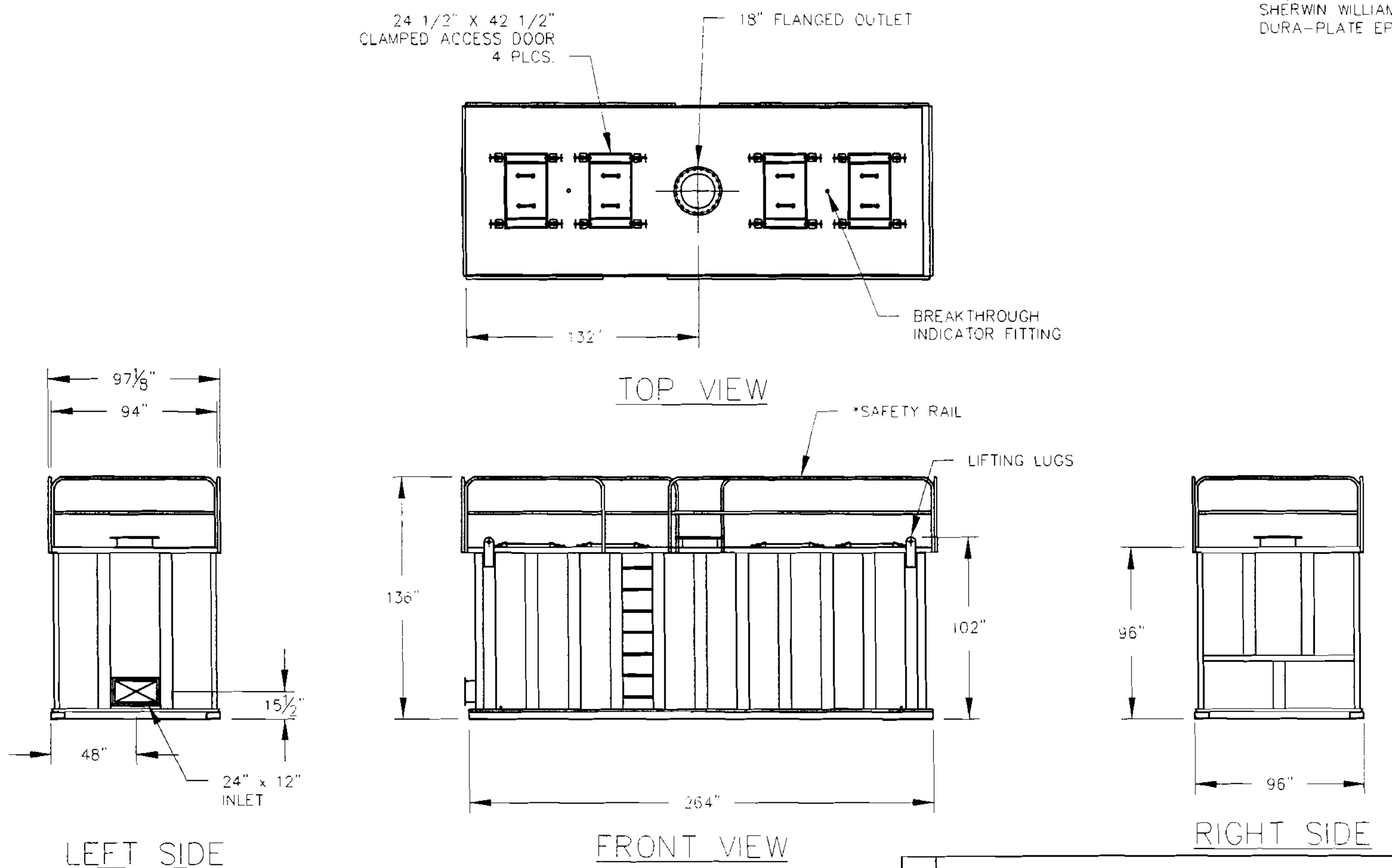


Carbon	Type	Density	MPD	Bed Depth	Media
		(lbs/cuft)	(mm)	(in)	(lbs)
TIGG 5GC	612	31.5	2.5	[illegible]	27983

10/16/2003 THU 15:50 [TX/RX NO 8083] 003

PPZ Units

* SAFETY RAIL–
1 1/4"ø A–53 PIPE CONSTRUCTION
SHERWIN WILLIAMS SAFETY YELLOW
DURA-PLATE EPOXY 235



NO.	REVISION	BY	DATE
1	REMOVE 86" X 16" ACCESS WAY ON LEFT SIDE	JB	10/3/05

VESSEL STANDARDS

VESSEL MATERIALS : CARBON STEEL A-36	BED VOLUME STD/MAX : 413 FT³ / 517 FT³
LINING : HIGH SOLIDS EPOXY	CARBON FILL : 12,000 LBS
EXTERIOR PAINT : HIGH SOLIDS EPOXY	SHIP WT. EMPTY/MAX.FILL : 9,000 LBS/21,000 LBS
WALL THICKNESS : 12 GAUGE STD.	CARBON TYPE : TIGG 5CC 0612 VAPOR PHASE
FLOOR THICKNESS : 3/16" STD.	MAX. OPERATING PRESSURE : 40"H_2O
INTERNALS : CARBON STEEL & POLYETHYLENE	MAX. OPERATING TEMP. : 140°F
ADSORBENT OUTLET ASSEMBLY : 24" X 42" CLAMPED ACCESS AND 86" X 16" BOLTED DOORS	

PROJECT

BBL

PROJ. NO. E05-061-JK

P.O. NO.

DRAWN BY	JB
DESIGN BY	BB
CHKD. BY	BB
DATE	9/26/05
SCALE	NTS

TIGG corporation

NB-15

DWG. NO. N05-1022 REV 1

PPZ Specifications

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

TIGG PPM
Vapor Phase Impregnated Zeolite

DESCRIPTION

TIGG PPM is a natural zeolite that has been specially impregnated to enhance properties for removal of contaminants not normally removed by activated carbon. The substrate has unique properties which include high open area, a crystal form which enables very high levels of cation exchange capacity, excellent hardness and freedom from friability and dusting.

TYPICAL PROPERTIES

U.S. Sieve, 90 wt% min	4 x 8
Apparent Density, (dense packing) lbs/ft^3	60
Moisture - wt % max (as packaged)	15
Impregnant ($KMnO_4$) wt % max	6.0

TYPICAL APPLICATIONS

TIGG PPM is used to remove easily oxidized compounds that are poorly adsorbed by activated carbon such as:

- Formaldehyde
- Methanol, ethanol and other light solvents
- Acid gases such as hydrogen sulfide
- Vinyl chloride

Standard packaging is in 2000 pound supersaks.

Last Revision
12/20/04

800 Old Pond Road
Suite 706
Bridgeville, PA 15017
800-925-0011
412-257-9580 phone
412-257-8520 fax
www.tigg.com

Specifications on Spectrum HS-600

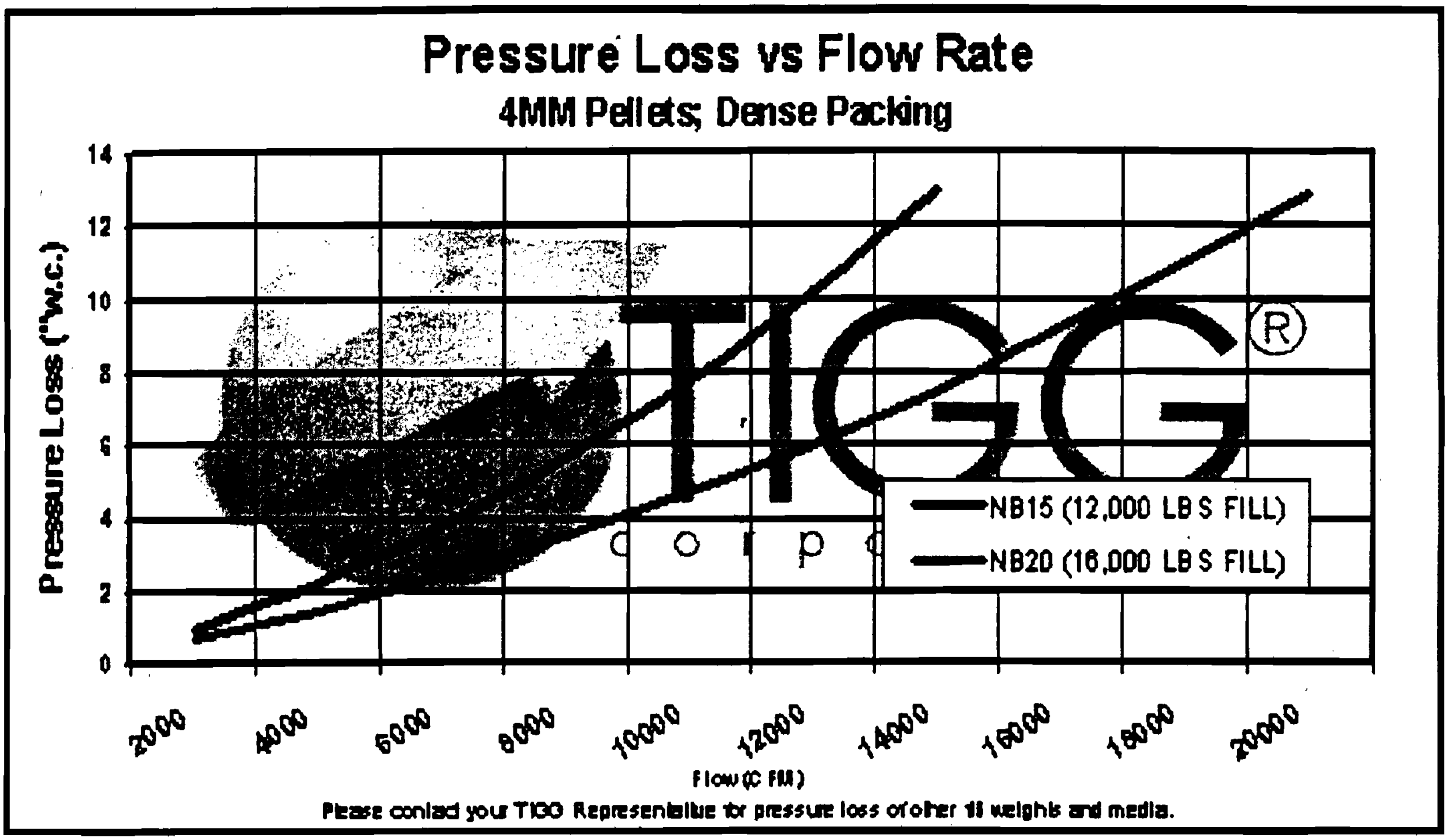
Hydrosil vigorously controls the production process. Data is reviewed and maintained on each batch as it is being produced through and including the moisture content of the HS-600 being delivered to our customer.

