CDM

Former All Fab
Building C-19 Chlorinated Solvent Delineation
Snohomish County Airport
Everett, Washington

February 14, 2005

Prepared For:

Snohomish County Airport
3220 100th Street SW
Everett, Washington

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A report prepared for:

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FORMER ALL FAB
BUILDING C-19 CHLORINATED SOLVENT DELINEATION
SNOHOMISH COUNTY AIRPORT
EVERETT, WASHINGTON

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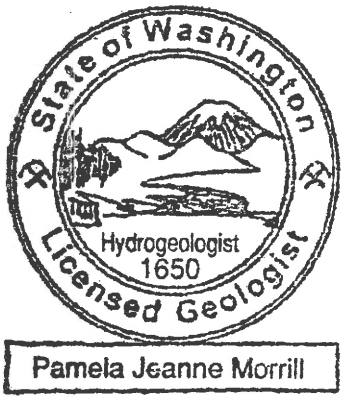

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Executive Summary

This report presents the results of Camp Dresser & McKee Inc.'s (CDM) investigation of chlorinated solvents in soil and groundwater near Building C-19 at Snohomish County Airport/Paine Field in Everett, Washington (site or subject property).

In 1978 Snohomish County leased the ground at the site to All Fab, Inc. pursuant to a ground lease executed by Thomas V. Giddens as President on behalf of All Fab, Inc. In 1991 the ground lease was assigned by All Fab, Inc. to Thomas V. Giddens. In 1993 the ground lease was assigned by Thomas V. Giddens to the Thomas V. Giddens Living Trust. The Thomas V. Giddens Living Trust is the current lessee of the site.

In 1979 Building C-19 was constructed by All Fab, Inc. pursuant to the terms of the ground lease with Snohomish County. Building C-19 is currently occupied by Neuvant Aerospace Corporation (Neuvant), a fabricator of aircraft parts. Neuvant, and its various predecessors including All Fab, Inc., Certified Aerospace, UNC, UNC All Fab, and All Star Aerospace Inc., have occupied the site and have engaged in essentially the same business activities since Building C-19 was first constructed in 1979. The site name is referred to as "All Fab" to be consistent with historical referenced sources.

In 1993 Landau Associates, Inc. (Landau) completed a Phase 1 Environmental Site Assessment that indicated the potential for environmental contamination. In 1994 and 1995 Landau completed limited investigations under a vapor degreaser pit located at the south corner of Building C-19. Results of these investigations identified the chlorinated volatile organic compound (cVOC) trichloroethene (TCE) in soil and perched groundwater at concentrations that substantially exceeded Washington State Model Toxics Control Act (MTCA) Method A cleanup levels. Snohomish County Pubic Works Department subsequently installed three monitoring wells in the road near Building C-19 and CDM later sampled these wells. Results of soil and groundwater testing also identified high concentrations of TCE and its degradation products in soil and groundwater. In 1999 CDM also installed a monitoring well in the Advance Outwash (Qva) aquifer underlying the area where TCE was detected in the perched groundwater.

The purpose of this investigation was to delineate the lateral extent of cVOCs in shallow soil and perched groundwater near Building C-19. CDM investigated underground utility lines by researching historical drawings, conducting a camera survey, and a ground penetrating radar and electromagnetic survey (GPR/EM) in order to evaluate migration pathways. The plume limits in perched groundwater were investigated by collecting soil and groundwater samples using drive-point sampling methods. Groundwater samples were also collected from existing wells.

Based on the results of this investigation, the core of the TCE plume in perched groundwater appears to be located in 29th Ave. W and extends in a generally east-west direction. Historical drawings and the camera and GPR/EM surveys indicate that there are numerous active and abandoned underground utilities in the

immediate vicinity of Building C-19, including two floor drains inside the building, one of which is next to the vapor degreaser pit. The TCE plume appears to have migrated along active and abandoned sewer and storm drain lines that occur around the south site of Building C-19. Field investigation and analytical testing did not identify any offsite TCE source that could be migrating into the area.

TCE has also migrated vertically to the Qva aquifer. Recent analytical testing indicates TCE concentrations in the Qva aquifer are increasing.

Section 1
Introduction

This report presents the results of Camp Dresser & McKee Inc.'s (CDM) investigation of chlorinated solvents in soil and groundwater near Building C-19 at Snohomish County Airport/Paine Field in Everett, Washington (site or subject property). The site location is shown on **Figure 1**. Snohomish County Airport (SCA) retained CDM to perform this work. CDM's services were performed under the Snohomish County Public Works Department (SCPWD) On Call contract, Master Agreement OC02-00, Work Authorization No. 20.

1.1 Background

In 1978 Snohomish County leased the ground at the site to All Fab, Inc. pursuant to a ground lease executed by Thomas V. Giddens as President on behalf of All Fab, Inc. In 1991 the ground lease was assigned by All Fab, Inc. to Thomas V. Giddens. In 1993 the ground lease was assigned by Thomas V. Giddens to the Thomas V. Giddens Living Trust. The Thomas V. Giddens Living Trust is the current lessee of the site.

In 1979 Building C-19 was constructed by All Fab, Inc. pursuant to the terms of the ground lease with Snohomish County. Building C-19 is currently occupied by Neuvant Aerospace Corporation (Neuvant), a fabricator of aircraft parts. Major processes include metal fabrication, parts painting, solvent degreasing, sandblasting, and foundry operations. Neuvant, and its various predecessors including All Fab, Inc., Certified Aerospace, UNC, UNC All Fab, and All Star Aerospace Inc., have occupied the site and have engaged in essentially the same business activities since Building C-19 was first constructed in 1979. Throughout this report, the site name is referred to as "All Fab" to be consistent with historical referenced sources.

In November 1993 Landau Associates, Inc. (Landau) completed a Phase 1 Environmental Site Assessment (ESA) of the All Fab lease area and facilities, including Buildings C-19 through C-23 and C-29. The Phase 1 ESA identified numerous historical practices that could have resulted in potential soil and groundwater contamination. During 1994 through 1996 Landau conducted several limited scope investigations of soil and groundwater at Buildings C-19 and C-29 (Landau, 1994, 1995, 1996a, 1996b, and 1996c). Landau's investigations identified several volatile organic compounds (VOCs) in soil and perched groundwater at both locations investigated. For purposes of this report, further discussion is limited to VOC contamination at and around Building C-19.

Landau's April 1994 and August 1995 reports summarize investigations under the vapor degreaser pit located at the south corner of Building C-19 (**Figure 3**). The investigations involved collecting and analyzing soil and perched groundwater samples from beneath the sump inside this pit. During the 1995 investigation, the concrete floor of the sump and about 2.5 feet of soil were removed. Results of these investigations identified the chlorinated VOC (cVOC) trichloroethene (TCE) in soil

and perched groundwater at concentrations that substantially exceeded Washington State Model Toxics Control Act (MTCA) Method A cleanup levels.

During December 1996, SCPWD drilled three borings near Building C-19 and installed monitoring wells in the perched groundwater in each of those borings. TCE concentrations in 11 of the 15 soil samples analyzed exceeded the current MTCA Method A soil cleanup level of 30 micrograms per kilogram (µg/kg). The laboratory detection limit for TCE at the time (50 µg/kg) did not meet the current Method A soil cleanup level, so additional soil samples may also have contained TCE at concentrations exceeding the cleanup level. Soil collected from the maximum depth sampled (33.5 feet below ground surface [ft bgs]) contained 1,250 µg/kg TCE, still well above the MTCA Method A cleanup level.

In 1999 CDM (formerly AGI Technologies) compiled and reviewed the data from environmental investigations conducted by Landau and SCPWD (AGI Technologies, 1999). CDM also collected and analyzed groundwater samples from the three monitoring wells in the zone of perched groundwater near Building C-19. From this investigation, CDM concluded that various cVOCs were present in perched groundwater in the immediate vicinity of Building C-19 at levels that substantially exceed MTCA Method A cleanup levels. The lateral and vertical extent of cVOC contamination had not been delineated.

Because of the high concentrations of cVOCs in perched groundwater, the depth to which they were observed in soil, their high mobility, and recalcitrant nature, CDM recommended additional investigation to evaluate whether the aquifer in the Advance Outwash underlying the site has been impacted. One well was installed in the aquifer near Building C-19. Two additional aquifer wells were installed downgradient of Building C-19. During that investigation, TCE was detected at a concentration of 10 µg/kg in one soil sample collected at a depth of 57.5 ft bgs, but not in any samples collected deeper than this. TCE was detected in the aquifer at concentrations of 8 and 62 micrograms per liter (µg/L) in December 1999 and March 2000, respectively, which exceed the MTCA Method A cleanup level of 5 µg/L.

1.2 Purpose and Scope of Services

The purpose of this investigation was to delineate the lateral extent of cVOCs in shallow soil and perched groundwater and to check current concentrations of cVOCs in the underlying aquifer near Building C-19. CDM's scope of services to conduct this investigation included the following tasks:

- Investigated and identified current and historical sewer lines in the site area by:
  - Performing a camera survey of accessible existing lines.
  - Performing a ground penetrating radar (GPR) and electromagnetic (EM) survey.
  - Examining historical site engineering drawings.

- Investigated subsurface conditions in the area of potential concern using direct-push sampling methods to examine soil for evidence of contamination and collect samples of soil and perched groundwater for possible chemical analysis.
- Purged and sampled existing monitoring wells installed in the perched groundwater and in the aquifer in the vicinity of Building C-19.
- Submitted selected soil and groundwater samples collected for chemical analytical testing of cVOCs.
- Evaluated field observations, research data, and the analytical data and prepared this report documenting our findings.

Section 2
Site Features

2.1 Location

The site is located within Snohomish County Airport, which is about 6 miles southwest of downtown Everett, Washington. The site itself is located near the southeastern corner of the Snohomish County Airport, on 29th Avenue W (**Figure 1**). Land use in the surrounding area is primarily industrial in nature.

2.2 Site Description

The area of investigation is immediately south, east, and west of the southern corner of Building C-19 as is shown on **Figure 2**. Test holes were situated throughout the block bounded by 29th Avenue West, 30th Avenue W, and 112th Street SW. This block is currently undeveloped. It is bisected by the abandoned East Army Street, which is partly asphalt-paved and partly gravel. Areas to the north and south of this abandoned road are asphalt-paved, as they were formerly parking lots. The remainder of the block is covered by lawn. Several test holes were also situated east of 29th Avenue W in the facility parking lot southeast of Building C-19. The site and vicinity topography is relatively level with a slight slope downward toward the southeast.

2.3 Geologic Setting

2.3.1 Regional Geology

SCA is located within the Puget Sound Lowland, a north-south trending structural and topographic depression bordered on the west by the Olympic Mountains and on the east by the Cascade Mountains. The lowland is underlain by Tertiary volcanic and sedimentary bedrock and filled to the present-day land surface with Pleistocene glacial and nonglacial sediments. Deposits of at least four glaciations have been identified in the southern Puget Sound Lowland. The latest of these glaciations, termed the Fraser, includes the glacial advances termed the Sumas (youngest) and the Vashon (oldest). Only deposits of the Vashon Stade have been identified in Snohomish County.

The SCA and the surrounding area are situated on the Intercity Plateau. The Plateau ranges in elevation from approximately 400 to 600 feet above mean sea level and is characterized by low rolling hills with incised ravines eroded into its perimeter. Till and recessional glacial deposits generally mantle the plateau.

2.3.2 Site Geology

According to published sources (Thomas, et. al., 1997; Minard, 1985), and prior subsurface investigations by CDM (CDM, 2000a; CDM 2000b), the site and vicinity are underlain by Vashon till (till), and in localized areas by fill. Vashon till comprises a very dense, non-sorted mixture of clay, silt, sand, pebbles, cobbles, and boulders. The

till underlying the site is approximately 85 feet thick. Based on a deep boring drilled onsite by CDM, the first 55 feet of till consists of very dense gray silty sand with gravel and occasional boulders. There is a transitional zone between about 55 and 85 ft bgs where the gravel content in the till increases, becoming a very dense gray silty gravel with sand.

Advance Outwash (Qva) occurs at 85 ft bgs. The Advance Outwash starts off as a brown sandy gravel, becoming a clean, brown to gray, fine to coarse-grained sand. At 145 ft bgs, the Advance Outwash increased in gravel content, becoming gravelly sand.

2.3.3 Groundwater

Perched water occurs generally within the first 30 feet of the ground surface in the fill and in the upper, weathered, and more permeable zones of the till. Perched groundwater fluctuates seasonally in response to rainfall. Shallow monitoring wells currently at the site range from 18 to 30 feet deep. Perched water levels in these wells range from about 2.5 to 8.8 ft bgs. It appears that there are localized variations in the depth of the perched groundwater (or lack thereof), which may be based upon the thickness of the fill and weathered till and the occurrence and configuration of sand interlayers in the till.

The uppermost aquifer at SCA occurs under unconfined conditions (water table) within the Advance Outwash (Qva aquifer), at a depth of about 133 ft bgs, which corresponds to an elevation of about 464 feet above mean seal level.

Section 3
Field Investigation Methods

CDM's field investigation was conducted on various dates between March and November 2003. The investigation included:

- Locating storm and floor drain lines using a downhole camera and GPR/EM devices.
- Conducting a shallow subsurface soil and groundwater investigation using drive-point sampling methods,
- Collecting groundwater samples from existing monitoring wells.

Soil and groundwater samples were submitted to a fixed-chemical analytical laboratory for analysis. The following sections describe the methods used during these investigations. Investigation findings are discussed in Section 4.

3.1 Camera Survey

An investigation of storm and floor drain lines was conducted using a downhole camera. Applied Professional Services, Inc. (APS) conducted the survey under the observation and direction of CDM personnel.

There are two, approximately 3-inch diameter floor drains inside Building C-19 along the southwest side, near the south end of the building as shown on **Figure 3**. There may be additional floor drains farther north, but this investigation focused on drains near the vapor degreaser pit. Both of these lines were camera-surveyed until they terminated at a catch basin located at the north corner of the intersection of 29th Ave. W. and East Army Street. We also attempted to camera the footing drain for Building C-19, but the line was completely blocked by silt.

The storm drain lines that extend off several additional catch basins at this intersection were also at least partially investigated as shown on **Figure 3**. The camera was extended up each line until: 1) blockage was encountered, 2) termination at another catch basin, or 3) it was not considered necessary to continue farther up the line once the direction had been established. Conditions inside each line were videotaped during the camera survey. The location and size of each of these lines was noted and mapped on existing site drawings as shown on **Figure 3**.

3.2 GPR/EM Survey

Underground utility lines were further investigated using ground penetrating radar/electromagnetic (GPR/EM) devices. Apollo Geophysics Corporation (Apollo) conducted the survey under the observation and direction of CDM personnel. Apollo's report is included in **Appendix A** and provides details the GPR/EM methods.

GPR establishes the relative depth, size, and ground projection of subsurface objects using an electromagnetic step-pulse to detect changes in subsurface properties. A portion of this signal is reflected back and the properties of various subsurface materials are reflected differently. This is detected by the machine, and taken as a whole, this creates a "picture" of the subsurface. The maximum depth "seen" by the GPR is about 9 ft bgs.

EM uses electrical properties (i.e., electrical conductivity or resistivity) to determine the lateral configuration of subsurface materials. This investigation utilized a dual di-pole (Horizontal/Vertical) Frequency Domain Electromagnetic (FDEM) instrument, which provides the soil conductivity for two separate depths. The Horizontal Dipole depth of exploration is approximately 10 ft bgs, and the Vertical Dipole depth of exploration is approximately 20 ft bgs.

The area of investigation is shown on **Figure 3**. A grid was established in a 40-foot by 100-foot area located in 29th Avenue W, just north of the East Army Road intersection. This area extended from the All Fab fence line west to just beyond the road. Parallel with the road, the GPR grid was traversed on 2.5-foot spacings. Perpendicular to the road, the GPR grid was traversed on 10-foot spacings. Additionally, the area between the fence and Building C-19 was investigated by two traverses parallel to the road and three traverses perpendicular to the road.

