SITE EVALUATION AND CONCEPTUAL MODEL REPORT

ALCAS CUTLERY CORPORATION PROPERTY

OLEAN WELL FIELD SUPERFUND SITE
OLEAN, NY

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1.0 Executive Summary

The original site conceptual model for the Alcas Property is inferred in the OU 2 ROD for the Olean Well Field Superfund Site (hereinafter referred to as the Site) in Olean, NY. The inferred model is based on surrounding investigation of the Site, regional geologic assessment, and limited investigation of the Alcas Property geared for assessment of source potential to the Site. The inferred model did not include site-specific characterization of the Alcas Property in terms of underlying site geology, hydrogeology, or source constituents and associated phase-derivatives.

Since development of the original OU 2 ROD, significant new information became available through additional investigations, new technical advances, new historical site knowledge, and comprehensive reevaluation of new information combined with historical data. The new information substantiates that the original site conceptual model was incomplete and therefore inaccurate. This report therefore provides an update of the site conceptual model of the Alcas Property, which identifies significant differences from the original inferred model. The update also demonstrates the need for reassessment of site restoration potential in accordance with EPA Policy and the state of practice for chlorinated sites.

2.0 Olean Well Field Superfund Site Background

2.1 Site Description

The Alcas Cutlery Corporation facility (hereinafter referred to as the Alcas Property) is located within the Olean Well Field Superfund Site (Site). The Site is located in the eastern portion of the City of Olean and east and south of the City in the Towns of Olean and Portville in Cattaraugus County, New York. The Site incorporates three municipal wells and spans approximately 800 acres of property principally occupied by industrial facilities. The Allegheny River flows through the southwest and south portion of the Site, and State Routes 16 and 417 provide access to the area. The overall layout of the Site is shown in Figure 2-1.

Groundwater in the Site's upper aquifer and lower ("City") aquifer is contaminated with trichloroethene (TCE) and other chlorinated compounds. Groundwater drawn from municipal wells 18M (north of the Allegheny River) and 37M and 38M (south of the Allegheny River) is being treated by air stripping to meet drinking water standards prior to distribution to the City of Olean. Potentially responsible parties (PRPs) residing within the Site boundary and found to be contributing to the groundwater contamination include the Alcas Property, AVX Corporation (AVX), and McGraw-Edison (refer to Figure 2-1).

2.2 Site History

The following presents a brief history of activities conducted at the Site, followed by an overview of Site history specific to the Alcas Property.

2.2.1 Olean Well Field

TCE and other chlorinated solvents were detected above drinking water standards in the City of Olean municipal wells in 1981. The wells were then shut down, and a former surface-water treatment facility was reactivated to supply the City of Olean with water. Following an investigation of the contamination, the U.S. Environmental Protection Agency (EPA) added the Olean Well Field to the National Priorities List in September 1983.

Between 1983 and 1985, the EPA conducted additional investigations of the Site and undertook some early removal actions and supplied carbon adsorption filters to owners of impacted private wells. The agency additionally implemented a broad-scale remedial investigation and feasibility study (RI/FS), conducted a focused feasibility study, and implemented initial remedial measures (IRM) including regular monitoring of private wells and installation of carbon adsorption units as needed. Pursuant to administrative orders issued in 1984, PRPs (McGraw-Edison, AVX, and Alcas) also conducted investigations at their respective facilities. The results of the EPA and PRP investigations concluded that soil and groundwater at each of the facilities was contaminated with TCE and other chlorinated constituents, with established pathways of migration to the Lower Aquifer.

Based on the results of the early studies and interim actions, the EPA issued the Operable Unit (OU) 1 Record of Decision (ROD) in September 1985. The ROD required six principle actions:

- Installation of air strippers at municipal wells 18M and 37M/38M,
- Extension of the City's public water supply,
- Inspection/repair of an industrial sewer at McGraw-Edison,
- Recommendation for institutional controls to restrict withdrawal of contaminated groundwater.
- Institution of a Site Monitoring Plan, and
- Initiation of a Supplemental RI/FS to evaluate source control measures at PRP facilities.

The agency issued a unilateral administrative order in February 1986, requiring the PRPs to carry out the actions in the ROD. To implement the Supplemental RI/FS, the PRPs conducted investigations of their respective facilities and the EPA conducted studies of 10 additional properties. The Supplemental RI/FS conducted pursuant to the ROD identified four areas on Site as apparent sources of VOC contamination to the groundwater: the Alcas Property, Loohn's Dry Cleaners and Launderers, AVX, and McGraw-Edison facilities.

Following implementation of the OU 1 ROD, the agency issued an OU 2 ROD in September 1996. This ROD set forth selected remedies for the four source areas. The remedies involved combinations of vacuum enhanced recovery, groundwater pump-and-treat, and excavation technologies. The remedy decisions were based on an inferred Site Conceptual Model reflected in the ROD. A specific application of vacuum enhanced recovery was the principle technology in the remedy chosen for the Alcas Property by the EPA.

2.2.2 Site Superfund Actions Specific to the Alcas Property

A summary of Olean Well Field Superfund Site investigative and remedial activities relevant to the Alcas Property is provided in Table 2-1.

Table 2-1
Alcas Property at Olean Well Field Site - History of Activities

Date	Action
January 1981	Contamination discovered in municipal wells
September 1983	Olean Well Field Site added to NPL list – Alcas listed as a PRP
1984	Administrative Order issued to Alcas by EPA requiring investigation of facility
September 1985	Record of Decision issued by EPA for Operable Unit One
November 1989	Administrative Order issued to Alcas by EPA requiring removal of 10 cubic yards of TCE-contaminated soil (former weed killer area)
June 1991	Administrative Order issued by EPA for Supplemental RI/FS
November 1994	VER Pilot Test Conducted by Geraghty and Miller
September 1996	Record of Decision issued by EPA for Operable Unit Two
March 1998	Consent Decree entered for implementation of OU 2 ROD
March 1999	Remedial Design/Remedial Action Work Plan approved
July 1999	Phase 1 Predesign Investigation conducted
October 1999	Phase 2 Predesign Investigation conducted

2.3 Site Geologic/Hydrogeologic Setting

The geologic and hydrogeologic setting at the Olean Superfund Site was researched and described in various Site documents on a regional scale

2.3.1 Site Surface Water Hydrology

The town of Olean is located in the Allegheny River Valley near the border of the northwestern Allegheny plateau. The Allegheny River, a principle tributary of the Ohio River, flows north-northwest through the southern portion of the Site. Olean and Haskell Creeks, tributaries of the Allegheny, are located to the west and east of the Site, respectively. Surface runoff, direct precipitation, and groundwater inflow sustain the annual river/stream systems.

The size, shape and occurrence of modern-day surface water features are largely the result of past geologic and climatological processes. The major drainage feature in Olean is the Allegheny River which flows to the north and west and ranges in depth from 0 feet on sand and gravel bars to as deep as 15 feet in the center of the channel. At least 12 major floods have occurred on the Allegheny River since the early 1900's. Because of the flood hazard to the population in Olean, the Army Corps of Engineers raised the levees along the northern bank of the river. Storm water sewers from Olean passed through the dike via check-valved culverts so that back flow can be prevented during flood events.

Two major creeks feed the Allegheny River in the vicinity of Olean. Olean Creek begins at the confluence of Old Creek and Ischua Creek near Hinsdale, New York, and flows south through the City of Olean. Haskell Creek has its headwaters near South Cuba, New York, flows south to southwest along Haskell Road, and eventually empties into the Allegheny River approximately ½ mile west of the town of Weston Mills.

A less predominant topographic feature near the Alcas Property is a linear ditch behind the Alcas Property on East State Street. This is the remnant of a historic canal, which at one time was a shallow (approximately 3-5 foot deep) barge canal the runs roughly parallel to and north of the Allegheny River. Today, most of the canal is partially filled and/or drained so that there is no standing water.

2.3.2 Site Geology

The following discussion of regional geology is based on information from Muller (1975), McClintock and Patel (1944), NYSGA (1977), and Muller (1977) as summarized by Engineering-Science (1985).

The City of Olean is located in the Appalachian Highland Physiographic province, an upland of moderate relief underlain by sedimentary rocks dipping south at approximately 2 degrees. Most of this region has been covered by several continental ice sheets during the Pleistocene Epoch (1,600,000 to 10,000 years before the present). The glaciers, however, never progressed south of the Allegheny River Valley in western New York. The nonglaciated area, called the Salamanca Re-entrant, is the northernmost area in the eastern United States to escape Pleistocene glaciation. The Salamanca Re-entrant is bounded on the north, east, and west by terminal moraines. Remnants of the Olean Terminal Moraine, which reflects the maximum southerly position of the ice sheet in this area, are found on the south bank of the Allegheny River in the vicinity of Olean.

The bedrock valley floor in the vicinity of Olean occurs as deep as 300 feet. The bedrock consists of an Upper Devonian blue-green shale belonging to the Conewango Group.

Geologic and geophysical analysis of borehole data reveal that the upper 100 feet of sediment can be divided into 5 lithologic units, distinguished primarily on the basis of color, texture, grain size, and mode of deposition. These units are identified as Units A through E, from oldest to youngest (deepest to shallowest) and discussed below.

With the exception of Unit E, the sediments described are probably associated with a late Wisconsinian glaciation. At some time during this period, the edge of an ice sheet progressed southward down the Olean Creek and Haskell Creek valleys. These ice lobes dammed the northward flowing Allegheny River, creating a lake in front of the ice sheet suitable for deposition of the glacio-lacustrine sediments, Unit A.

The lithology of Unit B is very similar to samples taken from an outcrop of the Olean Terminal Moraine south of the Allegheny River. The Olean Terminal Moraine has been mapped as a kame complex; therefore, deposition of Unit B is likely glacial outwash associated with the melting of large blocks of disintegrating (stagnant) ice. The unsorted sand, gravel, and silt portions of the unit may actually be a melt-out till, which has retained many of the material properties of the sediment derived from the glacial ice. The sandier lenses, some of which are stratified, either reflect channelized deposition from braided streams emanating from these ice blocks or kame-like cavity fillings.

The till unit (Unit C) is identifiable by its olive to olive-gray appearance and poorly sorted texture. Grain size curves, from wet sieve and hydrometer analysis, clearly distinguish Unit B as much coarser than Unit C with Unit C containing a large percentage (>50 percent) of silt and clay in addition to gravel and sands. Another distinguishing feature of this material is its high density, and as such, it may be a lodgment till, formed during a minor, local readvance of ice, which entrained and subsequently deposited locally-derived siltstone and shale fragments that was consolidated by the weight of the advancing ice.

The sequence of sediments deposited above Unit C appears to be fluvial in origin, although the sequence can be subdivided into 2 units. Coarse sandy gravel directly overlying Unit C has been classified as glacio-fluvial materials, probably associated with decaying ice as the ice retreated from the Olean area (Unit D). Fine sands and silts and occasional clay or gravel deposits have been grouped as recent alluvium, implying deposition by modern river processes of the Allegheny River, Olean, and Haskell Creeks (Unit E). Construction fill and waste materials have also been lumped into Unit E.

2.3.4 Site Hydrogeologic Units

Hydrogeologic units are units of consistent hydraulic properties. They may be composed of one lithologic unit, a group of lithologic units, or parts of a unit. Consequently, lithologic and hydrogeologic units may not coincide.

The five lithologic units identified in the area have been grouped into four hydrogeologic units: an upper aquifer, a lower aquifer, an upper aquitard, and a lower aquitard. Unit D (glacial fluvial sands and gravel) and Unit E (recent fluvial deposits including fine sands and silts and some fill) comprise the Upper Aquifer, although local clay lenses may act as discontinuous semi-confining layers. Unit B (glacial outwash), combined with sandy lenses in the upper part of Unit A, forms the Lower Aquifer. Unit C (till, perhaps more specifically a lodgment till) comprises the upper aquitard, which separates the two aquifers. The layered glaciolacustrine silts and clays of Unit A form a lower aquitard beneath the Lower Aquifer separating this aquifer from bedrock below.