HS-600 Specifications

The potassium permanganate impregnated media shall have no less than 3.6 pounds of potassium permanganate per cubic foot a bulk density of no less than 60 pounds per cubic foot, a moisture content of 12-15% by weight and shall not dust. The media shall have an irregular particle size of 4 x 8 mesh.

The performance characteristics of the air filtration media shall meet or exceed a service life of no less than 72 hours for breakthrough of hydrogen sulfide at the following test conditions:

Media Bed Volume	76.00 cubic centimeters
Bed Configuration	2.54 cm (id) x 15.00
Flow Rate	3000 (+/- 100) ml/minute
Relative Humidity	70%
Challenge Gas	Hydrogen sulfide
Challenge Gas Concentration	10 (+/- 0.25) PPM


Pressure Loss vs Flow Rate
4MM Pellets; Dense Packing
Pressure Loss ("w.c.)
0
2
4
6
8
10
12
14
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
Flow (CFM)
NB15 (12,000 LBS FILL)
NB20 (16,000 LBS FILL)
TIGG®
Please contact your TIGG Representative for pressure loss of other fill weights and media.

Appendix F

Air Permit Application

New York State Department of Environmental Conservation
Air Facility Registration

DEC ID
- -

Owner/Firm			Taxpayer ID
Name Lockheed Martin Corporation			
Street Address 6801 Rockledge Drive, Mail Point DM 315			
City / Town / Village Bethesda	State or Province MD	Country USA	Zip 20817

Owner/Firm Contact	
Name Tina Armstrong	Phone No. (301) 214-9971

Facility	
Name Off-Site Remediation System, Former Unisys Facility	
Location Address Tanners Road Extension	
☐ City / ☐ Town / ☒ Village Lake Success	Zip 11020

Facility Information	
Total Number of Emission Points: 1	☐ Cap by Rule

Description

Proposed groundwater treatment facility consists of two (2) air stripping towers with one emission source. Air stripper off-gas shall be treated with vapor phase granular activated carbon and potassium permanganate-impregnateo zeolite prior to discharge. Proposed facility is exempt from registration pursuant to 6 NYCRR Part 201-3.3 (c) (29)

Standard Industrial Classification Codes

HAP CAS Numbers

156 - 59 - 2	127 - 18 - 4	79 - 01 - 6	76 - 13 - 1	75 - 45 - 6	75 - 01 - 4
75 - 69 - 4	75 - 71 - 8	74 - 87 - 3		- -	- -

Applicable Federal and New York State Requirements (Part Nos.)

201-3.3 (c) (29)					

Certification	
I certify that this facility will be operated in conformance with all provisions of existing regulations.	
Responsible Official	Title
Signature	Date / /

Spill Cleanup/Remediation Air Emission Work Sheet
New York State Department of Environmental Conservation
Region 1, Building 40, SUNY Campus, Stony Brook, NY 11790-2356

Site Name: Off-Site Remediation System, Former Unisys Facility, Great Neck, New York

Site Address/Location: Tanners Road Extension________
Great Neck, NY 11020__________

Startup Date March 2006________
Shutdown Date To Be Determined_

Stack Height: 14.5 FT
Stack Exit Inside Dimensions: 1.5 FT
Stack Exit Temperature: 80 F
Stack Exit Flow Rate: 4,500 SCFM

Contaminant Name	CAS #	Emission Rate Potential (lbs/hr)	Percent Control	Actual Emissions (lbs/hr)
Tetrachloroethene	00127-18-4	<0.000057	TBD*	<0.000057
Trichloroethene	00079-01-6	<0.000045	TBD*	<0.000045
Cis-1,2 dichloro-ethene	00156-59-2	<0.000034	TBD*	<0.000034
Vinyl chloride	00075-01-4	<0.000022	TBD*	<0.000022
Trichlorofluoro-methane (Freon 11)	00075-69-4	<0.000047	N/A	<0.000047
Dichlorodifluoro-methane (Freon 12)	00075-71-8	<0.000101	N/A	<0.000101
Chlorodifluorome-thane (Freon 22)	00075-45-6	<0.000354	N/A	<0.000354
Trichlorotrifluoro-ethane (Freon 113)	00076-13-1	<0.000064	TBD*	<0.000064
Chloromethane	00074-87-3	<0.000017	N/A	<0.000017

* Emitted concentration of the denoted compounds will be below 0.5 ppbV. Actual Percent Control will depend on the actual influent concentration of the compounds.

Site Name: Off-Site Remediation System____Air Emission Worksheet

Use Air Guide 1 software to estimate ambient impact. Compare impact estimate to AGC and SGC from tables in the back of Air Guide 1. See Air Guide 1 for compounds not listed.

CAS #	Short Term Impact (%SGC)	SGC (ug/m3)	Actual Annual Impact (%AGC)	AGC (ug/m3)
Tetrachloroethylene	<0.0132	1,000	<1.4288	1
Trichloroethylene	<0.0002	54,000	<0.4429	0.5
Cis-1,2 dichloroethylene	<0.0000	--	<0.0001	1,900
Vinyl chloride	<0.0000	180,000	<1.2469	0.11
Trichlorofluoromethane (Freon 11)	<0.0000	560,000	<0.0000	--
Dichlorodifluoromethane (Freon 12)	<0.0000	--	<0.0001	12,000
Chlorodifluoromethane (Freon 22)	<0.0000	--	<0.0000	50,000
Trichlorotrifluoroethane (Freon 113)	<0.0000	960,000	<0.0000	180,000
Chloromethane	<0.0002	22,000	<0.0012	90

Control Equipment:

________ Not Needed Based on Analysis of Design Conditions
________ Not Needed Based on Analysis of Operating Conditions
___X___ Described Below

Control Type:

____ None	____ Thermal Afterburner
__X_ Activated Bed Adsorber	____ Catalytic Unit
__x_ Other, Explain: Oxidizer	

Adsober Manufacturers Name: TIGG Corporation________________
Model Number: Three (3) VPGAC-filled NB-20 units,

Oxidizer Manufacturers Name: TIGG Corporation
Model Number: Two (2) KMnO4 zeolite-filled NB-15 units ____________________

Disposal of Collected Contaminants:

__X_ Landfill Off-Site	____ Recycled On-Site
____ Recylced in the Process	____ Other, Explain:

Frequency of stack emission monitoring/testing ___ Per NYSDEC-APPROVED Operation, Maintenance, and Monitoring Manual_________________

Monitoring/testing method __Sample Collection and Analysis Following USEPA Modified Method TO-15 ____

Name of DEC Spill/Remediation Project Manager _Girish Desai________________
Phone # _(631) 444-0243______________

All specifications and limits stated above and contained in any attached materials submitted with this work sheet are binding and enforcable conditions.

I certify this system will be operated in accordance with the specifications stated above and in compliance with all existing laws, rules and regulations.

Signature of Responsible Party	Title	Date

c: DEC Project Manager

Appendix G

SPDES Permit Application

BBL®
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

State Pollutant Discharge Elimination System (SPDES)

INDUSTRIAL APPLICATION FORM NY-2C

For New Permits and Permit Modifications to Discharge Industrial Wastewater and Storm Water

Section I - Permittee and Facility Information

Please type or print the requested information.

1. Current Permit Information (leave blank if for new discharge)

SPDES Number:	DEC Number:

2. Permit Action Requested: (Check applicable box)

[X] A **NEW** proposed discharge
[ ] An **EBPS INFORMATION REQUEST** response
[ ] A **RENEWAL** of an existing SPDES permit
[ ] A **MODIFICATION** of the existing permit
[ ] An **EXISTING** discharge currently without permit

Does this request include an increase in the quantity of water discharged from your facility to the waters of the State?

[ ] **YES** - Describe the increase:
[ ] **NO** - Go to Item 3. below.

3. Permittee Name and Address

Name		Attention
Lockheed Martin Corporation		Tina Armstrong
Street Address: 6801 Rockledge Drive, Mail Point DM 315		
City or Village: Bethesda	State: MD	ZIP Code: 20817

4. Facility Name, Address and Location

Name: Off-Site Treatment System, Former Unysis Facility			
Street Address: Tanners Road		P.O. Box:	
City or Village: Lake Success	State: NY	ZIP Code: 11020	
Town: North Hempstead	County: Nassau		
Telephone:	FAX:	NYTM - E:	NYTM - N:
Tax Map Info (New York City, Nassau County and Suffolk County only)			
Section:	Block:	Subblock:	Lot: 132

5. Facility Contact Person

Name: Scott Morris		Title: Project Engineer	
Street Address: 2001 Marcus Blvd, Suite 5-170			P.O. Box:
City or Village: New Hyde Park		State: NY	ZIP Code: 11042
Telephone: (516) 328-0464	FAX: (516) 328-0734	E-Mail or Internet: smorris@bbl-inc.com	

6. Discharge Monitoring Report (DMR) Mailing Address

Name: Scott Morris			
Street Address: 2001 Marcus Blvd, Suite 5-170			P.O. Box:
City or Village: New Hyde Park		State: NY	ZIP Code: 11042
Telephone: (516) 328-0464	FAX: (516) 328-0734	E-Mail or Internet: smorris@bbl-inc.com	
Name and Title of person responsible for signing DMRs: Scott Morris / Project Manager		Signature:	

INDUSTRIAL APPLICATION FORM NY-2C
Section I - Permittee and Facility Information

Facility Name: Off-Site Treatment System, Former Unysis Facility	SPDES Number:

7. Summarize the outfalls present at the facility:

Outfall Number	Receiving Water	Type of discharge
001	Groundwater	Effluent from Groundwater Remediation System
002	Groundwater	Effluent from Groundwater Remediation System
003	Groundwater	Effluent from Groundwater Remediation System

8. Map of Facility and Discharge Locations:

Provide a detailed map showing the location of the facility, all buildings or structures present, wastewater discharge systems, outfall locations into receiving waters, nearby surface water bodies, water supply wells, and groundwater monitoring wells, and attach it to this application. Also submit proof, either by indication on the map or other documentation, that a right of way for the discharges exists from the facility property to a public right of way.