3.3 Drive-Point Sampling

A truck mounted drive-point sampling device (Geoprobe™) was utilized to explore subsurface conditions and to collect subsurface soil and groundwater samples for laboratory analysis. The drive-point sampling method utilizes a hydraulically-powered percussion/direct push machine that drives a tool string directly through the ground. Twenty test holes (GP1 through GP20) were extended throughout the site at the locations shown on **Figure 4**. Test hole depths ranged from 8 to 13 ft bgs.

Soil samples were collected continuously using core samplers attached to drive rods. Five-foot-long core samplers with acetate liners were used. Each sampled interval was logged according to the Unified Soil Classification System as described on **Figure B1** in **Appendix B**. Boring logs are included in **Appendix B** as **Figures B2** through **B21**.

Field Screening: Recovered soil samples were checked for noticeable contamination and field screened for VOCs. Field screening was conducted by placing a representative portion of each sample into a resealable plastic bag and disaggregated. After about 5 minutes VOCs were measured in the headspace using an organic vapor meter equipped with a photoionization detector (OVM-PID). This is not a compound-specific analysis and is affected by, among other influences, climate (e.g., temperature and humidity), soil type and conditions, instrument calibration and operation, and type of compounds present.

Soil Sampling: Up to two soil samples were collected from each test hole for potential analysis. The primary criteria for selecting soil samples for analysis were as follows: 1) where contamination was evident based on field screening, and 2) where contamination was considered a high probability due to the activity in the area.

Soil samples were collected by cutting of a section of the acetate liner, covering the ends with Teflon™ tape and sealing them with plastic caps. Alternatively, a clean stainless steel spoon was used to pack the soil into 4-ounce laboratory grade sample jars.

Groundwater Sampling: Samples of perched groundwater were collected through a screen attached to the end of the tool string. After the rods are driven to the desired depth the rods were pulled back, thereby exposing the screen and allowing groundwater to enter into the rods. Groundwater samples were then collected through the rods using either a Watera pump or peristaltic pump with dedicated tubing. The peristaltic pump works by positive displacement. The Watera pump consists of a length of tubing with a valve at the bottom and works by oscillating the tube up and down. The downward stroke draws the water into the tubing and the upward stroke projects the water upwards. The Watera pump is particularly useful in instances where there is a very low yield. Groundwater samples were collected from the pump discharge directly into laboratory supplied pre-cleaned 40-milliliter VOA vials bottled containing hydrochloric acid as a preservative.

Decontamination and Hole Closure: Each test hole was filled with bentonite granules. All sampling equipment, including drive rods and screens were decontaminated by scrubbing in a solution of alconox soap and potable water and rinsing with potable water and distilled water.

3.4 Monitoring Well Sampling

Three existing monitoring wells in the perched groundwater, identified as SCPWD-2, SCPWD-3, SCPWD-4, and one monitoring well in the Qva aquifer, identified as DW1 were purged and sampled. Monitoring well locations are shown on **Figure 4**.

Water levels in each well were measured prior to sampling using a Sinco® sounder. The monitoring wells were then purged of stagnant water within the well casing and sandpack annulus. Purging was conducted using a submersible Grundfo Redi-Flo 2® pump.

Groundwater samples were collected from the pump discharge directly into laboratory supplied pre-cleaned 40-milliliter VOA vials bottled containing hydrochloric acid as a preservative.

3.5 Analytical Methods

All sample containers were sealed, labeled, and placed in a chilled cooler and transported under chain-of-custody protocol to the analytical laboratory. Soil and groundwater samples were submitted to CCI Analytical Laboratories in Everett, Washington for analysis. Soil and groundwater samples were analyzed for halogenated VOCs by EPA Method 8260.

Section 4
Findings

4.1 Underground Utilities

In addition to the camera and GPR/EM surveys, CDM reviewed historical airport drawings that show sanitary and storm sewer lines. Included in our review were the following drawings:

- Sanitary & Storm Sewers, Cantonment Area, Paine Field, Everett, Washington. Prepared by the U.S. Engineer Office, Seattle, Washington. Dated 1945.
- Air Defense Command Master Plan, Detail Utilities Map, Paine Field, Everett, Washington. Prepared by the Department of the Air Force. Dated March 15, 1962.
- Air Defense Command Master Plan, General Utility Map Storm Drainage, Paine Field, Everett, Washington. Prepared by the Department of the Air Force. Dated March 15, 1962.

Because of the size and quality of these old maps, it was not considered practical to include copies of them with this report. It was also not practical to include the video from the camera survey with this report. These referenced sources are maintained at CDM's Bellevue office. The report that details the findings of the GPR/EM survey is included in **Appendix A** and includes cross sections and plan view slices.

Numerous confirmed and suspected storm and sewer lines and other as yet unidentified underground utilities were identified in the area around the south end of Building C-19. Any one or several of these storm/sewer lines and utility corridors could be acting as conduits for contaminant migration. Our understanding of the location of current and abandoned underground sewer and storm drain lines, based on the information from these historical drawings and the field investigation results, is summarized in **Figure 3**.

Significant findings from these drawings and field investigations are as follows:

- Both of the investigated floor drains inside Building C-19, discharge to a storm drain line that extends parallel to Building C-19. These floor drain lines currently discharge to a grown-over (i.e., not maintained) stormwater catch basin located at the north corner of 29th Ave W. and East Army Road. While the floor drains appear very old (i.e., original vintage of the building), the pipe appears to change from cast iron and/or concrete to PVC once the line extends past the edge of building, possibly indicating a revision of the line after the building was constructed. It is also notable that the PVC collection drain line, which extends parallel to the building, is the same location as a barracks sewer line that was shown on the 1945 drawing. The original sewer line discharged to a 6-inch sewer main line (shown on **Figure 3**) that extended parallel to the southeast side of Building C-19 and across 29th Ave. W, passing within a few feet of SCPWD-3. The 1962 Detail Utilities Map

shows the 6-inch sewer line as being abandoned. The smaller barracks sewer lines are not shown on the more recent drawing. As indicated on the 1962 drawing, it is likely that main sewer lines were abandoned by plugging portions of the line and filling manholes at select locations and that the secondary lines were simply left unplugged.

- The GPR survey identified a very distinct underground line at a depth of about 3 ft bgs which extends across 29th Ave. W and passes within about 2 to 3 feet of SCPWD-2. This line heads directly toward Building C-19, but was not clearly identified between the fence and Building C-19. There was no indication (nor is it likely) that the line made a 90-degree turn away from the building.

- Storm drain lines begin at the corner of 29th Ave. W and East Army Road and extend eastward into the All Fab parking lot.

- There are several apparent abandoned utility lines and other unidentifiable features in 29th Ave. W just off the south corner of Building C-19.

4.2 Observed Subsurface Conditions

4.2.1 Soil and Groundwater

Drive-point test holes, encountered fill and glacial till. The fill appears to be glacial till that was graded off higher elevations to fill in the lower elevations and ultimately level off the topography. The fill and till consists of brown to gray silty sand, although at the east end the fill also contains sand layers. **Figure 5** shows the location of geologic cross sections that are shown on **Figures 6** and **7**. These cross sections indicate that the fill thickness is generally shallower on the west and deepens on the east and that the till surface generally slopes downward toward the east and southeast.

Perched groundwater seepage was generally first encountered at depths between 4 and 8 ft bgs. GP13, off the southeast corner of Building C-19, was the only test hole that did not produce water, even though increased moisture was observed at 6.5 ft bgs. GP17, also next to Building C-19, was also very slow to produce water. This could be a direct result of dewatering by footing drains around the building, or other features of the building that may be influencing the presence of perched groundwater.

Water levels in the perched groundwater monitoring wells at the time of sampling in October 2003 ranged from 5.64 to 8.77 ft bgs and are indicative of the seasonal low water table. Water levels in the spring of 1999 were about 1 to 3 feet higher. Depths to perched groundwater and corresponding elevations are summarized on **Table 1**. The direction of perched groundwater flow shows some seasonal variation. In the spring of 1999 the perched groundwater flow was toward the southeast, and in the fall of 2003 toward the east as shown on **Figures 8** and **9**, respectively.

Depth to water in the Qva aquifer wells at the time of sampling in October 2003 ranged from about 133.4 to 134.5 ft bgs, consistent with prior water levels. Groundwater elevations for the Qva aquifer wells are also summarized on **Table 2**. The Qva aquifer flows in a north to northeasterly direction as shown on **Figures 10** and **11**.

4.2.2 Field Screening

Notable OVM-PID readings, ranging from 6 to 33 parts per million (ppm), were observed at GP3, GP17, and GP18. Slight OVM-PID readings were also observed at GP13, GP6, and GP19 (i.e., < 2 ppm). OVM-PID readings are shown on the boring logs. With the exception of GP6 and GP19, VOCs were detected by the OVM-PID only in test holes within about 80 feet of Building C-19.

At GP3 a slight VOC reading of 0.5 ppm was observed at the groundwater interface (4.5 ft bgs), which increased to 15 ppm at 8 ft bgs and then to 25 ppm at 9 ft bgs. GP3 was placed approximately next to the abandoned sewer line that extends alongside Building C-19 and across 29th Ave. W. At GP18, about 40 ft south of the abandoned sewer line, the 9 ft bgs sample produced an OVM-PID reading of 33 ppm. At GP17, we observed a stained dark brown, wet layer at about 7.5 ft to 8 ft bgs, which produced an OVM-PID reading of 6 ppm. At GP13 slight OVM-PID readings were observed at all three depths checked (3 ft, 7.5 ft, and 9 ft), ranging from 0.3 to 1.7 ppm.

GP6 was located next to the former Building 442 and a vault-like structure that appeared to be a crude oil/water separator. At the time of this investigation it was full of water, oil and grease – it was later pumped out. GP19 was the farthest downgradient exploration point in the TCE plume, though as will be noted later the concentration of TCE still exceeds the MTCA Method A groundwater cleanup level at this location.

4.3 Analytical Results

The analytical reports are included in **Appendix C**. The data are summarized in **Tables 2** through **5**. For the purpose of this investigation, soil and groundwater data are compared to MTCA Method A and B cleanup levels. These cleanup levels are included on the summary tables.

4.3.1 Soil

One to two soil samples from 11 of the test holes were submitted for analysis of cVOCs. Soil sample depths ranged from 2 to 9 ft bgs. Soil analytical data are summarized in **Table 2**. TCE and methylene chloride were the only two VOCs detected. Methylene chloride, which was detected in only two samples, is a common laboratory contaminant. Given that the reported concentrations in each sample were just above the method reporting limit of 20 µg/kg, we assume that the methylene chloride is an artifact of laboratory contamination

TCE was detected in four samples, ranging from 19 to 63 µg/kg, three of which exceeded the MTCA Method A cleanup level of 30 µg/kg. The analytical data are consistent with the field screening data. TCE was only detected in the test holes within about 80 feet of the Building C-19. Also, TCE was detected only in soil samples collected at a depth of 8 or 9 ft bgs and not in the shallower soil samples collected at 2 to 4.5 ft bgs. TCE was not detected in the soil sample collected at GP6 located next to the oil/water separator.

4.3.2 Perched Groundwater

Groundwater samples were submitted from all 20 test holes, except GP13 which did not yield water sufficient for sampling. Groundwater analytical data for the test holes are summarized in **Table 3**. TCE and its degradation products cis- and trans-1,2-dichloroethene (*c*-1,2-DCE, *t*-1,2-DCE) and vinyl chloride (VC) were detected in five groundwater samples (GP3, GP12, GP17, GP18, and GP19). TCE concentrations ranged from 24 to 5,000 µg/L. All of these reported concentrations exceed the MTCA Method A cleanup level of 5 µg/L. The degradation products c-1,2-DCE and vinyl chloride also exceeded their respective Method B cleanup levels at GP17 and/or GP18.

Groundwater analytical data from the perched groundwater monitoring wells is summarized in **Table 4**, which also includes prior VOC data from these wells. Groundwater samples collected from these monitoring wells contain high concentrations of TCE and its degradation products. During the October 2003 sampling, TCE was detected in SCPWD-3 at a concentration of 100,000 µg/L and in SCPWD-2 at 43,000 µg/L. These concentrations are indicative of free phase product. Undissolved TCE is a dense nonaqueous phase liquid (DNAPL) that is heavier that water.

1,1,1-Trichloroethane (1,1,1-TCA) and its degradation products were detected at only one location, GP12. The concentration of 1,1,1-TCA at GP12 is relatively low and did not exceed the MTCA Method A cleanup level. GP12 is located about 50 feet off the southeast side of Building C-19 and 120 feet southwest of the degreaser vault. Furthermore, GP12 is located next to a 16-inch storm drain line. A spill from the former above ground 1,1,1-TCA tank would have entered the catch basin at the intersection of 29th Ave. W and East Army Way and discharged through this 16-inch storm drain line.

Figure 12 shows the most recent cVOC data for individual sample locations and indicates our estimate of the TCE plume limits in perched groundwater, based on existing data. The TCE plume extends in an east-west direction, generally along the abandoned sewer line and existing storm drain lines. The south corner of Building C-19 lies within the central portion of the plume. It is evident that, while the plume migration is generally toward the west, in the direction of groundwater flow, the plume has followed a path along the abandoned sewer line, upgradient of

Section 5
Conclusions

This investigation identified a TCE plume in perched groundwater in the immediate vicinity of the south corner of Building C-19. Also included in the TCE plume are the degradation products of TCE. TCE concentrations at two of the groundwater sample locations are high enough to indicate the presence of DNAPL.

1,1,1-TCA and one of its degradation products was identified in perched groundwater at only one location along the storm drain line downgradient of Building C-19. At the low concentration detected and lack of occurrences throughout the site, 1,1,1-TCA is not considered a contaminant of concern.

TCE was only detected in soils at depths of about 8 feet or greater. TCE was not detected in soils shallower than 5 feet. This indicates the release occurred subsurface.

Based on existing soil and perched groundwater data, the core of the plume appears to be located in 29th Ave. W and extends in a generally east-west direction. The TCE plume appears to have migrated along active and abandoned sewer and storm drain lines. Historical drawings and the camera and GPR/EM surveys indicate that there are numerous active and abandoned underground utilities in the immediate vicinity of Building C-19. Existing floor drains inside Building C-19 connect to the storm drain system that is in the middle of the plume. Furthermore, historical drawings, and the camera and GPR/EM surveys indicate that the floor drain discharge lines may have been redirected from their original configuration, possibly having once discharged through the core of the plume.

Field investigation and analytical testing did not identify any offsite TCE source that could be migrating into the area. For example, TCE was not found to be migrating into the area along sewer or storm drain lines from any other potential offsite source. Except for the area occupied by Building C-19, the north, west, and south sides of the plume have been delineated by groundwater samples that are nondetected for TCE. The downgradient edge of the plume (eastern), is not quite delineated.

TCE has migrated vertically to the Qva aquifer. Recent analytical testing indicates that TCE concentrations in the Qva aquifer are increasing. Given the concentration of TCE in the perched groundwater and probable presence of DNAPL, TCE concentrations in the Qva aquifer will probably continue to increase until remedial actions are taken to address TCE in soil and perched groundwater.

Section 6
Use of this Report

This report was prepared for exclusive use of the Snohomish County Airport for this project only. The analyses, conclusions, and recommendations in this report are based on conditions encountered at the time of our field investigation, design information you provided, and our experience and engineering judgment. CDM cannot be responsible for the interpretation by others of the data contained herein.

We must presume the conditions encountered are representative of the entire site. However, you should be aware that subsurface conditions may vary between exploration locations and with time, and unanticipated conditions can and do often occur.

Our work has been performed in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing under similar conditions in the area. No other warranty, express or implied, is made.

Section 7
References

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Paine Field Historical Drawings

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- Air Defense Command Master Plan, Detail Utilities Map, Paine Field, Everett, Washington. Prepared by the Department of the Air Force. Dated March 15, 1962.
- Air Defense Command Master Plan, General Utility Map Storm Drainage, Paine Field, Everett, Washington. Prepared by the Department of the Air Force. Dated March 15, 1962.