3.0 Original Alcas Property Conceptual Model

The original Conceptual Model for the Alcas Property is inferred within the Site OU 2 ROD. The inferred model did not include site-specific characterization of site geology, hydrogeology, source releases and affected media. The original inferred model is summarized below.

3.1 Geology and Hydrogeology

The original geological conceptual model reflected in the ROD is best illustrated in a schematic figure contained in the ROD, and is shown as Figure 3-1. The original model consists of a two-aquifer system based on two borings (SB-04 and SB-07), one monitor well (D-2), and general assessment of regional geology. As depicted in this figure, the Upper Aquifer is shown to be a homogeneous unit of relatively uniform thickness. The Lower Aquifer also is shown to be a homogeneous unit of relatively uniform thickness. The two aquifers are separated by an aquitard shown to be fairly uniform.

The ROD infers that the Upper Aquifer is comprised of coarse sands and sandy gravel, with fine sands and silts, and some clay. Although the model does not describe physical properties of any of these units, the Upper Aquifer model is inferred as a unit of sufficient uniformity and permeability for comprehensive and uniform application of in-situ dewatering and advective air flow treatment of Upper Aquifer soils. This inference is based on the information illustrated in Figure 3-1, the ROD's "Summary of Site Characteristics" and "Description of Remedial Alternatives" sections.

The ROD model infers that the Upper Aquitard is a low permeability lodgement till composed of greater than 50% fines, of an undefined yet uniform thickness. The Lower Aquifer is inferred as a uniform deposit of sand, silt and gravel. This inference is based on the compilation of Figure 3-1 and the ROD's "Summary of Site Characteristics".

Groundwater flow in the Upper Aquifer is reflected as having horizontal and vertical flow components with horizontal flow toward the Allegheny River. However, the model infers that the vertical flow component dominates sufficiently before potentially affected groundwater in the upper zone can pose a threat off-site and is captured by municipal well 18M in the lower zone. The model infers that groundwater flow in the Lower Aquifer is from east to west except where influenced by municipal wells. This inference is based on the compilation of the ROD's "Summary of Site Characteristics" section (page 20), and pages 27 and 28 of the "Remedial Action Objectives" section.

3.2 Nature and Extent of Site Effects

A site conceptual model for the Alcas Property did not include site-specific characterization of the nature and extent of affected media in the ROD. Investigative work was conducted at the Alcas Property and surrounding Site for the purpose of assessing the potential for source areas and technology performance evaluations. The Alcas Property was not modeled in terms of characterization, delineation, behavior, and phase derivatives of source constituents and effected media.

The following is a summary of investigative sampling conducted at the Alcas Property for the ROD.

Soil gas, soil, and groundwater samples were collected from the Alcas property in 1991 and 1993. Significant levels of VOCs were detected in the southern portion of the facility in samples from soil boring SB07, as shown in Figure 3-1. The following maximum concentrations of VOCs were detected: TCE (12,000 μg/Kg and tetrachloroethene (PCE) (200 μg/Kg). In addition, 1,2-dichloroethene (DCE) (1,000 μg/Kg), TCE (690 μg/Kg), and vinyl chloride (100 μg/Kg) were detected in a sample from boring SB04.

Soil samples were collected from five other borings at the facility. VOC contaminants were either not detected in samples from these borings or were detected at low levels.

Analysis of a groundwater grab sample taken from the bottom of boring SB06 showed TCE (8,800 μg/L), 1,1,1-trichloroethane (TCA) (500 μg/L), 1,2-DCE (640 μg/L), and vinyl chloride (25 μg/L). TCE was detected at concentrations ranging between 7.8 mg/L and 28 mg/L in samples collected from Alcas D2 between years 1996 and 1999.

The investigative results were used as verification that the Alcas property is a source of VOC impact to the Olean Well Field Site groundwater. Characterization and delineation of sources and phase derivatives were not included in the original site conceptual model. The original model also did not include potential for the presence of residual liquid solvents (DNAPLs).

3.3 Overall Original Site Conceptual Model

The conceptual model inferred in the ROD can be summarized as follows:

- The Alcas Property is a source of VOC contamination to the Site;
- Affected soils (leaching to groundwater) are the source of impacts;
- Source area soils are only present in the Upper Aquifer;
- Source area soils do not exist below the main Alcas building;
- Upper Aquifer groundwater has horizontal flow component but flows vertically into the Lower Aquifer and is contained by the influence of municipal wells pumping from the Lower Aquifer;
- Site stratigraphy underlying the Alcas Property consists of an Upper Aquifer, an aquitard, and a Lower Aquifer;
- The two aquifers consist of uniform sand lithology;
- Upper Aquifer soils are uniform and conducive to VER remediation technology;

3.4 Remedial Action Objectives

Based on the above summary, the ROD further implies the following:

- Desorption of source area soils will remove sources to groundwater contamination;
- Municipal Well 18M contains the Upper Aquifer groundwater at the Alcas Property;
- Desorption of source soil in the Upper Aquifer will eliminate further contribution of contaminants to the Lower Aquifer;
- Source area soils in the Upper Aquifer can be cost-effectively treated in-situ using VER technology to levels at which no further leaching of VOCs to groundwater would be significant;
- Source area soils will be remediated after operation of a VER system reaches negligible concentrations in the vapor and groundwater recovered, after which time the remedy is considered

to be complete and permanent;

- After permanent remediation of source area soils in the Upper Aquifer, the Lower Aquifer groundwater will be restored to drinking water quality.

Remedial action objectives were presented in the ROD based on the inferred conceptual model and parameters stated above.

The remedial objectives can be summarized as follows:

- Remove and/or control the sources of contamination to and already in the groundwater;
- Eliminate leaching of source area soils in the upper zone in order to meet groundwater MCL; and Restore Upper and Lower Aquifers to their beneficial use as a source for drinking water.

4.0 New Information

The sections that follow contain new information discovered after the ROD, which is relevant to the Alcas Property conceptual model. This new information includes predesign investigations, advances in the understanding of chlorinated solvent releases to the environment, a more complete understanding of the history of solvent use and release at the Alcas property, and a reevaluation of site conditions based on the results of this new information.

4.1 Predesign Site Investigations at Alcas Property

Pursuant to the original ROD, and for the purpose of obtaining better site definition, a predesign investigation was performed at the Alcas Property. This investigation was conducted in two phases. The Phase 1 investigation was performed in accordance with Section 4 and Appendix B of the Remedial Design/Remedial Action Work Plan for the Alcas Property (ICF Kaiser, March 1999). Soil samples were collected for Target Compound List (TCL) VOCs. Groundwater samples were collected from each boring for analysis of TCL VOCs, metals, and inorganics. The metals and inorganic compounds were analyzed because they would be indicative of potential equipment fouling. The results of the Phase 1 predesign investigation were transmitted to the EPA on August 31, 1999.

Because the results of the Phase 1 investigation did not sufficiently enable characterization of source constituents and impacted media and suggested that geological conditions at the facility are inconsistent with the original site conceptual model inferred in the ROD, Alcoa submitted a work plan for a Phase 2 investigation of the site on September 19, 1999. Phase 2 investigation activities included a screening-level passive soil gas survey. Passive soil gas detectors were installed on approximate 100-foot center grid pattern throughout the area south of the main plant building. Additional borings were also drilled, and several existing borings were extended to the top of the City Aquifer. Also, the new soil borings were located to coincide with selected passive soil gas sampling locations. Each soil boring was continually logged and select samples were collected for TCL VOC and geotechnical analysis. The field investigation included the collection of groundwater samples from wells both on and off the facility, screened in both the Upper and Lower Aquifers, for VOC analysis. Five of the groundwater wells sampled were also monitored for parameters that would measure the natural attenuation of the chlorinated compounds. Results of the Phase 2 predesign investigation were transmitted to the EPA on December 7, 1999. Overall, the predesign (Phase 1 & 2) investigation consisted of 19 soil borings, 98 soil samples, 43 passive soil gas sampling modules, and 13 groundwater well samples, eight open bore hole water samples, and 19 geotechnical soil samples.

4.2 Advances in the Understanding of Chlorinated Solvent Releases

In recent years there have been significant advances in the understanding of chlorinated solvent releases and the behavior of these releases in the subsurface.

When released into the environment, chlorinated organic solvents that are heavier than water are commonly referred to as dense nonaqueous phase liquids or DNAPLs. Because they are heavier than water, DNAPLs can readily migrate downward and through groundwater deep into the subsurface. DNAPL can exist in the subsurface as free-phase and residual DNAPL. When released, free-phased

DNAPL will move downward through the subsurface under the force of gravity or laterally along the surface of sloping fine-grained soil units. Point release types of equal mass, will typically travel much deeper than release types that are spread over greater surface areas. Free-phased DNAPLs will distribute in the subsurface as both disconnected blobs and ganglia of liquid referred to as "residual", and in larger accumulations referred to as "pools." The portion of the subsurface where DNAPLs are located, either free or residual, is commonly referred to as the DNAPL zone. The DNAPL zone is that portion of the subsurface where the released immiscible liquids (via free-phased DNAPL migration and chemical diffusion) are present within the subsurface media.

Free DNAPL refers to the presence of DNAPL at saturations higher that residual DNAPL. Free DNAPL is distinctive from residual DNAPL in that free DNAPL is still potentially capable of traveling in the environment.

The trailing end of a migrating DNAPL being trapped in pore spaces or fractures by capillary forces forms residual DNAPL. The amount of residual DNAPL contained in the subsurface is a function of the DNAPL's density, viscosity, and interfacial tension and the geologic characteristics of the site such as, soil pore size, permeability, capillary pressure, root holes, small fractures, and slickensides found in silt, clay layers, etc.. The subsurface DNAPL distribution is typically impossible to locate or delineate accurately. DNAPL migrates preferentially through selected pathways and is affected by small-scale changes in the stratigraphy. Therefore, the ultimate path taken by DNAPL can be very difficult to characterize and predict.

Both free and residual DNAPLs give rise to contaminant vapors in the unsaturated zone and as dissolved phase plume in the saturated zone (below the water table). Groundwater flowing past the DNAPL slowly dissolves soluble components of the DNAPL, forming a dissolved or aqueous phase plume zone downgradient of the DNAPL zone. Contributing to evaporation and aqueous dissolution, with time some chemical diffusion of the DNAPL can occur into the surrounding soil matrix. These DNAPL depleting mechanisms typically operate very slowly under natural conditions; thus subsurface DNAPL tends to persist as a long-term source of dissolved phase derivatives into groundwater. Complete dissolution of DNAPL in the saturated zone can take decades or centuries due to the limits on chemical solubility, groundwater velocity, and vertical dispersion.

The aqueous plume zone is that portion of the groundwater surrounding and downgradient of the DNAPL zone where DNAPLs are not present. The plume zone originates from and extends beyond the DNAPL zone as it progressively migrates with groundwater flow for as long as the DNAPL zones persist. Within both the DNAPL and the plume zones there is a quazi-equilibrium between aqueous contamination and that portion sorbed to the soils, especially organic carbon. From a mass perspective, typically the mass of free or residual DNAPL significantly exceeds that which is sorbed to soils, dissolved in the groundwater or present as vapors in the vadose zone. Depending on the volume of the release and site-specific subsurface characteristics, the plume zone may extend over a large distance from the entry zone and the underlying DNAPL zone. The migration of constituents in these plumes is subject to advection, dispersion, sorption, and degradation.

The residual or free DNAPL in the saturated zone will eventually deplete through dissolution. Dissolution will however be influenced by several factors including:

- Solubility of DNAPL components;
- DNAPL volume vs.-water contact area;
- Groundwater seepage velocity; and molecular diffusivity of DNAPL in water (vertical dispersion).