9. Water Flow Diagram:

See attached Figure 3.

INDUSTRIAL APPLICATION FORM NY-2C
Section I - Permittee and Facility Information

Facility Name:	SPDES Number:
Off-Site Treatment System, Former Unysis Facility	

10. Nature of business: (Describe the activities at the facility and the date(s) that operation(s) at the facility commenced)

Proposed facility will consist of groundwater treatment system comprised of two (2) air stripping towers. Treatment system operation is planned to begin in Spring 2006

11. List the 4-digit SIC codes which describe your facility in order of priority:

Priority 1	Description:	Priority 3	Description:
Priority 2	Description:	Priority 4	Description:

12. Is your facility a primary industry as listed in Table 1 of the instructions?

[ ] **YES** - Complete the following table.

[X] **NO** - Go to Item 13. below.

Industrial Category	40 CFR Part	40 CFR Subpart	Industrial Category	40 CFR Part	40 CFR Subpart

13. Does this facility manufacture, handle, or discharge recombinant-DNA, pathogens, or other potentially infectious or dangerous organisms?

[ ] **YES** - Attach a detailed explanation to this application.

[X] **NO** - Go to Item 14 below.

14. Is storm runoff or leachate from a material storage area discharged by your facility?

[ ] **YES** - Complete the following table, and show the location of the stockpile(s) and discharge point(s) on the diagram in Item 9.

[X] **NO** - Go to Item 15 on the following page.

Size of area	Type(s) of material stored	Quantity of material stored	Runoff control devices

INDUSTRIAL APPLICATION FORM NY-2C
Section I - Permittee and Facility Information

Facility Name:	SPDES Number:
Off-Site Treatment System, Former Unysis Facility	

15. Facility Ownership: (Place an "X" in the appropriate box)

Corporate [X] Sole Proprietorship [ ] Partnership [ ] Municipal [ ] State [ ] Federal [ ] Other ____

Are any of the discharges applied for in this application on Indian lands? Yes [ ] No [ ]

16. List information on any other environmental permits for this facility:

Issuing Agency	Permit Type	Permit Number	Permit Status Active	Permit Status Applied for	Permit Status Inactive
NYSDEC	AIR			X	

17. Laboratory Certification:

Were any of the analyses reported in Section III of this application performed by a contract laboratory or a consulting firm?

[ ] **YES** - Complete the following table.

[X] **NO** - Go to Item 18 below.

Name of laboratory or consulting firm	Address	Telephone (area code and number)	Pollutants analyzed

18. Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, 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.

Name and official title (type or print)		Date signed
Scott Morris		
Signature	Telephone number	FAX number
	(516) 328-0464	(516) 328-0734

INDUSTRIAL APPLICATION FORM NY-2C
Section I - Permittee and Facility Information

Facility Name:	SPDES Number:
Off-Site Treatment System, Former Unysis Facility	

19. Industrial Chemical Survey (ICS)

Complete all information for those substances your facility has used, produced, stored, distributed, or otherwise disposed of in the past five (5) years at or above the threshold values listed in the instructions. Include substances manufactured at your facility, as well as any substances that you have reason to know or believe present in materials used or manufactured at your facility. Do not include chemicals used only in analytical laboratory work, or small quantities of routine household cleaning chemicals. Enter the name and CAS number for each of the chemicals listed in Tables 6-10 of the instructions, and the table number which lists the chemical. You may use ranges (e.g. 10-100 lbs., 100-1000 lbs., 1000-10000 lbs., etc.) to describe the quantities used on an annual basis as well as for the amount presently on hand. For those chemicals listed in Tables 6, 7, or 8 which are indicated as being potentially present in the discharge from one or more outfalls at the facility, indicate which outfalls may be affected in the appropriate column below, and include sampling results in Section III of this application for each of the potentially affected outfalls. Make additional copies of this sheet if necessary.

Name of Substance	Table	CAS Number	Average Annual Usage	Amount Now On Hand	Units (gallons, lbs, etc)	Purpose of Use (see codes in Table 2 of instructions)	Present in Discharge? (Outfall(s)?)
Not Applicable, New Facility							

This completes Section I of the SPDES Industrial Application Form NY-2C. Section II, which requires specific information for each of the outfalls at your facility, and Section III, which requires sampling information for each of the outfalls at your facility, must also be completed and submitted with this application.

State Pollutant Discharge Elimination System (SPDES)

INDUSTRIAL APPLICATION FORM NY-2C

For New Permits and Permit Modifications to Discharge Industrial Wastewater and Storm Water

Section II - Outfall Information

Please type or print the requested information.

Facility Name:	SPDES Number:
Off-Site Treatment System, Former Unysis Facility	

1. Outfall Number and Location

Outfall No.: 001		
Latitude ° ' "	Longitude ° ' "	Receiving Water Groundwater

2. Type of Discharge and Discharge Rate (List all information applicable to this outfall)

	Volume/Flow	Units MGD	Units GPM	Units Other (specify)		Volume/Flow	Units MGD	Units GPM	Units Other (specify)
a. Process Wastewater					f. Noncontact Cooling Water				
b. Process Wastewater					g. Remediation System Discharge	167		X	
c. Process Wastewater					h. Boiler Blowdown				
d. Process Wastewater					i. Storm Water				
e. Contact Cooling Water					j. Sanitary Wastewater				
k. Other discharge (specify):									
l. Other discharge (specify):									

3. List process information for the Process Wastewater streams identified in 2.a-d above:

a. Name of the process contributing to the discharge			Process SIC code:
Describe the contributing process	Category / Subcategory	Quantity per day	Units of measure
b. Name of the process contributing to the discharge			Process SIC code:
Describe the contributing process	Category / Subcategory	Quantity per day	Units of measure
c. Name of the process contributing to the discharge			Process SIC code:
Describe the contributing process	Category / Subcategory	Quantity per day	Units of measure
d. Name of the process contributing to the discharge			Process SIC code:
Describe the contributing process	Category / Subcategory	Quantity per day	Units of measure

4. Expected or Proposed Discharge Flow Rates for this outfall:

a. Total Annual Discharge	b. Daily Minimum Flow	c. Daily Average Flow	d. Daily Maximum Flow	e. Maximum Design flow rate
88 MG	0 MGD	0.24 MGD	0.86 MGD	0.86 MGD

INDUSTRIAL APPLICATION FORM NY-2C
Section II - Outfall Information

Outfall No.: 001

SPDES Number:

Facility Name:
Off-Site Treatment System, Former Unysis Facility

5. Is this a seasonal discharge?

[ ] **YES** - Complete the following table.

[X] **NO** - Go to Item 6 below.

Operations contributing flow (list)	Discharge frequency		Flow				
	Batches per year	Duration per batch	Flow rate per day		Total volume per discharge	Units	Duration (Days)
			LTA	Daily Max			

6. Water Supply Source (indicate all that apply)

	Name or owner of water supply source	Volume or flow rate	Units (check one)		
Municipal Supply			MGD	GPD	GPM
Private Surface Water Source			MGD	GPD	GPM
Private Supply Well	Lockheed Martin Corporation	500	MGD	GPD	X GPM
Other (specify)			MGD	GPD	GPM

7. Outfall configuration: (Surface water discharges only)

A. Where is the discharge point located with respect to the receiving water?

In the streambank: [ ]

In the stream: [ ]

Within a lake or ponded water: [ ]

Within an estuary: [ ] Attach Supplement C, MIXING ZONE REQUIREMENTS FOR DISCHARGES TO ESTUARIES.

Discharge is equipped with diffuser: [ ] Attach description, including configuration and plan drawing of diffuser, if used.

B. If located in a stream, approximately what percentage of stream width from shore is the discharge point located?

10% [ ] **25%** [ ] **50%** [ ] **Other:** [ ]

C. If located in a stream, describe the stream geometry in the general vicinity of the discharge point, under low flow conditions:

Stream width	Stream depth	Stream velocity
Feet	**Feet**	**Feet/Sec**

Are the results of a mixing/diffusion study attached? [ ] **YES** [ ] **NO**

Section II - Outfall Information

Facility Name:	Outfall No.: 001
Off-Site Treatment System, Former Unysis Facility	SPDES Number:

8. Thermal Discharge Criteria

Is your facility one of the applicable types of facilities listed in the instructions, and does the temperature of this discharge exceed the receiving water temperature by greater than three (3) degrees Fahrenheit?

[ ] **YES** - Complete the following table.

[X] **NO** - Go to Item 9. below.

[ ] **Information on the intake and discharge configuration of this outfall is attached.**

Discharge Temperature, deg. F			Duration of maximum discharge temperature		Dates of maximum discharge temperature		Maximum flow rate	Discharge configuration (e.g. subsurface, surface, effluent diffuser, diffusion well, etc.)
Average change in temperature (delta T)	Maximum change in temperature (delta T)	Maximum temperature	hours per day	days per year	From	To	MGD	

9. Are any water treament chemicals or additives that are used by your facility subsequently discharged through this outfall?

[ ] **YES** - Complete the following table and complete pages 1 of 3 and 2 of 3 of Form WTCFX for each water treatment chemical listed.

[X] **NO** - Go to Item 10. below.

Manufacturer	WTC trade name	Manufacturer	WTC trade name

10. Has any biological test for acute or chronic toxicity been performed on this outfall or on the receiving water in relation to this outfall in the past three (3) years?

[ ] **YES** - Complete the following table.

[X] **NO** - Go to Item 11. on the following page.