Distribution

3 Copies	Snohomish County Airport 3220 100th Street SW Everett, Washington 98204-1390 Attention: Mr. Jim Maynard
1 Copy	Snohomish County Public Works Department 2930 Wetmore Avenue Everett, Washington 98201 Attention: Dale Topham

Quality Assurance / Technical Review by:

Susan J. Penoyar, P.E.
Principal

Tables

Table 1
Groundwater Level Data
Snohomish County Airport/Building C-19 - Chlorinated Solvent Delineation
Everett, Washington

Well I.D.	Date Measured	Time (hours)	Top of Casing Elevation [a] (ft MSL)	Depth to Groundwater (ft TOC)	Groundwater Elevation (ft MSL)
Aquifer					
DW1	12/28/99	0950	596.93	132.93	464.00
	03/03/00	1014		133.91	463.02
	05/24/00	1345		132.34	464.59
	10/17/03	0935		133.37	463.56
DW2	12/28/99	1210	597.71	134.20	463.51
	03/03/00	0915		134.19	463.52
	05/24/00	1325		133.82	463.89
	10/17/03	1840		134.45	463.26
DW3	05/24/00	1335	596.82	132.65	464.17
	10/17/03	1821		133.49	463.33
Perched Groundwater					
SCPWD-2	03/09/99	0915	596.75	2.47	594.28
	04/02/99	1154		2.52	594.23
	10/17/03	1515		5.64	591.11
SCPWD-3	03/09/99	0920	596.67	5.55	591.12
	04/02/99	1153		4.47	592.20
	10/17/03	1547		6.17	590.50
SCPWD-4	03/09/99	1305	597.75	6.80	590.95
	04/02/99	1151		6.72	591.03
	10/17/03	1305		8.77	588.98

Notes:
a) Top of casing surveyed to NGVD29 by Reid Middleton, March 2000.
ft MSL - feet above mean sea level.
ft TOC - feet below top of casing.

Table 2
Volatile Organic Compounds in Soil - Drive-Point Investigation
Snohomish County Airport/Building C-19 - Chlorinated Solvent Delineation
Everett/Washington

Sample I.D.	Sample Depth (ft bgs)	Date Sampled	Methylene Chloride	Trichloroethene
			µg/kg	
GP3	4.5	03/20/03	ND	ND
	8	03/20/03	ND	63
GP4	3	03/20/03	26 B	ND
GP5	3	03/20/03	ND	ND
	8	03/20/03	ND	ND
GP6	2	03/20/03	ND	ND
GP7	2	03/21/03	ND	ND
GP8	2	03/21/03	ND	ND
GP9	2	03/21/03	ND	ND
GP13	9	03/20/03	ND	19
GP15	3	03/20/03	22 B	ND
GP17	8	03/20/03	ND	43
GP18	2	03/20/03	ND	ND
	9	03/20/03	ND	59
Laboratory Detection Limit			20	10
MTCA Method A Cleanup Level [a]			N/A	30

Notes:
Boxed values exceed MTCA Method A soil cleanup level.
a) Washington Administrative Code Chapter 173-340, Model Toxics Control Act Cleanup Regulation, Method A suggested soil cleanup level for unrestricted land uses; promulgated August 15, 2001.
B - Result may be due to laboratory contamination.
ND - not detected.
N/A - not available.
µg/kg - microgram per kilogram.

Table 3

Volatile Organic Compounds in Perched Groundwater - Drive-Point Investigation

Snohomish County Airport/Building C-19 - Chlorinated Solvent Delineation

Everett/Washington

Sample I.D.	Date Sampled	Trichloroethene	*cis*-1,2-Dichloroethene	*trans*-1,2-Dichloroethene	Vinyl Chloride	1,1,1-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethene
		µg/L						
GP1	03/20/03	ND	ND	ND	ND	ND	ND	ND
GP2	03/20/03	ND	ND	ND	ND	ND	ND	ND
GP3	03/20/03	240	100	20	ND	ND	ND	ND
GP4	03/20/03	ND	ND	ND	ND	ND	ND	ND
GP5	03/20/03	ND	ND	ND	ND	ND	ND	ND
GP6	03/20/03	ND	ND	ND	ND	ND	ND	ND
GP7	03/21/03	ND	ND	ND	ND	ND	ND	ND
GP8	03/21/03	ND	ND	ND	ND	ND	ND	ND
GP9	03/21/03	ND	ND	ND	ND	ND	ND	ND
GP10	03/21/03	ND	ND	ND	ND	ND	ND	ND
GP11	03/21/03	ND	ND	ND	ND	ND	ND	ND
GP12	03/20/03	100	17	ND	ND	7	6	3
GP14	03/20/03	ND	ND	ND	ND	ND	ND	ND
GP15	03/20/03	ND	ND	ND	ND	ND	ND	ND
GP16	03/20/03	ND	ND	ND	ND	ND	ND	ND
GP17	03/20/03	1,300	130	3	ND	ND	ND	ND
GP18	03/20/03	5,000	220	10	44	ND	ND	4
GP19	05/23/03	24	3	ND	ND	ND	ND	ND
GTP20	05/23/03	ND	ND	ND	ND	ND	ND	ND
Laboratory Detection Limit		2	2	2	2	2	2	2
MTCA Method A Cleanup Levels [a]		5	N/A	N/A	0.2	200	N/A	N/A
MTCA Method B Cleanup Levels [b]		3.98	80	160	0.29	7,200	800	72

Notes:

Boxed values exceed MTCA Method A groundwater cleanup level.

a) Washington Administrative Code Chapter 173-340, Model Toxics Control Act Cleanup Regulation, Method A suggested groundwater cleanup level; promulgated August 15, 2001.

b) Method B formula value (direct contact pathway as a carcinogen or noncarcinogen) from the Department of Ecology Publication #94-145, Cleanup Levels and Risk Calculations under the Model Toxics Control Act Cleanup Level Regulation CLARC Version 3.1). Updated November 2001.

ND - not detected. N/A - not available. µg/L - microgram per liter.

Table 4
Volatile Organic Compounds in Perched Groundwater - Monitoring Wells
Snohomish County Airport/Building C-19 - Chlorinated Solvent Delineation
Everett, Washington

Well I.D.	Date Sampled	Trichloroethene	*cis*-1,2-Dichloroethene	*trans*-1,2-Dichloroethene	Vinyl Chloride	1,1-Dichloroethene	Tetrachloroethene
		µg/L					
SCPWD-2	03/09/99	39,000	2,500	18	9	24	ND
	10/17/03	4,300	540	4	ND	ND	ND
SCPWD-3	03/09/99	140,000	4,200	18	68	110	12
	10/17/03	100,000	3,700	28	61	74	ND
SCPWD-4	03/09/99	580	260	160	82	ND	ND
	03/21/03	8	15	6	ND	ND	ND
	10/17/03	190	200	37	ND	ND	ND
Detection Limit		5 / 2	5 / 2	5 / 2	5 / 2	5 / 2	4
MTCA Method A Cleanup Level [a]		5	N/A	N/A	0.2	N/A	5
MTCA Method B Cleanup Level [b]		3.98	80	160	0.029	72	0.858

Notes:

Boxed values exceed Method A groundwater cleanup level.

a) Washington Administrative Code Chapter 173-340, Model Toxics Control Act Cleanup Regulation, Method A suggested groundwater cleanup level; promulgated August 15, 2001.

b) Method B formula value (direct contact pathway as a carcinogen or noncarcinogen) from the Department of Ecology Publication #94-145, Cleanup Levels and Risk Calculations under the Model Toxics Control Act Cleanup Level Regulation CLARC Version 3.1). Updated November 2001.

ND - not detected.
N/A - not available.
mg/L - milligram per liter.
µg/L - microgram per liter.

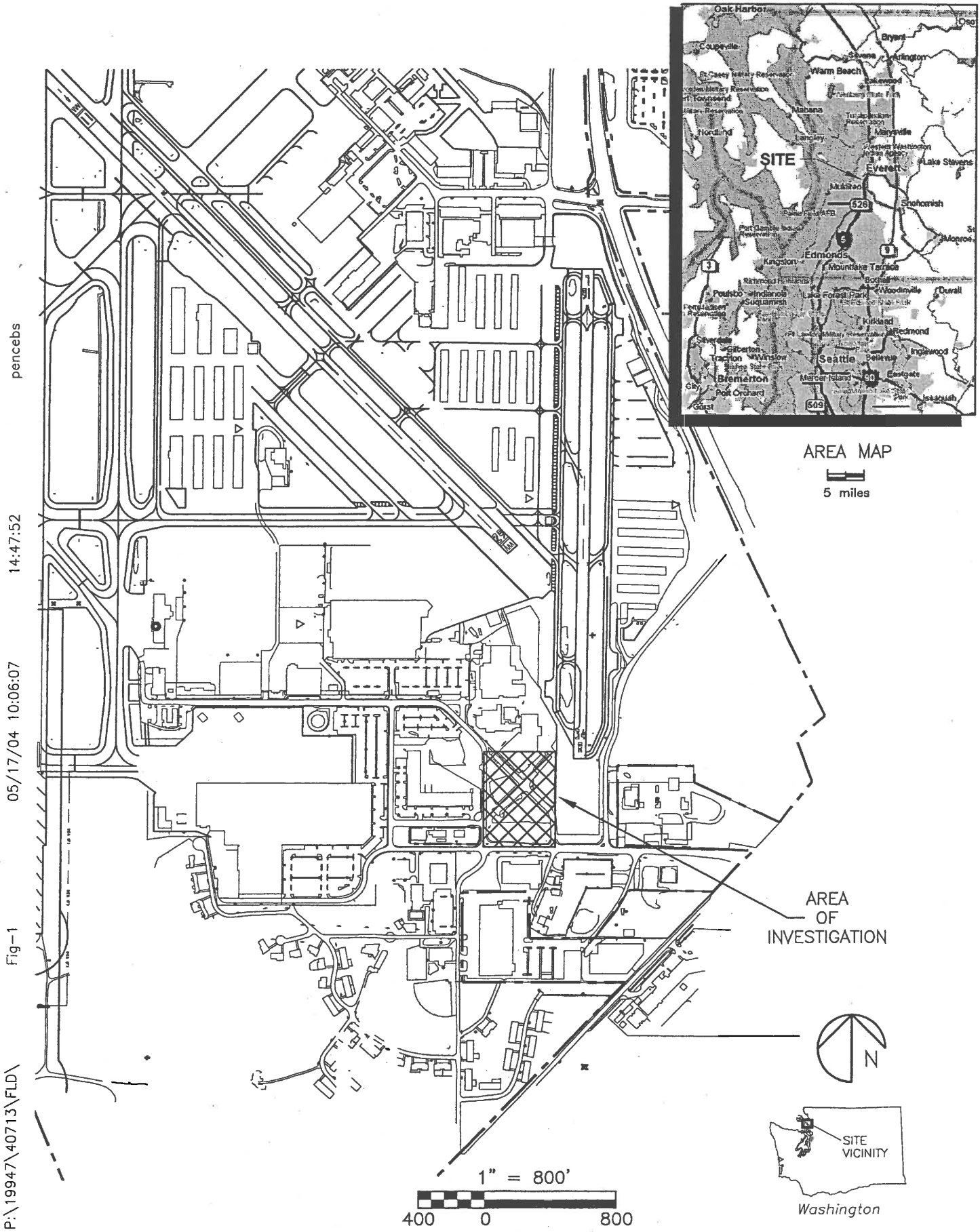
Table 5
Aquifer Analytical Summary
Snohomish County Airport/Building C-19 - Chlorinated Solvent Delineation
Everett, Washington

Well I.D.	Date Sampled	Trichloroethene	*cis*-1,2-Dichloroethene	1,1,2-Trichloroethane	1,2-Dichloroethane	1,2-Dichloropropane
		µg/L				
DW1	12/28/99	8	ND	ND	ND	ND
	03/08/00	62	5	ND	ND	ND
	10/17/03	81	ND	ND	ND	ND
DW2	12/28/99	ND	ND	49	26	10
	03/08/00	ND	ND	45	15	13
DW3	05/19/00	ND	ND	ND	ND	ND
Method Reporting Limit		5 / 2	5 / 2	5 / 2	5 / 2	5 / 2
MTCA Method A [a]		5	N/A	N/A	5	N/A
MTCA Method B [b]		3.98	80	0.768	0.481	0.643

Note:

Boxed values exceed one or more cleanup levels.
a) Washington Administrative Code Chapter 173-340 Model Toxics Control Act Cleanup Regulation Method A suggested cleanup level for groundwater.
b) Method B cleanup levels from Model Toxics Control Act Cleanup Levels and Risk Calculations (CLARCII) tables. Updated 2/96.
ND - not detected.
N/A - not available.
µg/L - microgram per liter.