These factors indicate that dissolution of residual ganglia will produce a high chemical concentration in the groundwater and depletion will occur more rapidly than from a free DNAPL pool. The approximate time to dissolve the residual DNAPL will typically take decades to centuries in the saturated zone (Cohen and Mercer).

The plume zone will often include a light vapor phase just above the water table. The volatilization of the residual DNAPL and from the dissolved plume will form a sinking, density driven vapor plume that can condense on the surface of the water table. The time for volatilization of DNAPL to occur is highly variable and will fluctuate with changing site conditions (*e.g.*, dry/wet soils, discontinuous channels, voids, and coarse/fine-grained soils).

The DNAPL zone is typically the source area of dissolved and vapor phase transport of chlorinated compounds, which affect soils within the plume zones to the extent the plume migrates. While it represents a fraction of contaminant mass and vehicle for continuing transport of dissolved phase compounds, the plume-affected media itself is not the governing source component at chlorinated sites in terms of generation and persistence, except where all residual liquids in the origin DNAPL zone have dissipated.

The presence of DNAPL (free liquid and residual) at a site poses potential problems for the spreading of contaminants through invasive site activities. EPA Publication 9355.4-07FS, "Estimating Potential for Occurrence of DNAPL at Superfund Sites" warns that the risk of spreading contaminants increases with the proximity to a potential DNAPL zone. Special precautions should be taken to ensure that invasive site activities (i.e. drilling, excavation, etc.) does not mobilize DNAPL-laden media or create pathways for continued vertical migration of DNAPLs.

4.3 Alcas Property Operations and Solvent Release History

The Alcas Cutlery facility has manufactured cutlery and sporting knives at the Olean site since 1949. The plant used TCE in vapor degreasers as part of finishing operations. The quantity of TCE used annually has been estimated at 4,000 gallons to 6,500 gallons in the late 1970's and early 1980's. Beginning in the mid 1980's usage decreased to 4,000 to 5,000 gallons per year until 1989 when TCE usage stopped. The quantity of distillation residues disposed of from 1949 to 1980 was approximately one 55-gallon drum per month containing approximately 10 percent TCE.

New TCE was shipped and stored in 55-gallon drums in an area along the eastern portion of the main building. The plant operated five vapor degreasers in the main building. Reportedly, during normal manufacturing operations *de minimis* loses of TCE occurred to the floor of the building. In addition, more significant loses of TCE are believed to have occurred periodically from the vapor degreasers. One degreaser in particular, located in the southwest portion of the main building, was reported to leak continuously. Historically, spilled TCE would normally be collected in floor drains, which discharged into the sanitary sewer system. The sanitary sewer lines generally drained southward to a trunk line that ran westward along the south perimeter of the main building. The sanitary line exits the site from a manhole located at the southwest corner of the main building through the southern edge of the property. Figure 4-1 shows the location of the vapor degreasers, TCE storage area, and drain lines within the main building area. Possible TCE release points beneath the main building exist throughout the floor drainage system, along the sanitary sewer line and through cracks and seams in the floor.

Exterior to the building, waste TCE was reportedly used as a weed killer along the fence on the northern side of the plant from 1975 to 1979. The quantity applied was estimated at 25 to 40 gallons per year. The leftover waste TCE used for weed killing was most likely disposed of at various points at or around the storage building. The number or specific location of these entry points is unknown.

Considering the facility history, the persistence of DNAPL in the subsurface and conditions at other facilities with very similar histories, it is reasonable to expect that DNAPL (residual and possible free phase) is present at the Alcas Property both below the main building and in areas exterior to the building. Considering the mass release potential over an approximately 40-year period, it would be expected that a significant source might exist from under the main building. This source may be substantial in comparison to the potential of point sources located outside the buildings.

4.4 Revaluation of Alcas Property Conceptual Model

4.4.1 Alcas Property Geology

The Alcas property geologic description has changed significantly since the ROD was finalized. A total of 19 boring were drilled in the southern portion of the Alcas property in July and October 1999. The stratigraphic information from this drilling program forms the basis of different geologic conceptual model for the Alcas property.

The geology of this property is illustrated by generalized cross sections shown in Figures 4-2, 4-3, and 4-4. The major stratigraphic units at the Alcas property are the Fill, Fluvial Deposits, Glacial Till, and Glacial Outwash (City Aquifer). These major units were identified on the basis of color, density, and lithology.

The Fill is imported material that was added to the surface of the property. The Fill consists of materials such as topsoil, coal fragments, crushed rock, cinders, and horsehair.

The next layer is the Fluvial Deposits that have been deposited primarily by the Allegheny River. These deposits include silty sands, sandy silts, silts, and sandy clays. In addition, these sediments are brown in color reflecting an oxidizing environment for the Fluvial Deposits. It is believed that an oxidizing environment reflects a permeable zone containing groundwater.

In addition, the Fluvial Deposits have a zone of low permeability sandy clay and silt in the southeastern portion of the property. Within this clayey zone is a small sand "channel" or "lens" that is shown in plan view in Figure 4-5. This sand channel is most likely a sand zone within the Glacial Till. This feature appears to be under the main building extending south before turning toward the southeast corner of the property.

The third layer is the Glacial Till (lodgement till) that is characterized by an olive to olive-gray color and are generally denser than the overlying Fluvial Deposits. The olive to olive-gray color indicates a reducing environment meaning that little groundwater flow occurs. Along with a more dense material, these sediments are probably less permeable than the overlying strata. In addition, the Glacial Till is made up of a variety of different sediments including more permeable sandy lenses, such as the sand channel described above. Laboratory permeability on samples from the clay zones in the Glacial Till was on the order of 10^{-8} cm/sec.

The last layer making up the Alcas property geologic conceptual model is the Glacial Outwash, commonly referred to as the City Aquifer. This layer is a predominately brown sandy gravel zone that is 25 to 35 feet deep at the Alcas Property. The brown color of the sediments indicates an oxidizing zone. None of the borings on the property have penetrated the entire thickness of this aquifer, making the total depth and thickness of this unit unknown. Based on the purging data for the City Aquifer monitor wells and the pumping rates for the municipal wells, this formation has a high permeability.

4.4.2 Groundwater Flow

At the Alcas property, groundwater flow direction in the Upper Aquifer is generally to the south toward the river. In the Lower Aquifer, the groundwater flow direction below the Alcas Property is toward 18M, which is to the east-southeast.

In reviewing the potentiometric surface contour maps for both aquifers from February and March 1992, several observations can be made. First, the pumping in 18M, 37M, and 38M has created a sizeable capture in the Lower Aquifer. This same pumping, however, has not altered the Upper Aquifer potentiometric surface contours since October 1984 when 18M, 37M, and 38M were not pumping. This means that this pumping has not lowered the water levels in the Upper Aquifer in the two years these wells have pumped. Therefore, much of the groundwater flow in the Upper Aquifer may be moving toward the river south of the property. A portion of the groundwater flow is moving downward in response to the lower head in the Lower Aquifer.

4.5 Nature and Extent of Site Impacts

With the new information summarized above, a more comprehensive and site-specific evaluation of the nature and extent of impacted media at the Alcas Property can be made.

4.5.1 Soil Gas Contaminant Data

The Phase 2 soil gas investigation indicated the presence of vapor phase mass of several chlorinated organic compounds (PCE, TCE, and DCE) at the site. One area of concern is immediately west of the Block Building extending southeasterly to the corner of the property. The second area is a narrow band from just east of the southwest corner of the plant building extending southerly to the property line. These two areas are indicative of vapor phase derivatives from unsaturated source areas and/or dissolved phase transport in groundwater. The two bands of soil gas extend or sequence in north-south configurations south of the building are comparable to the upper zone groundwater flow direction. These two bands also appear to align with the locations of the suspected solvent release points at the facility property, namely the degreasers, and the sewer lines. In addition, the eastern band of elevated soil gas coincides with the apparent sand "channel" south of the southeastern corner of the building as described in Section 4.4.1. The areas also could be indicative of potential release points outside of the building.

A VER pilot study was conducted at the site. During this study, soil gas samples were collected from RW-1 and analyzed for various chlorinated organic constituents. The results showed that TCE was detected at concentrations ranging from 950 ppm to 2,380 ppm. Based on EPA guidance, soil gas concentrations from 100 ppm to 1,000 ppm are indicative of DNAPL presence. Given the TCE concentrations in these soil gas samples, it is likely that DNAPL is present in the general vicinity of the pilot test area. The extent of where vapors were drawn is not known.

4.5.2 Soil Contaminant Data

Phase 2 soil samples were collected from the southeast area of the property. The location of the borings and the number and depth of the soil samples analyzed are given in Figure 4-6. As shown in this figure, the area of the site has affected soils from near surface to a depth of 36 feet. These data indicate that the soils in this area are affected confirming the results of the soil gas study. However, the concentrations in the soil samples do not indicate residual DNAPL in this portion of the site. It is possible that some of the affected soils may be associated with nearby surface releases. The overall soil data are more indicative of impacts associated with the transport of phase derivatives emanating from residual DNAPL zones.

4.5.3 Dissolved Phase Groundwater Data

The well locations and results of the Phase 2 sampling program are shown in Figure 4-7. The concentration ranges of TCE and DCE in the Upper and Lower Aquifers can be summarized are as follows, relative to 1 percent aqueous solubility levels:

Organic Constituent	Concentration Range (mg/L)		One Percent of Aqueous Solubility
	Fluvial Deposits	Glacial Outwash	
TCE	ND - 39	ND - 17	11
DCE	ND - 3.7	0.3 - 1.2	6

The concentration of TCE in the Glacial Outwash of 17 mg/L is from D-2. This well is screened in the upper portion of the Glacial Outwash. As a result, the concentration of TCE in this well reflects the upper part of this aquifer, and not its entire thickness.

When 1 percent of the aqueous solubility of a DNAPL compound is detected in the groundwater, it is highly suggestive that DNAPL is present in the aquifer. The 1 percent aqueous solubility limit is considered to be the strongest indicator of DNAPL presence in the saturated zone in accordance with the current state of practice, EPA guidance, and the latest research by Dr. John A. Cherry at the Waterloo Centre for Groundwater Research. As shown in the above table, groundwater concentrations in the Upper and Lower Aquifers exceed 1 percent of the aqueous solubility for TCE. This data, when combined with groundwater flow direction, indicates a DNAPL source zone upgradient of the area south of the main building. This data, coupled with site-specific modeling and historical data from well D-2, indicates that residual DNAPL is likely present in both aquifers or at least as deep as the base of the upper aquifer.

4.5.4 Summary of Nature and Extent of Affected Media and Source Areas at the Alcas Property

Residual DNAPL is evident at the Alcas Property. The actual location(s) and extents of the residual DNAPL is not known and practicably cannot be determined. Based on EPA guidance (Publication 9355.4-07FS), the Alcas Property is ranked as a Category I-II Site. While residual DNAPL may be present south of the main building, the compilation of site-specific data point to beneath the main building as the probable location of source DNAPL. Soil concentration data south of the building are more reflective of soil affected by dissolved phase transport from DNAPL zones upgradient of the area, rather than a significant DNAPL zone within the soil column. Vapor mass data seems to coincide with apparent pathways of preferential groundwater flow indicated by a possible sand "channel" or lens. An overall comprehensive evaluation of the data indicate that the area south of the main building is more reflective of a plume zone which is emanating from a DNAPL zone present beneath the main building.

5.0 Revised Alcas Conceptual Model

5.1 Alcas Property Conceptual Model

Decisions regarding the effectiveness of remedial actions must be based on a thorough understanding of physical and chemical conditions of a site. The conceptual model serves as a way for evaluating the restoration potential of a site. The conceptual model relates governing parameters to site-specific data, which are the basis for evaluating restoration potential of an affected site.

