DRAFT CLEANUP ACTION PLAN

ALLISON'S NORGE VILLAGE
120 NORTHEAST TURNER STREET
OLYMPIA, WASHINGTON
FACILITY SITE ID# 14214153

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ACRONYMS AND ABBREVIATIONS

ARARs	applicable or relevant and appropriate requirements
bgs	below ground surface
CAP	Cleanup Action Plan
CFR	Code of Federal Regulations
COCs	constituents of concern
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
Farallon	Farallon Consulting, L.L.C.
G-Logics	G-Logics, Inc.
HASP	Health and Safety Plan
HVOCs	halogenated volatile organic compounds
IOW	inches of water
µg/l	micrograms per liter
mg/kg	milligrams per kilogram
MTCA	Washington State Department of Ecology Model Toxics Control Act Cleanup Regulation
O&M	operation and maintenance
OnSite	OnSite Environmental Inc.
ORCAA	Olympic Region Clean Air Agency

PCE	tetrachloroethene
ppmv	parts per million volume
PQL	practical quantitation limit
PVC	polyvinyl chloride
RCW	Revised Code of Washington
Saltbush	Saltbush Environmental Services, Inc.
scfm	standard cubic feet per minute
Site	the former Allison's Norge Village Dry Cleaners site located at 120 Northeast Turner Street in Olympia, Washington
SVE	soil vapor extraction
USGS	U.S. Geological Survey
VCP	Voluntary Cleanup Program
WAC	Washington Administrative Code

1.0 INTRODUCTION

Farallon Consulting, L.L.C. (Farallon) has prepared this Cleanup Action Plan (CAP) for the cleanup of the former Allison's Norge Village Dry Cleaners site located at 120 Northeast Turner Street in Olympia, Washington (herein referred to as the Site) (Figure 1). Subsurface investigations at the Site have identified the presence of tetrachloroethene (PCE) in soil and groundwater exceeding the Washington State Department of Ecology (Ecology) Model Toxics Control Act Cleanup Regulation (MTCA) cleanup levels for PCE (Chapter 173-340 of the Washington Administrative Code [WAC 173-340]). The PCE is attributable to releases from dry cleaning operations at the Site.

The main source area of PCE is associated with dry cleaning operations in the Dry Cleaner suite located at the north end of the Site building (Figure 2). Two minor source areas identified in close proximity to the main source area are related to potential surface discharges of dry cleaning wastewater/sludge outside the Site building. The majority of PCE contamination at the Site is limited to a localized area of relatively high concentrations in shallow soil beneath the main source area. PCE concentrations in soil decrease rapidly with depth below the main source area; only low concentrations of PCE are present in the groundwater-bearing zone, at a depth of approximately 85 feet below the main source area.

The lateral and vertical extent of PCE in soil and groundwater at the Site has been sufficiently defined to support the design and implementation of a cleanup action. The CAP has been prepared by Farallon on behalf of Mr. Wilbur Allison dba Allison's Norge Village Dry Cleaners, one of the former operators of the dry cleaning facility at the Site, to implement the selected cleanup action. A Site Location Map that depicts the geographical location of the Site, and a Site Plan depicting Site features are provided as Figures 1 and 2, respectively.

1.1 PURPOSE AND OBJECTIVES

The purpose of the CAP is to document the engineering concepts and criteria used in the design of the cleanup action. The objectives of the selected cleanup action are to meet the threshold requirements at the defined points of compliance; protect human health and the environment; comply with applicable state and federal laws; provide for compliance monitoring; and provide a

permanent solution to the maximum extent practicable in accordance with WAC 173-340-360(2). The CAP provides specific details for implementation of vapor extraction to remediate concentrations of PCE in soil in the vadose zone. A plan for long-term compliance monitoring for concentrations of PCE in groundwater after completion of the soil remediation is also provided.

The cleanup action will be conducted as an independent cleanup action under Ecology's Voluntary Cleanup Program (VCP) to meet the requirements for obtaining a No Further Action determination from Ecology. The Site was entered in the VCP program in 2001, and is identified as "FS ID 14214153 Eastside Laundry." The requirements for substantial equivalence under WAC 173-340-515 will be met, including providing Ecology with information on the Site and cleanup action, obtaining confirmation from Ecology that the cleanup action is performed in accordance with MTCA, and providing public notification prior to initiating the cleanup action. Among the parties to be included in the public notification are the City of Olympia, the Thurston County Public Health Department, and potentially liable persons identified as sources of contamination to the Site.

1.2 ORGANIZATION

The following documents have been developed in preparation for implementing the cleanup action at the Site:

- A Sampling and Analysis Plan, included in Appendix A (WAC 173-340-820);
- A Quality Assurance Project Plan, included in Appendix B; and
- A Site-specific Safety and Health Plan, (HASP) included in Appendix C (WAC 173-340-810).

These documents have been included in a single comprehensive CAP, to minimize duplication of effort and to expedite the cleanup action.

The CAP has been organized into the following sections:

- **Section 2—Site Description and Background:** Section 2 provides background information for the Site, including the Site location, description, and history; a summary of previous investigations by others; a brief description of the Site environmental setting; and the Site's geologic and hydrogeologic setting.
- **Section 3—Subsurface Investigations:** Section 3 summarizes the additional subsurface investigations and soil vapor extraction (SVE) pilot testing conducted by Farallon to complete characterization of the Site, to further develop and refine the conceptual site model, and to evaluate the performance of SVE technologies prior to selection of a final remedial alternative.
- **Section 4—Conceptual Site Model:** Section 4 provides a summary of the types and suspected sources of hazardous substances identified at the Site, the nature and extent of contamination at the Site, and the fate and transport mechanisms identified based on the subsurface investigations at the Site.
- **Section 5—Technical Elements:** Section 5 provides a summary of the technical elements of the cleanup action, including a discussion of the cleanup action objectives, applicable or relevant and appropriate requirements (ARARs), anticipated local permits, media of concern, the derivation of cleanup standards, and the restoration time frame. Section 5 also includes a discussion of the Terrestrial Ecological Evaluation exclusion for the Site.
- **Section 6—Cleanup Action Design and Implementation:** Section 6 presents the cleanup alternatives evaluated and a brief discussion of the applicability of each alternative. This section also provides a general description of the selected cleanup action, and a detailed discussion of cleanup action components and implementation, including SVE system components, installation, equipment, start-up, and operation and maintenance (O&M). This section also presents an overview of cleanup action monitoring and management of the wastes generated during the cleanup action.

- **Section 7—Schedule:** Section 7 presents the anticipated schedule for SVE system installation. This section also describes the frequency of performance monitoring and reporting.
- **Section 8—Documentation Requirements:** A summary of the documentation to be generated for the cleanup action is described in Section 8, including data management, health and safety specifications, and progress reports.
- **Section 9—References:** The documents cited in this CAP are presented in Section 9.

2.0 SITE DESCRIPTION AND BACKGROUND

This section provides a description and the historical background of the Site and surrounding area, a summary of prior investigations at the Site and surrounding area, and a description of the Site's environmental setting, geology, and hydrogeology. The sources of historical data used to develop the Site background include previous Site investigations conducted by Saltbush Environmental Services, Inc. (Saltbush) (Saltbush 2000) and G-Logics, Inc. (G-Logics) (G-Logics 2001a, 2001b); subsurface investigations conducted by Farallon (see Section 3, Subsurface Investigations); records from the City of Olympia, Thurston County, Ecology, and the Olympia Fire Department; and interviews with the former dry cleaner owner/operator, the current Site owner; and the current dry cleaner owner/operator.

2.1 SITE DESCRIPTION AND HISTORY

The Site is located at 120 Northeast Turner Street in Olympia, Washington (Figure 1). The Site is located at 122 degrees, 52 minutes, 44 seconds west longitude, and 47 degrees, 2 minutes, 49 seconds north latitude in the southeast quarter of Township 18 North, Range 2 West, Section 13 of the Willamette Meridian in Thurston County, Washington. The Site is identified in Thurston County municipal records as tax parcel 80800500102, and covers an area of 0.37 acre (Thurston County GeoData Center, 2005). The property dimensions are approximately 150 feet from north to south by 100 feet from east to west. The Site currently is developed with a single-story brick masonry building located on the northwestern portion of the Site that was constructed in the early 1960s (Figure 2). The remaining Site areas are covered with asphalt. The building is developed with four separate suites that currently are occupied by Eastside Laundry, a barbershop, and an insurance broker (Figure 2). Eastside Laundry occupies the northern and southern suites. Both historic and current dry cleaning operations have been located in the northern suite. According to Eastside Laundry, the southern suite is used only for laundry pick-up and drop-off. The Site is adjoined by State Street to the north, Turner Street to the west, and a paved parking lot for a grocery store to the south and east (Figure 2).

Subsurface utilities that enter the Site building from the west side include natural gas, sanitary sewer, and water services (Figure 2). Sanitary sewer service is provided to the Site building by a

municipal sewer main, which runs south to north in the center of Turner Street on the west side of the Site. Based on a review of the City of Olympia Office Of Public Works side sewer plans for the Site and a private utility locate performed by Farallon, the sanitary sewer service enters the Site building at two locations, one on the west side of the Dry Cleaner suite, and a second on the west side the Insurance Broker suite (Figure 2). The sewer main in Turner Street connects to a sewer main at the intersection of the Turner Street and State Street, which runs east to west in the center of State Street.

Dry cleaning operations commenced at the Site in the early 1960s, and continue to the present. Records reviewed from the City of Olympia Office of Public Works indicate that a sanitary side sewer line was installed in May 1962 for a self-service dry cleaner located in the northern suite of the Site building. Owner/operator records for the dry cleaner prior to 1970 were not available. A review of information provided by the property owner indicates that the dry cleaner was operated by Wilma M. White from June 1970 to July 1978, and by Donald Nedrow from July 1978 to September 1984. From late 1984 to late 1990, Mr. Allison dba Allison's Norge Village Dry Cleaners, operated the dry cleaner, which included eight coin-operated dry cleaning machines located on the south side of the Dry Cleaner suite (Figure 2). According to Mr. Allison, the coin-operated dry cleaning machines were supplied with PCE from an aboveground storage tank located inside the building (Figure 2). According to Mr. Bergt, the current operator of Eastside Laundry, the coin-operated dry cleaning machines were not in use when Eastside Laundry took over the dry cleaner from Allison's Norge Village in late 1990. Subsequently, Eastside Laundry disassembled the coin-operated dry cleaning machines in late 1990, and installed a single, dry-to-dry type commercial dry cleaning machine in place of the coin-operated dry cleaning machines. The aboveground PCE storage tank was pumped out in late 1990, and remains in-place.

2.2 PREVIOUS INVESTIGATIONS

A Phase I Environmental Site Assessment was completed for the adjacent property to the east by Saltbush (2000a) in March 2000. The Phase I Environmental Site Assessment investigated whether a risk of environmental contamination existed on or adjacent to the Site due to present and/or previous land use and related activities. The Phase I Environmental Site Assessment

identified the historical and current presence of the dry cleaner at the Site as a recognized environmental condition.

A Phase II Environmental Site Assessment was conducted at the Site by Saltbush in March 2000 to investigate the potential for impact to the Site from the dry cleaner located on the northwest corner of the Site. The Phase II Environmental Site Assessment activities consisted of advancing five exterior soil borings at select locations on the Site, using a Stratoprobe direct-push drill rig, and collecting soil samples from the borings for laboratory analysis of volatile organic compounds by U.S. Environmental Protection Agency (EPA) Method 8021B.

The borings advanced during the Phase II Environmental Site Assessment conducted by Saltbush included borings B1 through B5, located proximate to the Dry Cleaner suite (Figure 2). Soil samples analyzed from borings B1 and B4, collected from depths of 14 to 16 feet below ground surface (bgs), detected concentrations of PCE at 0.51 and 0.54 milligrams per kilogram (mg/kg), respectively, and were the only samples identified as having detected concentrations of PCE above the MTCA Method A cleanup level of 0.50 mg/kg in effect at that time (Table 1). However, when MTCA regulations were amended in February 2001, the MTCA Method A cleanup level for PCE in soil was adjusted to 0.05 mg/kg. Soil samples collected from depths of 14 to 16 feet bgs in borings B2, B3, and B5 had detected concentrations of PCE at 0.27, 0.17, and 0.44 mg/kg, respectively. Using the amended MTCA level of 0.05 mg/kg for PCE in soil, each of the soil samples from borings B1, B2, B3, B4, and B5 had concentrations above the MTCA Method A cleanup level for PCE in soil. The Phase II Environmental Site Assessment report did not include boring logs or provide a description of the subsurface conditions encountered at the Site such as soil lithology, unusual odors, or field analyses of volatile organic vapor concentrations in soil (Saltbush 2000b).

The results of the Phase II Environmental Site Assessment conducted by Saltbush confirmed that concentrations of PCE in soil at the Site exceed the current MTCA Method A cleanup level for PCE in soil of 0.05 mg/kg. Based on these findings, the property owner was notified that he was required to report the presence of PCE contamination in soil at the Site to Ecology, as specified in WAC 173-340-300.

G-Logics conducted a subsurface exploration in April 2001 to assess the extent of subsurface PCE contamination at the Site. The subsurface exploration included advancing interior borings IB-1 through IB-3 in the northern portion of the Site building near the existing dry cleaning machine, and exterior borings EB-1 through EB-9 proximate to the Site building, using a Stratoprobe direct-push drill rig, to total depths ranging from 9 to 34 feet bgs (Figure 2). Soil was continuously sampled and logged for soil lithology in each of the borings. Soils encountered during advancement of the borings generally consisted of native silty sands and sandy silts in the upper 15 to 20 feet bgs. At depths of 15 to 20 feet bgs, mixed sand and gravel layers were encountered, followed by clayey gravel (presumed to be glacial till) to the maximum depth explored. According to G-Logics, PCE odors were evident only in the interior borings within the upper 5 feet.

Perched groundwater was encountered in borings IB-3, and EB-1 through EB-9, at depths ranging from 5 to 22 feet bgs within the stringer of sand. However, none of the water-containing layers yielded a sufficient amount of water to allow collection of a groundwater sample (G-Logics 2001a). Therefore, G-Logics did not collect or submit for laboratory analysis any perched groundwater samples from any borings in which perched groundwater was encountered.

Soil samples analyzed from borings IB-1 through IB-3 and EB-1 through EB-8, collected from depths ranging from 3 to 32 feet bgs, detected concentrations of PCE above the current MTCA Method A cleanup level of 0.05 mg/kg (Table 1). Soil samples analyzed from boring EB-9 did not contain detectable concentrations of PCE above the laboratory practical quantitation limit (PQL). The results of the subsurface exploration conducted by G-Logics indicated that concentrations of PCE in soil at the Site exceeded the MTCA Method A cleanup level of 0.05 mg/kg, with the highest concentrations found in shallow soil in the vicinity of the dry cleaning machine.

G-Logics conducted additional subsurface exploration in August 2001 to further explore the extent of subsurface PCE contamination in deeper soils, and the potential impact to groundwater beneath the Site (G-Logics 2001b). The additional subsurface exploration included drilling borings SB-1 and SB-2, and drilling and installing groundwater monitoring wells MW-1 and MW-2 at the Site to total depths ranging from 60 to 105 feet bgs (Figure 2). Soil samples were

collected at 10-foot intervals in the upper 30 feet bgs and at 5-foot intervals from 30 feet bgs to the maximum depth drilled in borings SB-1 and SB-2, and in monitoring well MW-1. The samples were retained for laboratory analysis, and for lithologic descriptions. During the drilling of MW-2, soil samples were collected at 5-foot intervals, beginning at 60 feet bgs due to the proximity to boring SB-2, from which soil samples and soil descriptions were collected in the upper 60 feet bgs.

Soils encountered in the borings and monitoring wells advanced during the additional subsurface exploration generally consisted of native silty sands and sandy silts in the upper 15 to 20 feet bgs. At depths of 15 to 20 feet bgs, mixed sand and gravel layers were encountered, followed by clayey gravel (presumed to be glacial till) extending to depths ranging from 70 to 85 feet bgs. Sands, sandy gravels, and gravels were encountered at depths ranging from 70 to 105 feet bgs during the drilling of monitoring well MW-2.

A perched groundwater-bearing zone was encountered in boring MW-1 at a depth of approximately 53 feet bgs. Monitoring well MW-1 was constructed using 10 feet of well screen set at a depth interval of 50 to 60 feet bgs (Table 2). A deeper groundwater-bearing zone was encountered in boring MW-2 at approximately 86 feet bgs in well-graded gravel, which extended to the total depth drilled of approximately 105 feet bgs. Monitoring well MW-2 was constructed using 25 feet of well screen set at the depth interval of 80 to 105 feet bgs (Table 2).

Soil samples analyzed from soil borings SB-1 and SB-2 and monitoring well MW-2 detected concentrations of PCE above the MTCA Method A cleanup level of 0.05 mg/kg at depths ranging from 10 to 80 feet bgs (Table 1). Soil samples analyzed from monitoring well MW-1 did not detect concentrations of PCE above the laboratory PQL. Groundwater samples analyzed from monitoring wells MW-1 and MW-2 detected concentrations of PCE above the MTCA Method A cleanup level for groundwater of 5.0 micrograms per liter (µg/l) (Table 3).

The results of the additional subsurface exploration conducted by G-Logics in August 2001 confirmed that concentrations of PCE exceeding MTCA Method A cleanup levels were present in soil to 80 feet bgs and in multiple groundwater–bearing zones at the Site. However, no PCE

degradation products such as trichloroethene, cis-1,2-dichloroethene, trans-1,2-dichloroethene, and vinyl chloride were detected in soil or groundwater samples collected at the Site.

2.3 ENVIRONMENTAL SETTING

This section provides a summary of the environmental setting of the Site. The information presented in this section has been obtained from local, state, and national records, including national census statistics.

2.3.1 Land Use

The Site is located within the city limits of Olympia in Thurston County, Washington (Figure 1). According to the Thurston County Assessor Parcel Records, the Site and adjacent properties are zoned as High Density Commercial 2 (Thurston County Geo Data Center, 2005).

2.3.2 Demographics

The Site is located east of downtown Olympia in the Upper Eastside neighborhood, a predominantly commercial retail area. As of the 2000 census, 42,514 people, 18,670 households, and 9,969 families were residing in Olympia (Wikipedia 2005).