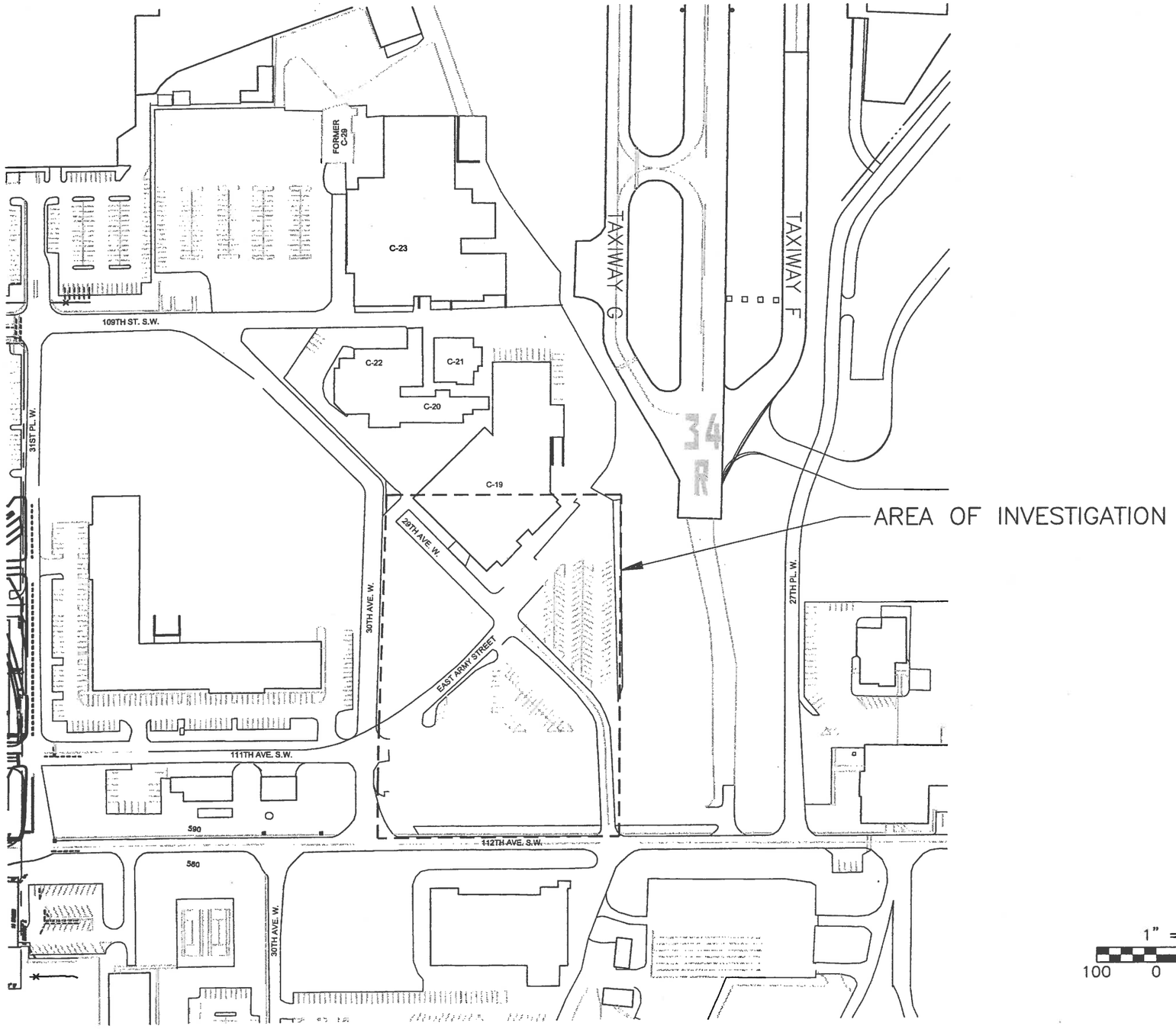
Figures



BUILDING C-19 CHLORINATED SOLVENT DELINEATION
SNOHOMISH COUNTY AIRPORT
EVERETT, WASHINGTON

Figure No. 1
Vicinity Map

CDM



BUILDING C-19 CHLORINATED SOLVENT DELINEATION
SNOHOMISH COUNTY AIRPORT
EVERETT, WASHINGTON

Figure No. 2
Site Plan

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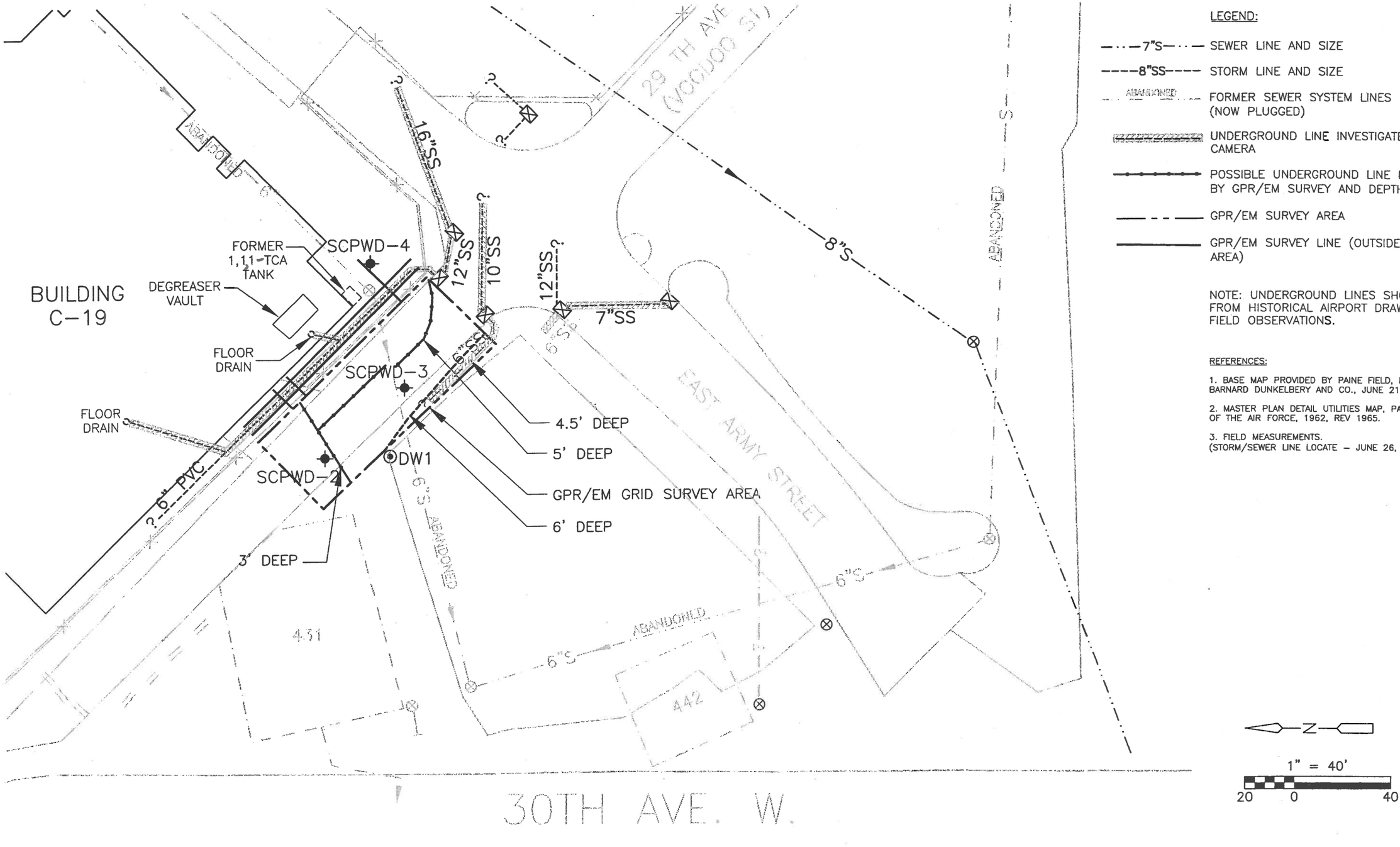

LEGEND:

- 7"S — SEWER LINE AND SIZE
- 8"SS — STORM LINE AND SIZE
- ABANDONED — FORMER SEWER SYSTEM LINES (NOW PLUGGED)
- UNDERGROUND LINE INVESTIGATED WITH CAMERA
- POSSIBLE UNDERGROUND LINE IDENTIFIED BY GPR/EM SURVEY AND DEPTH
- GPR/EM SURVEY AREA
- GPR/EM SURVEY LINE (OUTSIDE OF MAIN AREA)

NOTE: UNDERGROUND LINES SHOWN ARE FROM HISTORICAL AIRPORT DRAWINGS AND FIELD OBSERVATIONS.

REFERENCES:

1. BASE MAP PROVIDED BY PAINE FIELD, DRAWN BY BARNARD DUNKELBERY AND CO., JUNE 21, 2000.
2. MASTER PLAN DETAIL UTILITIES MAP, PAINE FIELD, DEPT. OF THE AIR FORCE, 1962, REV 1965.
3. FIELD MEASUREMENTS. (STORM/SEWER LINE LOCATE – JUNE 26, 2003)

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BUILDING C-19 CHLORINATED SOLVENT DELINEATION
SNOHOMISH COUNTY AIRPORT
EVERETT, WASHINGTON

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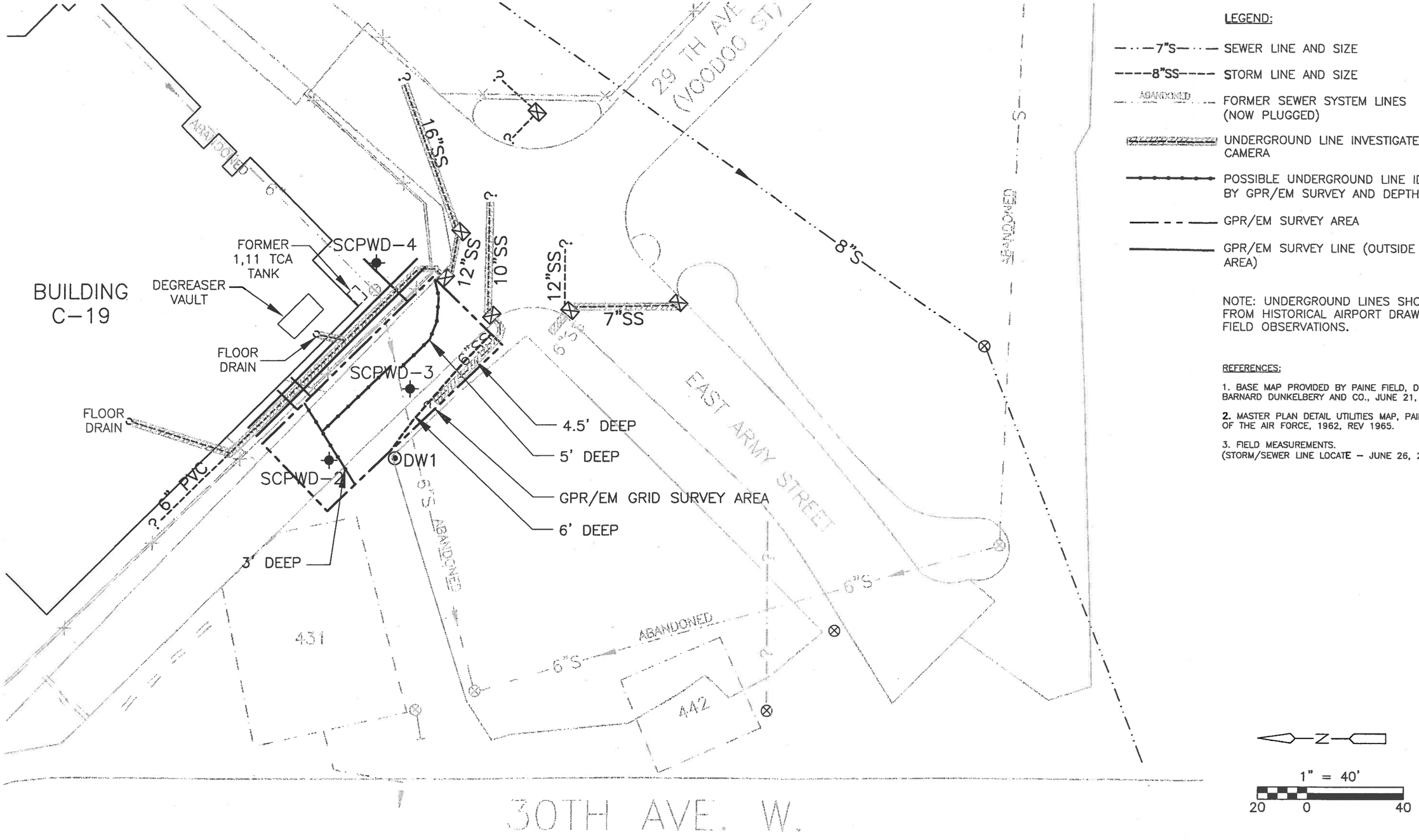
Figure No. 3
Underground Utilities



LEGEND:

- 7"S — SEWER LINE AND SIZE
- 8"SS — STORM LINE AND SIZE
- ABANDONED — FORMER SEWER SYSTEM LINES (NOW PLUGGED)
- UNDERGROUND LINE INVESTIGATED WITH CAMERA
- POSSIBLE UNDERGROUND LINE IDENTIFIED BY GPR/EM SURVEY AND DEPTH
- GPR/EM SURVEY AREA
- GPR/EM SURVEY LINE (OUTSIDE OF MAIN AREA)

NOTE: UNDERGROUND LINES SHOWN ARE FROM HISTORICAL AIRPORT DRAWINGS AND FIELD OBSERVATIONS.

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2. MASTER PLAN DETAIL UTILITIES MAP, PAINE FIELD, DEPT. OF THE AIR FORCE, 1962, REV 1965.
3. FIELD MEASUREMENTS. (STORM/SEWER LINE LOCATE – JUNE 26, 2003)

N

1" = 40'

20 0 40

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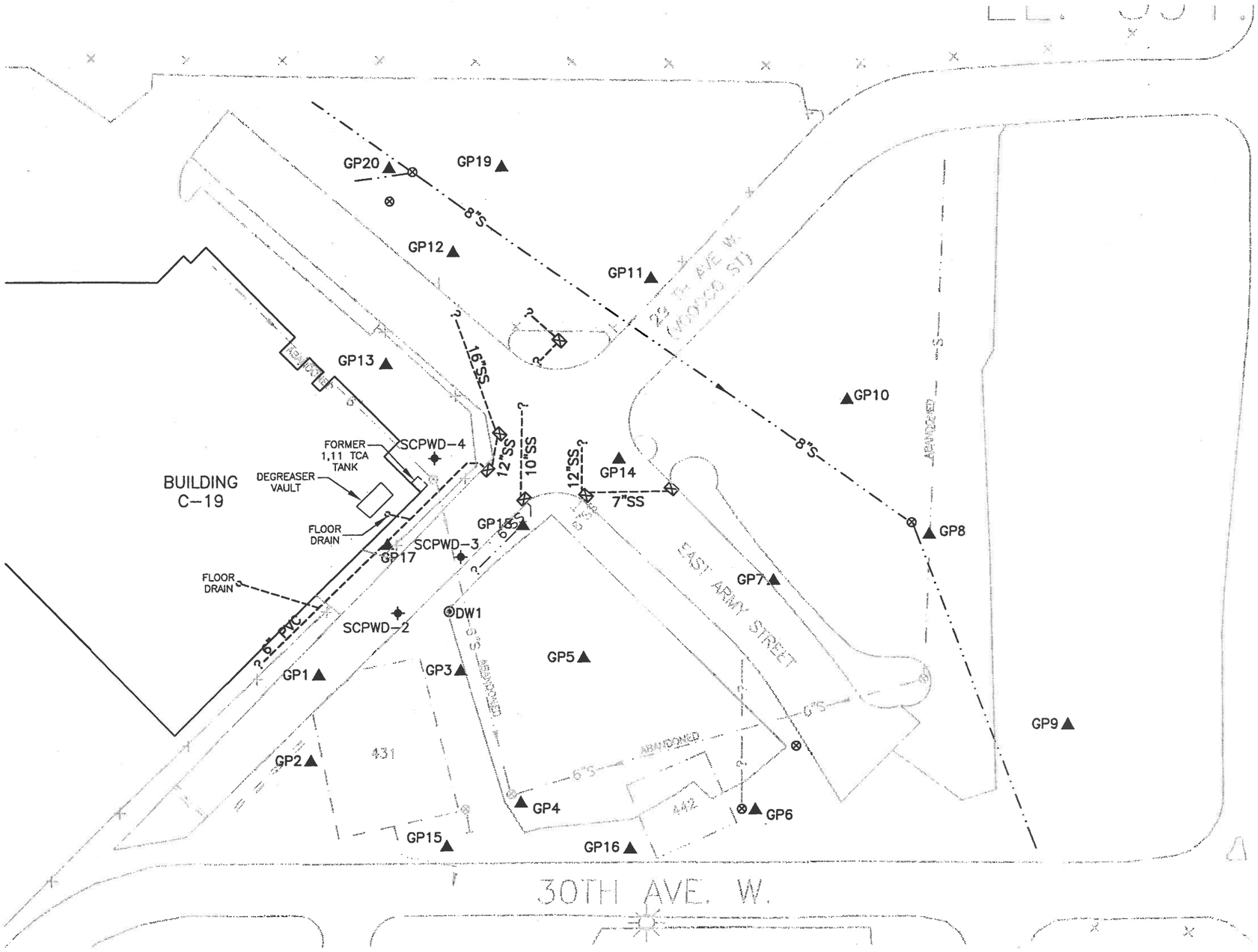
BUILDING C-19 CHLORINATED SOLVENT DELINEATION
SNOHOMISH COUNTY AIRPORT
EVERETT, WASHINGTON

CDM

Figure No. 3
Underground Utilities



LEGEND:

- 7"S — SEWER LINE AND SIZE
- 8"SS — STORM LINE AND SIZE
- ABANDONED — FORMER SEWER SYSTEM LINES (NOW PLUGGED)
- MANHOLE (STORM/SEWER)
- STORM CATCH BASIN
- 442 — FORMER BUILDING AND NUMBER
- GP1 — GEOPROBE LOCATION AND NUMBER
- SCPWD-2 — EXISTING SHALLOW MONITORING WELL LOCATION AND NUMBER
- DW1 — EXISTING DEEP AQUIFER MONITORING WELL LOCATION AND NUMBER

NOTE: UNDERGROUND LINES SHOWN ARE FROM HISTORICAL AIRPORT DRAWINGS AND FIELD OBSERVATIONS.