Water tested	Purpose of test	Type of test	Chronic or Acute?	Subject species	Testing date(s)		Submitted? (Date)
					Start	Finish	

INDUSTRIAL APPLICATION FORM NY-2C
Section II - Outfall Information

Outfall No.: 001

SPDES Number:

Facility Name:
Off-Site Treatment System, Former Unysis Facility

11. Is the discharge from this outfall treated to remove process wastes, water treatment additives, or other pollutants?

[X] **YES** - Complete the following table. Treatment codes are listed in Table 4.

[ ] **NO** - Go to Item 12 below.

Treatment process	Treatment Code(s)	Treatment used for the removal of:	Design Flow Rate (include units)
Recovered groundwater is treated by two (2) air stripping towers in series.	1-Y	Chlorinated solvent	600 GPM

12. Does this facility have either a compliance agreement with a regulating agency, or have planned changes in production, which will materially alter the quantity and/or quality of the discharge from this outfall?

[X] **YES** - Complete the following table.

[ ] **NO** - Go to Section III on the following page.

Description of project	Subject to Condition or Agreement in existing permit or consent order? (List)	Change due to production increase?	Completion Date(s)	
			Required	Projected
Groundwater remediation per NYSDEC Consent Order	Consent Order #W1-0527-91-02			12/91

This completes Section II of the SPDES Industrial Application Form NY-2C. Section I, which requires general information regarding your facility, and Section III, which requires sampling information for each of the outfalls at your facility, must also be completed and submitted with this application.

INDUSTRIAL APPLICATION FORM NY-2C
Section III - Sampling Information

Facility Name:	SPDES No.:	Outfall No.:
Off-Site Treatment System, Former Unysis Facility		001

1. Sampling Information - Conventional Parameters

Provide the analytical results of at least one analysis for every pollutant in this table. If this outfall is subject to a waiver as listed in Table 5 of the instructions for one or more of the parameters listed below, provide the results for those parameters which are required for this type of outfall.

PLEASE PRINT OR TYPE IN THE UNSHADED AREAS ONLY. You may report some or all of this information on separate sheets (using the same format) instead of completing this page.

Pollutant	Effluent data							Units		Intake data (optional)		
	a. Maximum daily value		b. Maximum 30 day value		c. Long term average		d. Number of analyses	a. Concentration	b. Mass	a. Long term average value		b. Number of analyses
	1. Concentration	2. Mass	1. Concentration	2. Mass	1. Concentration	2. Mass				1. Concentration	2. Mass	
a. Biochemical Oxygen Demand, 5 day (BOD)	N/A	N/A	N/A	N/A	N/A	N/A	N/A					
b. Chemical Oxygen Demand (COD)	N/A	N/A	N/A	N/A	N/A	N/A	N/A					
c. Total Suspended Solids (TSS)	N/A	N/A	N/A	N/A	N/A	N/A	N/A					
d. Total Dissolved Solids (TDS)	N/A	N/A	N/A	N/A	N/A	N/A	N/A					
e. Oil & Grease	N/A	N/A	N/A	N/A	N/A	N/A	N/A					
f. Chlorine, Total Residual (TRC)	N/A	N/A	N/A	N/A	N/A	N/A	N/A					
g. Total Organic Nitrogen (TON)	N/A	N/A	N/A	N/A	N/A	N/A	N/A					
h. Ammonia (as N)	N/A	N/A	N/A	N/A	N/A	N/A	N/A					
i. Flow	Value 0.86 MG		Value 26 MG		Value 0.24 MGD		N/A			Value		
j. Temperature, winter	Value N/A		Value N/A		Value N/A		N/A			Value		
k. Temperature, summer	Value N/A		Value N/A		Value N/A		N/A			Value		
l. pH	Minimum N/A	Maximum N/A	Minimum N/A	Maximum N/A			N/A			Minimum	Maximum	

2. Sampling Information - Priority Pollutants, Toxic Pollutants, and Hazardous Substances

a. Primary Industries:

i. Does the discharge from this outfall contain process wastewater?

[ ] **Yes** - Go to Item ii. below.
[X] **No** - Go to Item **b.** below.

ii. Indicate which GC/MS fractions have been tested for: Volatiles: [ ] Acid: [ ] Base/Neutral: [ ] Pesticide: [ ]

b. All applicants:

i. Do you know or have reason to believe that any of the pollutants listed in Tables 6, 7, or 8 of the instructions are present in the discharge from this outfall?

[X] **Yes** - Concentration and mass data attached.
[ ] **No** - Go to Item ii. below.

ii. Do you know or have reason to believe that any of the pollutants listed in Table 9 or Table 10 of the instructions, or any other toxic, harmful, or injurious chemical substances not listed in Tables 6-10, are present in the discharge from this outfall?

[ ] **Yes** - Source or reason for presence in discharge attached
[ ] **Yes** - Quantitative or qualitative data attached
[X] **No**

INDUSTRIAL APPLICATION FORM NY-2C
Section III - Sampling Information

Facility Name:	SPDES No.:	Outfall No.:
Off-Site Treatment System, Former Unysis Facility		001

3. Projected Effluent Quality - Priority Pollutants, Toxic Pollutants, and Hazardous Substances

Provide analytical results of at least one analysis for each pollutant that you know or have reason to believe is present in this discharge, as well as for any GC/MS fractions and metals required to be sampled from Section III Forms, Item 2.a on the preceding page.

List the name and CAS number for each pollutant that you know or have reason to believe is present in the discharge from this outfall. For each pollutant listed from Tables 6, 7, or 8, provide the results of at least one analysis for that pollutant, and determine the mass discharge based on the flow rate reported in Item 1.i. For each pollutant listed from Table 9, or any other toxic pollutant not listed in Tables 6-10, you must provide concentration and mass data (if available) and/or an explanation for their presence in the discharge. Make as many copies of this table as necessary for each outfall.

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Pollutant and CAS Number	Effluent data							Units		Intake data (optional)			Believed present, no sampling results available
	a. Maximum daily value		b. Maximum 30 day value (if available)		c. Long term average value (if available)		d. Number of analyses	a. Concentration	b. Mass	a. Long term average value		d. Number of analyses	
	(1) Concentration	(2) Mass	(1) Concentration	(2) Mass	(1) Concentration	(2) Mass				(1) Concentration	(2) Mass		
cis-1,2 Dichloroethylene CAS Number: 00156-59-2	<5	N/A	<5	N/A	N/A	N/A	N/A	ug/L	N/A	N/A	N/A	N/A	N/A
Tetrachloroethylene CAS Number: 00127-18-4	<5	N/A	<5	N/A	N/A	N/A	N/A	ug/L	N/A	N/A	N/A	N/A	N/A
Trichloroethylene CAS Number: 00079-01-6	<5	N/A	<5	N/A	N/A	N/A	N/A	ug/L	N/A	N/A	N/A	N/A	N/A
Freon 113 CAS Number: 00076-13-1	<5	N/A	<5	N/A	N/A	N/A	N/A	ug/L	N/A	N/A	N/A	N/A	N/A
Freon 22 CAS Number: 00075-45-6	<5	N/A	<5	N/A	N/A	N/A	N/A	ug/L	N/A	N/A	N/A	N/A	N/A
Freon 12 CAS Number: 00075-69-4	<5	N/A	<5	N/A	N/A	N/A	N/A	ug/L	N/A	N/A	N/A	N/A	N/A
Vinyl Chloride CAS Number: 00075-01-4	<5	N/A	<5	N/A	N/A	N/A	N/A	ug/L	N/A	N/A	N/A	N/A	N/A
CAS Number:													
CAS Number:													
CAS Number:													
CAS Number:													
CAS Number:													
CAS Number:													

INDUSTRIAL APPLICATION FORM NY-2C
Section III - Sampling Information

Facility Name:	SPDES No.:	Outfall No.:
Off-Site Treatment System, Former Unysis Facility		001

4. Existing Effluent Quality - Priority Pollutants, Toxic Pollutants, and Hazardous Substances

Provide analytical results for the last three (3) years for each pollutant that you know or have reason to believe present in this discharge from this outfall, as well as for any GC/MS fractions and metals required to be sampled from Section III Forms, Item 2.a for this discharge.

Make as many copies of this table as necessary for each outfall. You can list the results from 24 sampling dates on each copy of this page.		Parameter name:	Parameter name:	Parameter name:	Parameter name:	Parameter name:	Parameter name:	Parameter name:
Page Of		CAS Number:	CAS Number:	CAS Number:	CAS Number:	CAS Number:	CAS Number:	CAS Number:
Date	Flow rate	Concentration	Concentration	Concentration	Concentration	Concentration	Concentration	Concentration
	Units:	Units:	Units:	Units:	Units:	Units:	Units:	Units:
Not available	- New Facility							

State Pollutant Discharge Elimination System (SPDES)

INDUSTRIAL APPLICATION FORM NY-2C

For New Permits and Permit Modifications to Discharge Industrial Wastewater and Storm Water

Section II - Outfall Information

Please type or print the requested information.

Facility Name:	SPDES Number:
Off-Site Treatment System, Former Unysis Facility	

1. Outfall Number and Location

Outfall No.:		
002		
Latitude ° ' "	Longitude ° ' "	Receiving Water Groundwater

2. Type of Discharge and Discharge Rate (List all information applicable to this outfall)

	Volume/Flow	Units MGD	GPM	Other (specify)		Volume/Flow	Units MGD	GPM	Other (specify)
a. Process Wastewater					f. Noncontact Cooling Water				
b. Process Wastewater					g. Remediation System Discharge	167		X	
c. Process Wastewater					h. Boiler Blowdown				
d. Process Wastewater					i. Storm Water				
e. Contact Cooling Water					j. Sanitary Wastewater				
k. Other discharge (specify):									
l. Other discharge (specify):									

3. List process information for the Process Wastewater streams identified in 2.a-d above:

a. Name of the process contributing to the discharge			Process SIC code:
Describe the contributing process	Category / Subcategory	Quantity per day	Units of measure
b. Name of the process contributing to the discharge			Process SIC code:
Describe the contributing process	Category / Subcategory	Quantity per day	Units of measure
c. Name of the process contributing to the discharge			Process SIC code:
Describe the contributing process	Category / Subcategory	Quantity per day	Units of measure
d. Name of the process contributing to the discharge			Process SIC code:
Describe the contributing process	Category / Subcategory	Quantity per day	Units of measure

4. Expected or Proposed Discharge Flow Rates for this outfall:

a. Total Annual Discharge	b. Daily Minimum Flow	c. Daily Average Flow	d. Daily Maximum Flow	e. Maximum Design flow rate
88 MG	0 MGD	0.24 MGD	0.86 MGD	0.86 MGD

INDUSTRIAL APPLICATION FORM NY-2C
Section II - Outfall Information

Outfall No.: 002

SPDES Number:

Facility Name: Off-Site Treatment System, Former Unysis Facility

5. Is this a seasonal discharge?

[ ] **YES** - Complete the following table.