2.3.3 Topography

The Site topography is relatively flat, sloping slightly toward the west. The ground surface elevation at the Site is approximately 180 feet above mean sea level (U.S. Geological Survey [USGS] 1997). Olympia is located on Budd Inlet of the Puget Sound on the Deschutes River delta, and is surrounded by the Olympic Mountains on the west and the Cascade Mountains on the east. The topography of Olympia includes flat-lying areas located on the Deschutes River delta, and surrounding hillsides to the east and west.

2.3.4 Climate

The climate of the Olympia area is maritime, characterized by warm, generally dry summers, and wet, mild winters. The mean average low and high temperatures are 39.2 and 60.2 degrees Fahrenheit, respectively. The average annual precipitation in Olympia is 50.59 inches (Wikipedia 2005).

2.3.5 Groundwater Use

During most of the year, Olympia water is supplied from McAllister Springs, which receives its supply directly from groundwater flow from an underground aquifer (City of Olympia 2005). The springs discharge directly into a collection lagoon over which Olympia's pumping facility is built. The pump intakes extend into the lagoon directly above where crystal-clear water comes out of the bank into the lagoon (City of Olympia 2005). The water is chlorinated at a very low level as it is pumped from the lagoon into the supply system. Six municipal groundwater supply wells are located throughout the Olympia area to supplement the springs during periods of higher water demand. There are no municipal or private drinking water supply wells within a 0.5-mile radius of the Site (Ecology 2003).

2.4 GEOLOGY AND HYDROGEOLOGY

The Site is located at an elevation of approximately 180 feet above mean sea level in a generally flat area located above the lowlands of downtown Olympia, Washington. Puget Sound is located approximately 1.3 miles west of the Site (Figure 1).

Geologic maps for Northern Thurston County published by USGS indicate that unconsolidated sediments range in thickness from absent to greater than 1,800 feet, with thickness generally increasing toward the north (USGS 1999). The unconsolidated sediments in the vicinity of the Site are estimated to be approximately 450 feet thick, with the formations designated from youngest to oldest as Holocene alluvium, Vashon Recessional Outwash, Vashon Till, Vashon Advance Outwash, Kitsap Formation, Salmon Springs Drift, and undifferentiated deposits. The lithologically similar Holocene alluvium and Vashon Recessional Outwash consist of sand and gravel, and are estimated to be between 0 and 25 feet thick in the vicinity of the Site. The Vashon Recessional Outwash contains an unconfined water-bearing zone in the lower saturated portion, which is referred to as the Recessional Outwash Aquifer. The underlying Vashon Till is described as consisting of dense "hardpan" composed of sand, gravel, and boulders in a matrix of silt and clay. The Vashon Till is estimated to be between 0 and 50 feet thick in the vicinity of the Site. The Vashon Till serves as a confining layer between the Recessional Outwash Aquifer above, and the sand and gravel aquifer within the Vashon Advance Outwash below. The Vashon Advance Outwash contains a confined aquifer referred to as the Vashon Advance Aquifer. The

Vashon Advance Aquifer is estimated to be between 25 and 50 feet thick in the vicinity of the Site, and overlies the Kitsap formation, a clay and silt confining layer. Two deeper water-bearing zones known as the Salmon Springs/Sea Level Aquifer and the undifferentiated Aquifer underlie the Kitsap formation (USGS 1999).

The USGS database includes interpreted boring logs for two wells located relatively near the Site, including a private well owned by Del Knudson (well record 18N/02W-12Q03), located approximately 4,000 feet north-northeast of the Site, and a private well owned by John Mallinger (well record 18N/02W-24B01), located approximately 3,200 feet south-southeast of the Site (USGS 1998, 1999).

Well records 18N/02W-12Q03 and 18N/02W-24B01 report the total depths of the Del Knudson and John Mallinger wells as 44 and 51 feet bgs, respectively. The thickness of the Vashon Recessional Outwash is reported to be 16 feet in both the Del Knudson and John Mallinger wells. The thickness of the Vashon Till is reported to be 18 and 29 feet at the Del Knudson and John Mallinger wells, respectively. Well records 18N/02W-12Q03 and 18N/02W-24B01 report that the Del Knudson and John Mallinger wells extend 10 and 6 feet, respectively, into the Vashon Advance Outwash, but do not fully penetrate the formation.

The hydraulic conductivies of the Advance Outwash Aquifer calculated by the USGS for the Del Knudson and John Mallinger wells are 120 and 62 feet per day, respectively (USGS 1999). The difference between the hydraulic conductivities of the Vashon Advance Aquifer calculated for these two wells indicates that some heterogeneity exists in the Vashon Advance Aquifer.

Based on the subsurface investigations conducted at the Site, the general stratigraphy is divided into the Shallow Zone, the Intermediate Zone, and the Deep Zone. The Shallow Zone is comprised of silts, silty sands, and sands from just below the ground surface to total depths ranging from 20 to 35 feet bgs. The Intermediate Zone is comprised predominantly of dense silty gravels and silty sands with cobbles encountered below 20 to 35 feet bgs to total depths ranging from 85 to 90 feet bgs. The underlying Deep Zone is comprised predominantly of gravels encountered from approximately 85 to 90 feet bgs to the maximum depth explored at the Site of 105 feet bgs in boring MW-2.

Groundwater is present only in the Deep Zone at the Site. Groundwater measured in Deep Zone monitoring wells MW-2, MW-5, and MW-7 was encountered at depths ranging from 77 to 88 feet bgs, and appears to fluctuate seasonally (Table 4). The groundwater flow direction and the gradient in the Deep Zone have not been estimated due to the extremely flat gradient of the groundwater-bearing zone between well data points at the Site. However, based on the topography of the Site vicinity and groundwater flow directions at other facilities in the Site vicinity, groundwater is inferred to flow to the west-northwest toward Capitol Lake and Budd Inlet of the Puget Sound. A discontinuous perched groundwater zone is localized in the area of monitoring well MW-1 at approximately 59 feet bgs in the Intermediate Zone. Groundwater was not encountered in any of the other borings advanced in either the Shallow or Intermediate Zones at the Site.

3.0 SUBSURFACE INVESTIGATIONS

This section summarizes the subsurface investigations conducted at the Site by Farallon between December 2004 and June 2005. The purpose of the subsurface investigations was to evaluate potential source areas associated with dry cleaning operations, define the vertical and lateral distribution of PCE in soil and groundwater at the Site, and evaluate feasible cleanup alternatives. The data from the subsurface investigations were used to select remedial alternatives, and to guide the design and implementation of a feasible and cost-effective cleanup action.

Potential source areas identified by Farallon at other projects involving dry cleaners include releases from dry cleaning machines, PCE stills, floor drains and associated sanitary and storm sewer lines, chemical and used filter storage areas, and waste disposal areas (e.g., dumpsters, disposal to the ground surface). Subsurface utilities such as sanitary and storm sewer lines can provide preferential transport pathways from a point(s) of release. The previous investigations conducted at the Site did not assess all of these potential source areas for the Site. Confirmed and potential sources identified by Farallon at the Site included the following:

- The existing and former dry cleaning machines located in the northernmost suite of the Site building;
- The former coin-operated dry cleaning machines (operated until the late 1980s) that were located near the current dry cleaning machine;
- The sanitary sewer line beneath the northern end of the building. City records indicate that a sanitary sewer connection to the City main was permitted for a dry cleaner at the Site in 1962;
- The former dry cleaning condensate water discharge pipe (vent pipe) located on the exterior of the west side of the building;
- The 165-gallon aboveground storage tank inside the Dry Cleaner suite that formerly was used to store PCE for the coin-operated dry cleaning machines; and

- Potential surface discharges of dry cleaning wastewater/sludge outside to the west and south of the building.

3.1 FIELD PROGRAM

Farallon conducted subsurface investigation activities at the Site between December 2004 and June 2005. The purpose of the initial subsurface investigation conducted in December 2004 was to: assess confirmed and potential on-Site source areas of PCE contamination; further assess the nature and extent of PCE in soil and the groundwater zone; and collect geologic and hydrogeologic data to refine the conceptual site model and evaluate preliminary cleanup alternatives for the Site. The purpose of the subsurface investigation conducted in June 2005 was to confirm the applicability of SVE as the preferred remedial alternative for cleanup of PCE in soil in the Shallow and Intermediate Zones at the Site. Data from the SVE pilot test were used to support the design and implementation of a feasible cleanup alternative.

The initial subsurface investigation conducted in December 2004 included the following elements:

- Advancement of borings IB-4 and IB-5 inside the Dry Cleaner suite to total depths of 20 feet bgs;
- Advancement of borings EB-10 and EB-11 outside the Site building to total depths of 20 and 23 feet bgs, respectively;
- Installation of SVE wells MW-3, MW-4, and MW-6 to total depths of 20, 24, and 12.5 feet bgs, respectively;
- Installation of groundwater monitoring wells MW-5 and MW-8 to total depths of 100 feet bgs;
- Collection and laboratory analysis of soil samples from interior and exterior borings; and
- Collection and laboratory analysis of groundwater samples from monitoring wells MW-1, MW-2, MW-5, and MW-7.

The subsurface investigation conducted in June 2005 included the following elements:

- Installation of SVE well MW-8 in the Intermediate Zone;
- Collection of soil samples for laboratory analysis for halogenated volatile organic compounds (HVOCs); and
- Feasibility testing of SVE technology in the Shallow and Intermediate Zones at the Site.

The elements of the subsurface investigations conducted in December 2004 and June 2005 are described in detail in the following subsections.

3.2 RECONNAISSANCE SAMPLING

Borings IB-4, IB-5, EB-10, and EB-11 were advanced on December 6, 2004 by Cascade Drilling, Inc. of Woodinville, Washington using a Geoprobe direct-push drill rig, under the observation of a Farallon Geologist (Figure 2). Soil samples were collected from the borings in accordance with American Society for Testing Materials and EPA standard protocols. Boring lithologies were documented on the Log of Boring forms in accordance with the Unified Soil Classification System. The boring logs are included in Appendix D. The soil samples were field-screened for volatile organic vapors using a photoionization detector, and were observed for signs of contamination (e.g., odor, staining). A field volatile organic vapor analysis was conducted by placing a portion of the soil obtained from each sample interval into a sealed plastic bag and allowing the sample to warm for approximately 30 seconds. The bag was then punctured with the probe of the photoionization detector, and the highest concentration indicated by the photoionization detector over an approximately 30-second interval was recorded on the boring log.

Soil samples were collected continuously using 4-foot long macrocore samplers from the ground surface to the total depth of the boring. Soil samples collected from borings IB-4, IB-5, EB-10, and EB-11 were submitted to OnSite Environmental Inc. of Redmond, Washington (OnSite) for analysis of HVOCs by EPA Method 8260B. Upon completion of soil sample collection, borings IB-4, IB-5, EB-10, and EB-11 were abandoned by backfilling with hydrated bentonite, and replacing the concrete or asphalt overlying the borings.

3.3 MONITORING WELL INSTALLATION

Groundwater monitoring wells MW-5 and MW-7 were installed between December 9 and 14, 2004 under the observation of a Farallon Geologist. The groundwater monitoring wells were installed by Cascade Drilling, Inc. using a hollow-stem auger drill rig. Soil samples were collected from the borings during monitoring well installation using a 300-pound hammer with a 1.5-foot split-spoon sampler. Soil samples were not collected in the upper 20 feet of soil during the drilling of boring MW-5 due to its close proximity to boring EB-10; however, soil samples were collected continuously from 20 feet bgs to the total depth drilled of 100 feet bgs. Soil samples from boring MW-7 were collected at 5 and 16 feet bgs, and at 2.5-foot intervals from 30 feet bgs to the total depth drilled of 100 feet bgs.

Four soil samples collected from boring MW-5, and three soil samples collected from boring MW-7 were submitted to OnSite for analysis of HVOCs by EPA Method 8260B. Borings MW-5 and MW-7 were converted into monitoring wells in accordance with the *Minimum Standards for Construction and Maintenance of Wells*, WAC 173-160. Each of the wells was constructed using 2-inch inner-diameter Schedule 40 polyvinyl chloride (PVC) blank casing, flush-threaded to 2-inch inner-diameter Schedule 40, 0.010-inch slotted PVC well screen. Each well was constructed using 15 feet of well screen set at the depth interval of 85 to 100 feet bgs (Table 2). Monitoring wells MW-5 and MW-7 were completed with flush-mounted, traffic-rated enclosures with a locking cap. Monitoring well construction details are summarized in Table 2, and shown on the well logs in Appendix D. Groundwater was encountered during advancement of monitoring wells MW-5 and MW-7 at approximately 88 feet bgs.

3.4 SOIL VAPOR EXTRACTION WELL INSTALLATION

SVE wells MW-3, MW-4, and MW-6 were intended to be constructed as Shallow Zone groundwater monitoring wells. However, no groundwater was encountered in the Shallow Zone during the December 2004 subsurface investigation. Therefore, wells MW-3, MW-4, and MW-6 were constructed as Shallow Zone SVE wells. Shallow Zone SVE wells MW-3, MW-4, and MW-6, and Intermediate Zone SVE well MW-8 were installed by Cascade Drilling, Inc. using a hollow-stem auger drill rig. Soil samples were collected from the borings using a 300-pound hammer with a 1.5-foot split-spoon sampler. Soil samples were collected continuously from

boring MW-6 from 5 to 35 feet bgs. Soil samples were not collected from borings MW-3, MW-4, or MW-8 due to the close proximity of these wells to previously advanced borings and groundwater monitoring wells.

Three soil samples collected from boring MW-6 were submitted to OnSite for analysis of HVOCs by EPA Method 8260B. Borings MW-3, MW-4, MW-6, and MW-8 were converted into SVE wells in accordance with the *Minimum Standards for Construction and Maintenance of Wells*, WAC 173-160. Each of the wells was constructed using 4-inch diameter Schedule 40 PVC casing with 4-inch 0.010-inch slotted PVC well screen. The SVE wells were completed with flush-mounted, traffic-rated enclosures with locking caps. SVE well construction details, including screened intervals, are summarized in Table 2, and are shown on the well logs in Appendix D.

3.5 GROUNDWATER SAMPLING

Following installation of the monitoring wells, Farallon developed monitoring wells MW-5 and MW-7, and re-developed monitoring well MW-1 using a surge block and submersible pump. Monitoring wells MW-1, MW-5, and MW-7 were developed by repeatedly surging the submerged portion of the well screen for approximately 5 to 10 minutes, followed by purging with a submersible pump. Monitoring wells MW-1, MW-5, and MW-7 were purged dry following removal of 1.25, 17, and 10 gallons of water, respectively from these wells.

Depth to groundwater data were collected at the Site on December 23, 2004; January 26, 2005; and June 23, 2005 (Table 4). Prior to obtaining groundwater measurements, the monitoring wells were opened, and the water level in the wells was allowed to equilibrate to atmospheric pressure for a minimum of 15 minutes. The depth to groundwater measured beneath the Site ranged from 76.95 to 88.73 feet below the top of the casing in monitoring wells MW-2, MW-5, and MW-7 during December 2004, and January and June 2005 (Table 4). Groundwater was not detected in SVE wells MW-3, MW-4, or MW-6 in December 2004 or January 2005, or in SVE wells MW-3, MW-4, MW-6, or MW-8 in June 2005.

The depth to groundwater in each of the wells was measured relative to the surveyed point on the top of the well casings. Groundwater levels were measured to within an accuracy of 0.01 foot

using an electronic water level meter. A summary of the measured groundwater levels and calculated groundwater elevations at the Site is provided in Table 4.

The depth to water in monitoring wells MW-1, MW-2, MW-5, and MW-7 exceeded the maximum practicable limit for sampling using a peristaltic pump; therefore, standard purge and sample techniques using a down-hole submersible pump and disposable bailers were employed at these wells. Prior to groundwater sampling at monitoring wells MW-1, MW-5, and MW-7 on December 14, 2004, a minimum of three submerged well casing volumes of water was removed from each of the wells during the well development activities conducted immediately prior to sampling. The down-hole submersible pump used to purge the monitoring wells was decontaminated with a solution of Alconox and tap water and rinsed with de-ionized water before and after use at each monitoring well. On December 23, 2004 a grab groundwater sample was collected from monitoring well MW-2. The groundwater samples collected from monitoring wells MW-1, MW-2, MW-5, and MW-7 were not field-analyzed for groundwater quality parameters prior to purging and sampling.

Groundwater samples were obtained from monitoring wells MW-1, MW-2, MW-5, and MW-7 using new, dedicated, disposable bailers to transfer the samples directly into laboratory-prepared sample containers. The samples were labeled, packed on ice, and submitted under chain-of-custody protocols to OnSite for laboratory analysis of HVOCs by EPA Method 8260B. All development and purge water generated during the well development and groundwater sampling event was placed into a labeled 55-gallon steel drum and stored on Site pending waste profiling and proper disposal.

3.6 ANALYTICAL RESULTS

The soil and groundwater analytical results for the subsurface investigation activities are summarized in the following subsections. The laboratory analytical reports for soil and groundwater are provided in Appendix E.

3.6.1 Soil

The general stratigraphy encountered at the Site is divided into the Shallow Zone, the Intermediate Zone, and the Deep Zone. The Shallow Zone is comprised of silts, silty sands, and

sands from just below the ground surface to total depths ranging from 20 to 35 feet bgs. The Intermediate Zone is comprised predominantly of dense silty gravels and silty sands with cobbles encountered below 20 to 35 feet bgs to total depths ranging from 85 to 90 feet bgs. The underlying Deep Zone is comprised predominantly of gravels encountered from approximately 85 to 90 feet bgs to the maximum depth explored at the Site of 105 feet bgs in boring MW-2. The soil analytical data are summarized in Table 1 and depicted on Figure 3. The laboratory analytical results for soil indicate the following:

- Concentrations of PCE ranging from 0.0033 to 18 mg/kg were detected in soil samples collected from depths less than 18 feet bgs in interior borings IB-4 and IB-5 and monitoring wells MW-6 and MW-7;
- Concentrations of PCE were detected at 1.1 and 0.11 mg/kg in exterior borings EB-10 and EB-11, respectively, in soil samples collected from depths less than 5.5 feet bgs;
- Concentrations of PCE ranging from 0.0033 to 0.19 mg/kg were detected in soil samples collected from depths ranging from 34.5 to 99 feet bgs in monitoring wells MW-5, MW-6, and MW-7; and
- HVOCs other than PCE were not detected above laboratory PQLs in any of the soil samples analyzed.