REFERENCES:

1. BASE MAP PROVIDED BY PAINE FIELD, DRAWN BY BARNARD DUNKELBERY AND CO., JUNE 21, 2000.
2. MASTER PLAN DETAIL UTILITIES MAP, PAINE FIELD, DEPT. OF THE AIR FORCE, 1962, REV 1965.
3. FIELD MEASUREMENTS. (STORM/SEWER LINE LOCATE – JUNE 26, 2003)

N

1" = 60'

30 0 60

BUILDING C-19 CHLORINATED SOLVENT DELINEATION
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Figure No. 4
Exploration Location Map

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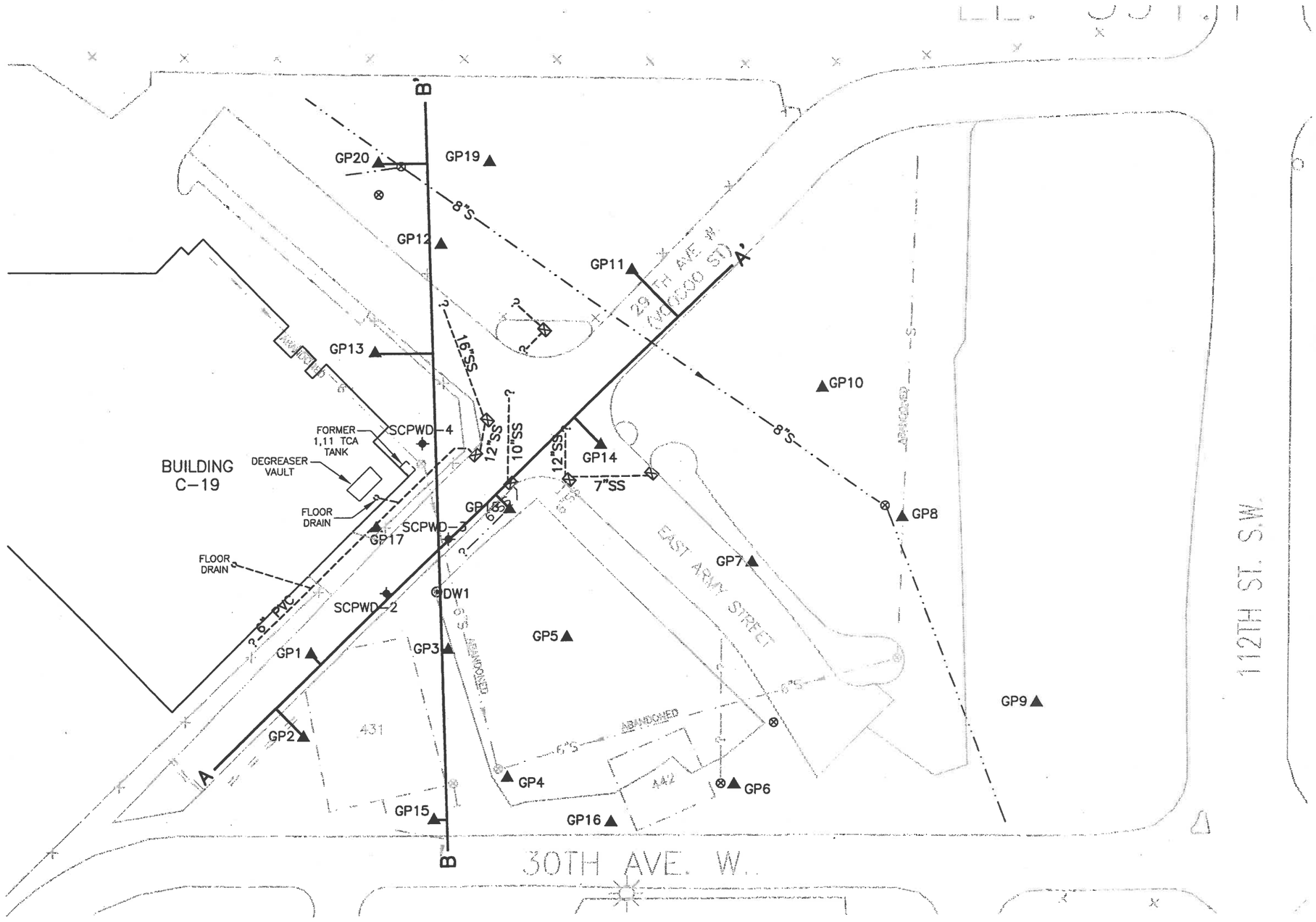

LEGEND:

- 7"S — SEWER LINE AND SIZE
- 8"SS — STORM LINE AND SIZE
- ABANDONED — FORMER SEWER SYSTEM LINES (NOW PLUGGED)
- MANHOLE (STORM/SEWER)
- STORM CATCH BASIN
- 142 — FORMER BUILDING AND NUMBER
- GP1 ▲ GEOPROBE LOCATION AND NUMBER
- SCPWD-2 ✦ EXISTING SHALLOW MONITORING WELL LOCATION AND NUMBER
- DW1 ⊙ EXISTING DEEP AQUIFER MONITORING WELL LOCATION AND NUMBER
- A — A' LOCATION OF GEOLOGIC CROSS SECTION

NOTE: UNDERGROUND LINES SHOWN ARE FROM HISTORICAL AIRPORT DRAWINGS AND FIELD OBSERVATIONS.

REFERENCES:

1. BASE MAP PROVIDED BY PAINE FIELD, DRAWN BY BARNARD DUNKELBERY AND CO., JUNE 21, 2000.

2. MASTER PLAN DETAIL UTILITIES MAP, PAINE FIELD, DEPT. OF THE AIR FORCE, 1962, REV 1965.

3. FIELD MEASUREMENTS. (STORM/SEWER LINE LOCATE – JUNE 26, 2003)

N

1" = 60'

30 0 60

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BUILDING C-19 CHLORINATED SOLVENT DELINEATION
SNOHOMISH COUNTY AIRPORT
EVERETT, WASHINGTON

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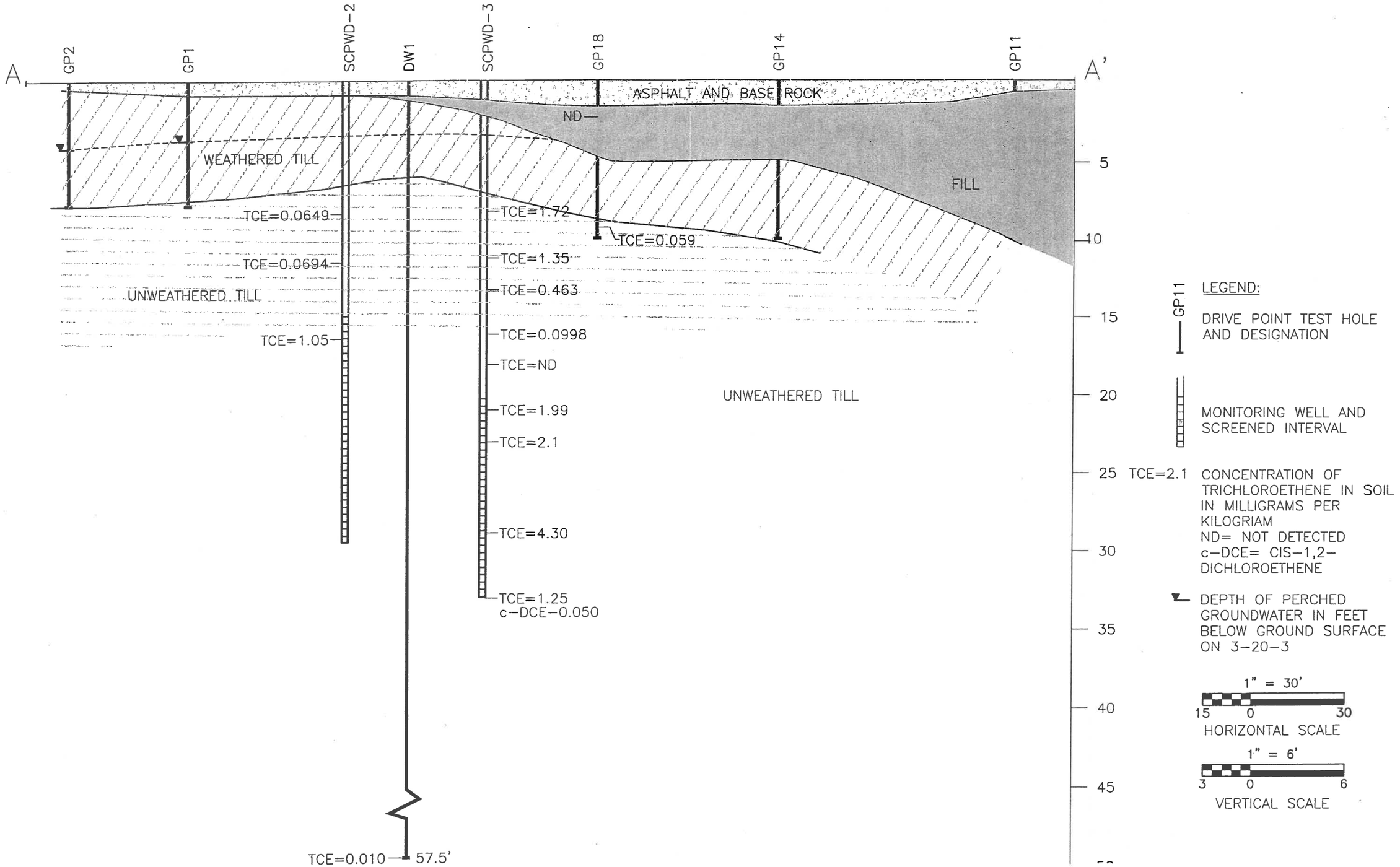
Figure No. 5
Cross Section Map



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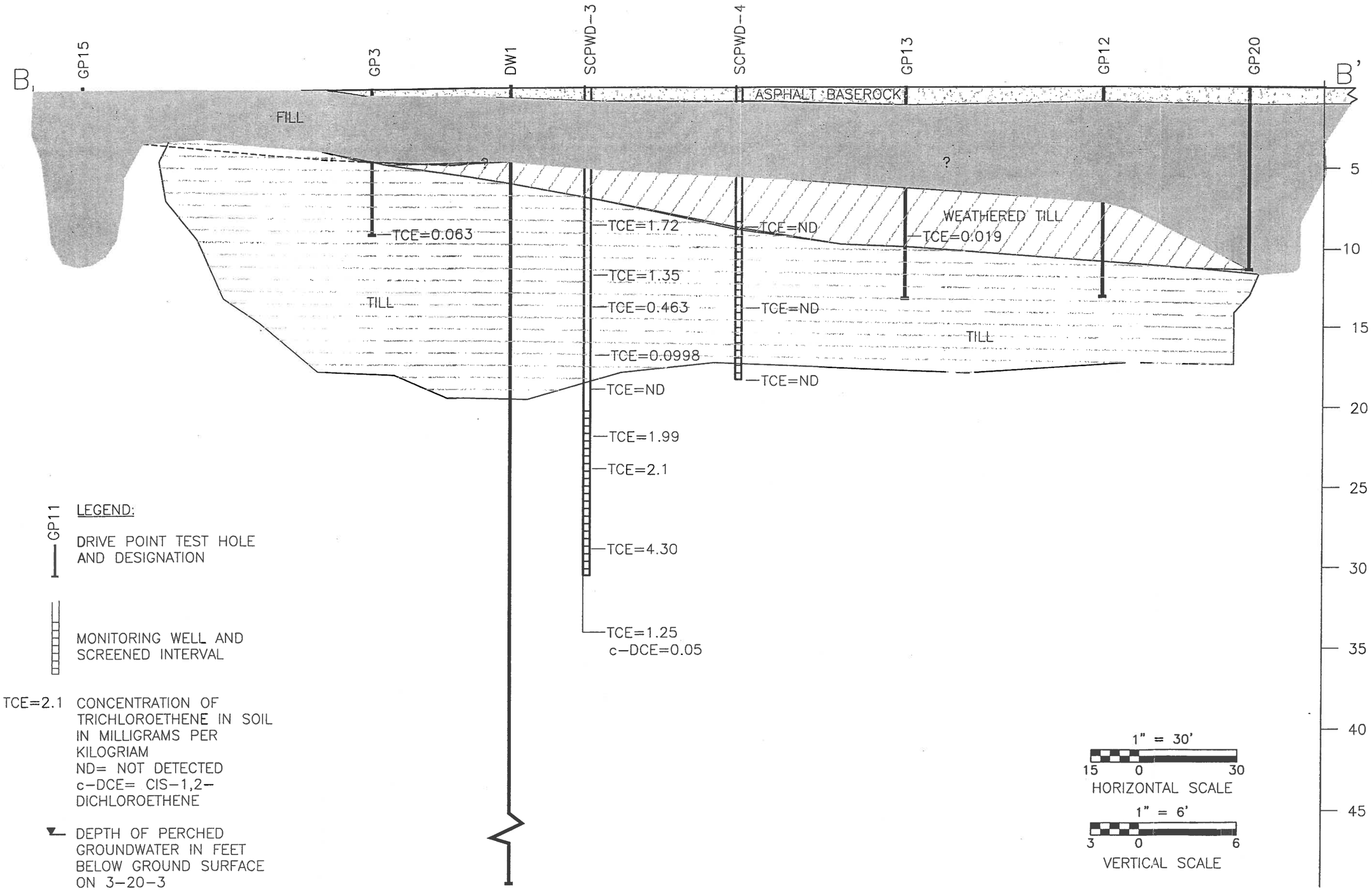
BUILDING C-19 CHLORINATED SOLVENT DELINEATION
SNOHOMISH COUNTY AIRPORT
EVERETT, WASHINGTON

Figure No. 6
Geologic Cross Section A-A'

CDM



LEGEND:

GP11 — DRIVE POINT TEST HOLE AND DESIGNATION

MONITORING WELL AND SCREENED INTERVAL

TCE=2.1 CONCENTRATION OF TRICHLOROETHENE IN SOIL IN MILLIGRAMS PER KILOGRIAM
ND= NOT DETECTED
c-DCE= CIS-1,2-DICHLOROETHENE

DEPTH OF PERCHED GROUNDWATER IN FEET BELOW GROUND SURFACE ON 3-20-3

1" = 30'
15 0 30
HORIZONTAL SCALE

1" = 6'
3 0 6
VERTICAL SCALE

BUILDING C-19 CHLORINATED SOLVENT DELINEATION
SNOHOMISH COUNTY AIRPORT
EVERETT, WASHINGTON

Figure No. 7
Geologic Cross Section B-B'

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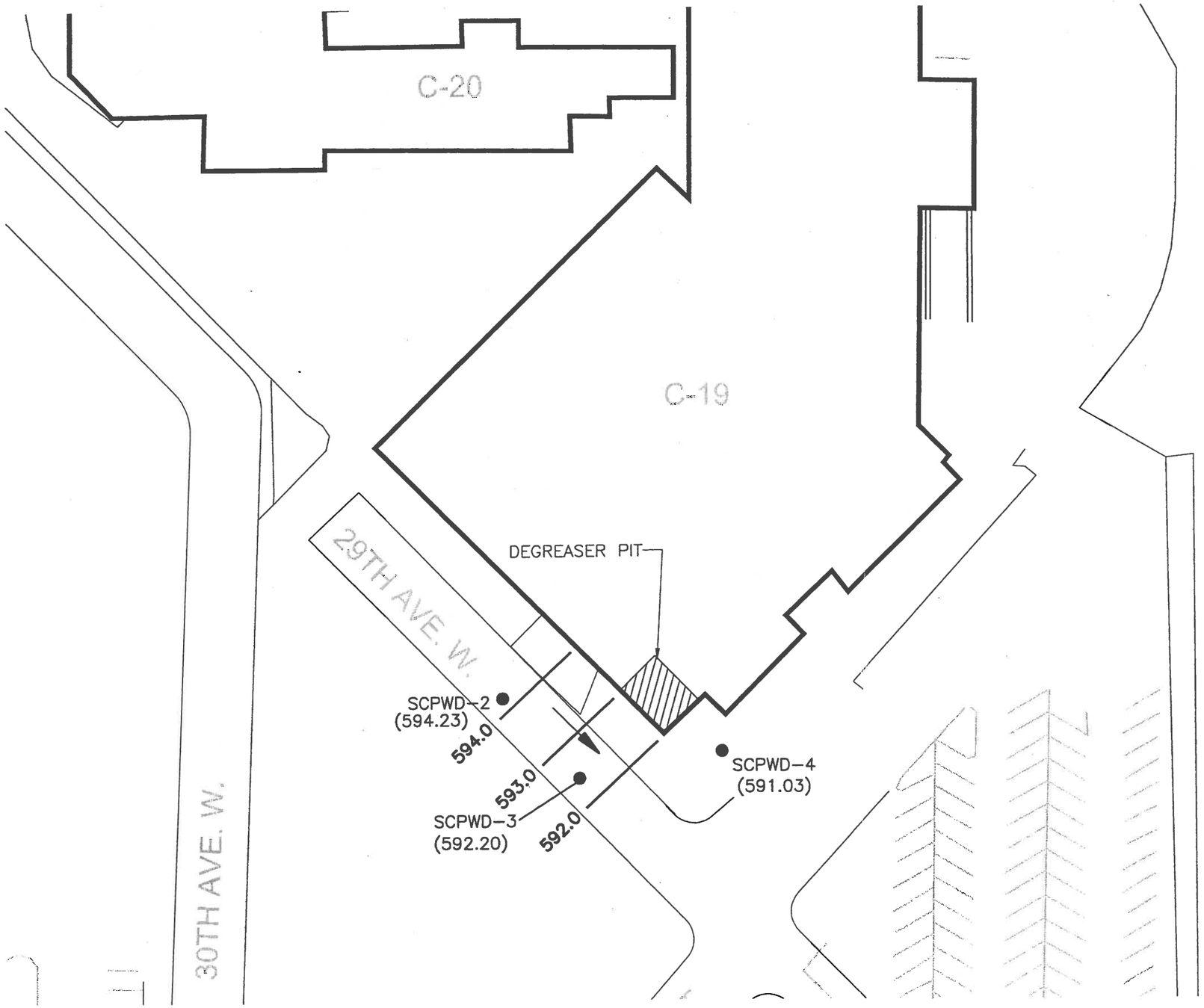