The data and analysis required for effective remedial objectives and remedy decisions should be determined on a site-specific basis. While the OU2 ROD utilized some data collected from the Alcas property for the selected remedy, the OU2 ROD did not take into consideration an Alcas site-specific conceptual model. The information contained in section 4 of this document provides the primary components for the development of a site-specific conceptual model for the Alcas property. When combined with past data, this new information enables updated interpretation of a site conceptual model of the Alcas Property.

Figure 5-1 presents a pictorial summation of the site-specific conceptual model for the Alcas property. The figure depicts a simplified west-east cross section from the Alcas property to the municipal well 18M. The model has been developed utilizing data collected from numerous investigations at the property over the past 15 years. Figure 5-2 depicts a plan view schematic of the conceptual model.

As reflected on the Figures, the dominant DNAPL zone is most evident under the main building. While other, more minor source areas may exist in the southern area of the property, this Upper Aquifer area south of the main building is more indicative of a plume zone than a DNAPL zone. The collective new information and data from this southern area point to beneath the main building as the location of a DNAPL zone. The line formed by the continuous draw from well 18M through the D-2 screen also points upgradient to beneath the building as the DNAPL zone source area. When factoring updated hydrogeological information, the multi-year D-2 data also suggests that residual DNAPL is likely as deep as the D-2 screen level, which indicates that the DNAPL zone is at least as deep as the base of Upper Aquifer below the building.

Therefore, as illustrated in the figures, the updated conceptual model can be summarized as follows:

- the source material is evidently residual chlorinated solvents which behave as DNAPL in the subsurface;
- the upper aquifer is a very heterogeneous unit comprised of predominantly silty/clayey formations with intermixed sandy units characterized by low permeabilities and an aquitard effect over the lower aquifer;
- horizontal groundwater flow is the primary component, and vertical groundwater flow is the secondary component;
- the horizontal component of groundwater flow in the upper aquifer is to the south toward the Allegheny River;
- the governing source areas on the Alcas Property are DNAPL zones which generate plume zones consisting of dissolved and vapor phase derivatives that transport through the soil media;

- the primary source area consisting of one or more entry zones and associated DNAPL zones is evidently located below the Alcas Facility main building;
- other, more minor entry zones may also be present south of the main building;
- the vertical extents of migration of the DNAPL zones are unknown but the primary DNAPL zone underlying the main building is apparently at least as deep as the upper aquifer and aquitard;
- the area south of the main building is more characteristic of the plume zone migrating in the upper aquifer downgradient from the source areas under the building;
- the extent of upper aquifer migration of the plume zone is not known; and
- dissolved phase derivatives migrating from DNAPL zones into the lower aquifer are contained by municipal wells in the lower aquifer.

This update suggests a probable long-term, DNAPL zone under the main building that will persist and continue to generate dissolved phase derivatives for decades, possibly centuries, as long as the source DNAPL persists. Overall, the DNAPL zone(s) evident in the updated model, include a significantly larger area then that originally specified in ROD.

Section 5.2 Implications of Revised Alcas Property Conceptual Model

As described in Section 3, a detailed conceptual model specific to the Alcas Property and distinguished from the Olean Well Field Superfund Site, was not prepared for use and development of the original ROD. The original model of the Alcas Property is inferred in the ROD based primarily on a general investigative assessment of the surrounding Olean Site. Therefore, the original remedy decision did not factor a site-specific model of the geological environment, nature and extent of sources, and phase derivatives of sources within an Alcas-specific geoenvironment. The remedy decision was instead based on a different conceptual model that has subsequently, with the addition of new information, been found to differ from the actual Alcas Property. This condition impacts the development of remedial objectives reflected in remedy decisions that limits remedy effectiveness. This conceptual model update based on new information presented herein, illustrates how this condition impacted the original remedial objectives and remedy decision for the Alcas Property.

In accordance with the Presumptive Response Strategy Initiative (EPA, Directive 9283.1-12), it is very important to use site-specific site/contaminant characteristics in order to effectively assess restoration potential, before establishing remedial objectives. Proper assessment of restoration potential will enable site-specific development of remedial objectives that are effective and reliable. Valid remedial objectives then dictate the remedy selection process in order to arrive at the optimal remedial alternative that best meets statutory requirements. These steps are particularly important for chlorinated sites, which generally triggered the development of the Presumptive Remedies Initiative and other applicable policies and reforms like the Remedy Update Reform.

In summary, the contrast of the updated site conceptual model with the original model inferred in the ROD is significant. Therefore the past remedy decision was based on a generic conceptual model that is not site-specific.