3.6.2 Groundwater

Groundwater levels were measured in monitoring wells MW-1 through MW-7 on December 23, 2004 and on January 26, 2005, and in monitoring wells MW-1 through MW-8 on June 23, 2005. The depth to water measured in Intermediate Zone monitoring well MW-1 ranged from 59.06 to 59.36 feet below the top of the well casing. The depth to water measured in Deep Zone monitoring wells MW-2, MW-5, and MW-7 on December 23, 2004 ranged from 84.50 to 88.73 feet below the top of the well casing (Table 4). The depth to water measured in Deep Zone monitoring wells MW-2, MW-5, and MW-7 on June 23, 2005 ranged from 76.95 to 80.22 feet below the top of the well casing (Table 4). Groundwater was not detected in Shallow Zone monitoring wells MW-3, MW-4, or MW-6, or in Intermediate Zone monitoring well MW-8 on any of the dates measured.

Groundwater analytical data are summarized in Table 3, and are depicted on Figure 4. The laboratory analytical reports for the groundwater samples collected during the subsurface investigations are included in Appendix E. The laboratory analytical results for groundwater indicate the following:

- Concentrations of PCE exceeding the MTCA Method A cleanup level of 5 µg/l were detected in the groundwater samples collected from Intermediate Zone well MW-1, and from Deep Zone wells MW-2, MW-5, and MW-7 during December 2004, ranging from a concentration of 7.0 µg/l in Deep Zone well MW-7 to a concentration of 170 µg/l in Intermediate Zone well MW-1.
- HVOCs other than PCE were not detected above laboratory PQLs in any of the groundwater samples analyzed.

3.7 SOIL VAPOR EXTRACTION PILOT TEST

Farallon conducted an SVE pilot test on June 23, 2005 at Shallow Zone SVE well MW-4 and Intermediate Zone SVE well MW-8, which are located on the western side of the Dry Cleaner suite (Figure 2). The purpose of the SVE pilot test was to evaluate the feasibility of using SVE technology to remediate concentrations of PCE exceeding the MTCA Method A cleanup level in soil at the Site.

Shallow Zone SVE pilot test well MW-4 is screened in the near-surface sandy soil between 8 and 24 feet bgs (Figure 5). SVE wells MW-1, MW-3, MW-6, and MW-8 were used as observation wells for the pilot test at SVE well MW-4. Intermediate Zone SVE pilot test well MW-8 is screened in the silty gravel between 35 and 60 feet bgs in the vicinity of Shallow Zone SVE well MW-4 (Figure 5). SVE wells MW-1, MW-3, MW-4, and MW-6 were used as observation wells for the pilot test at SVE well MW-8.

Ambient air pressures were measured in each observation well immediately prior to beginning the SVE pilot test. A vacuum was applied to SVE pilot test wells MW-4 and MW-8 using a Gast R5323-50, 2-horsepower regenerative blower. Magnehelix vacuum gauges were connected to SVE pilot test wells MW-4 and MW-8 to monitor the vacuum throughout the SVE pilot test.

The observation wells were fitted with modified well caps equipped with a monitoring port to allow measurement of changes in air pressure within each well.

Pilot testing consisted of applying a vacuum of 5.0 inches of water (IOW) to SVE pilot test well MW-4. The vacuum was maintained until the flow rate stabilized in the SVE pilot test wells, and the vacuum stabilized in the observation wells. This procedure was repeated for SVE pilot test well MW-8. The 5.0-IOW vacuum applied at SVE pilot test wells MW-4 and MW-8 produced steady-state flow rates of 41.45 and 23.69 standard cubic feet per minute (scfm), respectively. The vacuum applied to SVE pilot test wells MW-4 and MW-8 subsequently was increased to 10.0 IOW until the flow rate stabilized in the SVE pilot test wells, and the vacuum stabilized in the observation wells. The 10.0-IOW vacuum applied at SVE pilot test wells MW-4 and MW-8 produced steady-state flow rates of 72.5 and 34.53 scfm, respectively. The results of the SVE pilot test are presented in Appendix F.

Soil vapor samples collected periodically from the discharge from SVE pilot test wells MW-4 and MW-8 were analyzed using GasTech pump and colorimetric tubes specific to the measurement of PCE. Concentrations of PCE above 100 parts per million volume (ppmv), the detection limit of the colorimetric tube, were detected in the soil vapor discharged from SVE pilot test well MW-4 during application of both the 5.0- and 10.0-IOW vacuum. Concentrations of PCE were detected at 90 ppmv in the soil vapor discharged from SVE pilot test well MW-8 during application of the 5.0 IOW vacuum, and concentrations of PCE above 100 ppmv, the detection limit of the colorimetric tube, were detected in the soil vapor discharged from SVE pilot test well MW-8 during application of the 10.0-IOW vacuum.

Interpretation of the SVE pilot test results was based on measurable responses in the observation wells. The air pressure/vacuum readings indicated that there was measurable response in all observation wells. The determination of a positive response was based on a decrease of at least 1 percent of the applied vacuum from the initial baseline air pressure reading. The greatest air pressure response in Shallow Zone SVE wells was measured in SVE well MW-6, located at a distance of approximately 72 feet from Shallow Zone SVE pilot test well MW-4. The Shallow Zone air pressure response as measured in SVE well MW-3, located 112 feet from the SVE pilot test wells, was only moderately less than that measured in SVE well MW-6, indicating that the

radius of influence from the SVE pilot test wells is greater than 70 feet. A significant response in the Intermediate Zone air pressure was recorded in SVE well MW-1, the only Intermediate Zone observation well at the Site, located at a distance of approximately 163 feet from Intermediate Zone SVE pilot test well MW-8 (Figures 2, 5, and 6). The results of the SVE pilot test are depicted on the figures included in Appendix F.

The results of the SVE pilot test indicate that SVE technology can be successfully applied to treat concentrations of PCE in soil in the vadose zone at the Site. Based on air pressure measurements, there was measurable evidence of vacuum influence in the Shallow Zone approximately 112 feet from Shallow Zone SVE pilot test well MW-4, and measurable evidence of vacuum influence in the Intermediate Zone approximately 163 feet from Intermediate Zone SVE pilot test well MW-8.

Due to the observed response to the SVE pilot test, the conceptual design of the SVE well network has been based on a conservative radius of 35 feet from each Shallow Zone SVE well, and 50 feet from each Intermediate Zone SVE well. This design radius is anticipated to be adequate to account for the variability in the subsurface lithology. The Shallow Zone SVE wells will move air through the vadose zone from considerably beyond the 35-foot design radius, due to the capping effect of the low-permeability soils in the upper 5 to 8 feet bgs. The SVE system likely will operate at a flow rate range of 15 to 30 scfm in each Intermediate Zone SVE well, and of 20 to 40 scfm in each Shallow Zone SVE well.

4.0 CONCEPTUAL SITE MODEL

The conceptual site model has been developed based on the results of the subsurface investigations conducted by Farallon and others to identify types and concentrations of hazardous substances suspected sources of hazardous substances, contaminated media, and actual and potential exposure pathways and scenarios, in accordance with WAC 173-340-200. The conceptual site model is the basis for developing technically feasible cleanup alternatives, and selecting a final cleanup action. The conceptual site model is dynamic, and may be refined as additional information becomes available.

This section discusses the components of the conceptual site model developed from the results of the subsurface investigations and SVE pilot test conducted at the Site. Following is a discussion of the suspected types of hazardous substances present, sources of the identified hazardous substances, nature and extent of contamination, contaminant fate and transport, and preliminary exposure assessment.

4.1 TYPES OF HAZARDOUS SUBSTANCES

The Site has been used for dry cleaning operations since the early 1960s. The only reported hazardous substance used and stored on Site is PCE, which has been used in dry cleaning operations at the Site since the early 1960s. Results of the subsurface investigations conducted at the Site have identified concentrations of PCE in soil and groundwater exceeding MTCA Method A cleanup levels. Based on the historical Site activities and the use of PCE in dry cleaning operations, there is a potential for the presence of additional HVOCs to be present in soil and groundwater that are attributable to the natural degradation of PCE. However, laboratory analytical results of soil and groundwater samples collected during the subsurface investigations have not identified concentrations of any other HVOC above the laboratory PQLs. PCE is the only hazardous substance that has been identified at the Site.

4.2 SOURCES OF HAZARDOUS SUBSTANCES

The suspected sources of PCE to soil and groundwater at the Site appear to be surface releases attributable to the storage and use of PCE in dry cleaning operations, and shallow subsurface

releases attributable to the discharge of PCE-laden wastewater through underground drain lines. Specifically, these sources include:

- The existing and former dry cleaning machines located in the northernmost suite of the Site building;
- The former coin-operated dry cleaning machines (operated until the late 1980s) that were located near the current dry cleaning machine;
- The sanitary sewer line beneath the northern end of the Site building. City records indicate that a sanitary sewer connection to the City main was permitted for a dry cleaner at the Site in 1962;
- The former dry cleaning condensate water discharge pipe (vent pipe) located on the exterior of the western side of the building;
- The 165-gallon aboveground storage tank inside the building that formerly was used to store PCE for the coin-operated dry cleaning machines; and
- Potential surface discharges of dry cleaning wastewater/sludge outside to the west and south of the Site building.

The releases of PCE have directly impacted soil quality beneath and adjacent to the Dry Cleaner suite, and have migrated vertically to impact groundwater quality at the Site.

4.3 NATURE AND EXTENT

The nature and extent of PCE at the Site was assessed by the subsurface investigations and are based on the physical Site conditions and the suspected source areas. The following subsections summarize the physical conditions of the Site and known distribution of PCE in soil and groundwater at the Site.

4.3.1 Physical Site Conditions

The Site consists of a relatively flat-lying property that is developed with a single-story brick masonry building located on the northwestern portion of the Site (Figure 2). The remaining Site areas are covered with asphalt. The Site building is developed with four separate suites,

currently occupied by Eastside Laundry, an insurance broker, and a barbershop (Figure 2). Eastside Laundry occupies the northern and southern suites. The Site is adjoined by State Street to the north, Turner Street to the west, and a paved parking lot for a grocery store to the east and south (Figure 2).

The geologic and hydrogeologic information and the soil and groundwater analytical data were compiled on cross-sections of the Site to illustrate the conceptual model of Site conditions. As shown on Cross Sections A-A' and B-B' (Figures 5 and 6, respectively), the stratigraphy is divided into the Shallow Zone, the Intermediate Zone, and the Deep Zone. The Shallow Zone is comprised of silts, silty sands, and sands from just below the ground surface to total depths ranging from 20 to 35 feet bgs. The Intermediate Zone is comprised predominantly of dense silty gravels and silty sands with cobbles encountered below 20 to 35 feet bgs to total depths ranging from 85 to 90 feet bgs. The underlying Deep Zone is comprised predominantly of gravels encountered from approximately 85 to 90 feet bgs to the maximum depth explored at the Site of 105 feet bgs in boring MW-2.

Groundwater was encountered only in the Deep Zone at the Site. A discontinuous perched groundwater zone is localized in the area of monitoring well MW-1 at approximately 59 feet bgs. However, groundwater was not encountered in any of the other borings advanced in either the Shallow or the Intermediate Zones at the Site (Figures 5 and 6). Groundwater measured in monitoring wells MW-2, MW-5, and MW-7 was encountered at depths ranging from 77 to 88 feet bgs, and appears to fluctuate seasonally. Groundwater flow direction and gradient in the Deep Zone have not been estimated, due to the extremely flat gradient observed between well data points at the Site. However, based on the topography of the Site vicinity and the groundwater flow direction at other facilities within the Site vicinity, groundwater is expected to flow to the west-northwest towards Capitol Lake and Budd Inlet of the Puget Sound.

4.3.2 PCE in Soil

The laboratory analytical data from subsurface investigations conducted at the Site by Farallon and others confirm the presence of PCE above MTCA Method A cleanup levels in soil beneath the Site building in the vicinity of the existing dry cleaning machine and the former coin-operated dry cleaning machines (soil borings IB-1 through IB-5, and EB-1, and monitoring

well MW-6), and on the western side of the Site building near the sanitary sewer line and former condensate vent pipe (soil borings B4, B5, EB-2, EB-10, and SB-2, and monitoring wells MW-2 and MW-5). Additionally, concentrations of PCE exceeding the MTCA Method A cleanup level have been detected in soil to the south and southeast of the Site building (soil borings EB-5, EB-7, and EB-11, and monitoring well MW-3).

The lateral extent of concentrations of PCE exceeding the MTCA Method A cleanup level in soil is defined by soil boring EB-9 on the east, soil boring EB-6 on the southeast, and monitoring well MW-1 on the south. The laboratory analytical results did not detect concentrations of PCE above the laboratory PQLs in soil samples collected from soil borings EB-6 or EB-9, or monitoring well MW-1 at depths between 8 and 60 feet bgs. The lateral extent of PCE in soil extends to the limits of the investigation to the north and west of the suspected source areas.

The vertical extent of concentrations of PCE in soil exceeding the MTCA Method A cleanup level of 0.05 mg/kg is shown on Figures 5 and 6. The maximum depth of concentrations of PCE in soil exceeding the MTCA Method A cleanup level ranges from approximately 35 feet bgs on the eastern portion of the property (as indicated by monitoring well MW-7) and approximately 40 feet on the southern portion of the property (as indicated by soil boring EB-7 and monitoring well MW-1) to approximately 82 feet bgs beneath the Dry Cleaner suite (as indicated by monitoring wells MW-2 and MW-5).

4.3.3 PCE in Groundwater

Groundwater analytical data from Deep Zone monitoring wells MW-2, MW-5, and MW-7 confirm that concentrations of PCE above the MTCA Method A cleanup level are present in groundwater at the Site. During monitoring and sampling activities conducted by Farallon in 2004, the concentrations of PCE detected in groundwater at the Site ranged from 7 µg/l (monitoring well MW-7) to 56 µg/l (monitoring well MW-5), all of which exceed the MTCA Method A cleanup level of 5 µg/l for PCE in groundwater.

The groundwater encountered in Intermediate Zone monitoring well MW-1 is not considered representative of a continuous water-bearing zone at the Site. The depth to water measurements in monitoring well MW-1 have consistently been 15 to 16 feet above those encountered in Deep

Zone monitoring wells MW-2, MW-5, and MW-7. Additionally, the total depth of water observed in monitoring well MW-1 since development and sampling in August 2001 is less than 16 inches, with a total volume of less than 0.2 gallons. Borings MW-2, MW-5, and MW-8, which were advanced through the Intermediate and Deep Zones during subsurface investigations conducted in December 2004 and June 2005, did not encounter water-bearing zones in the Intermediate Zone. These data indicate that a thin, laterally discontinuous perched water-bearing zone is present only in the immediate vicinity of monitoring well MW-1, which has been completely dewatered by the installation and sampling of monitoring well MW-1. The analytical results for water samples collected from monitoring well MW-1 are not considered representative of groundwater conditions at the Site. Therefore, the laboratory analytical results of water samples collected from monitoring well MW-1 will not be included in the evaluation of the nature and extent of PCE in groundwater at the Site.

The highest concentrations of PCE in groundwater were observed along the western side of the Dry Cleaner suite. Monitoring well MW-5 is located adjacent to the side sewer connection for the Dry Cleaner suite, and contains the highest concentrations of PCE, indicating that the source of PCE to groundwater in this area may be disposal of PCE to drains inside the building, and leaks to the subsurface through the side sewer line. Monitoring wells MW-2 and MW-7 are located to the northwest and southeast of the Dry Cleaner suite at distances of 13 and 65 feet, respectively (Figure 2). Concentrations of PCE in groundwater collected from monitoring well MW-2 are slightly higher than those observed in groundwater collected from monitoring well MW-7. The concentrations observed in monitoring well MW-7 are just above the MTCA Method A cleanup level of 5 µg/l for PCE in groundwater, indicating that monitoring well MW-7 is located near the lateral extent of PCE exceeding the cleanup level in groundwater. The lateral extent of PCE in groundwater extends to the limits of the investigation to the north and west of the suspected source areas.

The vertical extent of PCE in the Deep Zone groundwater has not been defined; however, the low concentrations of PCE in the Deep Zone are not indicative of the presence of product-phase PCE or dense nonaqueous-phase liquid. The low concentrations of PCE observed in groundwater collected from monitoring wells MW-2, MW-5, and MW-7 indicate the presence of

a plume of dissolved-phase PCE that likely is limited to the upper 10 to 20 feet of the water-bearing zone.

4.4 FATE AND TRANSPORT

The distribution of PCE in soil and groundwater at the Site indicates that surface and/or shallow subsurface releases of PCE have infiltrated through the ground surface to affect subsurface soil from the ground surface to the top of the water-bearing zone at a depth of approximately 85 feet bgs. The soil analytical data for the Shallow Zone demonstrate that concentrations of PCE in Shallow Zone soil attenuate rapidly both laterally and vertically with distance from the primary source area beneath the dry cleaning equipment. This outcome is consistent with the expected low transmissivity of the silty gravel comprising the Intermediate Zone underlying the Shallow Zone. The relatively low concentrations of PCE detected in soil in the Intermediate Zone between depths of 30 and 80 feet bgs likely are attributable to vapor-phase PCE in the vadose zone from the underlying groundwater plume. Higher concentrations of PCE were detected in soil in the Intermediate Zone directly beneath the Site building, and are attributable to the downward migration of PCE by gravity and by sorption of PCE to soil in the vadose zone.

Vertical migration of PCE from the source area located beneath the former dry cleaning equipment and/or the nearby floor drain system is affecting groundwater quality in the Deep Zone. PCE concentrations detected in groundwater samples collected from the Deep Zone ranged from 56 µg/l in monitoring well MW-5 to 7 µg/l in up-gradient monitoring well MW-7. The lateral extent of PCE concentrations exceeding 5 µg/l in Deep Zone groundwater has not been characterized by the existing monitoring well network. However, based on the relatively flat groundwater gradient interpreted from the calculated groundwater elevations in the three Deep Zone monitoring wells (MW-2, MW-5, and MW-7), the dissolved-PCE plume in the Deep Zone groundwater is inferred to be limited to a localized area centered on monitoring well MW-5.

4.5 PRELIMINARY EXPOSURE ASSESSMENT

The two types of risk of exposure associated with release of PCE at the Site are terrestrial ecological risk and human health risk. The locations of PCE in the subsurface will determine the

potential exposure scenarios for terrestrial ecological and human health effects during the cleanup action. The following sections present the conclusions with respect to terrestrial ecologic and human health risk, and the corresponding exposure pathways.