LEGEND:

SCPWD-2 ● MONITORING WELL AND NUMBER

(592.20) GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL ON APRIL 2, 1999

592.0 —— GROUNDWATER CONTOUR ELEVATION IN FEET ABOVE MEAN SEA LEVEL (CONTOUR INTERVAL IS 1.0 FEET DATUM IS NGVD29)

→ INFERRED GROUNDWATER FLOW DIRECTION

1" = 50'

25 0 50

N

BUILDING C-19 CHLORINATED SOLVENT DELINEATION
SNOHOMISH COUNTY AIRPORT
EVERETT, WASHINGTON

Figure No. 8
Perched Groundwater Contour Map
APRIL 2, 1999

CDM

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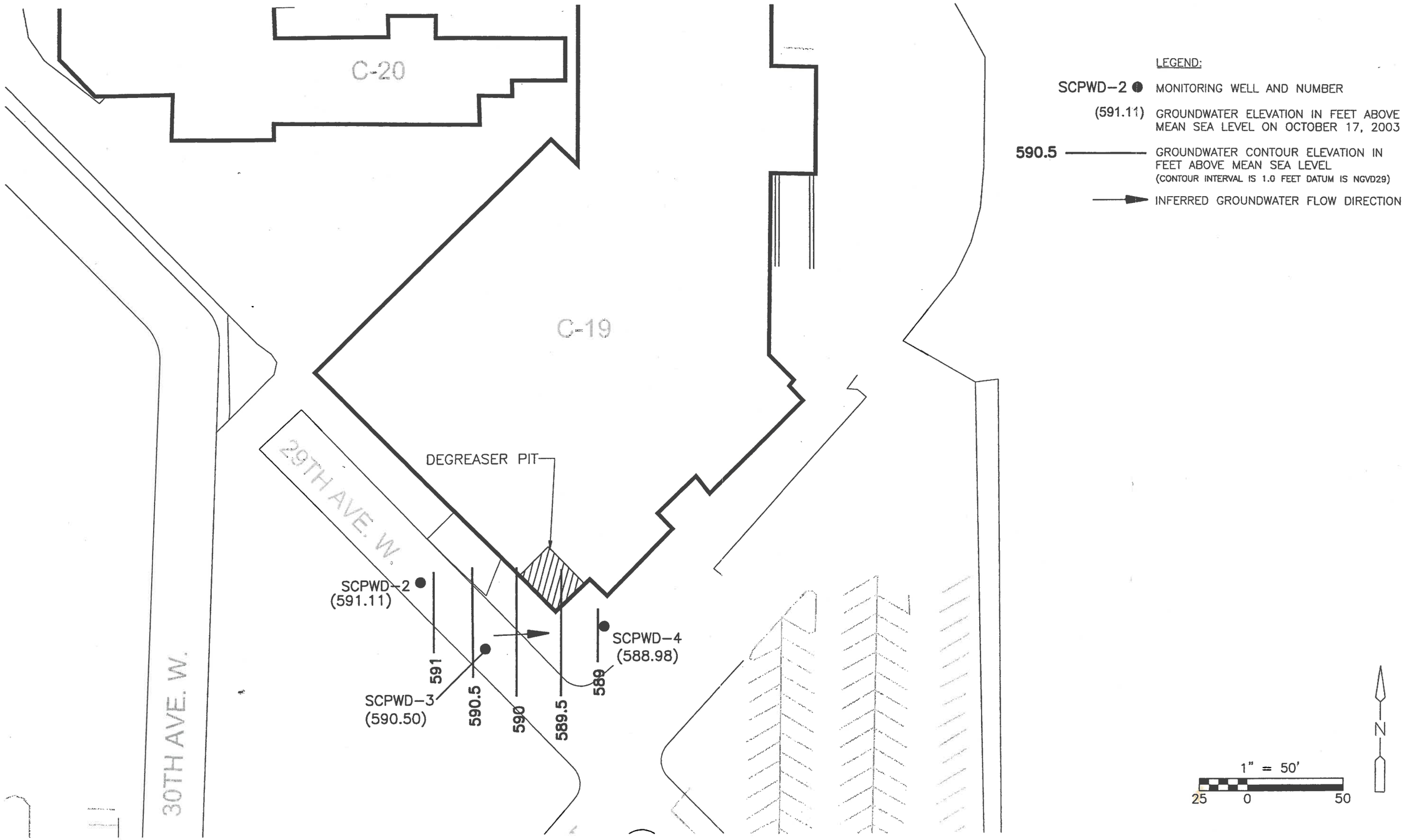

BUILDING C-19 CHLORINATED SOLVENT DELINEATION
SNOHOMISH COUNTY AIRPORT
EVERETT, WASHINGTON

Figure No. 9
Perched Groundwater Contour Map
October 17, 2003

CDM

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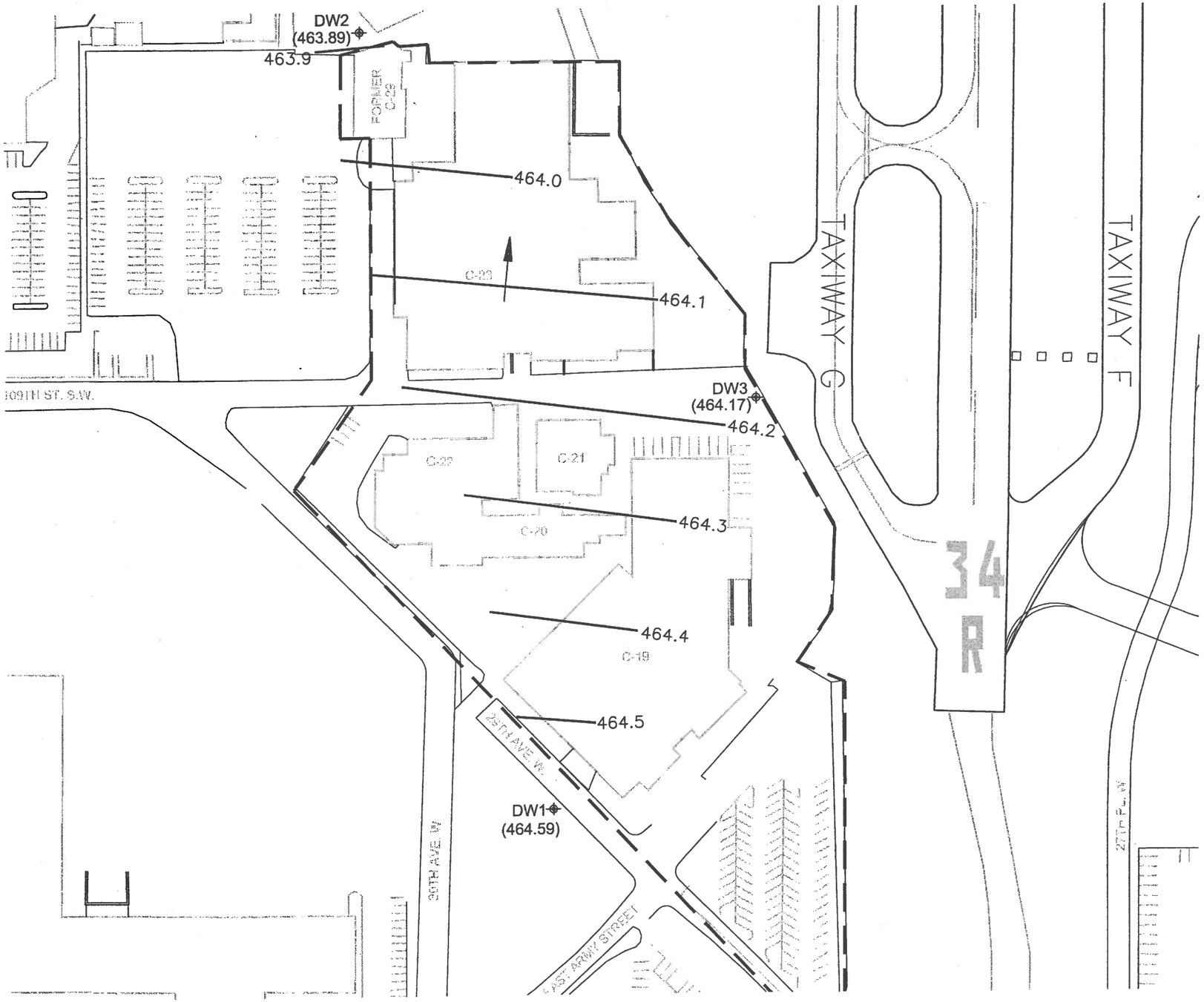

LEGEND:

- DW3 ⊕ AQUIFER MONITORING WELL LOCATION AND DESIGNATION
- (464.17) GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL ON MAY 24, 2000
- 464.5 —— GROUNDWATER ELEVATION CONTOUR (CONTOUR INTERVAL IS 0.5 FEET DATUM IS NGVD29)
- → INFERRED GROUNDWATER FLOW DIRECTION

1" = 120'

60 0 120

N

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SNOHOMISH COUNTY AIRPORT
EVERETT, WASHINGTON

Figure No. 10
Qva Aquifer Contour Map
MAY 24, 2000

CDM

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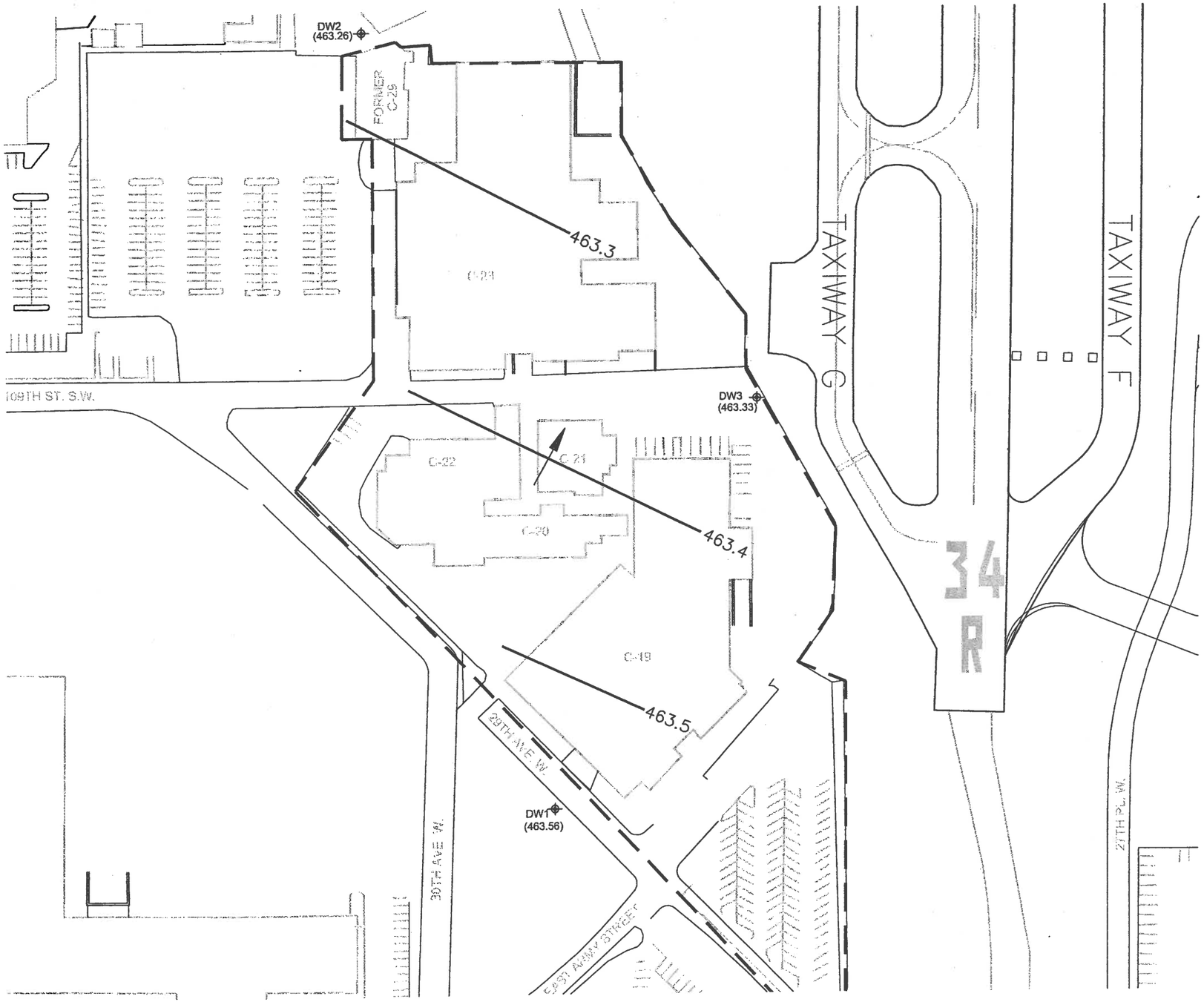

LEGEND:

- DW3 ⊕ AQUIFER MONITORING WELL LOCATION AND DESIGNATION
- (463.33) GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL ON OCTOBER 17, 2003
- 463.5 —— GROUNDWATER ELEVATION CONTOUR (CONTOUR INTERVAL IS 0.5 FEET DATUM IS NGVD29)
- → INFERRED GROUNDWATER FLOW DIRECTION

N

1" = 120'

60 0 120

BUILDING C-19 CHLORINATED SOLVENT DELINEATION
SNOHOMISH COUNTY AIRPORT
EVERETT, WASHINGTON

Figure No. 11
Qva Aquifer Contour Map
October 17, 2003

CDM

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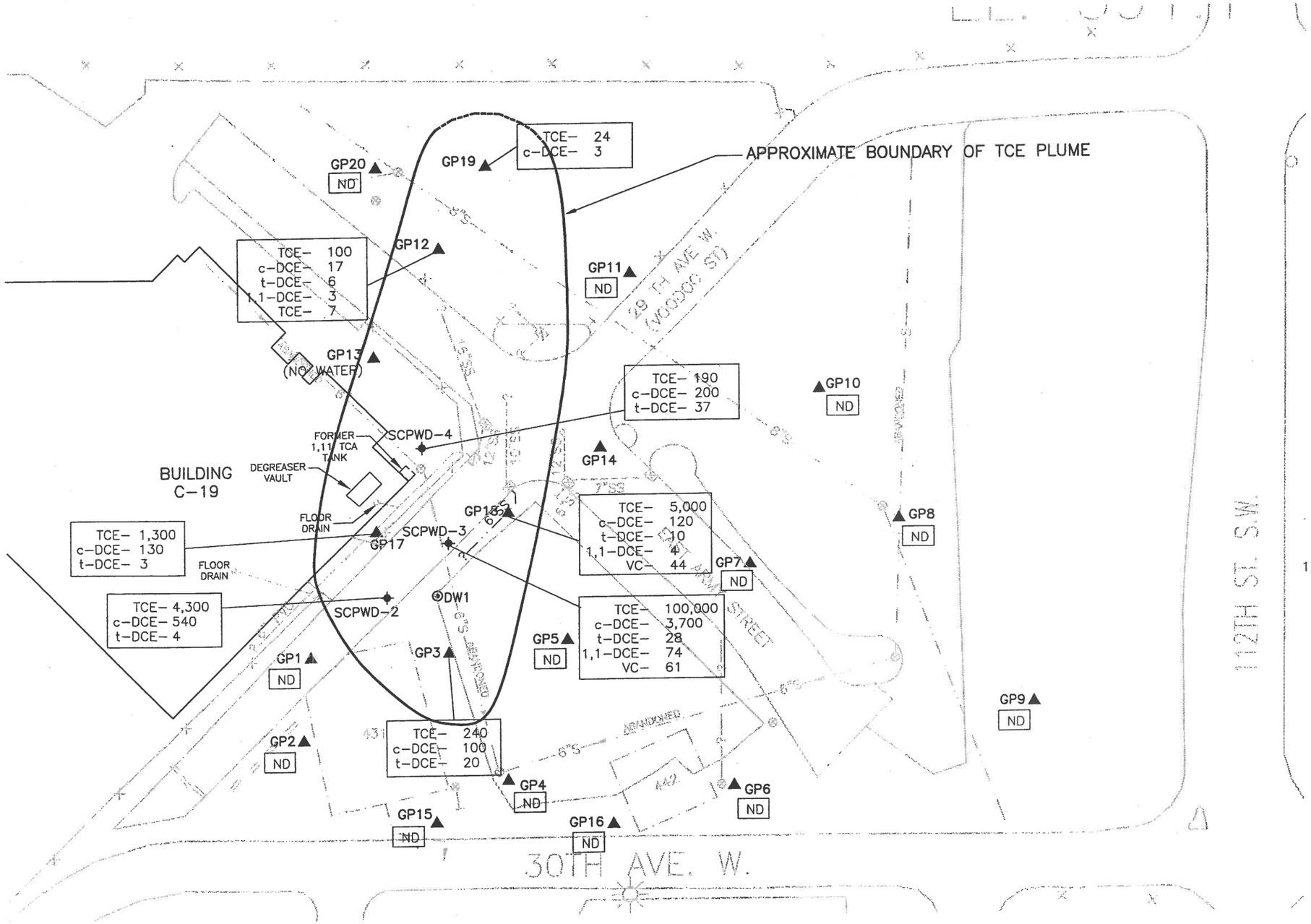