FIGURES

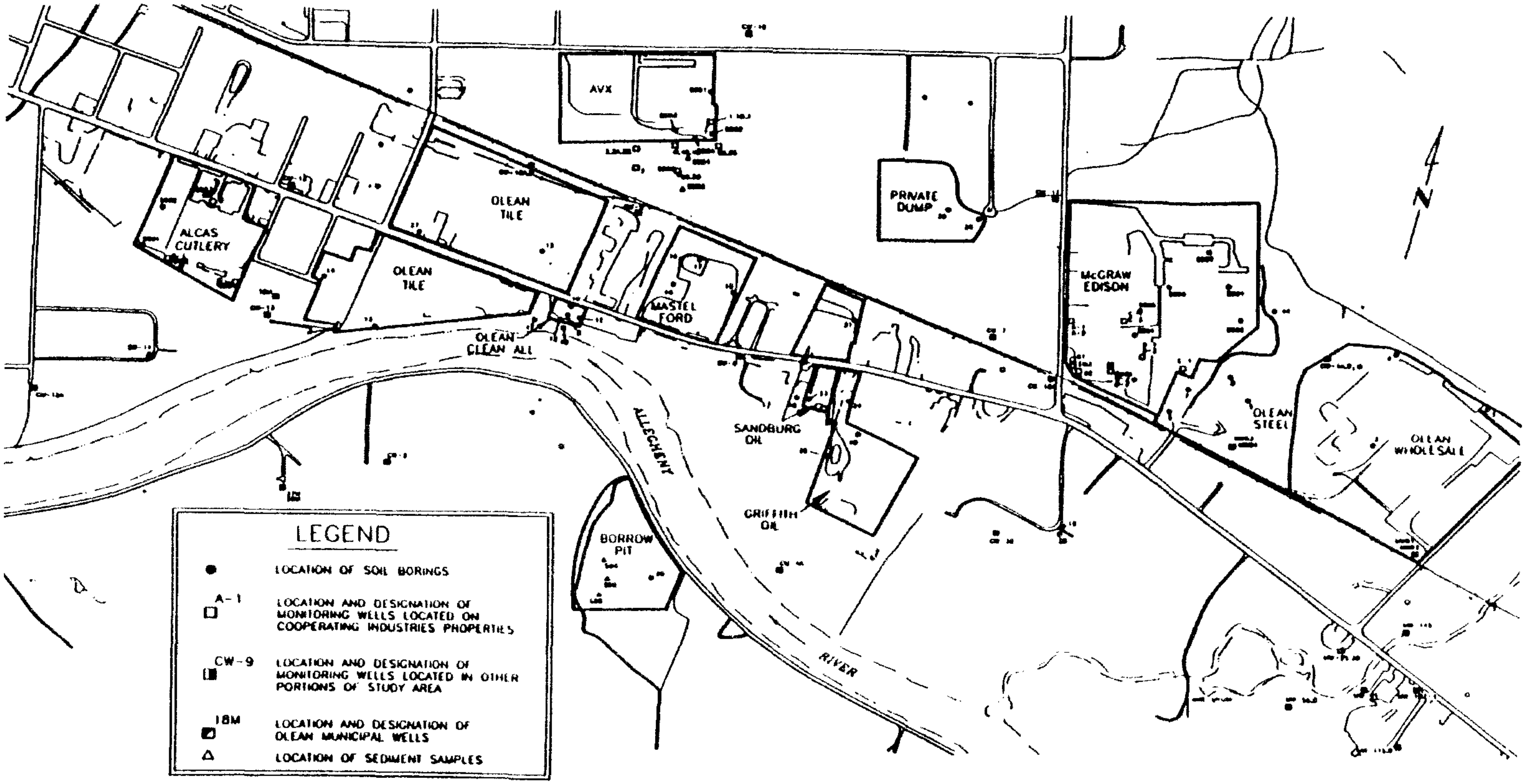


FIGURE 2-1

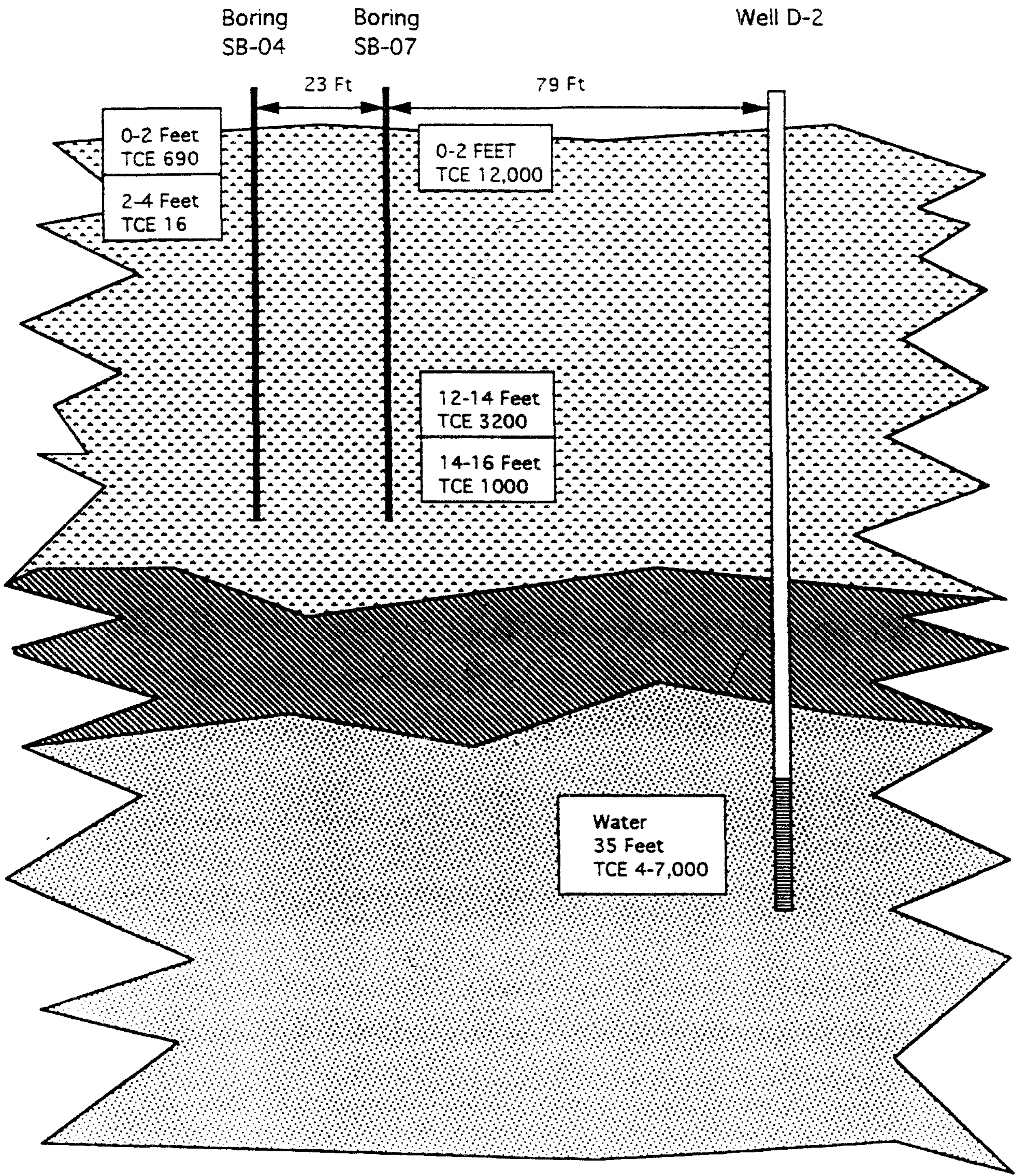
SCALE: AS NOTED	APPROVED BY	DRAWN BY JLB	
DATE: 1/13/00		CHECKED BY	B.B

OLEAN WELL FIELD SUPERFUND
SITE LAYOUT

ALCAS CUTLERY CORPORATION
FACILITY SITE
OLEAN, NEW YORK

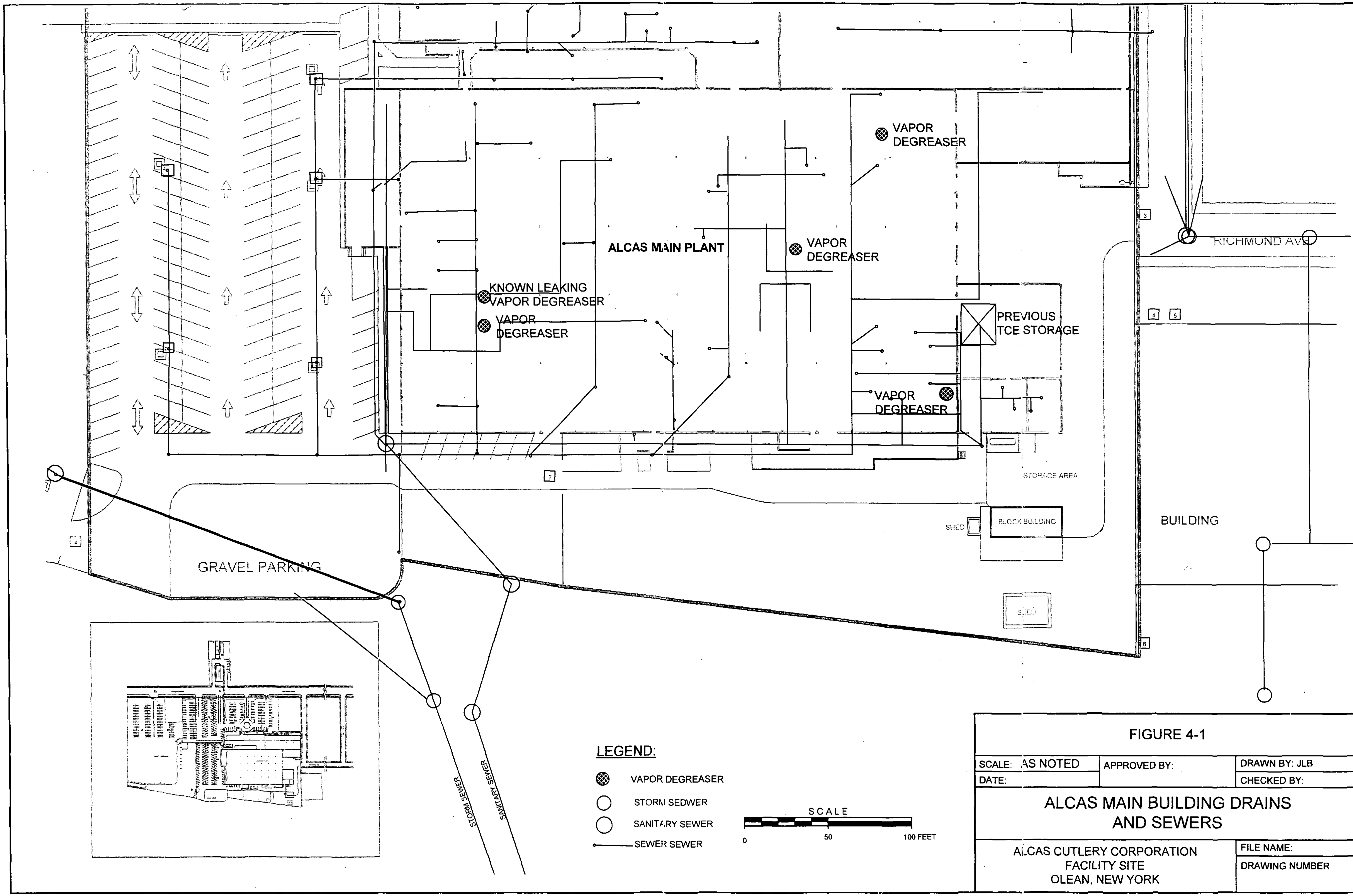
FILE NAME

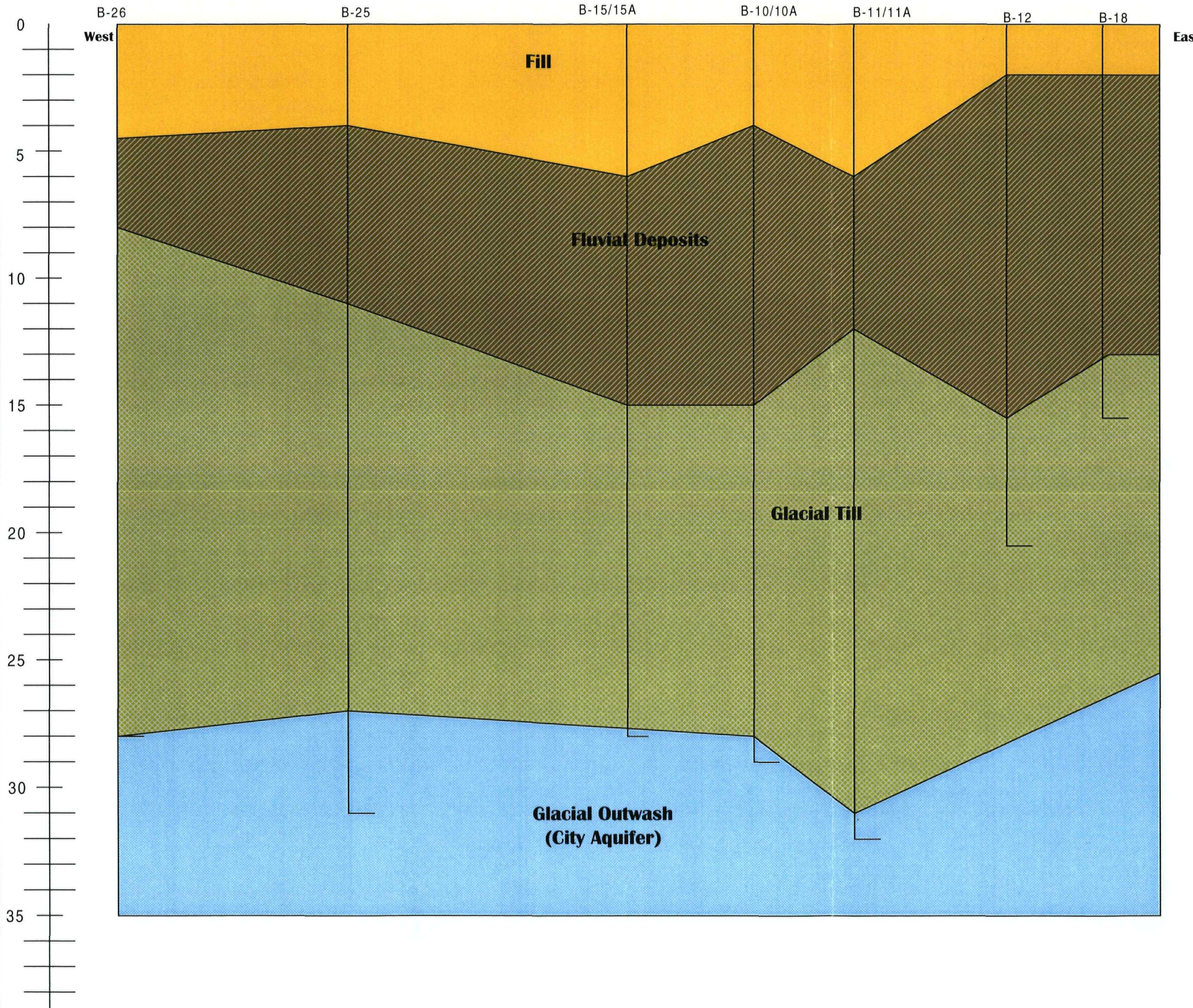
DRAWING NUMBER



Alcas, Olean, NY

FIGURE 3-1		
SCALE: NONE	APPROVED BY:	DRAWN BY:
DATE:		CHECKED BY:
ORIGINAL ALCAS GEOLOGIC CONCEPTUAL MODEL SCHEMATIC FROM ROD		
ALCAS CUTLERY CORPORATION FACILITY SITE OLEAN, NEW YORK		FILE NAME 20157002B
		DRAWING NUMBER


ALCAS MAIN PLANT
VAPOR DEGREASER
VAPOR DEGREASER
KNOWN LEAKING VAPOR DEGREASER
VAPOR DEGREASER
VAPOR DEGREASER
PREVIOUS TCE STORAGE
RICHMOND AVE
STORAGE AREA
SHED
BLOCK BUILDING
BUILDING
GRAVEL PARKING
SHED
STORM SEWER
SANITARY SEWER
LEGEND:
VAPOR DEGREASER
STORM SEDWER
SANITARY SEWER
SEWER SEWER
SCALE
0
50
100 FEET
FIGURE 4-1
SCALE: AS NOTED
APPROVED BY:
DRAWN BY: JLB
DATE:
CHECKED BY:
ALCAS MAIN BUILDING DRAINS AND SEWERS
ALCAS CUTLERY CORPORATION
FACILITY SITE
OLEAN, NEW YORK
FILE NAME:
DRAWING NUMBER



Fill: Consists of materials, such as, topsoil, coal fragments, crushed rock, cinders, and horsehair.

Fluvial Deposits: Consists of generally brown sediments including, silty sands, sandy silts, silts, and sandy clays.

Glacial Till: Consists of generally olive to olive gray, dense sediments, including sand, silty sand, gravelly silt, sandy gravel and clay.