4.5.1 Soil Pathway

The exposure pathways for soil include direct contact, atmospheric transport via the soil to vapor pathway, and soil leaching to groundwater. The direct contact pathway refers to direct contact with soil beneath the Site via dermal contact and/or ingestion. Concentrations of PCE have been detected in soil as shallow as 3 feet bgs. This depth is within the limit of 6 feet bgs that represents a risk to terrestrial ecological receptors. Because asphalt and the Site building cover the entire Site, the direct contact pathway is incomplete; there currently is not a risk to human health or the environment through the direct contact pathway. Direct contact with soil would require excavation activities to encounter levels of potential constituents of concern that could pose a human health risk.

Concentrations of PCE in shallow soil at the Site provide a potential risk to human health and the environment through exposure to soil vapor. However, the risk of exposure is low because of the total coverage of soil at the Site by asphalt and the building. The risk of exposure through the soil vapor to an indoor air pathway also is expected to be low because of the surface coverage, and because of the operation of an active dry cleaning business inside the Site building, which results in concentrations of PCE in indoor air, making it difficult to gauge the risk posed by volatilization of PCE from subsurface soil.

Leaching of PCE from soil to groundwater at the Site has resulted in concentrations of PCE exceeding the MTCA Method A cleanup level in groundwater. The planned cleanup action will reduce the concentrations of PCE in soil that are acting as a continuous source to groundwater.

4.5.2 Groundwater Pathway

Potential exposure pathways for groundwater include the direct contact pathway, which comprises both dermal contact and ingestion pathways. There are no groundwater supply wells at or in the vicinity of the Site that are used for potable water supply. Because of the availability of the municipal water supply in the Site vicinity, there is a low probability that groundwater at

the Site or adjacent properties would be used as a potable water source. Because there is no practical use of groundwater in the Site vicinity, direct contact with groundwater would require excavation activities in order to become a potential risk to human health. Because groundwater beneath the Site is located at a depth of approximately 77 to 89 feet bgs, it is unlikely that excavation activities at the Site would result in exposure to groundwater.

5.0 TECHNICAL ELEMENTS

This section presents an overview of the technical elements applicable to the cleanup action, including the development of the cleanup action objective and a summary of the ARARs, permit requirements, constituent(s) of concern (COCs) and media of concern. A discussion of the terrestrial ecological evaluation exclusion, cleanup standards, and restoration timeframe also are included in this section.

5.1 CLEANUP ACTION OBJECTIVE

The cleanup action objectives have been developed taking into consideration characteristics of the hazardous substances present, characteristics of the contaminated media, migration and exposure pathways, and potential receptors. The specific objective of the cleanup action is to restore beneficial use of soil and groundwater at the points of compliance by reducing the potential for:

- Direct human contact with soil containing concentrations of PCE above the applicable MTCA cleanup level;
- Direct human contact with and ingestion of groundwater with concentrations of PCE above applicable MTCA cleanup levels; and
- Transfer of concentrations of PCE from soil to groundwater or from groundwater to soil.

5.2 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Cleanup activities at the Site will be conducted under Ecology's VCP. Although Ecology will be the lead agency for the cleanup action, the effort will be conducted in accordance with all applicable local regulations and permitting requirements.

The primary ARARs applicable to the cleanup action include:

- MTCA (WAC 173-340);
- Water Quality Standards for Groundwater (WAC 173-200); and

- The Hazardous Waste Management Act (Chapter 70.105 of the Revised Code of Washington [RCW 70.105]).

These primary ARARs are anticipated to be the most applicable requirements, since they encompass the cleanup action framework, including applicable and relevant regulatory guidelines, cleanup standards, waste disposal criteria, and documentation standards.

Additional applicable ARARs for cleanup activities at the Site may include:

- The Occupational Safety and Health Act (Part 1910 of Title 29 of the Code of Federal Regulations [29 CFR 1910]);
- The State Environmental Policy Act (RCW 43.21);
- General occupational health standards (WAC 296-62);
- Safety Standards for Construction Work (WAC 296-155);
- Minimum Standards for Construction and Maintenance of Wells (WAC 173-160);
- National Primary and Secondary Air Quality Standards (40 CFR Part 50);
- Washington State General Requirements for Air Pollution Sources (WAC 173-400);
- Underground Injection Control Program Requirements (WAC 173-218);
- Accreditation of Environmental Laboratories (WAC 174-50); and
- Local permits required by the City of Olympia and the Olympic Region Clean Air Agency (ORCAA).

5.3 PERMITS

Final determination of permit requirements will be based on consultation with the relevant permit-issuing bodies. Compliance with the following permits may be required for the cleanup action at the Site:

- **General Notice of Construction Permit and Air Operating Permit**—If required by ORCAA, these permits would apply to the construction and operation of the SVE system.

- **Building Permit**—This permit may be required to modify Site facilities and the electrical system to meet the requirements for operation of the SVE system.

5.4 CONSTITUENTS OF CONCERN

The COCs include hazardous substances exceeding the MTCA cleanup levels that have been detected in soil and/or groundwater. The only contaminant detected in soil and groundwater above applicable MTCA cleanup levels is PCE; therefore PCE is the only COC for soil and groundwater.

5.5 MEDIA OF CONCERN

The media of concern for the cleanup action identified at the Site are described in the subsections below.

5.5.1 Soil

Soil has been identified as a medium of concern based on the results of subsurface investigations at the Site. Concentrations of PCE exceeded the MTCA Method A soil cleanup level in soil samples collected from the majority of the borings in the Shallow and Intermediate Zones that have been completed at the Site. The highest concentrations of PCE identified at the Site were detected in soil samples collected from shallow borings completed beneath the Dry Cleaner suite (Figure 3).

5.5.2 Groundwater

Groundwater has been identified as a medium of concern. Concentrations of PCE above the MTCA Method A cleanup level of 5 µg/l have been detected in groundwater samples collected from Deep Zone monitoring wells MW-2, MW-5, and MW-7 (Figure 4).

5.5.3 Surface Water

Surface water is not considered a medium of concern at the Site. Because of the absence of any surface water bodies in close proximity to the Site, the current distribution of PCE, and the expected contaminant dispersion rates, surface water is not a medium of concern.

5.5.4 Air

Air is not considered a medium of concern for the Site. The potential for short-term exposure during cleanup activities will be addressed in the HASP prepared for the Site. Concentrations of HVOC vapors in SVE system emissions will be monitored, and can be controlled with active carbon filtration, if needed.

Indoor air is not considered a medium of concern for the Site. An investigation of indoor air quality in the Dry Cleaner suite and in surrounding businesses in the Site building was conducted by the Washington State Department of Health in 2002 (Washington State Department of Health 2002). The results of the investigation identified concentrations of PCE and its breakdown product, trichloroethene, in indoor air samples collected from all three businesses in the Site building. However the conclusions of the investigation stated "it is not clear whether the source of PCE and trichloroethene is from current operations at Eastside [Laundry], from subsurface soil gas underneath Eastside [Laundry]..., from recently drycleaned laundry,...or a combination thereof" (Washington State Department of Health 2002). Because the source of PCE in indoor air cannot be identified and the operation of the SVE system at the Site will capture the concentrations of PCE in shallow soil and soil vapor beneath the building, indoor air is not considered a medium of concern for the Site.

5.6 TERRESTRIAL ECOLOGICAL EVALUATION EXCLUSION

Natural resources and ecological receptors are not considered a concern, since the Site qualifies for exclusion from terrestrial ecological evaluation under WAC 173-340-7491 and WAC 173-340-7492 (2)(a) (ii). These sections of MTCA include a provision for excluding properties from future evaluation if the land use and surrounding area make wildlife exposure unlikely. The Site qualifies for an exclusion based on the Simplified Terrestrial Ecological Evaluation – Exposure Analysis Procedure (WAC 173-340-7492(2)(a)(ii)). There is less than 1.5 acres of contiguous undeveloped land on or within 500 feet of any area of the Site, which makes the Site eligible for exclusion under the Undeveloped Land rule (WAC 173-340-7491(1)(c)).

5.7 CLEANUP STANDARDS

As defined in WAC 173-340-700, cleanup standards for the Site include establishing cleanup levels and points of compliance at which those cleanup levels will be attained. The cleanup standards for the Site have been established in accordance with WAC 173-340-700 through WAC 173-340-760, which are protective of human health and the environment, and comply with the ARARs defined for the Site.

5.7.1 Cleanup Levels

Cleanup levels are the concentrations of the identified COC that will be met for the media of concern at the points of compliance defined for the Site to meet the requirements of MTCA. The soil and groundwater cleanup levels for PCE are presented in the following subsections.

5.7.1.1 Soil

The cleanup level for PCE in soil has been established as the MTCA Method A cleanup level of 0.05 mg/kg, which is to be attained at the points of compliance to meet the requirements of MTCA. It is proposed that soil be determined to be compliant based on the results of confirmation monitoring after the results of SVE system emissions monitoring data collected during four consecutive quarters indicate asymptotic trends in the mass removal rate of PCE from the subsurface.

5.7.1.2 Groundwater

The cleanup level for PCE in groundwater is based on the MTCA Method A cleanup level of 5 µg/l, which will be attained at the points of compliance to meet the requirements of MTCA. Compliance with the groundwater cleanup level will be considered complete when concentrations of PCE in groundwater collected from monitoring wells at the Site are confirmed to be below the MTCA Method A cleanup level for four consecutive quarters.

5.7.2 Points of Compliance

The points of compliance are defined in WAC 173-340-200 as the locations where cleanup levels established in accordance with WAC 173-340-720 through WAC 173-340-760 will be attained

to meet the requirements of MTCA. Once the cleanup levels have been attained at the defined points of compliance, the Site is no longer considered to be a threat to human health or the environment.

5.7.2.1 Point of Compliance for Soil

The point of compliance for soil is defined as all soil at the Site where analytical results of in-situ soil samples have detected concentrations of PCE above the MTCA Method A cleanup level of 0.05 mg/kg for PCE in soil.

5.7.2.2 Point of Compliance for Groundwater

The point of compliance for groundwater is defined as groundwater throughout the Site, from the uppermost level of the saturated zone extending vertically to the lowest depth that has been adversely affected by releases of PCE.

5.8 RESTORATION TIME FRAME

Cleanup within a reasonable time frame that considers Site-specific factors is mandated by WAC 173-340-360[4][b]. The relative toxicity of PCE at the Site is moderate, but the potential risk posed to human health and the environment currently is low, based on the commercial zoning of the property, the presence of a building and pavement over much of the area of contamination, and the absence of sensitive receptors near the Site. However, risk to human health and the environment still exists, and makes the cleanup action necessary.

The SVE system will operate for an estimated 3 to 5 years to reduce the concentrations of PCE in subsurface soil at the Site to below the Method A cleanup levels. Groundwater will be monitored quarterly or bi-annually throughout the duration of active SVE system operation.

6.0 CLEANUP ACTION DESIGN AND IMPLEMENTATION

This section summarizes the evaluation of feasible cleanup alternatives for the Site, and describes the selected cleanup action, including specific details on the conceptual design and installation of the SVE system and the compliance monitoring plan. Management of waste generated by the cleanup action also is discussed. The design of the SVE system is shown in detail in the Engineering Design Drawings that are provided in Appendix G.

6.1 EVALUATION OF CLEANUP ALTERNATIVES

Prior to the selection of a cleanup action, MTCA requires development and evaluation of cleanup action alternatives that protect human health and the environment by eliminating, reducing, or controlling the risks posed through each exposure pathway and migration route (WAC 173-340-350). Based on the results of the subsurface investigations, technically feasible cleanup alternatives were identified and evaluated by Farallon. The following cleanup alternatives were evaluated:

- Excavation and source removal of soil containing concentrations of PCE exceeding the MTCA Method A cleanup level;
- In-situ remediation of soil using SVE technologies and monitored natural attenuation of groundwater;
- Long-term monitoring of biodegradation and natural attenuation of PCE in soil and groundwater; and
- No cleanup action.

Farallon determined that source removal of soil containing concentrations of PCE is not technically feasible because of the location of the contaminated soil under the Site building, and the presence of PCE exceeding the MTCA Method A cleanup level in soil to depths of 80 feet bgs. "No cleanup action" is not an applicable cleanup alternative, because there are concentrations of hazardous substances in soil and groundwater above established MTCA cleanup levels.

The previous investigation work included focused feasibility testing of SVE for treatment of vadose zone soil at the Site. The results of the SVE pilot testing conducted by Farallon in June 2005 confirmed that SVE is a technically feasible cleanup alternative for cleanup of vadose zone soil, based on the following factors:

- SVE is a proven technology for remediation of the PCE present in soil, and is acceptable to Ecology;
- The large vadose zone at the Site, which extends to a depth of approximately 85 feet bgs, is favorable to SVE technology;
- The Site geology (primarily sand with some silt), is conducive to application of SVE technology;
- The restoration timeframe is reasonable, typically ranging from 1 to 10 years, depending on Site-specific subsurface conditions, the volume of PCE released, and the distribution of PCE in the subsurface;
- There is a rapid reduction of contamination in the subsurface; and
- The incremental costs to implement, operate, and maintain SVE technology should be reasonable in view of the incremental benefits of this technology relative to other, more expensive cleanup technologies.

6.2 CLEANUP ACTION DESCRIPTION

The selected cleanup action for the Site will incorporate an SVE system to remediate residual source concentrations of PCE in soil, and long-term monitoring of the natural attenuation of PCE in groundwater. The SVE system will be designed to provide the maximum treatment radius practical to remove PCE present in soil and soil vapor in the vadose zone. The preliminary SVE design is based on a conservative treatment radius of 35 feet from each SVE well in the Shallow Zone (Figure 7), and 50 feet from each SVE well in the Intermediate Zone (Figure 8). The SVE pilot test results indicated that an even greater treatment radius could be attained depending on the vertical placement of the well screen in the subsurface. Therefore, conservative treatment radii were used for the SVE system. The SVE pilot test results indicated that the proposed SVE

system will likely remove concentrations of PCE potentially present in soil throughout the Site. Detailed engineering drawings of the SVE system are included in Appendix G.

The aboveground SVE system equipment will be placed outside the western side of the Site building, and will include all equipment necessary for operation of the SVE system, with required shut-off and safety controls. The preliminary design for the SVE system layout is shown on Sheet 3 of Appendix G.

The cleanup action will use multiple approaches to attain the cleanup objectives. Concentrations of PCE in soil will be remediated using the SVE system. The SVE well network on the Site will remove soil vapor PCE -containing from the vadose zone. The asphalt cap over the Site will enhance the SVE process by acting as a surface seal, while also protecting against precipitation-infiltration to the underlying soil. The SVE well network on the Site will consist of 11 Shallow Zone and 7 Intermediate Zone SVE wells. The Shallow Zone SVE wells will be installed to a depth of approximately 20 feet bgs; the Intermediate Zone SVE wells will be installed to a depth of approximately 65 feet bgs (Appendix G). The basis for selection of the SVE system design parameters is presented in the following sections.

6.3 CLEANUP ACTION COMPONENTS

The cleanup action will consist of construction, installation, operation, and maintenance of an SVE system, and monitored natural attenuation of groundwater. Each of the components of the cleanup action is described in detail below.

6.3.1 Soil Vapor Extraction System

The SVE system will consist of 11 SVE wells constructed in the Shallow Zone and 7 SVE wells constructed in the Intermediate Zone (Figures 7 and 8, respectively). The SVE wells will be constructed of 4-inch diameter Schedule 40 PVC. The top of each SVE well casing will be connected via 2-inch diameter Schedule 40 PVC piping to a piping manifold located near the SVE system vacuum blower in the remediation compound. The remediation compound will be located on the western side of the Site building (Figure 9). The piping from the SVE wells will be connected to controls and mechanical equipment in the remediation compound. The piping will be installed in underground trenches at a depth of 12 to 24 inches bgs. The trenches will be

backfilled with the excavated native material, if suitable, or with imported sand material. The preliminary layout of the trenches is depicted on Sheet 3 of Appendix G. Specific details regarding the SVE wells and SVE system equipment are described in the following subsections.

6.3.1.1 Shallow Zone Soil Vapor Extraction Wells

SVE wells MW-3, MW-4, and MW-6 are screened in the Shallow Zone, and will be used for the cleanup action. SVE well MW-3 is screened from 4 to 20 feet bgs; monitoring well MW-4 is screened from 8 to 24 feet bgs; and monitoring well MW-6 is screened from 7.5 to 12.5 feet bgs (Table 2). Eight additional SVE wells will be installed in the Shallow Zone at the locations shown on Figure 7 as part of the construction of the SVE system. The Shallow Zone SVE wells will be constructed to extend across the upper silt, silty sand, and sand encountered from the surface to total depths ranging from 20 to 25 feet bgs at the Site. The eight additional Shallow Zone SVE wells will be installed with screened intervals extending from 3 to 20 feet bgs.

6.3.1.2 Intermediate Zone Soil Vapor Extraction Wells

Groundwater monitoring wells MW-1 and MW-8 are screened in the Intermediate Zone, and will be used as SVE wells for the cleanup action. SVE well MW-1 is screened from 50 to 60 feet bgs; SVE well MW-8 is screened from 35 to 60 feet bgs (Table 2). Five additional SVE wells will be installed in the Intermediate Zone at the locations shown on Figure 8 as part of the construction of the SVE system. The Intermediate Zone SVE wells will be constructed to extend across the dense silty gravels encountered to total depths of 50 to 65 feet bgs at the Site. The five additional Intermediate Zone SVE wells will be installed with screened intervals extending from 25 to 60 feet bgs.

6.3.1.3 Soil Vapor Extraction System Equipment

The aboveground components of the SVE system will be installed on the western side of the Dry Cleaner suite as shown on Figure 9. The area will include the SVE vacuum blower, condensate water knockout drum, water sump, activated carbon treatment canisters, SVE piping arrays, and power requirements, and will be fenced for security.

Shut-off and safety switches will be installed in the equipment compound, and will include switches for high water in the knockout, loss of vacuum, and motor overload.

Vacuum for the SVE system will be applied using a Roton DR 909 regenerative blower, which will produce a flow of 100 scfm at a 10-IOW vacuum from the SVE wells. The SVE system vacuum blower will be housed in a sound-controlled enclosure inside the remediation compound to prevent the volume of the blower from exceeding 65 decibels during operation. An air-water separator (water knockout) will be installed in the intake pipe to the vacuum blower to protect the blower from water intake (Appendix G). An automatic vacuum blower motor shutoff will be installed as a safety measure in the event of a high water level in the condensate water knockout, or motor overload. Each connection pipe will contain a control valve and monitoring assembly at the well-head. Water sumps will be installed at the base of each of the SVE lines in the remediation compound to collect water (Appendix G). The water will be manually pumped from the sumps, as needed, to reduce the amount of condensate collected in the water knockout tank.