LEGEND:

- SEWER LINE AND SIZE
- STORM LINE AND SIZE
- FORMER SEWER SYSTEM LINES (NOW PLUGGED)
- MANHOLE (STORM/SEWER)
- STORM CATCH BASIN
- FORMER BUILDING AND NUMBER
- GP1 ▲ GEOPROBE LOCATION AND NUMBER
- SCPWD–2 ✦ EXISTING SHALLOW MONITORING WELL LOCATION AND NUMBER
- DW1 ◉ EXISTING DEEP AQUIFER MONITORING WELL LOCATION AND NUMBER

DETECTED cVOCs WITH CONCENTRATIONS IN MICROGRAMS PER LITER

cVOCs – CHLORINATED VOLATILE ORGANIC COMPOUNDS
TCE – TRICHLOROETHENE
c–DCE – cis–1,2–DICHLOROETHENE
t–DCE – TRANS–1,2–DICHLOROETHENE
1,1–DCE – 1,1–DICHLOROETHENE
VC – VINYL CHLORIDE
ND – NO cVOCs DETECTED

REFERENCES:

1. BASE MAP PROVIDED BY PAINE FIELD, DRAWN BY BARNARD DUNKELBERY AND CO., JUNE 21, 2000.
2. MASTER PLAN DETAIL UTILITIES MAP, PAINE FIELD, DEPT. OF THE AIR FORCE, 1962, REV 1965.
3. FIELD MEASUREMENTS. (STORM/SEWER LINE LOCATE – JUNE 26, 2003)

N

1" = 60'

30 0 60

BUILDING C-19 CHLORINATED SOLVENT DELINEATION
SNOHOMISH COUNTY AIRPORT
EVERETT, WASHINGTON

Figure No. 12
Summary of cVOCs in Perched Groundwater

CDM

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Appendix B
Boring Logs

SOIL CLASSIFICATION LEGEND

MAJOR DIVISIONS				TYPICAL NAMES
COARSE GRAINED SOILS More than half is larger than No. 200 sieve	GRAVELS More than half coarse fraction is larger than No. 4 sieve size	Clean gravels with little or no fines	GW	Well graded gravels, gravel-sand mixtures
			GP	Poorly graded gravels, gravel-sand mixtures
		Gravel with over 12% fines	GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS More than half coarse fraction is smaller than No. 4 sieve size	Clean sands with little or no fines	SW	Well graded sands, gravelly sands
			SP	Poorly graded sands, gravelly sands
		Sands with over 12% fines	SM	Silty sand, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
FINE GRAINED SOILS More than half is smaller than No. 200 sieve	SILTS AND CLAYS Liquid limit less than 50		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic clays and organic silty clays of low plasticity
	SILTS AND CLAYS Liquid limit greater than 50		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS			PT	Peat and other highly organic soils

SAMPLE TYPE SYMBOLS

- Disturbed bag or jar sample
- Std. Penetration Test (2.0" OD)
- Type U Ring Sampler (3.25" OD)
- California Sampler (3.0" OD)
- Undisturbed Tube Sample
- Grab Sample
- Core Run
- Non-standard Penetration Test (with split spoon sampler)

CONTACT BETWEEN UNITS

- Change in geologic unit
- Soil type change within geologic unit
- Obscure or gradational change

DESCRIPTORS FOR SOIL STRATA AND STRUCTURE (ENGLISH/METRIC)

General Thickness or Spacing

Parting:	less than 1/16 in. (1/6 cm)
Seam:	1/16 to 1/2 in. (1/6 to 1 1/4 cm)
Layer:	1/2 to 12 in. (1 1/4 to 30 1/2 cm)
Stratum:	> 12 in. (30 1/2 cm)
Scattered:	< 1 per ft. (30 1/2 cm)
Numerous:	> 1 per ft. (30 1/2 cm)

Structure

Pocket:	Erratic, discontinous deposit of limited extent
Lens:	Lenticular deposit
Varved:	Alternating seams of silt and clay
Laminated:	Alternating seams
Interbedded:	Alternating layers

General Attitude

Near horizontal:	0 to 10 deg.
Low angle:	10 to 45 deg.
High angle:	45 to 80 deg.
Near Vertical:	80 to 90 deg.

MOISTURE DESCRIPTION

Dry - Free of moisture, dusty

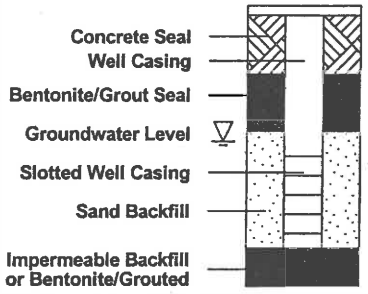
Moist - Damp but no visible free water

Wet - Visible free water, saturated

STRUCTURE DESCRIPTION (cont.)

Fractured	Breaks easily along definite fractured planes
Slickensided	Polished, glossy, fractured planes
Blocky, Diced	Breaks easily into small angular lumps
Sheared	Disturbed texture, mix of strengths
Homogenous	Same color and appearance throughout

WELL COMPLETIONS



RELATIVE DENSITY OR CONSISTENCY VS. SPT N-VALUE

COARSE GRAINED			FINE GRAINED		
Density	N (blows/ft)	Approx. Relative Density (%)	Consistency	N (blows/ft)	Approx. Undrained Shear Str. (psf)
Very Loose	0 to 4	0 - 15	Very Soft	0 to 2	<250
Loose	4 to 10	15 - 35	Soft	2 to 4	250 - 500
Medium Dense	10 to 30	35 - 65	Medium Stiff	4 to 8	500 - 1000
Dense	30 to 50	65 - 85	Stiff	8 to 15	1000 - 2000
Very Dense	Over 50	85 - 100	Very Stiff	15 to 30	2000 - 4000
			Hard	over 30	>4000

PHYSICAL PROPERTY TEST

AL -	Atterberg Limits
FC -	Fines Content
GSD -	Grain Size Distribution
MC -	Moisture Content
MD -	Moisture Content/Dry Density
Comp -	Compaction Test (Proctor)
SG -	Specific Gravity
CBR -	California Bearing Ratio
RM -	Resilient Modulus
Perm -	Permeability
TXP -	Triaxial Permeability
Cons -	Consolidation
Chem -	Analytical Chemical Analysis
Corr -	Corrosion
VS -	Vane Shear
DS -	Direct Shear
UC -	Unconfined Compression
TX -	Triaxial Compression
UU -	Unconsolidated, Undrained
CU -	Consolidated, Undrained
CD -	Consolidated, Drained

Notes:

1. Sample descriptions in this report are based on visual field and laboratory observations, which include density/consistency, moisture condition, grain size, and plasticity estimates, and should not be construed to imply field or laboratory testing unless presented herein. Visual-manual classification methods in accordance with ASTM D 2488 were used as an identification guide. Where laboratory data are available, soil classifications are in general accordance with ASTM D 2487.

2. Dual symbols are used to indicate gravel and sand units with 5 to 12 percent fines.

3. WOR = weight of rod.

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Snohomish County Airport
Bldg. C-19 - Chlorinated Solvent Delineation
Snohomish County, Washington

Project No: 19947.48713.FLD Figure: B1

SOIL CLASSIFICATION/LEGEND ALLFABGP.GPJ CDM_BLLV.GDT 5/17/04 REV.

Geoprobe Log GP-1

Other Tests	Sample No.	Moisture Content (%)	Dry Density (pcf)	PID (ppm) [reading/background]	Penetration Resistance (blows / 6 in.)	Depth (feet)	Sample	USCS	Symbol	DESCRIPTION	Elev. (feet)
								GW		SANDY GRAVEL (GW) Gray, very dense, moist, fine to coarse gravel (Baserock).	
				0		2		SM		SILTY SAND (SM) Brown, dense, moist, with gravel, fine to medium sand, fine gravel (Weathered Till).	
						▽4				Becomes very dense, wet.	
				0		8				Boring terminated at 8 feet bgs. Groundwater encountered at approximately 4 feet bgs.	
						10					
						12					

Latitude/Longitude: /

Surface Elevation:

Logged By: CJL

Drill Rig:

Equipment/Hammer: Geoprobe/

Date Completed: 3-20-03

Snohomish County Airport
Bldg. C-19 - Chlorinated Solvent Delineation
Snohomish County, Washington

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Geoprobe Log GP-1 Figure: B2

Project No: 19947.48713.FLD 1 of 1

NEIS_BORING_LOG ALLFABGP.GPJ CDM_BLLV.GDT 5/17/04 REV.

Geoprobe Log GP-2

Other Tests	Sample No.	Moisture Content (%)	Dry Density (pcf)	PID (ppm) [reading/background]	Penetration Resistance (blows / 6 in.)	Depth (feet)	Sample	USCS	Symbol	DESCRIPTION	Elev. (feet)
								GP		Gravel (Baserock).	
				0		2		SM		SILTY SAND (SM) Brown, dense, moist, with gravel, fine sand, fine gravel (Weathered Till).	
						4				Increasing moisture.	
						▽				Becomes wet, very dense.	
				0		6					
				0		8				At 8 feet bgs becomes gray, trace gravel (Till). Boring terminated at 8 feet bgs. Groundwater encountered at approximately 5 feet bgs.	
						10					
						12					

Latitude/Longitude: /
Surface Elevation:
Logged By: CJL

Drill Rig:
Equipment/Hammer: Geoprobe/
Date Completed: 3-20-03

Snohomish County Airport
Bldg. C-19 - Chlorinated Solvent Delineation
Snohomish County, Washington

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Geoprobe Log GP-2 Figure: B3
Project No: 19947.48713.FLD 1 of 1

NEIS_BORING_LOG ALLFABGP.GPJ CDM_BLLV.GDT 5/17/04 REV.

Geoprobe Log GP-3

Other Tests	Sample No.	Moisture Content (%)	Dry Density (pcf)	PID (ppm) [reading/background]	Penetration Resistance (blows / 6 in.)	Depth (feet)	Sample	USCS	Symbol	DESCRIPTION	Elev. (feet)
								GP		Asphalt and Baserock.	
				0		2		SM		SILTY SAND (SM) Gray-brown, dense moist, with gravel, fine sand, fine gravel (Till Fill).	
				0 0.5		4 ▽		SM		SILTY SAND (SM) Gray, very dense, wet, with iron mottling (Till).	
				15		6					
				25		8				Boring terminated at 9 feet bgs. Groundwater encountered at aproximately 4.5 feet bgs.	
						10					
						12					

Latitude/Longitude: /
Surface Elevation:
Logged By: CJL

Drill Rig:
Equipment/Hammer: Geoprobe/
Date Completed: 3-20-03

Snohomish County Airport
Bldg. C-19 - Chlorinated Solvent Delineation
Snohomish County, Washington

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Geoprobe Log GP-3 Figure: B4
Project No: 19947.48713.FLD 1 of 1

NEIS_BORING_LOG_ALLFABGP.GPJ CDM_BLLV.GDT 5/17/04 REV.

Geoprobe Log GP-4

Other Tests	Sample No.	Moisture Content (%)	Dry Density (pcf)	PID (ppm) [reading/background]	Penetration Resistance (blows / 6 in.)	Depth (feet)	Sample	USCS	Symbol	DESCRIPTION	Elev. (feet)
								GP		Asphalt and Baserock.	
				0		2 ▽4		SM		SILTY SAND (SM) Brown, dense, wet, with gravel, fine sand, fine gravel (Fill). Becomes saturated, very loose, no recovery between 4 and 10 feet bgs.	
						6 8 10				Boring terminated at 10 feet bgs. Groundwater encountered at approximately 4 feet bgs.	
						12					

Latitude/Longitude: /

Surface Elevation:

Logged By: CJL

Drill Rig:

Equipment/Hammer: Geoprobe/

Date Completed: 3-20-03

Snohomish County Airport
Bldg. C-19 - Chlorinated Solvent Delineation
Snohomish County, Washington

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Geoprobe Log GP-4 Figure: B5
Project No: 19947.48713.FLD 1 of 1

NEIS_BORING_LOG_ALLFABGP.GPJ CDM_BLLV.GDT 5/17/04 REV.

Geoprobe Log GP-5

Other Tests	Sample No.	Moisture Content (%)	Dry Density (pcf)	PID (ppm) [reading/background]	Penetration Resistance (blows / 6 in.)	Depth (feet)	Sample	USCS	Symbol	DESCRIPTION	Elev. (feet)
								GP		Asphalt and Bedrock.	
								SM		SILTY SAND (SM) Gray, dense, moist, with gravel, fine to medium sand, fine gravel (Fill).	
				0		2		SM		SILTY SAND (SM) Brown, dense, moist, fine to medium sand, fine gravel (Weathered Till).	
						4				Becomes wet.	
				0		6				Becomes very dense.	
				0		8				Boring terminated at 8 feet bgs. Groundwater encountered at approximately 5 feet bgs.	
						10					
						12					

Latitude/Longitude: /

Surface Elevation:

Logged By: CJL

Drill Rig:

Equipment/Hammer: Geoprobe/

Date Completed: 3-20-03

Snohomish County Airport
Bldg. C-19 - Chlorinated Solvent Delineation
Snohomish County, Washington

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Geoprobe Log GP-5 Figure: B6

Project No: 19947.48713.FLD 1 of 1

NEIS_BORING_LOG_ALLFABGP.GPJ CDM_BLLV.GDT 5/17/04 REV.

Geoprobe Log GP-7

Other Tests	Sample No.	Moisture Content (%)	Dry Density (pcf)	PID (ppm) [reading/background]	Penetration Resistance (blows / 6 in.)	Depth (feet)	Sample	USCS	Symbol	DESCRIPTION	Elev. (feet)
								GP		Asphalt and Baserock.	
				0		2		SM		SILTY SAND (SM) Brown, medium dense, moist, with gravel, and iron mottling, fine to medium sand, fine gravel (Till Fill).	
						4				Becomes gray (Till Fill).	
				0		6		SM		SILTY SAND (SM) Brown, dense, wet, fine to medium sand, fine gravel (Weathered Till).	
				0		8					
						10				Boring terminated at 10 feet bgs. Groundwater encountered at 5 feet bgs.	
						12					

Latitude/Longitude: /

Surface Elevation:

Logged By: CJL

Drill Rig:

Equipment/Hammer: Geoprobe/

Date Completed: 3-20-03

Snohomish County Airport
Bldg. C-19 - Chlorinated Solvent Delineation
Snohomish County, Washington

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Geoprobe Log GP-7 Figure: B8

Project No: 19947.48713.FLD 1 of 1

NEIS_BORING_LOG ALLFABGP.GPJ CDM_BLLV.GDT 5/17/04 REV.