[X] **NO** - Go to Item 6 below.

Operations contributing flow (list)	Discharge frequency		Flow				
	Batches per year	Duration per batch	Flow rate per day		Total volume per discharge	Units	Duration (Days)
			LTA	Daily Max			

6. Water Supply Source (indicate all that apply)

	Name or owner of water supply source	Volume or flow rate	Units (check one)		
Municipal Supply			MGD	GPD	GPM
Private Surface Water Source			MGD	GPD	GPM
Private Supply Well	Lockheed Martin Corporation	500	MGD	GPD	X GPM
Other (specify)			MGD	GPD	GPM

7. Outfall configuration: (Surface water discharges only)

A. Where is the discharge point located with respect to the receiving water?

In the streambank: [ ]

In the stream: [ ]

Within a lake or ponded water: [ ]

Within an estuary: [ ] Attach Supplement C, MIXING ZONE REQUIREMENTS FOR DISCHARGES TO ESTUARIES.

Discharge is equipped with diffuser: [ ] Attach description, including configuration and plan drawing of diffuser, if used.

B. If located in a stream, approximately what percentage of stream width from shore is the discharge point located?

10% [ ] **25%** [ ] **50%** [ ] **Other:** [ ]

C. If located in a stream, describe the stream geometry in the general vicinity of the discharge point, under low flow conditions:

Stream width	Stream depth	Stream velocity
Feet	**Feet**	**Feet/Sec**

Are the results of a mixing/diffusion study attached? [ ] **YES** [ ] **NO**

Section II - Outfall Information

Facility Name:	Outfall No.: 002
Off-Site Treatment System, Former Unysis Facility	SPDES Number:

8. Thermal Discharge Criteria

Is your facility one of the applicable types of facilities listed in the instructions, and does the temperature of this discharge exceed the receiving water temperature by greater than three (3) degrees Fahrenheit?

[ ] **YES** - Complete the following table.

[X] **NO** - Go to Item 9. below.

[ ] **Information on the intake and discharge configuration of this outfall is attached.**

Discharge Temperature, deg. F			Duration of maximum discharge temperature		Dates of maximum discharge temperature		Maximum flow rate	Discharge configuration (e.g. subsurface, surface, effluent diffuser, diffusion well, etc.)
Average change in temperature (delta T)	Maximum change in temperature (delta T)	Maximum temperature	hours per day	days per year	From	To	MGD	

9. Are any water treament chemicals or additives that are used by your facility subsequently discharged through this outfall?

[ ] **YES** - Complete the following table and complete pages 1 of 3 and 2 of 3 of Form WTCFX for each water treatment chemical listed.

[X] **NO** - Go to Item 10. below.

Manufacturer	WTC trade name	Manufacturer	WTC trade name

10. Has any biological test for acute or chronic toxicity been performed on this outfall or on the receiving water in relation to this outfall in the past three (3) years?

[ ] **YES** - Complete the following table.

[X] **NO** - Go to Item 11. on the following page.

Water tested	Purpose of test	Type of test	Chronic or Acute?	Subject species	Testing date(s)		Submitted? (Date)
					Start	Finish	

INDUSTRIAL APPLICATION FORM NY-2C
Section II - Outfall Information

Outfall No.: 002

Facility Name: Off-Site Treatment System, Former Unysis Facility

SPDES Number:

11. Is the discharge from this outfall treated to remove process wastes, water treatment additives, or other pollutants?

[X] **YES** - Complete the following table. Treatment codes are listed in Table 4.

[ ] **NO** - Go to Item 12 below.

Treatment process	Treatment Code(s)	Treatment used for the removal of:	Design Flow Rate (include units)
Recovered groundwater is treated by two (2) air stripping towers in series.	1-Y	Chlorinated solvent	600 GPM

12. Does this facility have either a compliance agreement with a regulating agency, or have planned changes in production, which will materially alter the quantity and/or quality of the discharge from this outfall?

[X] **YES** - Complete the following table.

[ ] **NO** - Go to Section III on the following page.

Description of project	Subject to Condition or Agreement in existing permit or consent order? (List)	Change due to production increase?	Completion Date(s)	
			Required	Projected
Groundwater remediation per NYSDEC Consent Order	Consent Order #W1-0527-91-02			12/91

This completes Section II of the SPDES Industrial Application Form NY-2C. Section I, which requires general information regarding your facility, and Section III, which requires sampling information for each of the outfalls at your facility, must also be completed and submitted with this application.

INDUSTRIAL APPLICATION FORM NY-2C
Section III - Sampling Information

Facility Name:	SPDES No.:	Outfall No.:
Off-Site Treatment System, Former Unysis Facility		002

1. Sampling Information - Conventional Parameters

Provide the analytical results of at least one analysis for every pollutant in this table. If this outfall is subject to a waiver as listed in Table 5 of the instructions for one or more of the parameters listed below, provide the results for those parameters which are required for this type of outfall.

PLEASE PRINT OR TYPE IN THE UNSHADED AREAS ONLY. You may report some or all of this information on separate sheets (using the same format) instead of completing this page.

Pollutant	Effluent data							Units		Intake data (optional)		
	a. Maximum daily value		b. Maximum 30 day value		c. Long term average		d. Number of analyses	a. Concentration	b. Mass	a. Long term average value		b. Number of analyses
	1. Concentration	2. Mass	1. Concentration	2. Mass	1. Concentration	2. Mass				1. Concentration	2. Mass	
a. Biochemical Oxygen Demand, 5 day (BOD)	N/A	N/A	N/A	N/A	N/A	N/A	N/A					
b. Chemical Oxygen Demand (COD)	N/A	N/A	N/A	N/A	N/A	N/A	N/A					
c. Total Suspended Solids (TSS)	N/A	N/A	N/A	N/A	N/A	N/A	N/A					
d. Total Dissolved Solids (TDS)	N/A	N/A	N/A	N/A	N/A	N/A	N/A					
e. Oil & Grease	N/A	N/A	N/A	N/A	N/A	N/A	N/A					
f. Chlorine, Total Residual (TRC)	N/A	N/A	N/A	N/A	N/A	N/A	N/A					
g. Total Organic Nitrogen (TON)	N/A	N/A	N/A	N/A	N/A	N/A	N/A					
h. Ammonia (as N)	N/A	N/A	N/A	N/A	N/A	N/A	N/A					
i. Flow	Value 0.86 MG		Value 26 MG		Value 0.24 MGD		N/A			Value		
j. Temperature, winter	Value N/A		Value N/A		Value N/A		N/A			Value		
k. Temperature, summer	Value N/A		Value N/A		Value N/A		N/A			Value		
l. pH	Minimum N/A	Maximum N/A	Minimum N/A	Maximum N/A			N/A			Minimum	Maximum	

2. Sampling Information - Priority Pollutants, Toxic Pollutants, and Hazardous Substances

a. Primary Industries:

i. Does the discharge from this outfall contain process wastewater?

[ ] **Yes** - Go to Item ii. below.
[X] **No** - Go to Item **b.** below.

ii. Indicate which GC/MS fractions have been tested for: Volatiles: [ ] Acid: [ ] Base/Neutral: [ ] Pesticide: [ ]

b. All applicants:

i. Do you know or have reason to believe that any of the pollutants listed in Tables 6, 7, or 8 of the instructions are present in the discharge from this outfall?

[X] **Yes** - Concentration and mass data attached.
[ ] **No** - Go to Item ii. below.

ii. Do you know or have reason to believe that any of the pollutants listed in Table 9 or Table 10 of the instructions, or any other toxic, harmful, or injurious chemical substances not listed in Tables 6-10, are present in the discharge from this outfall?

[ ] **Yes** - Source or reason for presence in discharge attached
[ ] **Yes** - Quantitative or qualitative data attached
[X] **No**

INDUSTRIAL APPLICATION FORM NY-2C

Section III - Sampling Information

Facility Name:	SPDES No.:	Outfall No.:
Off-Site Treatment System, Former Unysis Facility		002

3. Projected Effluent Quality - Priority Pollutants, Toxic Pollutants, and Hazardous Substances

Provide analytical results of at least one analysis for each pollutant that you know or have reason to believe is present in this discharge, as well as for any GC/MS fractions and metals required to be sampled from Section III Forms, Item 2.a on the preceding page.

List the name and CAS number for each pollutant that you know or have reason to believe is present in the discharge from this outfall. For each pollutant listed from Tables 6, 7, or 8, provide the results of at least one analysis for that pollutant, and determine the mass discharge based on the flow rate reported in Item 1.i. For each pollutant listed from Table 9, or any other toxic pollutant not listed in Tables 6-10, you must provide concentration and mass data (if available) and/or an explanation for their presence in the discharge. Make as many copies of this table as necessary for each outfall.