Electrical power connections for the Site building will require modification to accommodate the power requirements of the SVE system. Electrical power for the SVE system will be connected to a separate meter from that for the Dry Cleaner suite.

The extracted vapor from the SVE system will be sampled and monitored during the initial 48 hours of operation to determine whether concentrations of PCE are within the air discharge limits established by ORCAA. It is not anticipated that the vapors will exceed the discharge limits. Air will be discharged via a 4-inch diameter stack extended 10 feet above the roof of the Site building (Appendix G). Monitoring and sampling of the vapor emissions will continue weekly following start-up of the SVE system. The schedule will be modified thereafter, as needed, based on the sampling results.

6.3.2 Soil Vapor Extraction System Start-up, Operation, and Maintenance

Frequent monitoring will be conducted during the initial start-up period to ensure proper functioning of the SVE system. The initial start-up will occur after SVE system installation.

Following start-up and evaluation to assess performance of the SVE system, routine O&M will commence. O&M of the system will take place until the cleanup levels are attained, and decommissioning of the SVE system on the Site is agreed upon by Ecology.

6.3.3 Monitored Natural Attenuation of Groundwater

The selected cleanup action for groundwater at the Site is monitored natural attenuation. Operation of the SVE system will remove PCE from soil and soil vapor in the vadose zone, and will reduce the volume of PCE that continues to act as a source to groundwater. Reduction of the volume of the source area eventually will result in a reduction of PCE in groundwater through dilution and dispersion. Additionally, the SVE system will enhance the natural attenuation of groundwater by increasing the amount of volatilization of PCE at the water table surface.

Groundwater conditions will be monitored at the Site on a regular basis to document the natural attenuation of groundwater over time. The monitoring locations, frequency, scope, and duration of sampling is detailed in the Sampling and Analysis Plan (Appendix A). Additional cleanup alternatives may be evaluated in the future to address concentrations of PCE in groundwater, if necessary.

6.4 CLEANUP ACTION COMPLIANCE MONITORING PLAN

Compliance monitoring will be performed in accordance with the requirements of WAC 173-340-410, and will address protection and performance monitoring. The monitoring requirements are described briefly in this section, and are presented in detail in the Sampling and Analysis Plan (Appendix A). Quality assurance requirements for the project are detailed in the Quality Assurance Project Plan (Appendix B).

6.4.1 Protection Monitoring

Protection monitoring will be conducted to confirm that human health and the environment are being protected during installation and operation of the SVE system. Protection monitoring will include evaluating ambient air, soil, and groundwater quality during installation of the SVE system. Protection monitoring will also include evaluating the concentration of PCE in SVE system emissions during operation of the SVE system. SVE system emissions protection

monitoring will be conducted concurrently with SVE system emissions performance monitoring and is discussed in Section 6.4.2.1, Soil Vapor Extraction System Emissions Monitoring.

During excavation and piping installation activities, ambient air quality within the breathing zone of the workers will be monitored using a photoionization detector in accordance with the HASP. The potential airborne constituent of concern during subsurface work is PCE. The Occupational Safety and Health Administration Permissible Exposure Level for an 8-hour time-weighted average for PCE is 100 parts per million. The Site-specific HASP provides the details for air monitoring during subsurface activities at the Site (Appendix C). Air monitoring will be conducted continually during subsurface work; concentrations of volatile organic vapors will be documented daily. If concentrations of volatile organic vapors exceed 20 parts per million above background concentrations for a duration of 2 minutes or more, the work area will be evacuated, and options for maintaining worker safety will be evaluated.

Soil containing concentrations of PCE will be excavated and temporarily contained on Site during the trenching activities for installation of the SVE system. The laboratory analytical results of soil samples collected during subsurface investigations at the Site will be used to evaluate the quality of soil in the planned excavation areas. If necessary, soil samples will be collected from stockpiled soil and/or excavation limits to ascertain handling and disposal requirements. Specific soil handling and disposal requirements are not included in the CAP because it is not anticipated that soil protection monitoring will be required.

It is not anticipated that groundwater will be encountered during installation of the SVE system. However, if groundwater is encountered, groundwater samples will be collected for laboratory analysis to evaluate handling and disposal requirements. Specific soil handling and disposal requirements are not included in the CAP because it is not anticipated that groundwater protection monitoring will be required.

6.4.2 Performance Monitoring

Performance monitoring will include SVE system emissions monitoring and groundwater monitoring. A description of the scope of work for SVE system emissions performance monitoring and groundwater performance monitoring is provided in the following subsections.

The details regarding the frequency, scope, duration, and analyses are provided in the Sampling and Analysis Plan (Appendix A).

6.4.2.1 Soil Vapor Extraction System Emissions Monitoring

Soil vapor emissions from the SVE system will be collected and analyzed for PCE during the duration of SVE system operation to:

- Ensure compliance with local, state, and federal emissions standards;
- Ensure protection of human health and the environment; and
- Evaluate the progress of the cleanup action.

Prior to start-up of the SVE system, soil vapor samples will be collected from each SVE well to establish a baseline for performance monitoring, and from the SVE system outflow to document the concentrations of PCE emitted from the SVE system. The soil vapor samples will be collected from a sampling port installed in each SVE pipe, and from the total SVE system outflow in the remediation compound using a Tedlar bag. The soil vapor samples will be submitted for laboratory analysis of PCE by EPA Method 8260B.

Following start-up, soil vapor samples will be collected monthly for the first 3 months of operation of the SVE system. The soil vapor samples will be analyzed in the field using a GasTec sampling pump with a PCE-specific colorimetric detection tube. Soil vapor samples will be collected from each SVE well, and from the total SVE system outflow. After the first 3 months of operation, soil vapor samples will be collected quarterly through the end of the first year of operation. After 1 year of operation of the SVE system, soil vapor from each well will be collected and submitted for laboratory analysis of PCE to evaluate the progress of the cleanup action by direct comparison to the baseline monitoring results.

Soil vapor sampling will continue on a regular basis throughout the duration of SVE system operation. Trends noted in the concentrations of PCE removed from the vadose zone over time will be used to evaluate the completeness of the cleanup action. The SVE

system will operate continuously until the trends of PCE in soil vapor are asymptotic or non-detectable for at least four consecutive quarterly monitoring events, and rebound in the concentrations of PCE in any SVE well after a shutdown period of 3 months is less than 5 percent.

6.4.2.2 Groundwater Monitoring

Performance groundwater monitoring will be conducted during the cleanup action on a quarterly basis through the first year of SVE system operation, and bi-annually thereafter to evaluate the performance of the SVE system and monitor and document groundwater quality at the Site. Bi-annual groundwater monitoring and sampling events will be conducted at Deep Zone monitoring wells MW-2, MW-5, and MW-7 to document groundwater quality.

6.4.3 Confirmation Monitoring

The cleanup action will include soil and groundwater confirmation monitoring to demonstrate that the cleanup objectives have been met in accordance with WAC 173-340. A brief description of the soil and groundwater confirmation monitoring planned for the cleanup action is provided below. Additional details on the scope, duration, and anticipated laboratory analyses for the confirmation monitoring are provided in the Sampling and Analysis Plan (Appendix A).

6.4.3.1 Soil Confirmation Monitoring

Confirmation monitoring for soil will be conducted when the results of SVE system emissions performance monitoring and groundwater performance monitoring indicate that the cleanup goals have been met. Confirmation soil sampling will be performed by completing soil borings in areas where concentrations of PCE exceeding the MTCA Method A cleanup levels were identified previously.

6.4.3.2 Groundwater Confirmation Monitoring

Confirmation monitoring for groundwater will be conducted when the results of the performance groundwater monitoring indicate that concentrations of PCE have decreased to below the MTCA Method A cleanup level. Groundwater samples will be collected

from each of the monitoring wells on a quarterly basis for a minimum of four quarters. Additional cleanup alternative may be evaluated in the future, if necessary, to address remaining concentrations of PCE in groundwater.

6.5 MANAGEMENT OF INVESTIGATION-DERIVED WASTE

Management of waste materials generated by the subsurface installation of SVE system components and the groundwater monitoring is addressed in this section. Generated wastes will include:

- Waste soil generated by installation of the SVE system and piping;
- Wastewater generated during performance groundwater monitoring and decontamination of drilling and excavation equipment; and
- Condensate water generated during operation of the SVE system.

Management of the wastes generated from on-Site activities includes methods and the proposed location(s) for storing or staging waste pending disposal or treatment, and methods for handling, sampling, analyzing, and disposal of the generated wastes.

All waste soil and debris generated by excavation activities described herein will be temporarily stored on Site in 55-gallon steel drums, or in lined and covered roll-off bins pending the analytical results from waste disposal profiling. All waste characterization activities will be performed in accordance with the Dangerous Waste Regulations as stipulated in WAC 173-303. Waste that meets the criteria for dangerous waste will be managed accordingly. Wastes that do not meet the criteria for dangerous waste will be managed as solid waste in accordance with WAC 173-351.

Wastewater generated during installation of the SVE system or during groundwater monitoring will be temporarily stored on Site in labeled 55-gallon steel drums pending receipt of the analytical results for wastewater profiling. Wastewater will be removed on a quarterly basis.

7.0 SCHEDULE

The engineering design drawings will be finalized following approval of the selected cleanup action by Ecology. Farallon will initiate the permitting process and complete contractual arrangements with the selected contractor to conduct installation of the SVE system following finalization of the design drawings. Approximately 15 to 20 days will be required to install the SVE system following approval by all parties and completion of permitting. System start-up activities will occur once all components of the SVE system have been installed. Start-up activities for the SVE system, including optimization of SVE system performance, are anticipated to take up to 5 days to complete. SVE system emissions monitoring activities will be performed during the initial 48 hours of operation. The first groundwater performance monitoring and sampling event will occur after approximately 3 months of SVE system operation.

Progress reports will be completed quarterly following completion and start-up of the SVE system. The first progress report will include a summary of SVE system installation and engineered as-built plans for the SVE system, and a description of deviations, if any, from the engineered construction plans. All progress reports will include a summary of groundwater performance monitoring and sampling, SVE system emissions performance monitoring and sampling, O&M of the SVE system, trends in concentrations of PCE in groundwater and SVE system emissions, and an estimate of the progress made toward the cleanup goals. When the results of performance and confirmation monitoring indicate that the cleanup action is complete, a Site Closure Report will be prepared to demonstrate that the cleanup levels for the cleanup action have been met at the points of compliance, and to provide plans for long-term monitoring, if required.

8.0 DOCUMENTATION REQUIREMENTS

Documentation of the cleanup action will be prepared to meet MTCA requirements. Upon client review and approval, all applicable and relevant documentation generated for the cleanup action will be submitted to Ecology. A copy of cleanup action-related documents will be retained in Farallon files for a minimum of 3 years after completion of the project. The following subsections describe the data management, field documentation, health and safety specifications, and progress reporting applicable to the cleanup action.

8.1 DATA MANAGEMENT

An established document control system will be implemented during the cleanup action, which includes the following, as appropriate: (1) field documentation; (2) boring and well logs; (3) well purging and sampling documentation; (4) sampling event data documentation; (5) chain-of-custody documentation; (6) waste inventory documentation; (7) waste management labels; and (8) sample labels. Disposal manifests and Annual Dangerous Waste reports for the wastes generated at and disposed of from the Site also will be maintained and submitted with the project documentation.

8.2 FIELD DOCUMENTATION

Field personnel will keep a daily log of field activities recorded on a Field Report form. Field notes will be as descriptive and inclusive as possible so as to enable an independent party to reconstruct the sampling activities from the recorded information. Language will be objective, factual, and free of inappropriate terminology. At a minimum, field documentation will include the date, job number, project identification and location, weather conditions, sample collection data, field equipment used, and any activities performed in a manner other than as specified in the CAP. In addition, if other forms are completed or used (e.g., Chain-of-Custody form, maps) they will be cited in the Field Report form and attached.

Supplementary documentation forms will be used to augment the Field Report form. Supplementary forms will include Well Purging and Sampling forms, Waste Inventory forms, and other means of recording sampling event data that may be developed to facilitate

documentation of the cleanup action. Project-specific forms for documenting system settings and performance will be used to ensure thorough and complete documentation during system O&M work at the Site.

A written Chain-of-Custody form will be filled out by the field sampling team at the time each sample is obtained. The Chain-of-Custody procedures are designed to create an accurate written record that can be used to trace the possession and handling of a sample from the moment of its collection through analysis and reporting of analytical values. These procedures will be followed whenever samples are collected, transferred, stored, analyzed, or destroyed.

All samples submitted to the laboratory will be accompanied by the Chain-of-Custody form. which will be checked for accuracy and completeness, signed, and dated by the laboratory sample custodian accepting the sample. At the laboratory, each sample will be assigned a unique, sequential laboratory identification number that will be stamped or written on the Chain-of-Custody form.

At the laboratory, all samples will be held under internal custody in the Sample Control room under the appropriate storage conditions (e.g., ambient, refrigeration, frozen). The laboratory Project Manager assigned to this project will be responsible for tracking the status of the samples throughout the laboratory. Samples signed out of the Sample Control room will be recorded in a sample control logbook by the analyst who will prepare the samples for analysis.

The Chain-of-Custody form will include the Site name, sample identification number (assigned by the sampler in the field), sample date, sample location, and type of analysis required (if any). Whenever a sample is transferred from one party to another, both parties will sign the Chain of-Custody form and record the date and time of the transfer to ensure sample integrity from collection through analysis.

Sample labels will be prepared and affixed to containers immediately prior to sample collection. All soil samples collected during the cleanup action will be uniquely identified, labeled, and documented in the field at the time of collection. Affixed to each sample container will be a

label identifying project name, project number, sample identification number, preservatives (if applicable), required analyses, and date and time of sample collection.

8.3 HEALTH AND SAFETY

A HASP is required for all Site activities (WAC 173-340-810 and WAC 296-62). The HASP must comply with the requirements of the Occupational Safety and Health Act of 1970 and the Washington Industrial Safety and Health Act (RCW 49.17). Ecology approval of the HASP is not required. A copy of the HASP for the Site is provided in Appendix C.

8.4 FINAL DESIGN DRAWINGS

Final design drawings for the cleanup action will be prepared under the direction of a Professional Engineer, licensed in the State of Washington. The design drawings will provide specifications and construction details sufficient for solicitation of cost bids, procurement of equipment, and installation of the SVE system depicted. Final design drawings will be completed after the selected cleanup action has been approved. As-built drawings of the SVE system will be included in the first quarterly progress report following installation and start-up of the SVE system.

8.5 PROGRESS REPORTS

A quarterly progress report will be prepared following the first groundwater performance monitoring and sampling event, approximately 3 months after start-up of the SVE system. At a minimum, this report will include:

- Details of SVE system installation and construction, including as-built drawings;
- Compliance monitoring data for soil, groundwater, and vapor emissions sampling, as applicable;
- A brief report by the Project Engineer, asserting that the SVE system was constructed to design specifications; and
- An O&M Plan that will include at a minimum: details on SVE system components, their operation, safety features, and protocols; routine maintenance operations necessary to

optimize SVE system operation; and emergency procedures. The O&M Plan will be prepared following system start-up to guide routine O&M, and will be included as an appendix to the first quarterly progress report.

Following completion of the first quarterly progress report, additional progress reports will be prepared quarterly to document the ongoing progress of the cleanup action. The progress reports will include the following elements:

- A list of on-Site activities that have taken place during the reporting period;
- A detailed description of deviations from required tasks that are not otherwise documented in the project plans or amendments;
- All reviewed final data, including laboratory analyses, compliance monitoring data, waste disposal documentation, and O&M data;
- Groundwater elevation data and performance and/or confirmation monitoring results, presented in summary tables and on figures; and
- A list of activities and deliverables for the upcoming quarter, if different from those scheduled.

Unless otherwise specified, progress reports and other documents submitted pursuant to the cleanup action will be sent in draft format prior to further distribution. Once the documents have been finalized and client authorization has been received, copies of the progress reports will be distributed to the appropriate parties.