Geoprobe Log GP-8

Other Tests	Sample No.	Moisture Content (%)	Dry Density (pcf)	PID (ppm) [reading/background]	Penetration Resistance (blows / 6 in.)	Depth (feet)	Sample	USCS	Symbol	DESCRIPTION	Elev. (feet)
								GP		Asphalt and Baserock.	
				0		2		SM		SILTY SAND (SM) Brown, medium dense, moist, with gravel and iron mottling, fine to medium sand, fine gravel (Till Fill).	
				0		4	▽			Becomes wet.	
						6				No mottling.	
				0		8				Becomes gray (Till). Boring terminated at 8 bgs Groundwater encountered at 5 feet bgs.	
						10					
						12					

Latitude/Longitude: /
Surface Elevation:
Logged By: CJL

Drill Rig:
Equipment/Hammer: Geoprobe/
Date Completed: 3-21-03

Snohomish County Airport
Bldg. C-19 - Chlorinated Solvent Delineation
Snohomish County, Washington

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Geoprobe Log GP-8 Figure: B9
Project No: 19947.48713.FLD 1 of 1

NEIS_BORING_LOG_ALLFABGP.GPJ CDM_BLLV.GDT 5/17/04 REV.

Geoprobe Log GP-10

Other Tests	Sample No.	Moisture Content (%)	Dry Density (pcf)	PID (ppm) [reading/background]	Penetration Resistance (blows / 6 in.)	Depth (feet)	Sample	USCS	Symbol	DESCRIPTION	Elev. (feet)
								GP		Asphalt and Baserock.	
				0		2		SM		SILTY SAND (SM) Dark brown and gray, dense, moist, with gravel, fine to medium sand, fine to medium gravel (Fill).	
				0		6		SM		SILTY SAND (SM) Gray-brown, dense, wet (Till Fill). Becomes gray.	
				0		8					
						10		SM		SILTY SAND (SM) Brown, very dense, wet, fine sand, fine to coarse gravel (Weathered Till).	
						12				Boring terminated at 12 feet bgs. Groundwater at 5.5 feet bgs.	

Latitude/Longitude: /
Surface Elevation:
Logged By: CJL

Drill Rig:
Equipment/Hammer: Geoprobe/
Date Completed: 3-21-03

Snohomish County Airport
Bldg. C-19 - Chlorinated Solvent Delineation
Snohomish County, Washington

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Geoprobe Log GP-10 Figure: B11
Project No: 19947.48713.FLD 1 of 1

NEIS_BORING_LOG_ALLFABGP.GPJ CDM_BLLV.GDT 5/17/04 REV.

Geoprobe Log GP-11

Other Tests	Sample No.	Moisture Content (%)	Dry Density (pcf)	PID (ppm) [reading/background]	Penetration Resistance (blows / 6 in.)	Depth (feet)	Sample	USCS	Symbol	DESCRIPTION	Elev. (feet)
								SM		SILTY SAND (SM) Dark brown, medium dense, moist, with gravel, fine to coarse sand, fine gravel, with wood debris (Fill).	
				0.1		2				SILTY SAND (SM) Brown, medium dense, moist, fine to medium sand, trace fine gravel, with some iron mottling (Till Fill).	
						4	▽				
						6		SM		Becomes wet.	
				0		8					
						10				Boring terminated at 10 feet bgs. Groundwater encountered at approximately 5 feet bgs.	
						12					

Latitude/Longitude: /
Surface Elevation:
Logged By: CJL

Drill Rig:
Equipment/Hammer: Geoprobe/
Date Completed: 3-20-03

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Snohomish County Airport
Bldg. C-19 - Chlorinated Solvent Delineation
Snohomish County, Washington

Geoprobe Log GP-11 Figure: B12
Project No: 19947.48713.FLD 1 of 1

NEIS_BORING_LOG ALLFABGP.GPJ CDM_BLLV.GDT 5/17/04 REV.

Geoprobe Log GP-12

Other Tests	Sample No.	Moisture Content (%)	Dry Density (pcf)	PID (ppm) [reading/background]	Penetration Resistance (blows / 6 in.)	Depth (feet)	Sample	USCS	Symbol	DESCRIPTION	Elev. (feet)
								GP		Asphalt and Baserock.	
				0		2		SM		SILTY SAND (SM) Light gray, dense, moist, with gravel, fine to coarse sand, fine to medium gravel (Fill). Becomes dark gray.	
						4					
						▽				Becomes gray, wet.	
				0		6					
						8				SILTY SAND (SM) Brown, dense, wet (Weathered Till).	
						10		SM			
				0		12				Boring terminated at 13 feet bgs. Groundwater encountered at approximately 5 feet bgs.	

Latitude/Longitude: /
Surface Elevation:
Logged By: CJL

Drill Rig:
Equipment/Hammer: Geoprobe/
Date Completed: 3-20-03

CDM

Snohomish County Airport
Bldg. C-19 - Chlorinated Solvent Delineation
Snohomish County, Washington

Geoprobe Log GP-12 Figure: B13
Project No: 19947.48713.FLD 1 of 1

NEIS_BORING_LOG ALLFABGP.GPJ CDM_BLLV.GDT 5/17/04 REV.

Geoprobe Log GP-13

Other Tests	Sample No.	Moisture Content (%)	Dry Density (pcf)	PID (ppm) [reading/background]	Penetration Resistance (blows / 6 in.)	Depth (feet)	Sample	USCS	Symbol	DESCRIPTION	Elev. (feet)
								GP		Asphalt and Baserock.	
				0.3		2		SM		SILTY SAND (SM) Gray, medium dense, moist, with gravel, fine to coarse sand, fine gravel (Till Fill).	
				1.7		4		SM		SILTY SAND (SM) Brown, medium dense, moist, with gravel, fine to coarse sand, fine gravel (Weathered Till). Becomes wet.	
				1.2		6					
						8					
						10				Becomes gray, very dense, moist (Unweathered Till).	
						12				Boring terminated at 13 feet bgs. No groundwater encountered during drilling.	

Latitude/Longitude: /
Surface Elevation:
Logged By: CJL

Drill Rig:
Equipment/Hammer: Geoprobe/
Date Completed: 3-20-03

Snohomish County Airport
Bldg. C-19 - Chlorinated Solvent Delineation
Snohomish County, Washington

CDM

Geoprobe Log GP-13 Figure: B14
Project No: 19947.48713.FLD 1 of 1

NEIS_BORING_LOG_ALLFABGP.GPJ CDM_BLLV.GDT 5/17/04 REV.

Geoprobe Log GP-14

Other Tests	Sample No.	Moisture Content (%)	Dry Density (pcf)	PID (ppm) [reading/background]	Penetration Resistance (blows / 6 in.)	Depth (feet)	Sample	USCS	Symbol	DESCRIPTION	Elev. (feet)
								GP		Asphalt and Baserock.	
								SP-SM		SAND (SP-SM) Brown, medium dense, moist, with silt, fine to coarse sand (Fill).	
				0		2		SM		SILTY SAND (SM) Gray, dense, moist, with gravel, fine to medium sand, fine gravel (Till Fill). Becomes brown.	
						4					
						▽					
				0		6		SM		SILTY SAND (SM) Brown, very dense, wet, fine gravel (Weathered Till).	
				0		8					
						10				Boring terminated at 10 feet bgs. Groundwater encountered at approximately 5 feet bgs.	
						12					

Latitude/Longitude: /

Surface Elevation:

Logged By: CJL

Drill Rig:

Equipment/Hammer: Geoprobe/

Date Completed: 3-20-03

Snohomish County Airport
Bldg. C-19 - Chlorinated Solvent Delineation
Snohomish County, Washington

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Geoprobe Log GP-14 Figure: B15
Project No: 19947.48713.FLD 1 of 1

NEIS_BORING_LOG ALLFABGP.GPJ CDM_BLLV.GDT 5/17/04 REV.

Geoprobe Log GP-15

Other Tests	Sample No.	Moisture Content (%)	Dry Density (pcf)	PID (ppm) [reading/background]	Penetration Resistance (blows / 6 in.)	Depth (feet)	Sample	USCS	Symbol	DESCRIPTION	Elev. (feet)
										Grass and Topsoil.	
						2		SM		SILTY SAND (SM) Gray-brown, medium dense, moist, with some iron mottling, with gravel, fine sand, fine gravel (Fill).	
				0		4		SM		SILTY SAND (SM) Brown, very loose, saturated (Fill) No recovery between 3 and 10 feet bgs.	
						10				Boring terminated at 10 feet bgs. Groundwater encountered at 3 feet bgs.	
						12					

Latitude/Longitude: /
Surface Elevation:
Logged By: CJL

Drill Rig:
Equipment/Hammer: Geoprobe/
Date Completed: 3-20-03

Snohomish County Airport
Bldg. C-19 - Chlorinated Solvent Delineation
Snohomish County, Washington

CDM

Geoprobe Log GP-15 Figure: B16
Project No: 19947.48713.FLD 1 of 1

NEIS_BORING_LOG ALLFABGP.GPJ CDM_BLLV.GDT 5/17/04 REV.

Geoprobe Log GP-16

Other Tests	Sample No.	Moisture Content (%)	Dry Density (pcf)	PID (ppm) [reading/background]	Penetration Resistance (blows / 6 in.)	Depth (feet)	Sample	USCS	Symbol	DESCRIPTION	Elev. (feet)
										Grass and 2 inches of gravel.	
				0		2				SILTY SAND (SM) Brown, dense, moist, with gravel, fine sand, fine to medium gravel (Till Fill).	
						4		SM			
						6				Saturated between 7 and 8 feet bgs.	
				0		8		GP		SANDY GRAVEL (GP) Brown, very dense, moist, with silt, fine to coarse sand, fine to coarse gravel (Fill).	
				0		10		SP-SM		SAND (SP-SM) Gray, medium dense, saturated, with silt (Till). Boring terminated at 10 feet bgs. Groundwater encountered at 7 feet bgs.	
						12					

Latitude/Longitude: /
Surface Elevation:
Logged By: CJL

Drill Rig:
Equipment/Hammer: Geoprobe/
Date Completed: 3-20-03

Snohomish County Airport
Bldg. C-19 - Chlorinated Solvent Delineation
Snohomish County, Washington

CDM

Geoprobe Log GP-16 Figure: B17
Project No: 19947.48713.FLD 1 of 1

.NEIS_BORING_LOG_ALLFABGP.GPJ CDM_BLLV.GDT 5/17/04 REV.

Geoprobe Log GP-17

Other Tests	Sample No.	Moisture Content (%)	Dry Density (pcf)	PID (ppm) [reading/background]	Penetration Resistance (blows / 6 in.)	Depth (feet)	Sample	USCS	Symbol	DESCRIPTION	Elev. (feet)
								GP		Asphalt and Baserock.	
				0		2		SM		SILTY SAND (SM) Gray, medium dense, moist, with gravel, fine sand, fine gravel (Fill). Becomes brown, mottled.	
						4					
						6					
						▽				Becomes stained dark brown, wet at 7.5 to 8 feet bgs.	
				6.0		8		SM		SILTY SAND (SM) Brown, very dense, moist (Till).	
						10				Boring terminated at 10 feet bgs. Very slight seepage at 7.5 feet bgs.	
						12					

Latitude/Longitude: /
Surface Elevation:
Logged By: CJL

Drill Rig:
Equipment/Hammer: Geoprobe/
Date Completed: 3-20-03

Snohomish County Airport
Bldg. C-19 - Chlorinated Solvent Delineation
Snohomish County, Washington

CDM

Geoprobe Log GP-17 Figure: B18
Project No: 19947.48713.FLD 1 of 1

NEIS_BORING_LOG ALLFABGP.GPJ CDM_BLLV.GDT 5/17/04 REV.

Geoprobe Log GP-18

Other Tests	Sample No.	Moisture Content (%)	Dry Density (pcf)	PID (ppm) [reading/background]	Penetration Resistance (blows / 6 in.)	Depth (feet)	Sample	USCS	Symbol	DESCRIPTION	Elev. (feet)
								GP		Asphalt SANDY GRAVEL (GP) brown, dense, moist (Baserock).	
				0		2		SM		SILTY SAND (SM) Brown, dense, moist, with gravel, fine to medium sand, fine gravel (Till Fill). Becomes wet.	
						▽4					
				0		6		SM		SILTY SAND (SM) Brown, very dense, moist, wet (Till). Becomes gray-brown.	
				33		8					
						10				Boring terminated at 10 feet bgs. Groundwater encountered at 4 feet bgs.	
						12					

Latitude/Longitude: /

Surface Elevation:

Logged By: CJL

Drill Rig:

Equipment/Hammer: Geoprobe/

Date Completed: 3-20-03

Snohomish County Airport
Bldg. C-19 - Chlorinated Solvent Delineation
Snohomish County, Washington

CDM

Geoprobe Log GP-18 Figure: B19

Project No: 19947.48713.FLD 1 of 1

NEIS_BORING_LOG_ALLFABGP.GPJ CDM_BLLV.GDT 5/17/04 REV.

Strataprobe Log GP-19

Other Tests	Sample No.	Moisture Content (%)	Dry Density (pcf)	PID (ppm) [reading/background]	Penetration Resistance (blows / 6 in.)	Depth (feet)	Sample	USCS	Symbol	DESCRIPTION	Elev. (feet)
								SP		SAND (SP) Brown, fine to medium grained (Fill).	
				0.8		2		SM		SILTY SAND (SM) Dark gray-brown, medium dense, with gravel, brick (Till Fill).	
				0		4		SP		SAND (SP) Gray, with some silt and gravel, fine to medium grained (Fill).	
				0		6		SM		SILTY SAND (SM) Gray, medium dense, moist, with some gravel (Fill). Becomes wet. Becomes brown.	
						8	▽	SM		SILTY SAND (SM) Gray, loose, saturated, fine grained (Fill).	
						10		SM		SILTY SAND (SM) Brown, moist, fine to coarse grained. Coarse sand lense (1 inch) at 10 feet bgs, becomes moist (Fill).	
						12				Refusal at 11 feet bgs. Groundwater encountered at 9 ft bgs.	

Latitude/Longitude: /

Surface Elevation:

Logged By: CJL

Drill Rig:

Equipment/Hammer: Geoprobe/

Date Completed: 5-23-03

Snohomish County Airport
Bldg. C-19 - Chlorinated Solvent Delineation
Snohomish County, Washington

CDM

Strataprobe Log GP-19 Figure: B20

Project No: 19947.48713.FLD 1 of 1

NEIS_BORING_LOG_ALLFABGP.GPJ CDM_BLLV.GDT 5/17/04 REV.

Strataprobe Log GP-20

Other Tests	Sample No.	Moisture Content (%)	Dry Density (pcf)	PID (ppm) [reading/background]	Penetration Resistance (blows / 6 in.)	Depth (feet)	Sample	USCS	Symbol	DESCRIPTION	Elev. (feet)
				0		2		SM		SILTY SAND (SM) Brown, medium dense, moist, with some gravel, fine to coarse-grained sand and gravel, iron mottling (Till Fill).	
						4				Increasing sand and gravel.	
				0		6				Increasing silt content.	
						8					
						10		SP		SAND (SP) Brown, medium dense, wet, coarse grained, trace silt (Fill).	
								SM		SILTY SAND (SM) Gray-brown, medium dense, saturated, fine to medium grained (Fill).	
						12				Boring terminated at 12 feet bgs. Groundwater encountered at 11 feet bgs.	

Latitude/Longitude: /

Surface Elevation:

Logged By: CJL

Drill Rig:

Equipment/Hammer: Geoprobe/

Date Completed: 5-23-03

Snohomish County Airport
Bldg. C-19 - Chlorinated Solvent Delineation
Snohomish County, Washington

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Strataprobe Log GP-20 Figure: B21
Project No: 19947.48713.FLD 1 of 1

.NEIS_BORING_LOG ALLFABGP.GPJ CDM_BLLV.GDT 5/17/04 REV.