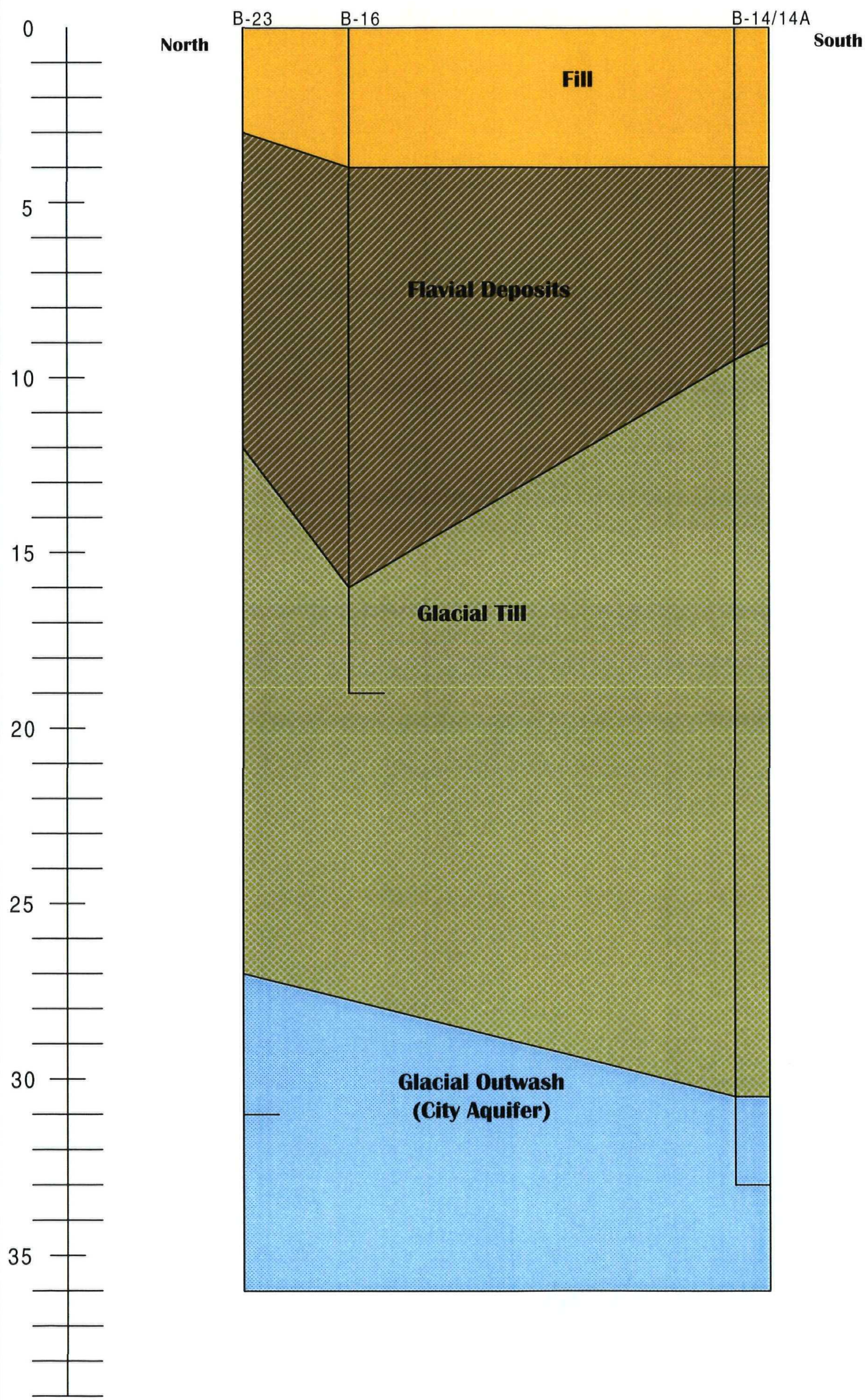
Glacial Outwash: Primarily brown sandy gravel.

FIGURE 4-2

DATE:	APPROVED BY:	DRAWN BY:
1/13/00		JLB

GENERALIZED CROSS SECTIONS A-A'

ALCAS CUTLERY CORPORATION
FACILITY SITE
OLEAN, NEW YORK



Fill: Consists of materials, such as, topsoil, coal fragments, crushed rock, cinders, and horsehair.

Fluvial Deposits: Consists of generally brown sediments including, silty sands, sandy silts, silts, and sandy clays.

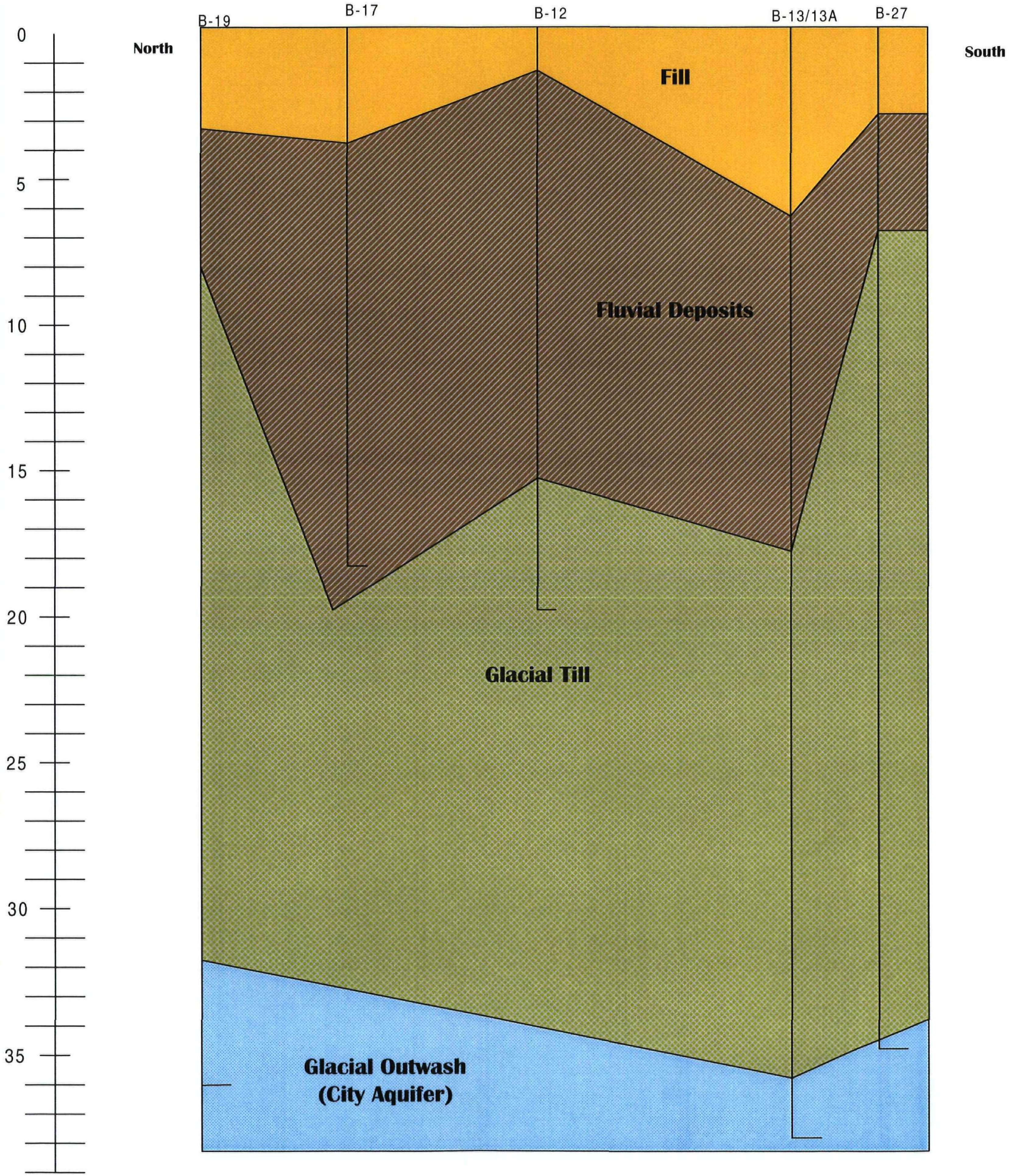
Glacial Till: Consists of generally olive to olive gray, dense sediments, including sand, silty sand, gravelly silt, sandy gravel and clay.

Glacial Outwash: Primarily brown sandy gravel.

FIGURE 4-3		
DATE: 1/14/00	APPROVED BY:	DRAWN BY: JLB

GENERALIZED CROSS SECTIONS B-B'

ALCAS CUTLERY CORPORATION
FACILITY SITE
OLEAN, NEW YORK



Fill: Consists of materials, such as, topsoil, coal fragments, crushed rock, cinders, and horsehair.

Fluvial Deposits: Consists of generally brown sediments including, silty sands, sandy silts, silts, and sandy clays.

Glacial Till: Consists of generally olive to olive gray, dense sediments, including sand, silty sand, gravelly silt, sandy gravel and clay.

Glacial Outwash: Primarily brown sandy gravel.

FIGURE 4-4		
DATE: 1/13/00	APPROVED BY:	DRAWN BY: JLB
GENERALIZED CROSS SECTIONS C-C'		
ALCAS CUTLERY CORPORATION FACILITY SITE OLEAN, NEW YORK		

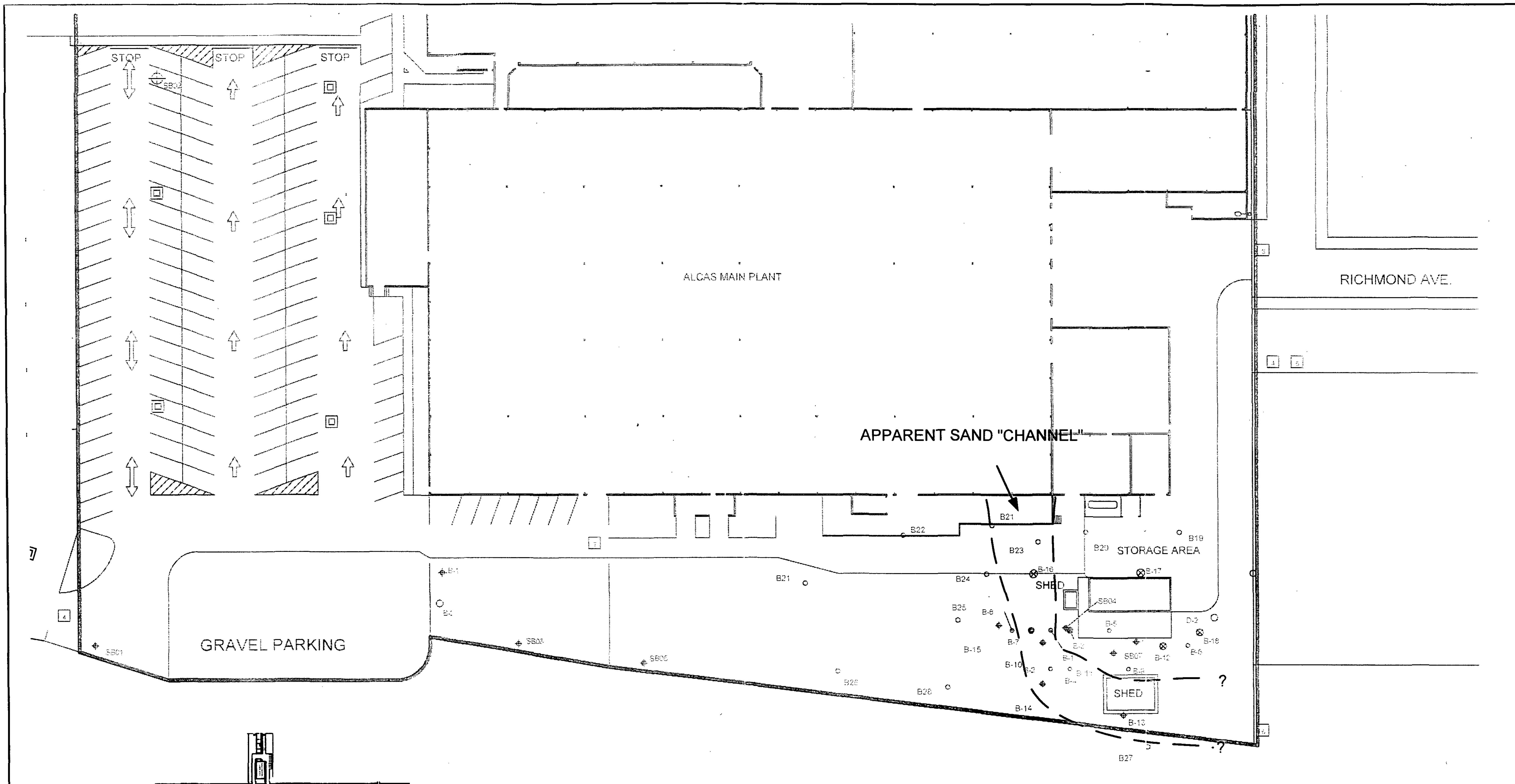


FIGURE 4-5		
SCALE: AS NOTED DATE: 1/13/00	APPROVED BY:	DRAWN BY: JLB CHECKED BY: B.B
Sand Channel Location		
ALCAS CUTLERY CORPORATION FACILITY SITE OLEAN, NEW YORK		FILE NAME: 20157002B DRAWING NUMBER