9.0 REFERENCES

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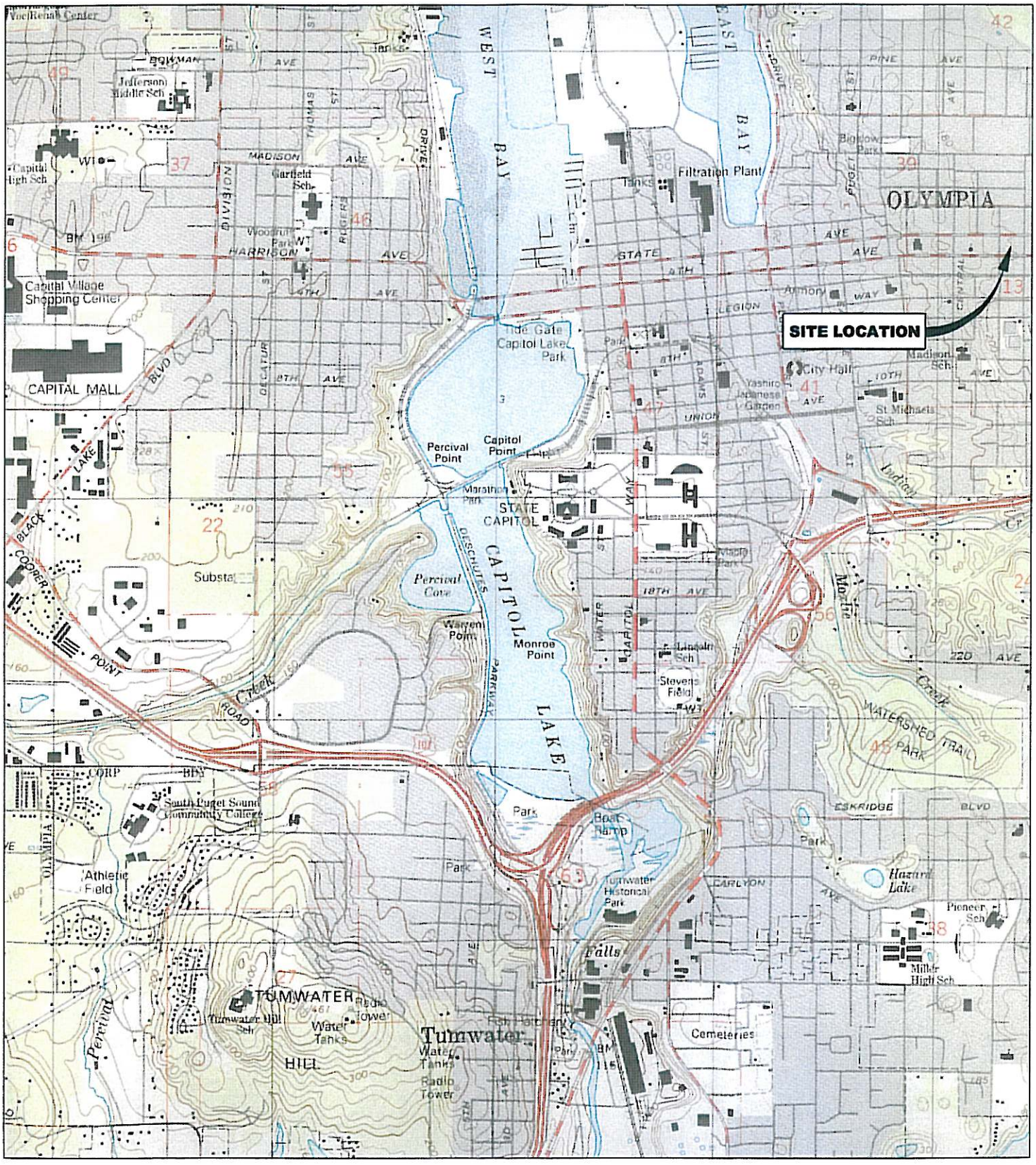
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FIGURES

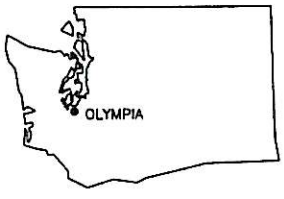
Draft Cleanup Action Plan
Allison's Norge Village
120 Northeast Turner Street
Olympia, Washington
Facility Site ID# 14214153

Farallon PN: 663-010



REFERENCE: 7.5 MINUTE USGS QUADRANGLE TUMWATER, WASHINGTON. DATED 1997

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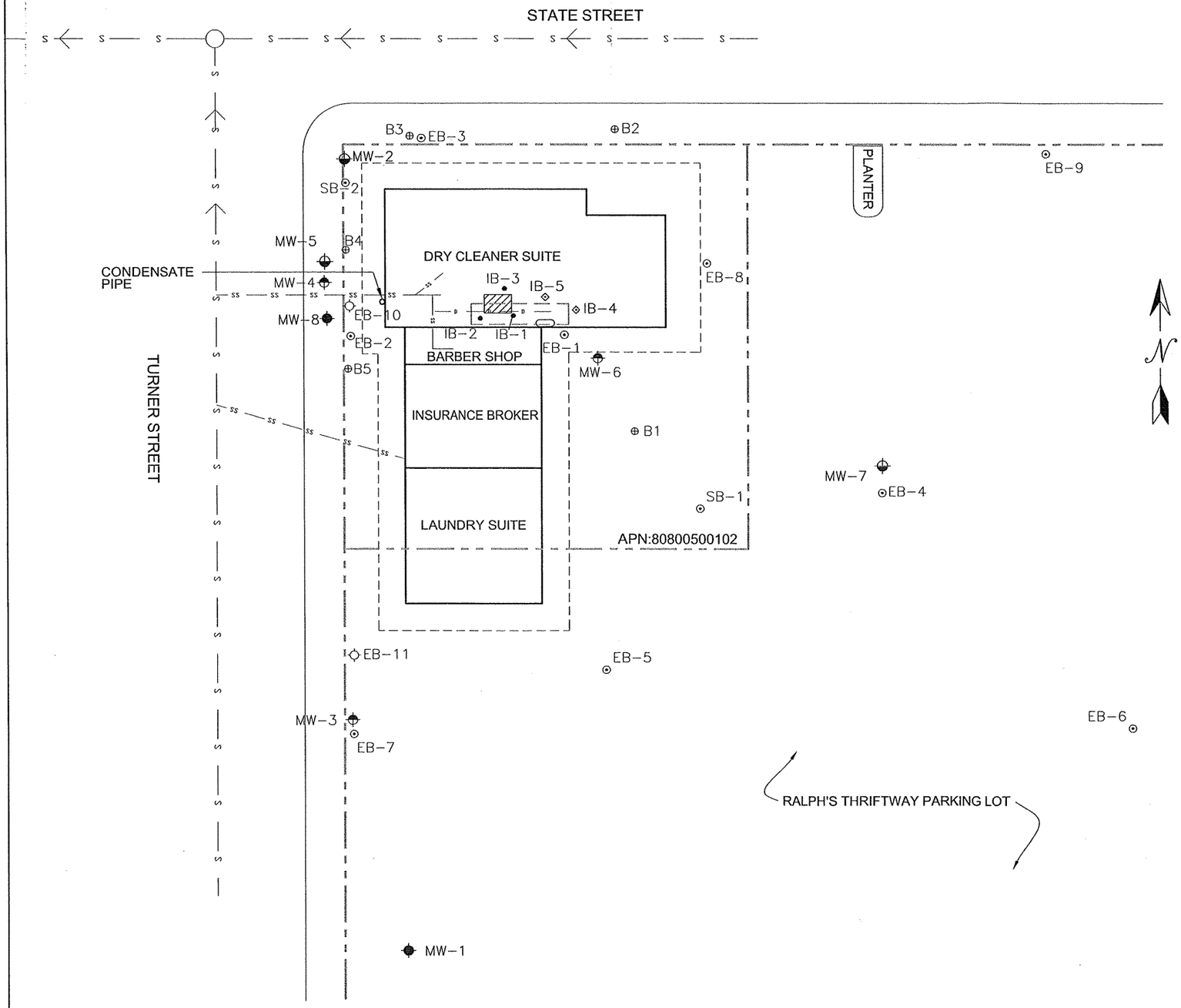
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320 3rd Ave. NE,
Issaquah, WA 98027

FIGURE 1

SITE LOCATION
ALLISON'S NORGE VILLAGE
120 NORTHEAST TURNER STREET
OLYMPIA, WASHINGTON

FARALLON PN: 663-010

Drawn By: DEW	Checked By: RC	Date: 9/24/04	Disk Reference: 663010



LEGEND

MW-4	SHALLOW ZONE SVE WELL
MW-8	INTERMEDIATE ZONE SVE WELL
MW-7	DEEP ZONE GROUNDWATER MONITORING WELL
B1	SOIL PROBE (SALTBUSH, 2000)
EB-11	EXTERIOR BORING (FARALLON 2004)
EB-8	EXTERIOR BORING (G-LOGICS, INC., 2001)
IB-1	INTERIOR BORING (G-LOGICS, INC., 2001)
IB-4	INTERIOR BORING (FARALLON 2004)
	DRY CLEANING MACHINE
	165-GALLON ABOVE-GROUND STORAGE TANK
	FORMER COIN-OPERATED DRY CLEANING AREA
	PROPERTY BOUNDARY
	ROOF LINE
	FLOOR DRAIN
	SANITARY SEWER MAIN
	SIDE SEWER
SVE	SOIL VAPOR EXTRACTION
APN:80800500102	ASSESSORS PARCEL NUMBER

NOTE:

1. ALL LOCATIONS ARE APPROXIMATE
2. SOURCE MAP: G-LOGICS, INC.

0 30

APPROXIMATE SCALE IN FEET

DRAFT

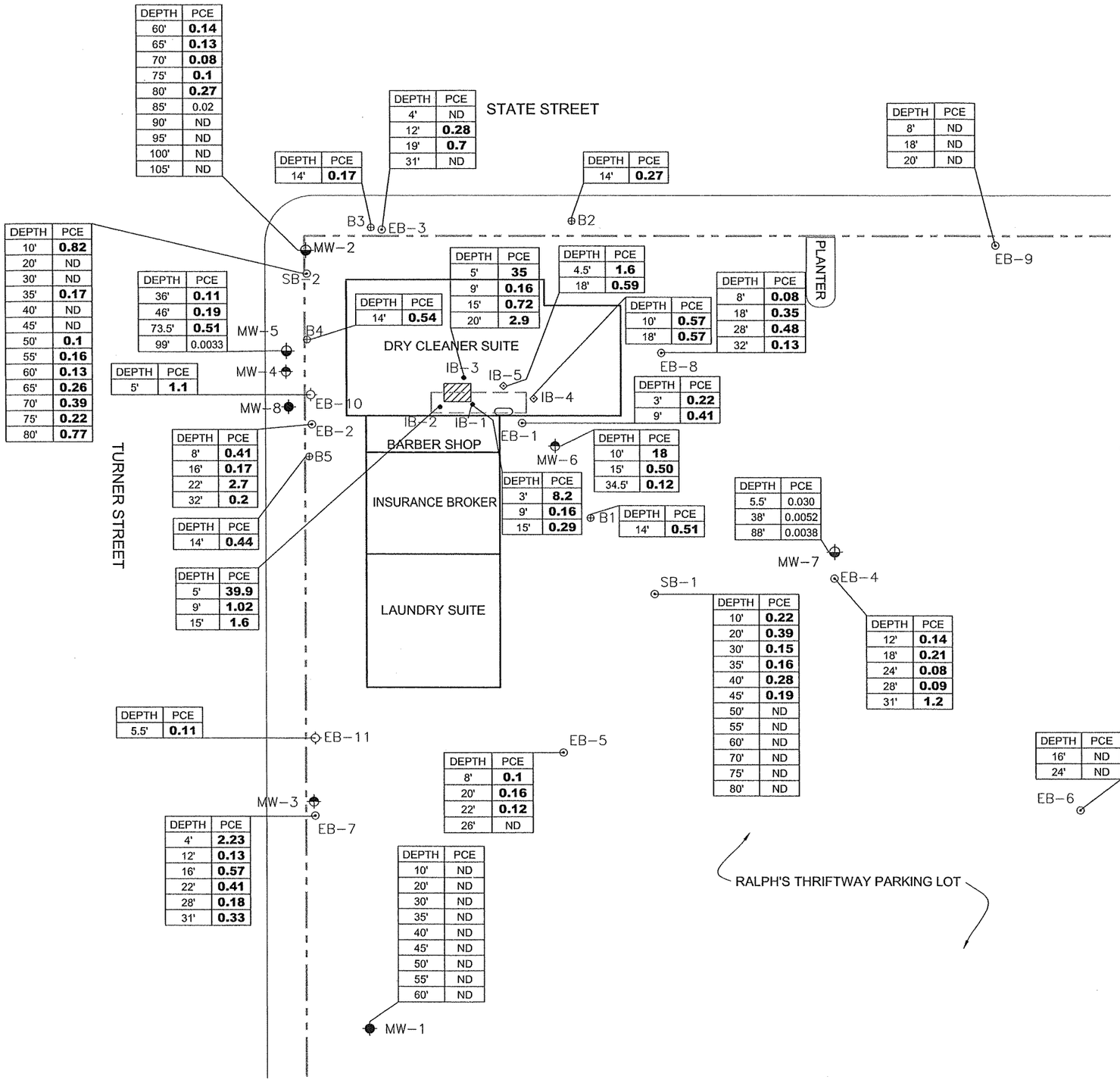
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FIGURE 2

SITE PLAN
ALLISON'S NORGE VILLAGE
120 NORTHEAST TURNER STREET
OLYMPIA, WASHINGTON

FARALLON PN: 663-010

Drawn By: DEW	Checked By: RC	Date: 11/7/05	Disk Reference: 663010



LEGEND

- MW-4 — SHALLOW SVE WELL
- MW-8 — INTERMEDIATE ZONE SVE WELL
- MW-7 — DEEP ZONE GROUNDWATER MONITORING WELL
- B1 — SOIL PROBE (SALTBUSH, 2000)
- EB-11 — EXTERIOR BORING (FARALLON 2004)
- EB-8 — EXTERIOR BORING (G-LOGICS, INC., 2001)
- IB-1 — INTERIOR BORING (G-LOGICS, INC., 2001)
- IB-4 — INTERIOR BORING (FARALLON 2004)
- DRY CLEANING MACHINE
- 165-GALLON ABOVE-GROUND STORAGE TANK
- FORMER COIN-OPERATED DRY CLEANING AREA
- PROPERTY BOUNDARY
- SVE — SOIL VAPOR EXTRACTION

ALL RESULTS IN MILLIGRAMS PER KILOGRAM
DEPTH IN FEET BELOW GROUND SURFACE
PCE = TETRACHLOROETHENE
BOLD = DENOTES CONCENTRATIONS ARE ABOVE THE MTCA CLEANUP LEVELS
ND = NOT DETECTED ABOVE THE LABORATORY PQL

NOTE:

1. ALL LOCATIONS ARE APPROXIMATE
2. SOURCE MAP: G-LOGICS, INC.

0 30
APPROXIMATE SCALE IN FEET

DRAFT

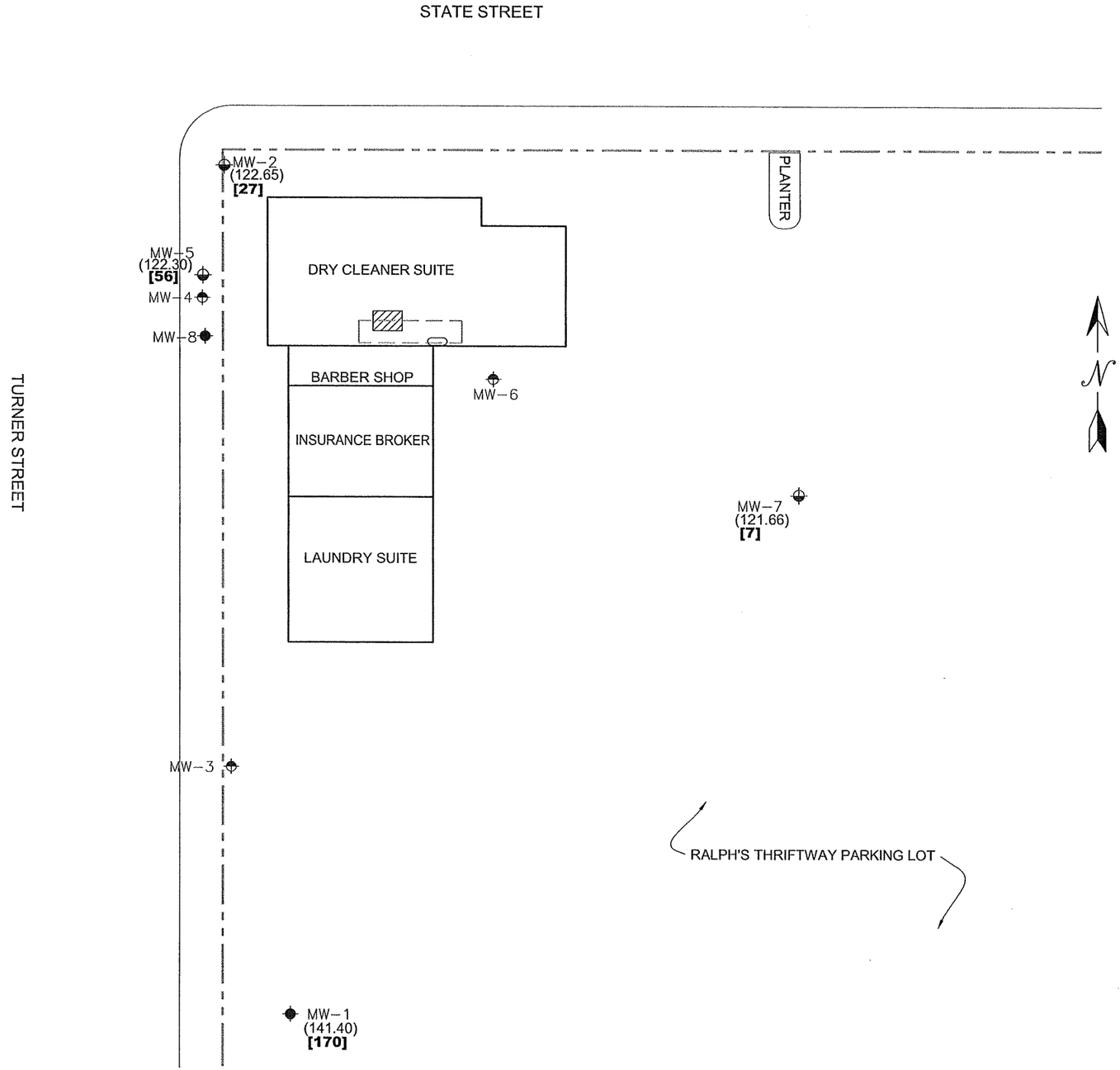
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FIGURE 3

PCE ANALYTICAL RESULTS FOR SOIL
ALLISON'S NORGE VILLAGE
120 NORTHEAST TURNER STREET
OLYMPIA, WASHINGTON

FARALLON PN: 663-010

Drawn By: DEW	Checked By: RC	Date: 11/2/05	Disk Reference: 663010



LEGEND

MW-4	SHALLOW ZONE SVE WELL
MW-8	INTERMEDIATE ZONE SVE WELL
MW-7	DEEP ZONE GROUNDWATER MONITORING WELL
	DRY CLEANING MACHINE
	165-GALLON ABOVE-GROUND STORAGE TANK
	FORMER COIN-OPERATED DRY CLEANING AREA
	PROPERTY BOUNDARY
SVE	SOIL VAPOR EXTRACTION
(141.40)	GROUNDWATER ELEVATION IN FEET (6/23/05)

ALL RESULTS IN MICROGRAMS PER LITER

[56] TETRACHLOROETHENE (PCE) IN GROUNDWATER

BOLD DENOTES CONCENTRATIONS ARE ABOVE THE MTCA CLEANUP LEVELS

NOTE:

1. ALL LOCATIONS ARE APPROXIMATE
2. SOURCE MAP: G-LOGICS, INC.

0 30

APPROXIMATE SCALE IN FEET

DRAFT

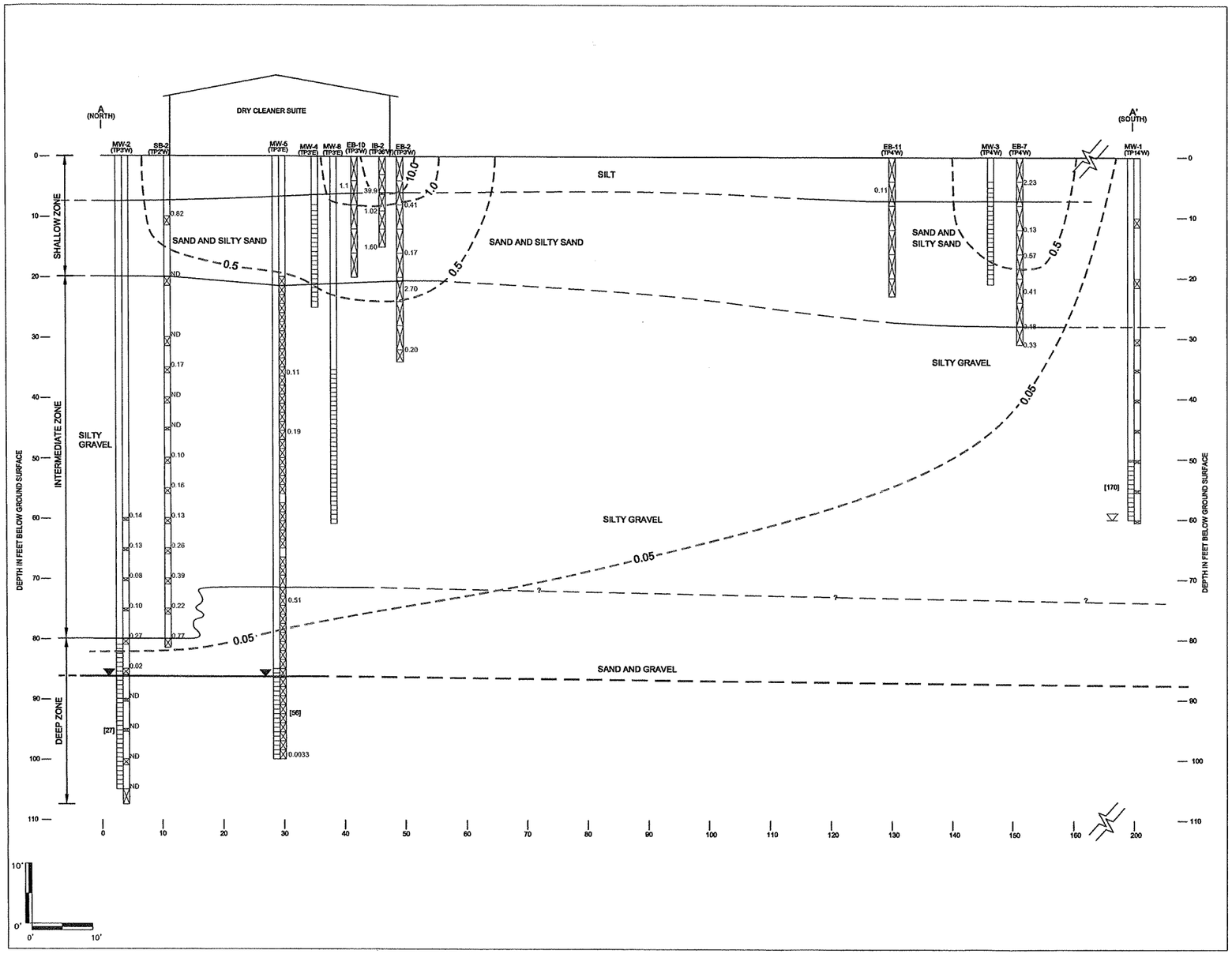
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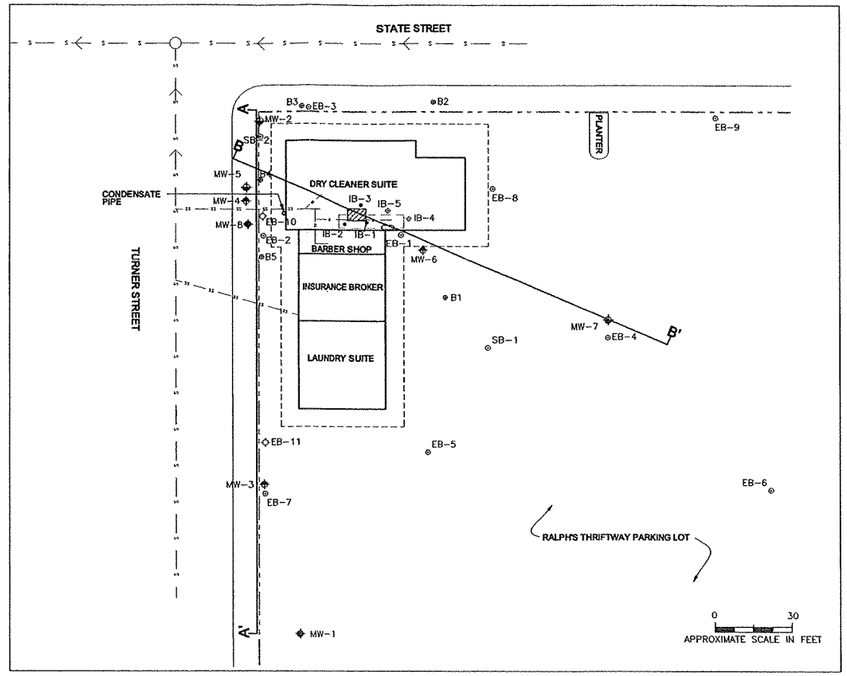
FIGURE 4

PCE ANALYTICAL RESULTS FOR GROUNDWATER
(DECEMBER 2004)
ALLISON'S NORGE VILLAGE
120 NORTHEAST TURNER STREET
OLYMPIA, WASHINGTON

FARALLON PN: 663-010

Drawn By: DEW	Checked By: RC	Date: 11/7/05	Disk Reference: 663010





LEGEND

- MW-4 — SHALLOW ZONE SVE WELL
- MW-8 — INTERMEDIATE ZONE SVE WELL
- MW-7 — DEEP ZONE GROUNDWATER MONITORING WELL
- B1 — SOIL PROBE (SALTBUSH, 2000)
- EB-11 — EXTERIOR BORING (FARALLON 2004)
- EB-8 — EXTERIOR BORING (G-LOGICS, INC., 2001)
- IB-1 — INTERIOR BORING (G-LOGICS, INC., 2001)
- IB-4 — INTERIOR BORING (FARALLON 2004)
- DRY CLEANING MACHINE
- 165-GALLON ABOVE-GROUND STORAGE TANK
- FORMER COIN-OPERATED DRY CLEANING AREA
- A — A' — LINE OF CROSS-SECTION
- PROPERTY BOUNDARY
- ROOF LINE
- FLOOR DRAIN
- SANITARY SEWER MAIN
- SIDE SEWER
- SVE — SOIL VAPOR EXTRATION

NOTE:
1. ALL LOCATIONS ARE APPROXIMATE
2. SOURCE MAP: G-LOGICS, INC.

MW-7 (TP 1W)

- BORING/MONITORING WELL LOCATION TRANSPOSED (TP) IN FEET, NORTH (N), SOUTH (S), EAST (E), OR WEST (W) OF CROSS-SECTION LINE.
- BLANK CASING
- SOIL SAMPLE INTERVAL
- GROUNDWATER LEVEL (12/23/2004)
- PERCHED GROUNDWATER-BEARING ZONE
- WATER TABLE
- WELL SCREEN INTERVAL

- 17 — CONCENTRATION OF PCE IN SOIL SAMPLE IN MILLIGRAMS PER KILOGRAM (mg/kg)
- ND — NON DETECT AT THE LABORATORY PRACTICAL QUANTITATION LIMIT
- [56] — PCE CONCENTRATION IN GROUNDWATER IN MICROGRAMS PER LITER (ug/L)
- 0.05 — ISOPLETH CONTOUR LINE WITH PCE CONCENTRATION IN mg/kg

DRAFT

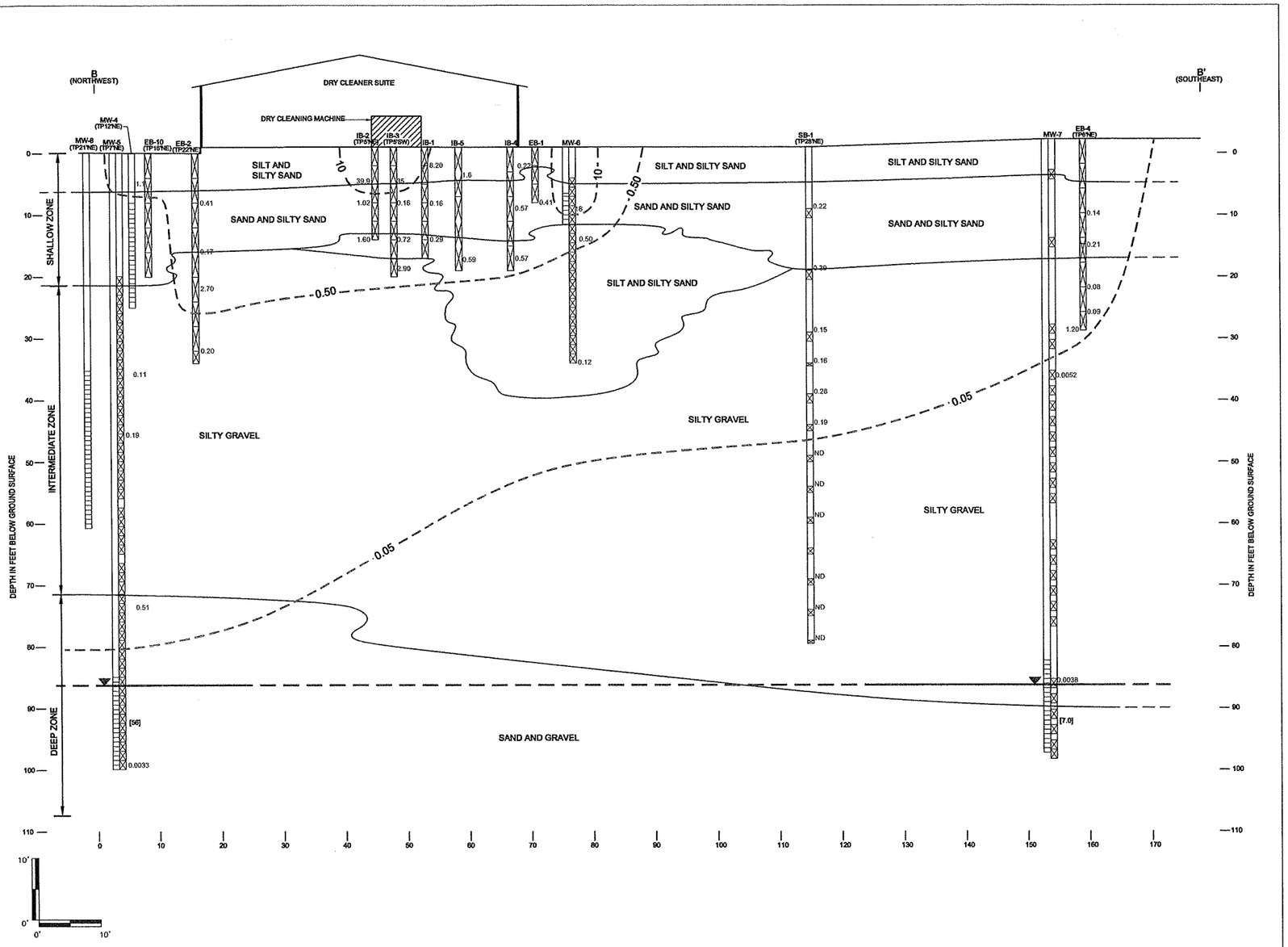
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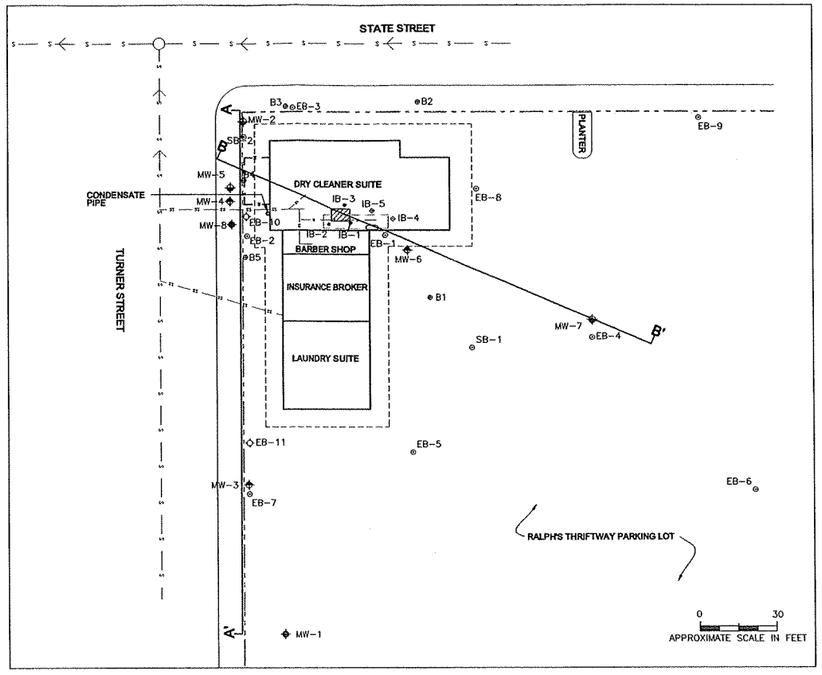
FIGURE 5

CROSS-SECTION A-A'
ALLISON'S NORGE VILLAGE
120 NORTHEAST TURNER STREET
OLYMPIA, WASHINGTON

FARALLON PN: 663-010

Drawn By: DEW	Checked By: RC	Date: 11/2/05	Disk Reference: 663010





LEGEND

- MW-4 — SHALLOW ZONE SVE WELL
- MW-8 — INTERMEDIATE ZONE SVE WELL
- MW-7 — DEEP ZONE GROUNDWATER MONITORING WELL
- B1 — SOIL PROBE (SALTBUSH, 2000)
- EB-11 — EXTERIOR BORING (FARALLON 2004)
- EB-8 — EXTERIOR BORING (G-LOGICS, INC., 2001)
- IB-1 — INTERIOR BORING (G-LOGICS, INC., 2001)
- IB-4 — INTERIOR BORING (FARALLON 2004)
- DRY CLEANING MACHINE
- 165-GALLON ABOVE-GROUND STORAGE TANK
- FORMER COIN-OPERATED DRY CLEANING AREA
- A — A' LINE OF CROSS-SECTION
- PROPERTY BOUNDARY
- ROOF LINE
- FLOOR DRAIN
- SANITARY SEWER MAIN
- SIDE SEWER
- SVE SOIL VAPOR EXTRATION

NOTE:
1. ALL LOCATIONS ARE APPROXIMATE
2. SOURCE MAP: G-LOGICS, INC.

MW-7 (TP 1W)
- BORING/MONITORING WELL LOCATION TRANSPOSED (TP) IN FEET, NORTH (N), SOUTH (S), EAST (E), OR WEST (W) OF CROSS-SECTION LINE.
- BLANK CASING
- SOIL SAMPLE INTERVAL
- GROUNDWATER LEVEL (12/23/2004)
- WATER TABLE
- WELL SCREEN INTERVAL

- 17 — CONCENTRATION OF PCE IN SOIL SAMPLE IN MILLIGRAMS PER KILOGRAM (mg/kg)
- ND — NON DETECT AT THE LABORATORY PRACTICAL QUANTITATION LIMIT
- [56] — PCE CONCENTRATION IN GROUNDWATER IN MICROGRAMS PER LITER (ug/L)
- 0.05 — ISOPLETH CONTOUR LINE WITH PCE CONCENTRATION IN mg/kg

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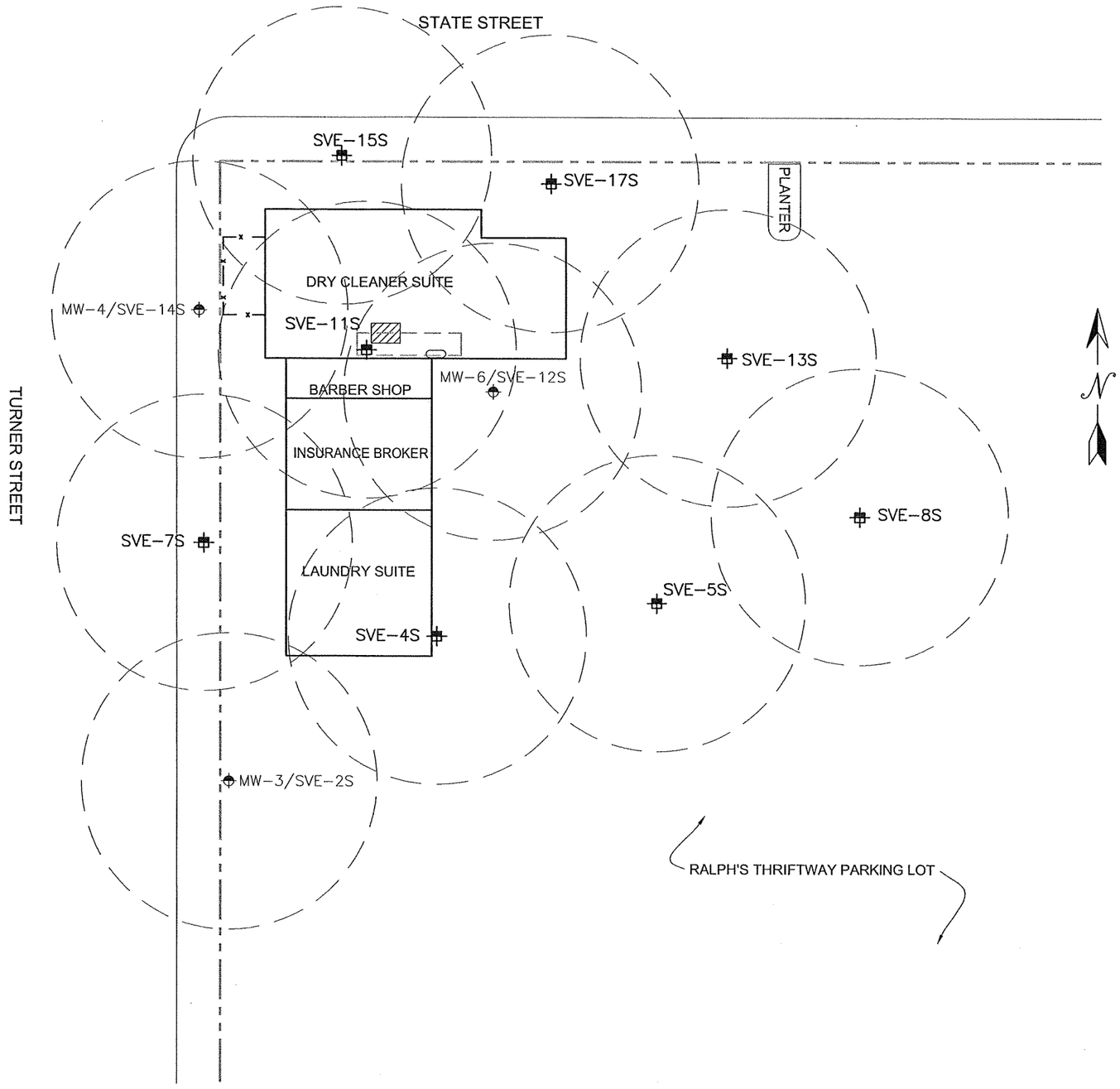
FIGURE 6