Page of

Pollutant and CAS Number	Effluent data							Units		Intake data (optional)			Believed present, no sampling results available
	a. Maximum daily value		b. Maximum 30 day value (if available)		c. Long term average value (if available)		d. Number of analyses	a. Concentration	b. Mass	a. Long term average value		d. Number of analyses	
	(1) Concentration	(2) Mass	(1) Concentration	(2) Mass	(1) Concentration	(2) Mass				(1) Concentration	(2) Mass		
cis-1,2 Dichloroethylene CAS Number: 00156-59-2	<5	N/A	<5	N/A	N/A	N/A	N/A	ug/L	N/A	N/A	N/A	N/A	N/A
Tetrachloroethylene CAS Number: 00127-18-4	<5	N/A	<5	N/A	N/A	N/A	N/A	ug/L	N/A	N/A	N/A	N/A	N/A
Trichloroethylene CAS Number: 00079-01-6	<5	N/A	<5	N/A	N/A	N/A	N/A	ug/L	N/A	N/A	N/A	N/A	N/A
Freon 113 CAS Number: 00076-13-1	<5	N/A	<5	N/A	N/A	N/A	N/A	ug/L	N/A	N/A	N/A	N/A	N/A
Freon 22 CAS Number: 00075-45-6	<5	N/A	<5	N/A	N/A	N/A	N/A	ug/L	N/A	N/A	N/A	N/A	N/A
Freon 12 CAS Number: 00075-69-4	<5	N/A	<5	N/A	N/A	N/A	N/A	ug/L	N/A	N/A	N/A	N/A	N/A
Vinyl Chloride CAS Number: 00075-01-4	<5	N/A	<5	N/A	N/A	N/A	N/A	ug/L	N/A	N/A	N/A	N/A	N/A
CAS Number:													
CAS Number:													
CAS Number:													
CAS Number:													
CAS Number:													
CAS Number:													

INDUSTRIAL APPLICATION FORM NY-2C
Section III - Sampling Information

Facility Name:	SPDES No.:	Outfall No.:
Off-Site Treatment System, Former Unysis Facility		002

4. Existing Effluent Quality - Priority Pollutants, Toxic Pollutants, and Hazardous Substances

Provide analytical results for the last three (3) years for each pollutant that you know or have reason to believe present in this discharge from this outfall, as well as for any GC/MS fractions and metals required to be sampled from Section III Forms, Item 2.a for this discharge.

Make as many copies of this table as necessary for each outfall. You can list the results from 24 sampling dates on each copy of this page.		Parameter name:	Parameter name:	Parameter name:	Parameter name:	Parameter name:	Parameter name:	Parameter name:
Page Of		CAS Number:	CAS Number:	CAS Number:	CAS Number:	CAS Number:	CAS Number:	CAS Number:
Date	Flow rate	Concentration	Concentration	Concentration	Concentration	Concentration	Concentration	Concentration
	Units:	Units:	Units:	Units:	Units:	Units:	Units:	Units:
Not available	- New Facility							

State Pollutant Discharge Elimination System (SPDES)

INDUSTRIAL APPLICATION FORM NY-2C

For New Permits and Permit Modifications to Discharge Industrial Wastewater and Storm Water

Section II - Outfall Information

Please type or print the requested information.

Facility Name:	SPDES Number:
Off-Site Treatment System, Former Unysis Facility	

1. Outfall Number and Location

Outfall No.: 003		
Latitude ° ' "	Longitude ° ' "	Receiving Water Groundwater

2. Type of Discharge and Discharge Rate (List all information applicable to this outfall)

	Volume/Flow	Units MGD	GPM	Other (specify)		Volume/Flow	Units MGD	GPM	Other (specify)
a. Process Wastewater					f. Noncontact Cooling Water				
b. Process Wastewater					g. Remediation System Discharge	167		X	
c. Process Wastewater					h. Boiler Blowdown				
d. Process Wastewater					i. Storm Water				
e. Contact Cooling Water					j. Sanitary Wastewater				
k. Other discharge (specify):									
l. Other discharge (specify):									

3. List process information for the Process Wastewater streams identified in 2.a-d above:

a. Name of the process contributing to the discharge			Process SIC code:
Describe the contributing process	Category / Subcategory	Quantity per day	Units of measure
b. Name of the process contributing to the discharge			Process SIC code:
Describe the contributing process	Category / Subcategory	Quantity per day	Units of measure
c. Name of the process contributing to the discharge			Process SIC code:
Describe the contributing process	Category / Subcategory	Quantity per day	Units of measure
d. Name of the process contributing to the discharge			Process SIC code:
Describe the contributing process	Category / Subcategory	Quantity per day	Units of measure

4. Expected or Proposed Discharge Flow Rates for this outfall:

a. Total Annual Discharge	b. Daily Minimum Flow	c. Daily Average Flow	d. Daily Maximum Flow	e. Maximum Design flow rate
88 MG	0 MGD	0.24 MGD	0.86 MGD	0.86 MGD

INDUSTRIAL APPLICATION FORM NY-2C
Section II - Outfall Information

Outfall No.: 003

Facility Name: Off-Site Treatment System, Former Unysis Facility

SPDES Number:

5. Is this a seasonal discharge?

[ ] **YES** - Complete the following table.

[X] **NO** - Go to Item 6 below.

Operations contributing flow (list)	Discharge frequency		Flow				
	Batches per year	Duration per batch	Flow rate per day: LTA	Flow rate per day: Daily Max	Total volume per discharge	Units	Duration (Days)

6. Water Supply Source (indicate all that apply)

	Name or owner of water supply source	Volume or flow rate	Units (check one)		
Municipal Supply			MGD	GPD	GPM
Private Surface Water Source			MGD	GPD	GPM
Private Supply Well	Lockheed Martin Corporation	500	MGD	GPD	X GPM
Other (specify)			MGD	GPD	GPM

7. Outfall configuration: (Surface water discharges only)

A. Where is the discharge point located with respect to the receiving water?

In the streambank: [ ]

In the stream: [ ]

Within a lake or ponded water: [ ]

Within an estuary: [ ] Attach Supplement C, MIXING ZONE REQUIREMENTS FOR DISCHARGES TO ESTUARIES.

Discharge is equipped with diffuser: [ ] Attach description, including configuration and plan drawing of diffuser, if used.

B. If located in a stream, approximately what percentage of stream width from shore is the discharge point located?

10% [ ] **25%** [ ] **50%** [ ] **Other:** [ ]

C. If located in a stream, describe the stream geometry in the general vicinity of the discharge point, under low flow conditions:

Stream width	Stream depth	Stream velocity
Feet	Feet	Feet/Sec

Are the results of a mixing/diffusion study attached? [ ] **YES** [ ] **NO**

Section II - Outfall Information

Facility Name:	Outfall No.: 003
Off-Site Treatment System, Former Unysis Facility	SPDES Number:

8. Thermal Discharge Criteria

Is your facility one of the applicable types of facilities listed in the instructions, and does the temperature of this discharge exceed the receiving water temperature by greater than three (3) degrees Fahrenheit?

[ ] **YES** - Complete the following table.

[X] **NO** - Go to Item 9. below.

[ ] **Information on the intake and discharge configuration of this outfall is attached.**

Discharge Temperature, deg. F			Duration of maximum discharge temperature		Dates of maximum discharge temperature		Maximum flow rate	Discharge configuration (e.g. subsurface, surface, effluent diffuser, diffusion well, etc.)
Average change in temperature (delta T)	Maximum change in temperature (delta T)	Maximum temperature	hours per day	days per year	From	To	MGD	

9. Are any water treament chemicals or additives that are used by your facility subsequently discharged through this outfall?

[ ] **YES** - Complete the following table and complete pages 1 of 3 and 2 of 3 of Form WTCFX for each water treatment chemical listed.

[X] **NO** - Go to Item 10. below.

Manufacturer	WTC trade name	Manufacturer	WTC trade name

10. Has any biological test for acute or chronic toxicity been performed on this outfall or on the receiving water in relation to this outfall in the past three (3) years?

[ ] **YES** - Complete the following table.

[X] **NO** - Go to Item 11. on the following page.

Water tested	Purpose of test	Type of test	Chronic or Acute?	Subject species	Testing date(s) Start	Finish	Submitted? (Date)

INDUSTRIAL APPLICATION FORM NY-2C
Section II - Outfall Information

Outfall No.: 003

Facility Name: Off-Site Treatment System, Former Unysis FAcility

SPDES Number:

11. Is the discharge from this outfall treated to remove process wastes, water treatment additives, or other pollutants?

[X] **YES** - Complete the following table. Treatment codes are listed in Table 4.

[ ] **NO** - Go to Item 12 below.

Treatment process	Treatment Code(s)	Treatment used for the removal of:	Design Flow Rate (include units)
Recovered groundwater is treated by two (2) air stripping towers in series.	1-Y	Chlorinated solvent	600 GPM

12. Does this facility have either a compliance agreement with a regulating agency, or have planned changes in production, which will materially alter the quantity and/or quality of the discharge from this outfall?

[X] **YES** - Complete the following table.

[ ] **NO** - Go to Section III on the following page.

Description of project	Subject to Condition or Agreement in existing permit or consent order? (List)	Change due to production increase?	Completion Date(s) Required	Completion Date(s) Projected
Groundwater remediation per NYSDEC Consent Order	Consent Order #W1-0527-91-02			12/91

This completes Section II of the SPDES Industrial Application Form NY-2C. Section I, which requires general information regarding your facility, and Section III, which requires sampling information for each of the outfalls at your facility, must also be completed and submitted with this application.

INDUSTRIAL APPLICATION FORM NY-2C
Section III - Sampling Information

Facility Name:	SPDES No.:	Outfall No.:
Off-Site Treatment System, Former Unysis Facility		003

1. Sampling Information - Conventional Parameters

Provide the analytical results of at least one analysis for every pollutant in this table. If this outfall is subject to a waiver as listed in Table 5 of the instructions for one or more of the parameters listed below, provide the results for those parameters which are required for this type of outfall.

PLEASE PRINT OR TYPE IN THE UNSHADED AREAS ONLY. You may report some or all of this information on separate sheets (using the same format) instead of completing this page.