LEGEND:

D-2 ○ EXISTING MONITORING WELL LOCATION IN LOWER AQUIFER (LOCATION TAKEN FROM G&M SUPPLEMENTAL RI, 1994 INSTALLATION DATE UNKNOWN - D2 WAS PRIOR TO 1989 AND B2 WAS PRIOR TO 1991)

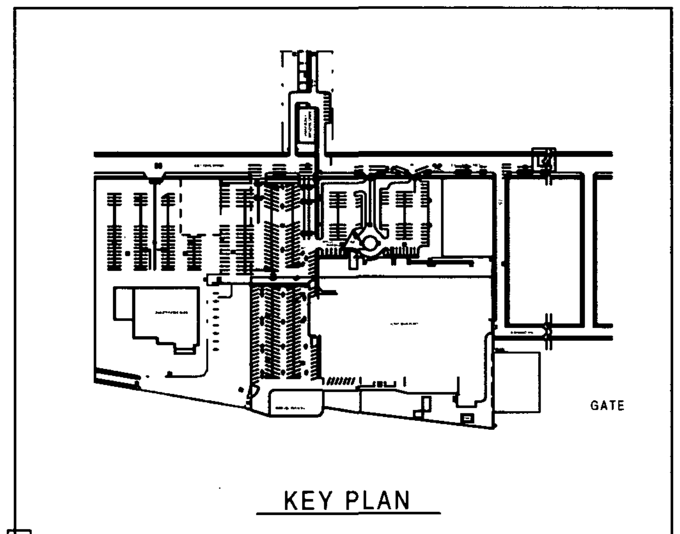
B-16 ⊗ SOIL BORING LOCATION IN UPPER AQUIFER DRILLED JULY 7 TO JULY 12, 1999

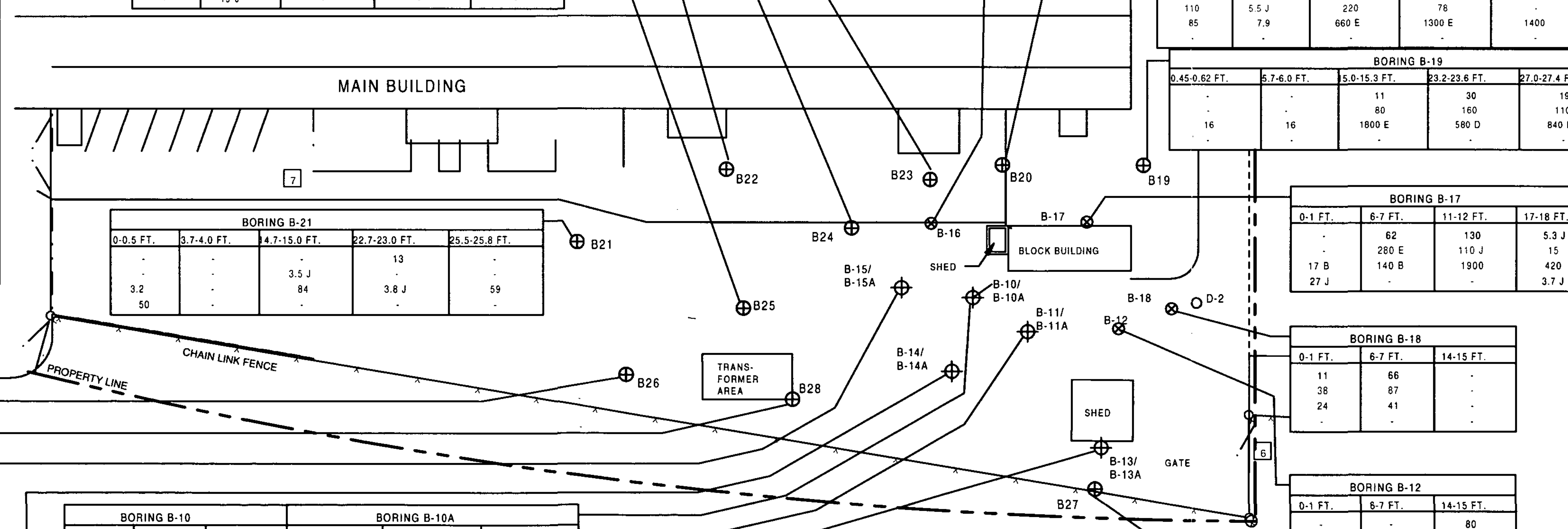
B19 SG68 ⊕ SOIL BORING LOCATION IN UPPER AQUIFER DRILLED OCTOBER 11 TO OCTOBER 20, 1999

B-13/ B-13A ⌖ LOCATION OF SOIL BORINGS THAT WERE EXTENDED.

MAXIMUM CONCENTRATIONS ABOVE GROUNDWATER

CHEMICAL COMPOUNDS	OU2 ROD CLEAN UP LEVELS
VINYL CHLORIDE	200 ppb
CIS 1,2 DICHLOROETHENE	300 ppb
TRICHLOROETHENE	700 ppb
2-BUTANONE (MEK)	300 ppb





BORING B-22

0-0.5 FT.	4.0-4.4 FT.	15.1-15.4 FT.	22.7-23.0 FT.	25.4-25.7 FT.
-	-	26	-	-
4.8 J	5 J	19	7.8	-
17	8.2	28	10	420
18 J	-	-	-	-

BORING B-24

0-0.5 FT.	3.7-4.0 FT.	15.2-15.5 FT.	22.8-23.1 FT.	26.2-26.6 FT.
-	29	-	-	62
-	8.1	-	-	350 E
42	9.8	3700	2200	1600 D
34 J	-	-	-	-

BORING B-23

0-0.5 FT.	3.7-4.0 FT.	6.5-6.8 FT.	15.0-15.3 FT.	24.3-24.5 FT.	25.1-25.3 FT.
460	540 E	-	-	-	-
7100	2100 E	-	-	-	-
510	530 E	600	24000	3100	3900
-	-	-	-	-	-

BORING B-25

0-0.5 FT.	3.7-4.0 FT.	15.6-16.0 FT.	20.8-21.2 FT.	26.7-27.0 FT.
-	-	-	-	-
-	3.5 J	-	-	2.9 J
17	29	4000	1900	16
-	19 J	-	-	-

BORING B-16

0-1 FT.	6-7 FT.	9-10 FT.	18-19 FT.
-	77	130	2.8 J
-	180	700 E	4.3 J
7.0	580 BE	890	25
-	-	-	-

BORING B-20

0.4-0.7 FT.	3.6-4.0 FT.	11.0-11.3 FT.	15.0-15.6 FT.	23.6-24.0 FT.	24.5-24.8 FT.
-	-	32	21	-	-
110	5.5 J	220	78	-	-
85	7.9	660 E	1300 E	1400	250
-	-	-	-	-	-

BORING B-19

0.45-0.62 FT.	5.7-6.0 FT.	15.0-15.3 FT.	23.2-23.6 FT.	27.0-27.4 FT.	31.4-31.7 FT.
-	-	11	30	19	-
-	-	80	160	110	7.6
16	16	1800 E	580 D	840 D	220 JD
-	-	-	-	-	-

BORING B-21

0-0.5 FT.	3.7-4.0 FT.	14.7-15.0 FT.	22.7-23.0 FT.	25.5-25.8 FT.
-	-	-	13	-
-	-	3.5 J	-	-
3.2	-	84	3.8 J	59
50	-	-	-	-

BORING B-17

0-1 FT.	6-7 FT.	11-12 FT.	17-18 FT.
-	62	130	5.3 J
-	280 E	110 J	15
17 B	140 B	1900	420
27 J	-	-	3.7 J

BORING B-18

0-1 FT.	6-7 FT.	14-15 FT.
11	66	-
38	87	-
24	41	-
-	-	-

BORING B-12

0-1 FT.	6-7 FT.	14-15 FT.
-	-	80
48	2.2 J	180
180	4.4 J	79
-	-	-

BORING B-26

0-0.5 FT.	3.7-4 FT.	15.7-16 FT.	21.5-21.8 FT.	27.5-27.8 FT.
-	-	-	12	-
-	-	-	-	-
5.3 J	6.2 J	450	10	6.8
17 J	-	-	-	-

BORING B-28

0-0.5 FT.	4.0-4.4 FT.	15.5-15.8 FT.	19.1-19.3 FT.	22.5-22.8 FT.	31.7-32 FT.
-	-	-	-	-	-
120	12	29	-	-	-
280 D	84	190 JD	1600	7200	25
49 J	-	-	-	-	-

BORING 15			BORING B-15A	
0-1 FT.	6-7 FT.	13-14 FT.	23.2-23.5 FT.	27.1-27.5 FT.
56	270 E	160	190	61
-	420 E	250	640 E	390 E
30 B	440 E	4900	920	2200 D
-	-	-	-	-

BORING 14			BORING B-14A	
0-1 FT.	5-8 FT.	18-20 FT.	24.1-24.6 FT.	30.4-30.8 FT.
-	-	15	-	-
7.6	14	640 E	-	-
840	1800 E	13000	13	500
32	-	-	-	-

BORING B-10			BORING B-10A		
0-1 FT.	7-8 FT.	17-18 FT.	23.4-23.8 FT.	25.0-25.3 FT.	28.3-28.7 FT.
-	4.8 J	-	-	-	-
-	6.4	-	-	-	5.1 J
120000	200 J	1200	530	2400	160 JD
-	-	-	-	-	-

BORING B-11			BORING B-11A			
0-1 FT.	4-5 FT.	11-12 FT.	15.0-15.3 FT.	21.5-21.8 FT.	27.2-27.7 FT.	30.3-30.7 FT.
-	-	15	12 J	-	9.3 J	13
-	-	170	95	12	67	83
85	110	2000 E	150 JD	120 JD	200 JD	1800 D
-	-	-	-	-	-	-

BORING 13			BORING B-13A	
0-1 FT.	7-8 FT.	16-18 FT.	24.2-24.7 FT.	35.4-36.2 FT.
-	32	95	-	-
97	130	670 E	12	15
3600	250 E	120 J	320 E	330 D
-	-	-	-	-

BORING B-27

0.1-0.6 FT.	4-4.4 FT.	15.5-15.9 FT.	21.2-21.6 FT.	31.8-32.3 FT.	33.2-33.6 FT.
-	-	-	-	-	-
-	270	17	10	-	5.6 J
1200	1300	120	11	1600	98
-	-	-	-	-	-

SCALE

0 50 100 FEET

FIGURE 4-6

SCALE: AS NOTED	APPROVED BY:	DRAWN BY: B. SNYDER
DATE: 10/7/99		CHECKED BY:

SOIL SAMPLING ANALYTICAL RESULTS FOR JULY & OCTOBER 1999

ALCAS CUTLERY CORPORATION FACILITY SITE OLEAN, NEW YORK

FILE NAME: 870724-B5

DRAWING NUMBER

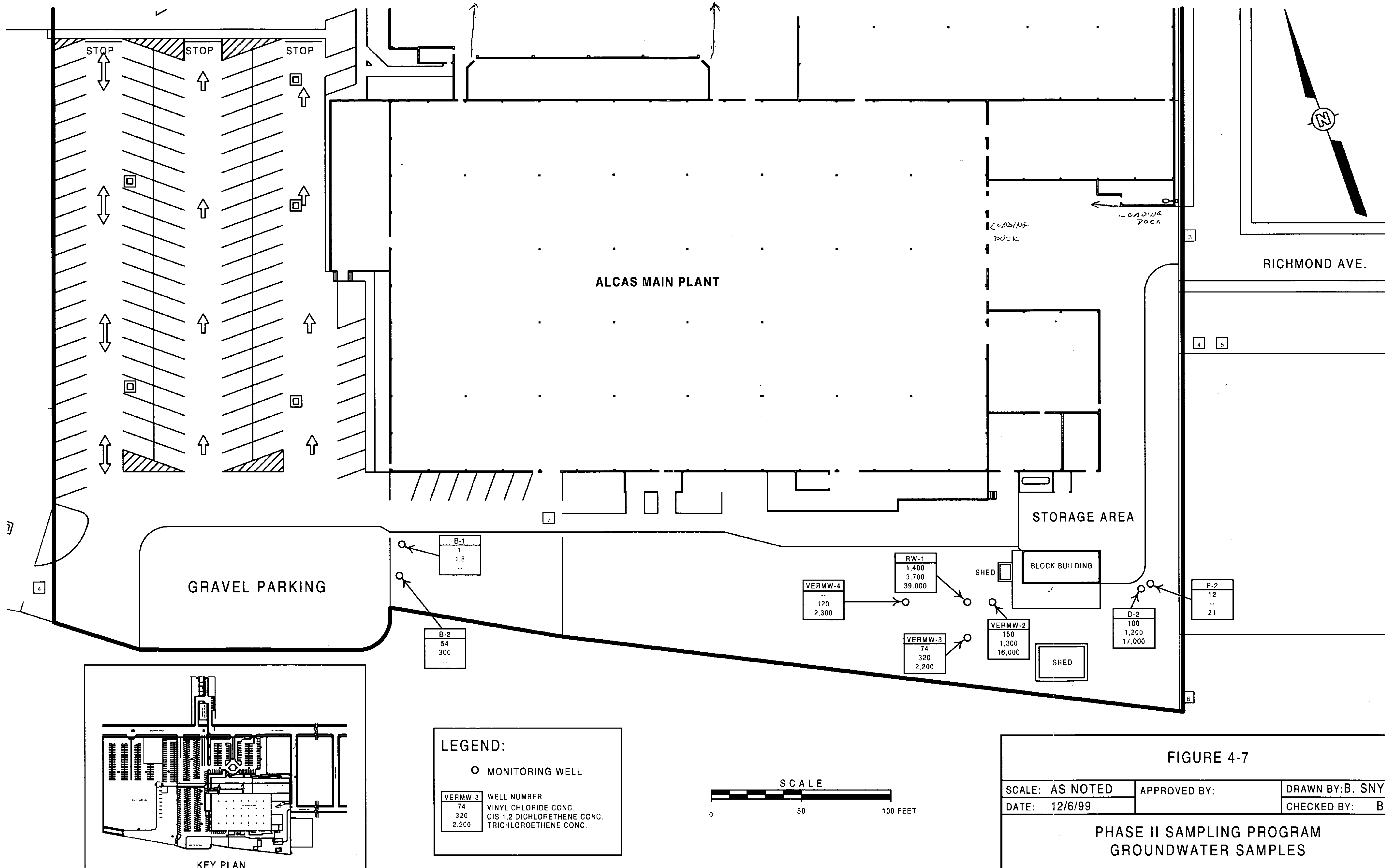
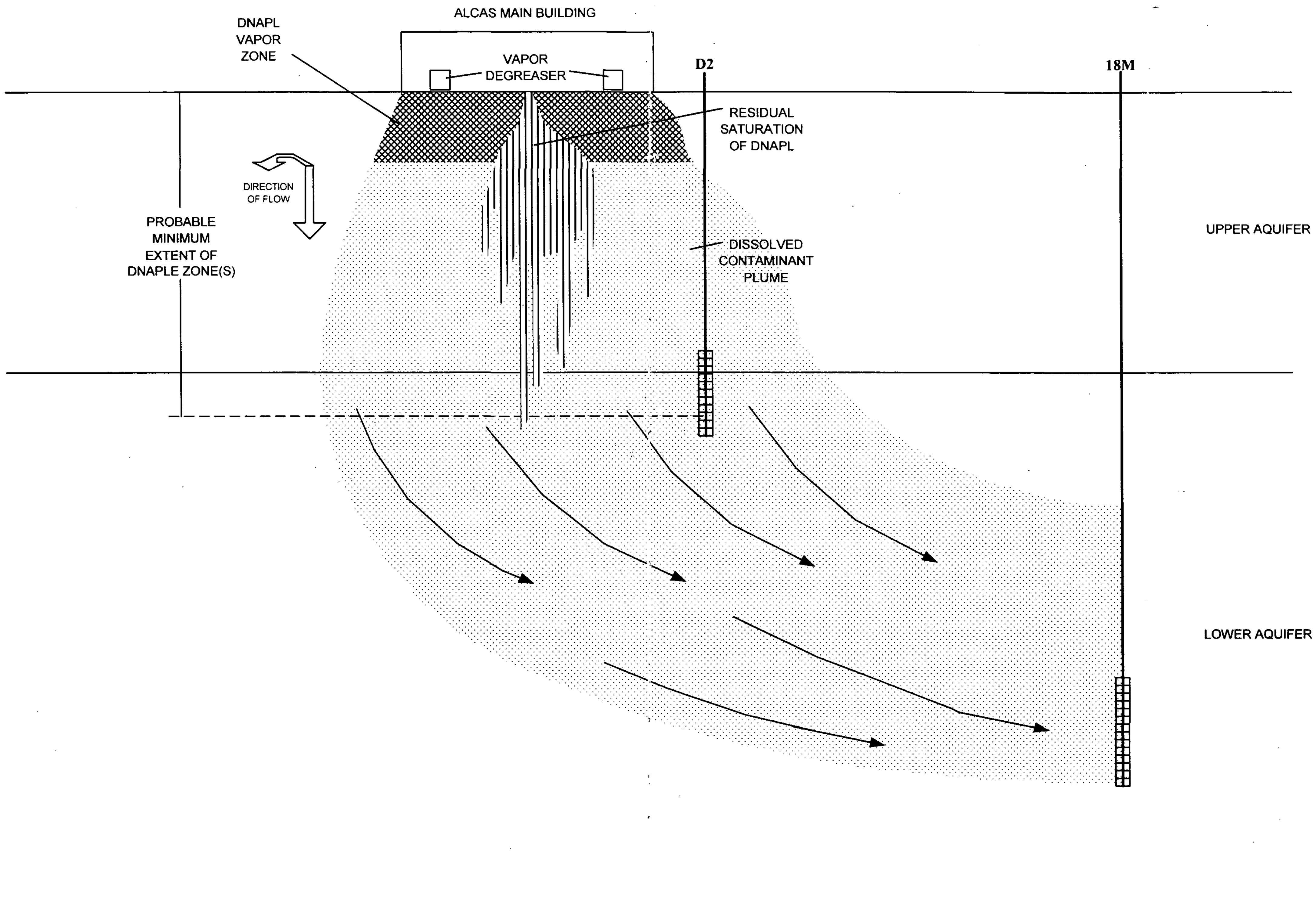


FIGURE 4-7

SCALE: AS NOTED DATE: 12/6/99	APPROVED BY:	DRAWN BY: B. SNYDER CHECKED BY: B.B

PHASE II SAMPLING PROGRAM
GROUNDWATER SAMPLES

ALCAS CUTLERY CORPORATION FACILITY SITE OLEAN, NEW YORK	FILE NAME: 20157002B DRAWING NUMBER



NOT TO SCALE

FIGURE 5-1		
SCALE: NONE	APPROVED BY:	DRAWN BY: L.GAMBLE
DATE: 1-11-00		CHECKED BY:B.B
UPDATED CONCEPTUAL MODEL PROFILE SCHEMATIC		
ALCAS CUTLERY CORPORATION FACILITY SITE OLEAN, NEW YORK		FILE NAME: E1370401 DRAWING NUMBER

E1370401

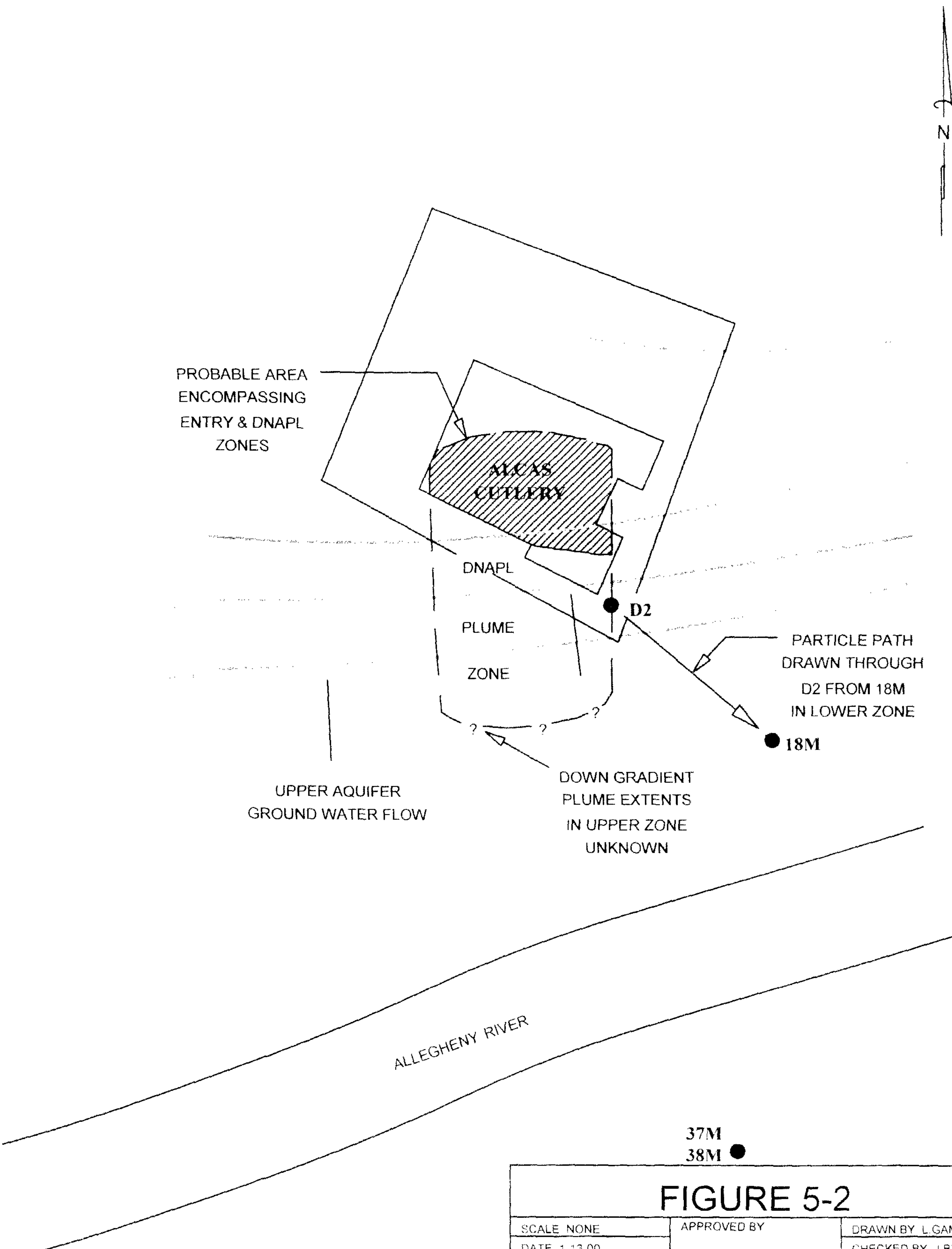


FIGURE 5-2

SCALE NONE	APPROVED BY	DRAWN BY L.GAMBLE
DATE 1-13-00		CHECKED BY J.BYRD

UPDATED CONCEPTUAL MODEL
PLAN VIEW SCHEMATIC

ALCAS CUTLERY CORPORATION
FACILITY SITE
OLEAN, NEW YORK

FILE NAME E1370402
DRAWING NUMBER

E1370402