Pollutant	Effluent data							Units		Intake data (optional)		
	a. Maximum daily value		b. Maximum 30 day value		c. Long term average		d. Number of analyses	a. Concentration	b. Mass	a. Long term average value		b. Number of analyses
	1. Concentration	2. Mass	1. Concentration	2. Mass	1. Concentration	2. Mass				1. Concentration	2. Mass	
a. Biochemical Oxygen Demand, 5 day (BOD)	N/A	N/A	N/A	N/A	N/A	N/A	N/A					
b. Chemical Oxygen Demand (COD)	N/A	N/A	N/A	N/A	N/A	N/A	N/A					
c. Total Suspended Solids (TSS)	N/A	N/A	N/A	N/A	N/A	N/A	N/A					
d. Total Dissolved Solids (TDS)	N/A	N/A	N/A	N/A	N/A	N/A	N/A					
e. Oil & Grease	N/A	N/A	N/A	N/A	N/A	N/A	N/A					
f. Chlorine, Total Residual (TRC)	N/A	N/A	N/A	N/A	N/A	N/A	N/A					
g. Total Organic Nitrogen (TON)	N/A	N/A	N/A	N/A	N/A	N/A	N/A					
h. Ammonia (as N)	N/A	N/A	N/A	N/A	N/A	N/A	N/A					
i. Flow	Value 0.86 MG		Value 26 MG		Value 0.24 MGD		N/A			Value		
j. Temperature, winter	Value N/A		Value N/A		Value N/A		N/A			Value		
k. Temperature, summer	Value N/A		Value N/A		Value N/A		N/A			Value		
l. pH	Minimum N/A	Maximum N/A	Minimum N/A	Maximum N/A			N/A			Minimum	Maximum	

2. Sampling Information - Priority Pollutants, Toxic Pollutants, and Hazardous Substances

a. Primary Industries:

i. Does the discharge from this outfall contain process wastewater?

[ ] **Yes** - Go to Item ii. below.
[X] **No** - Go to Item **b.** below.

ii. Indicate which GC/MS fractions have been tested for: Volatiles: [ ] Acid: [ ] Base/Neutral: [ ] Pesticide: [ ]

b. All applicants:

i. Do you know or have reason to believe that any of the pollutants listed in Tables 6, 7, or 8 of the instructions are present in the discharge from this outfall?

[X] **Yes** - Concentration and mass data attached.
[ ] **No** - Go to Item **ii.** below.

ii. Do you know or have reason to believe that any of the pollutants listed in Table 9 or Table 10 of the instructions, or any other toxic, harmful, or injurious chemical substances not listed in Tables 6-10, are present in the discharge from this outfall?

[ ] **Yes** - Source or reason for presence in discharge attached
[ ] **Yes** - Quantitative or qualitative data attached
[X] **No**

INDUSTRIAL APPLICATION FORM NY-2C
Section III - Sampling Information

Facility Name:	SPDES No.:	Outfall No.:
Off-Site Treatment System, Former Unysis Facility		003

3. Projected Effluent Quality - Priority Pollutants, Toxic Pollutants, and Hazardous Substances

Provide analytical results of at least one analysis for each pollutant that you know or have reason to believe is present in this discharge, as well as for any GC/MS fractions and metals required to be sampled from Section III Forms, Item 2.a on the preceding page.

List the name and CAS number for each pollutant that you know or have reason to believe is present in the discharge from this outfall. For each pollutant listed from Tables 6, 7, or 8, provide the results of at least one analysis for that pollutant, and determine the mass discharge based on the flow rate reported in Item 1.i. For each pollutant listed from Table 9, or any other toxic pollutant not listed in Tables 6-10, you must provide concentration and mass data (if available) and/or an explanation for their presence in the discharge. Make as many copies of this table as necessary for each outfall.

Page of

Pollutant and CAS Number	Effluent data							Units		Intake data (optional)			Believed present, no sampling results available
	a. Maximum daily value		b. Maximum 30 day value (if available)		c. Long term average value (if available)		d. Number of analyses	a. Concentration	b. Mass	a. Long term average value		d. Number of analyses	
	(1) Concentration	(2) Mass	(1) Concentration	(2) Mass	(1) Concentration	(2) Mass				(1) Concentration	(2) Mass		
cis-1,2 Dichloroethylene CAS Number: 00156-59-2	<5	N/A	<5	N/A	N/A	N/A	N/A	ug/L	N/A	N/A	N/A	N/A	N/A
Tetrachloroethylene CAS Number: 00127-18-4	<5	N/A	<5	N/A	N/A	N/A	N/A	ug/L	N/A	N/A	N/A	N/A	N/A
Trichloroethylene CAS Number: 00079-01-6	<5	N/A	<5	N/A	N/A	N/A	N/A	ug/L	N/A	N/A	N/A	N/A	N/A
Freon 113 CAS Number: 00076-13-1	<5	N/A	<5	N/A	N/A	N/A	N/A	ug/L	N/A	N/A	N/A	N/A	N/A
Freon 22 CAS Number: 00075-45-6	<5	N/A	<5	N/A	N/A	N/A	N/A	ug/L	N/A	N/A	N/A	N/A	N/A
Freon 12 CAS Number: 00075-69-4	<5	N/A	<5	N/A	N/A	N/A	N/A	ug/L	N/A	N/A	N/A	N/A	N/A
Vinyl Chloride CAS Number: 00075-01-4	<5	N/A	<5	N/A	N/A	N/A	N/A	ug/L	N/A	N/A	N/A	N/A	N/A
CAS Number:													
CAS Number:													
CAS Number:													
CAS Number:													
CAS Number:													
CAS Number:													

INDUSTRIAL APPLICATION FORM NY-2C
Section III - Sampling Information

Facility Name: Off-Site Treatment System, Former Unysis Facility	SPDES No.:	Outfall No.: 003

4. Existing Effluent Quality - Priority Pollutants, Toxic Pollutants, and Hazardous Substances
Provide analytical results for the last three (3) years for each pollutant that you know or have reason to believe present in this discharge from this outfall, as well as for any GC/MS fractions and metals required to be sampled from Section III Forms, Item 2.a for this discharge.

Make as many copies of this table as necessary for each outfall. You can list the results from 24 sampling dates on each copy of this page.		Parameter name:	Parameter name:	Parameter name:	Parameter name:	Parameter name:	Parameter name:	Parameter name:
Page Of		CAS Number:	CAS Number:	CAS Number:	CAS Number:	CAS Number:	CAS Number:	CAS Number:
Date	Flow rate	Concentration	Concentration	Concentration	Concentration	Concentration	Concentration	Concentration
	Units:	Units:	Units:	Units:	Units:	Units:	Units:	Units:
Not available	- New Facility							

Figures

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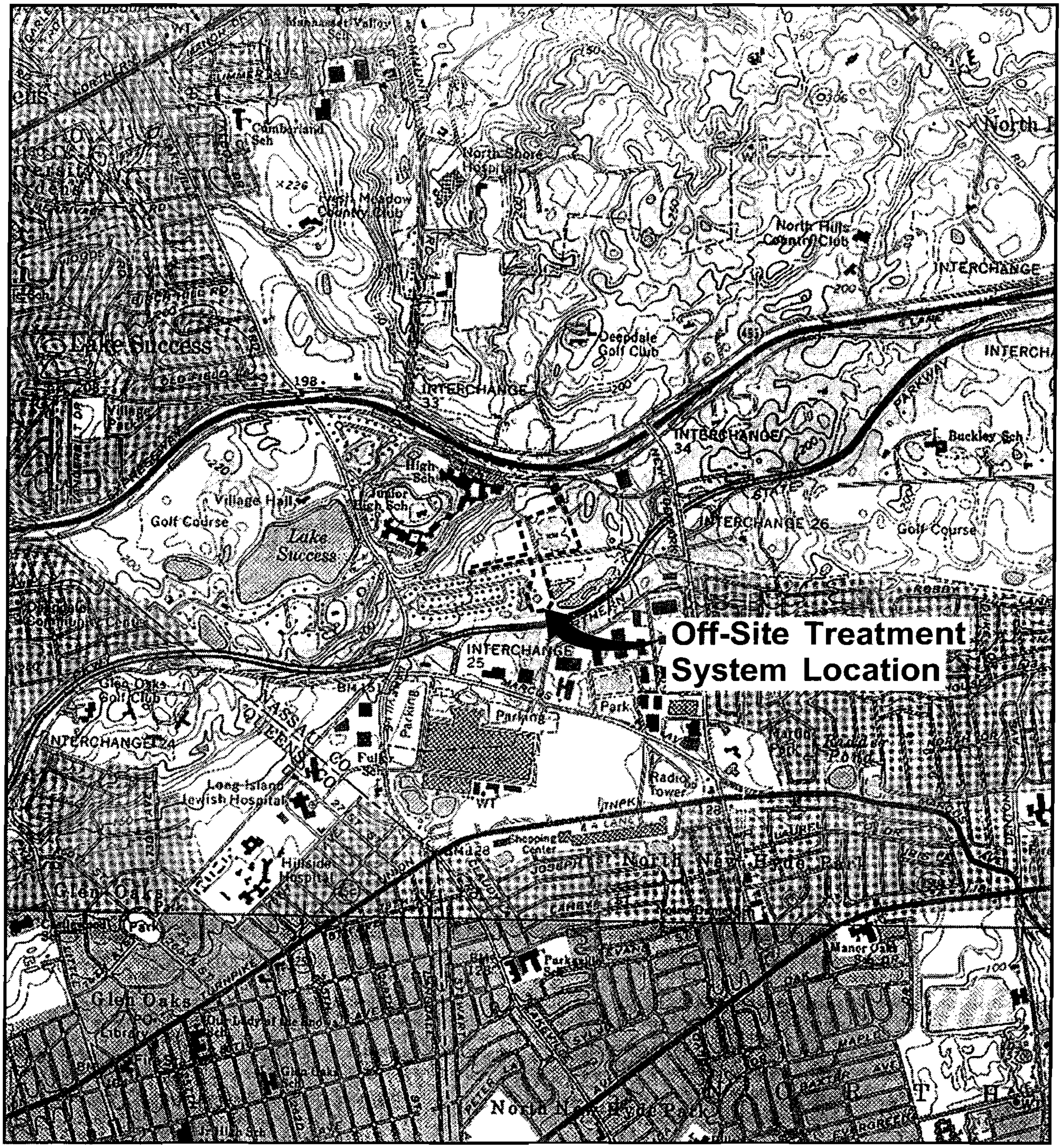
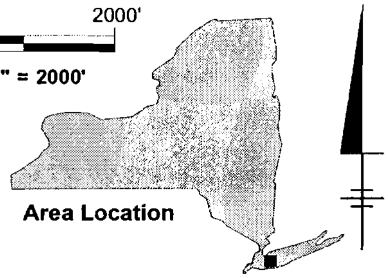
Remedial Management & Construction



REFERENCE: BASE MAP USGS 7.5 MIN. QUAD., LYNBROOK & SEA CLIFF, NY, 1968, PHOTOREVISED 1979.

2000' 0 2000'

Approximate Scale: 1" = 2000'



Area Location

03/23/06 SYR-D85-DJH, KLS
38031004/38031n04.cdr

FORMER UNISYS FACILITY
OFF-SITE IRM
GREAT NECK, NEW YORK

OFF-SITE TREATMENT SYSTEM LOCATION MAP

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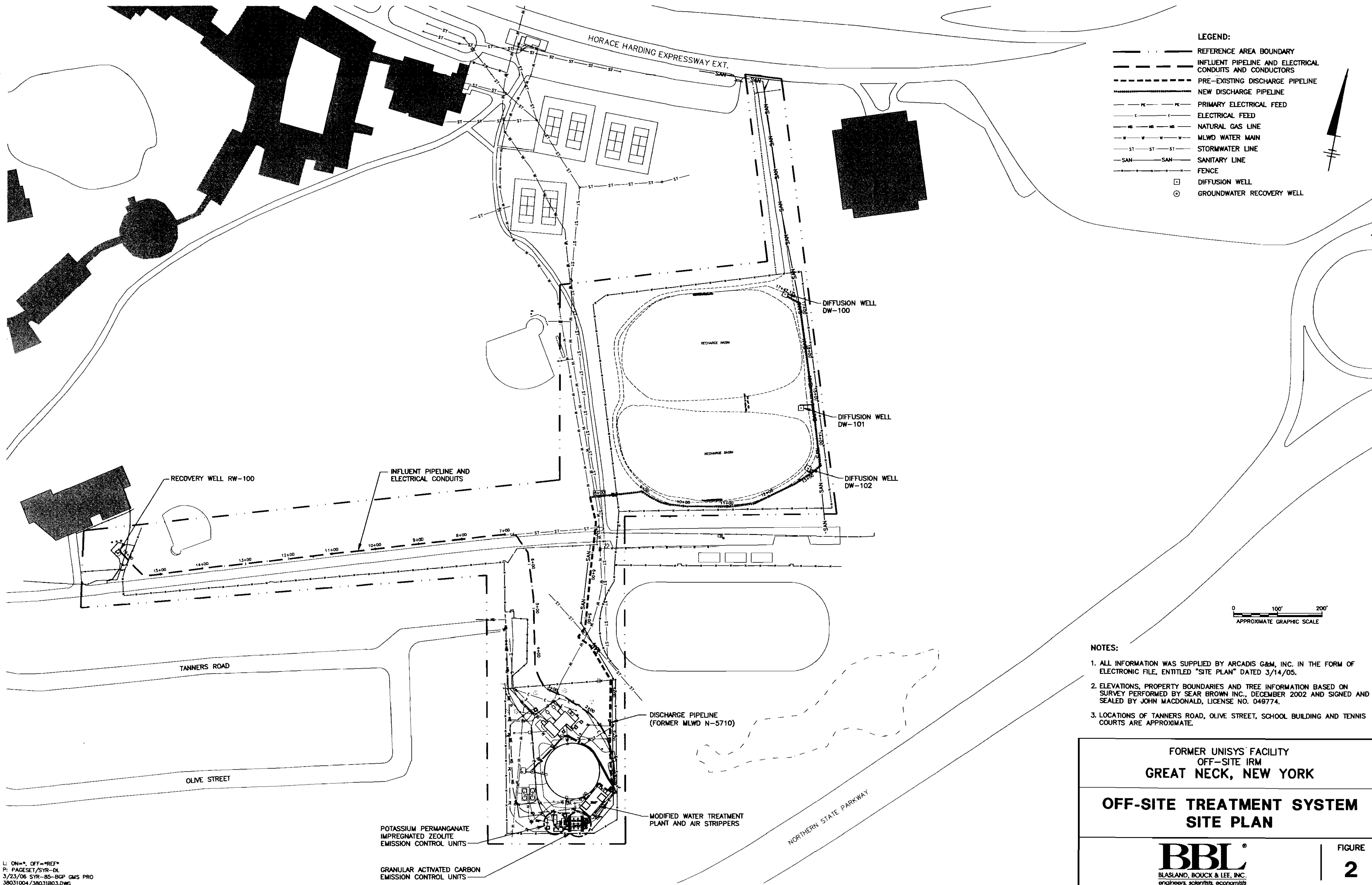
engineers, scientists, economists

FIGURE
1



NOTES:

1. ALL INFORMATION WAS SUPPLIED BY ARCADIS G&M, INC. IN THE FORM OF ELECTRONIC FILE, ENTITLED "SITE PLAN" DATED 3/14/05.
2. ELEVATIONS, PROPERTY BOUNDARIES AND TREE INFORMATION BASED ON SURVEY PERFORMED BY SEAR BROWN INC., DECEMBER 2002 AND SIGNED AND SEALED BY JOHN MACDONALD, LICENSE NO. 049774.
3. LOCATIONS OF TANNERS ROAD, OLIVE STREET, SCHOOL BUILDING AND TENNIS COURTS ARE APPROXIMATE.

FORMER UNISYS FACILITY
OFF-SITE IRM
GREAT NECK, NEW YORK

OFF-SITE TREATMENT SYSTEM SITE PLAN

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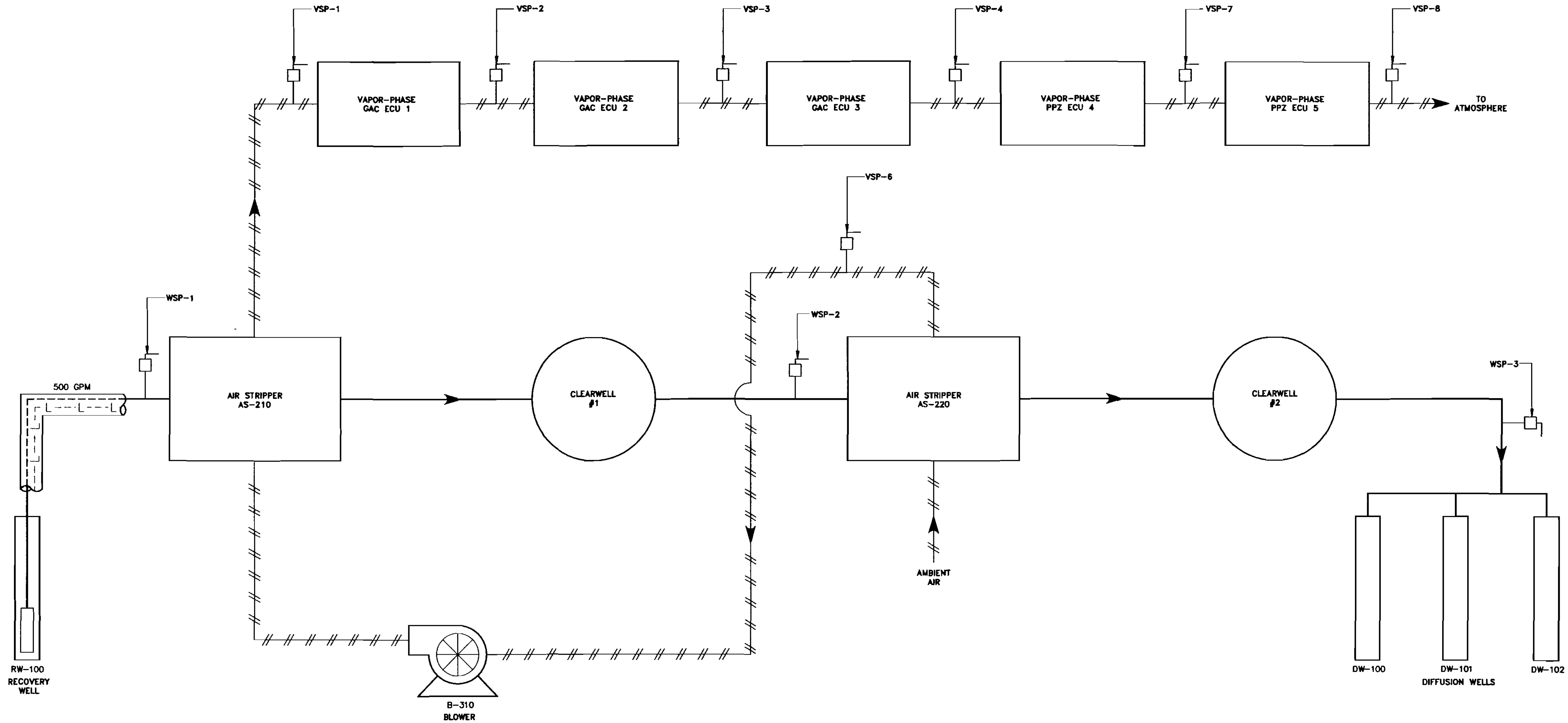
FIGURE 2



NOTE:

VSP-5 WAS FORMERLY THE DISCHARGE FROM THE FOURTH VAPOR-PHASE GAC UNIT.

LEGEND:

VSP-1	VAPOR SAMPLE PORT
WSP-1	WATER SAMPLE PORT
—//—//—//—//—	AIR PROCESS LINE
———	WATER PROCESS LINE
---L---L---L---	PROCESS LINE (DUAL WALL WITH LEAK DETECTION)
—□	SAMPLE PORT

FORMER UNISYS FACILITY
OFF-SITE IRM
GREAT NECK, NEW YORK

OFF-SITE TREATMENT SYSTEM SCHEMATIC

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FIGURE
3

X: (XREF)
L: (LAYER)
P: PAGESET/PLT-DL
03/23/06 SYR-85-SDL KLS PRO
38031004/38031F03.DWG