CROSS-SECTION B-B'
ALLISON'S NORGE VILLAGE
120 NORTHEAST TURNER STREET
OLYMPIA, WASHINGTON

FARALLON PN: 663-010

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LEGEND

MW–4/SVE–14S	EXISTING SHALLOW ZONE SVE WELL
SVE–8S	PROPOSED SHALLOW ZONE SVE WELL
	RADIUS OF influence
	DRY CLEANING MACHINE
	165-GALLON ABOVE-GROUND STORAGE TANK
	FORMER COIN-OPERATED DRY CLEANING AREA
	PROPERTY BOUNDARY
SVE	SOIL VAPOR EXTRACTION

NOTE:

1. ALL LOCATIONS ARE APPROXIMATE
2. SOURCE MAP: G-LOGICS, INC.

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APPROXIMATE SCALE IN FEET

DRAFT

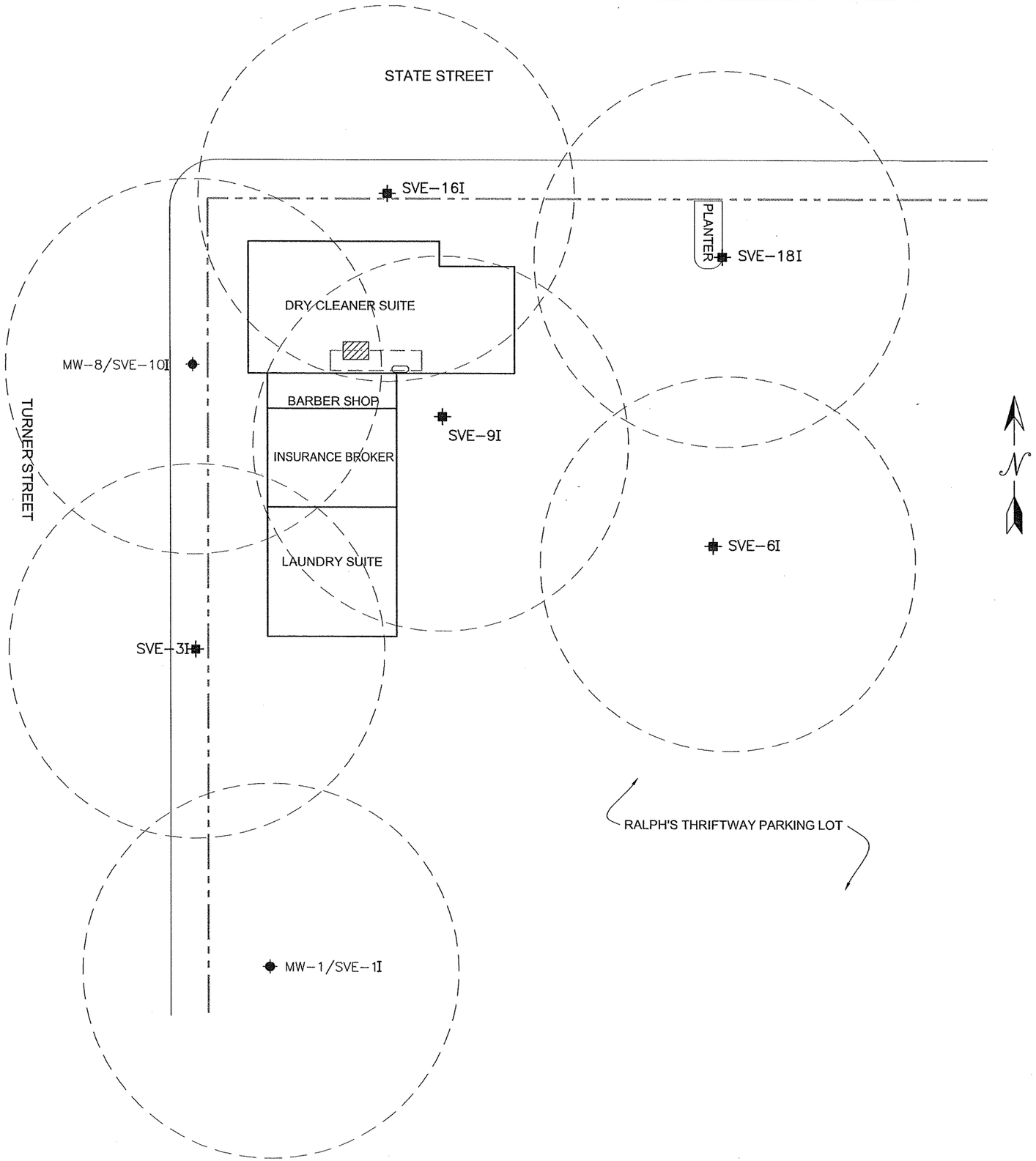
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FIGURE 7

PROPOSED SHALLOW ZONE SVE WELLS
ALLISON'S NORGE VILLAGE
120 NORTHEAST TURNER STREET
OLYMPIA, WASHINGTON

FARALLON PN: 663–010

Drawn By: DEW	Checked By: RC	Date: 11/7/05	Disk Reference: 663010



LEGEND

MW-1/SVE-1	EXISTING INTERMEDIATE ZONE SVE WELL
SVE-16I	PROPOSED INTERMEDIATE ZONE SVE WELL
	RADIUS OF influence
	DRY CLEANING MACHINE
	165-GALLON ABOVE-GROUND STORAGE TANK
	FORMER COIN-OPERATED DRY CLEANING AREA
	PROPERTY BOUNDARY
SVE	SOIL VAPOR EXTRACTION

NOTE:

1. ALL LOCATIONS ARE APPROXIMATE
2. SOURCE MAP: G-LOGICS, INC.

0 30

APPROXIMATE SCALE IN FEET

DRAFT

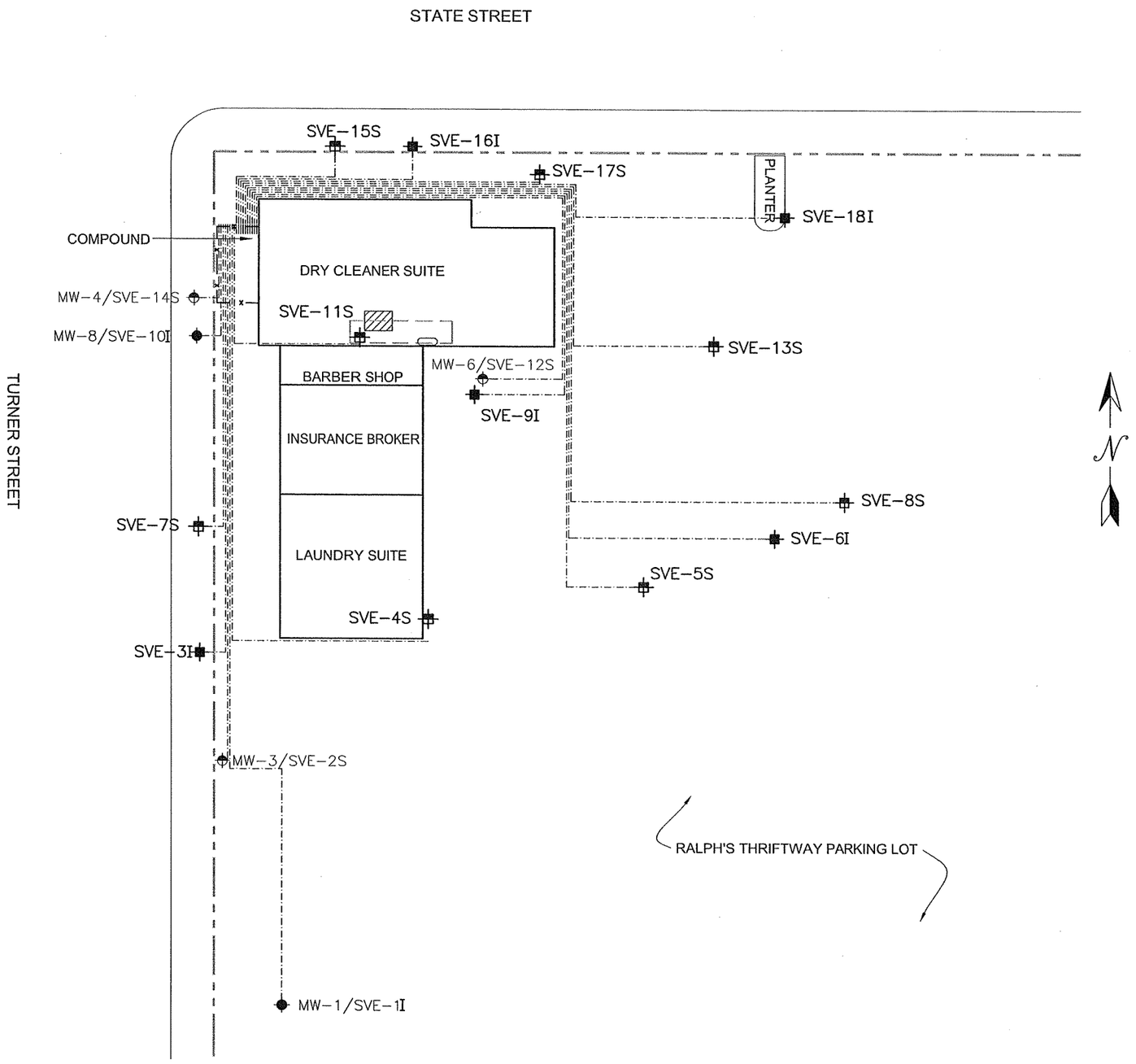
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FIGURE 8

PROPOSED INTERMEDIATE ZONE SVE WELLS
ALLISON'S NORGE VILLAGE
120 NORTHEAST TURNER STREET
OLYMPIA, WASHINGTON

FARALLON PN: 663-010

Drawn By: DEW	Checked By: RC	Date: 11/7/05	Disk Reference: 663010



LEGEND

MW–4/SVE–14S	EXISTING SHALLOW ZONE SVE WELL
SVE–8S	PROPOSED SHALLOW ZONE SVE WELL
MW–1/SVE–1	EXISTING INTERMEDIATE ZONE SVE WELL
SVE–16I	PROPOSED INTERMEDIATE ZONE SVE WELL
	DRY CLEANING MACHINE
	165-GALLON ABOVE-GROUND STORAGE TANK
	FORMER COIN-OPERATED DRY CLEANING AREA
	SOIL VAPOR EXTRACTION LINE
	PROPERTY BOUNDARY
SVE	SOIL VAPOR EXTRACTION

NOTE:

1. ALL LOCATIONS ARE APPROXIMATE
2. SOURCE MAP: G-LOGICS, INC.

0 30

APPROXIMATE SCALE IN FEET

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FIGURE 9

REMEDIAL SYSTEM DESIGN LAYOUT
ALLISON'S NORGE VILLAGE
120 NORTHEAST TURNER STREET
OLYMPIA, WASHINGTON

FARALLON PN: 663–010

Drawn By:DEW	Checked By: RC	Date: 11/7/05	Disk Reference: 663010

TABLES

Draft Cleanup Action Plan
Allison's Norge Village
120 Northeast Turner Street
Olympia, Washington
Facility Site ID# 14214153

Farallon PN: 663-010

Table 1
Soil Analytical Results for Selected HVOCs
Allison's Norge Village
Olympia, Washington
Farallon PN: 663-010

Location Identification	Sample Identification	Date Sampled	Sampled By	Depth (feet)[1]	Analytical Results (milligrams per kilogram)				
					PCE[2]	TCE[2]	cis-1,2-Dichloroethene[2]	trans-1,2-Dichloroethene[2]	Vinyl Chloride[2]
B1	B1	3/2/2000	Saltbush	14	**0.51**	ND	ND	ND	ND
B2	B2	3/2/2000	Saltbush	14	**0.27**	ND	ND	ND	ND
B3	B3	3/2/2000	Saltbush	14	**0.17**	ND	ND	ND	ND
B4	B4	3/2/2000	Saltbush	14	**0.54**	ND	ND	ND	ND
B5	B5	3/2/2000	Saltbush	14	**0.44**	ND	ND	ND	ND
EB-1	EB-1-3	4/4/2001	G-Logics	3	**0.22**	ND	ND	ND	ND
	EB-1-9	4/4/2001	G-Logics	9	**0.41**	ND	ND	ND	ND
	EB-1-9	4/4/2001	G-Logics	Duplicate	**0.41**	ND	ND	ND	ND
EB-2	EB-2-8	4/4/2001	G-Logics	8	**0.41**	ND	ND	ND	ND
	EB-2-16	4/4/2001	G-Logics	16	**0.17**	ND	ND	ND	ND
	EB-2-22	4/4/2001	G-Logics	22	**2.7**	ND	ND	ND	ND
	EB-2-32	4/4/2001	G-Logics	32	**0.2**	ND	ND	ND	ND
EB-3	EB-3-4	4/4/2001	G-Logics	4	ND	ND	ND	ND	ND
	EB-3-12	4/4/2001	G-Logics	12	**0.28**	ND	ND	ND	ND
	EB-3-19	4/4/2001	G-Logics	19	**0.7**	ND	ND	ND	ND
	EB-3-31	4/4/2001	G-Logics	31	ND	ND	ND	ND	ND
EB-4	EB-4-12	4/4/2001	G-Logics	12	**0.14**	ND	ND	ND	ND
	EB-4-18	4/4/2001	G-Logics	18	**0.21**	ND	ND	ND	ND
	EB-4-24	4/4/2001	G-Logics	24	**0.08**	ND	ND	ND	ND
	EB-4-24	4/4/2001	G-Logics	Duplicate	**0.08**	ND	ND	ND	ND
	EB-4-28	4/4/2001	G-Logics	28	**0.09**	ND	ND	ND	ND
	EB-4-31	4/4/2001	G-Logics	31	**1.2**	ND	ND	ND	ND
MTCA Cleanup Levels for Soil					**0.05**[3]	**0.03**[3]	**800**[4]	**1,600**[4]	**240**[4]

DRAFT - Issued for Client Review

Table 1
Soil Analytical Results for Selected HVOCs
Allison's Norge Village
Olympia, Washington
Farallon PN: 663-010

Location Identification	Sample Identification	Date Sampled	Sampled By	Depth (feet)[1]	Analytical Results (milligrams per kilogram)				
					PCE[2]	TCE[2]	cis-1,2-Dichloroethene[2]	trans-1,2-Dichloroethene[2]	Vinyl Chloride[2]
EB-5	EB-5-8	4/4/2001	G-Logics	8	**0.1**	ND	ND	ND	ND
	EB-5-20	4/4/2001	G-Logics	20	**0.16**	ND	ND	ND	ND
	EB-5-22	4/4/2001	G-Logics	22	**0.12**	ND	ND	ND	ND
	EB-5-22	4/4/2001	G-Logics	Duplicate	**0.1**	ND	ND	ND	ND
	EB-5-26	4/4/2001	G-Logics	26	ND	ND	ND	ND	ND
	EB-5-26	4/4/2001	G-Logics	Duplicate	ND	ND	ND	ND	ND
EB-6	EB-6-16	4/4/2001	G-Logics	16	ND	ND	ND	ND	ND
	EB-6-24	4/4/2001	G-Logics	24	ND	ND	ND	ND	ND
EB-7	EB-7-4	4/4/2001	G-Logics	4	**2.23**	ND	ND	ND	ND
	EB-7-12	4/4/2001	G-Logics	12	**0.13**	ND	ND	ND	ND
	EB-7-16	4/4/2001	G-Logics	16	**0.57**	ND	ND	ND	ND
	EB-7-22	4/4/2001	G-Logics	22	**0.41**	ND	ND	ND	ND
	EB-7-28	4/4/2001	G-Logics	28	**0.18**	ND	ND	ND	ND
	EB-7-31	4/4/2001	G-Logics	31	**0.33**	ND	ND	ND	ND
EB-8	EB-8-8	4/4/2001	G-Logics	8	**0.08**	ND	ND	ND	ND
	EB-8-18	4/4/2001	G-Logics	18	**0.35**	ND	ND	ND	ND
	EB-8-28	4/4/2001	G-Logics	28	**0.48**	ND	ND	ND	ND
	EB-8-32	4/4/2001	G-Logics	32	**0.13**	ND	ND	ND	ND
MTCA Cleanup Levels for Soil					**0.05[3]**	**0.03[3]**	**800[4]**	**1,600[4]**	**240[4]**

Table 1
Soil Analytical Results for Selected HVOCs
Allison's Norge Village
Olympia, Washington
Farallon PN: 663-010

Location Identification	Sample Identification	Date Sampled	Sampled By	Depth (feet)[1]	Analytical Results (milligrams per kilogram)				
					PCE[2]	TCE[2]	cis-1,2-Dichloroethene[2]	trans-1,2-Dichloroethene[2]	Vinyl Chloride[2]
EB-9	EB-9-8	4/4/2001	G-Logics	8	ND	ND	ND	ND	ND
	EB-9-18	4/4/2001	G-Logics	18	ND	ND	ND	ND	ND
	EB-9-20	4/4/2001	G-Logics	20	ND	ND	ND	ND	ND
	EB-9-20	4/4/2001	G-Logics	Duplicate	ND	ND	ND	ND	ND
EB-10	EB10-5	12/6/2004	Farallon	5	**1.1**	< 0.0012	< 0.0012	< 0.0012	< 0.0012
EB-11	EB11-5.5	12/6/2004	Farallon	5.5	**0.11**	< 0.0012	< 0.0012	< 0.0012	< 0.0012
IB-1	IB-1-3	4/4/2001	G-Logics	3	**8.2**	ND	ND	ND	ND
	IB-1-9	4/4/2001	G-Logics	9	**0.16**	ND	ND	ND	ND
	IB-1-15	4/4/2001	G-Logics	15	**0.29**	ND	ND	ND	ND
IB-2	IB-2-5	4/4/2001	G-Logics	5	**39.9**	ND	ND	ND	ND
	IB-2-9	4/4/2001	G-Logics	9	**1.02**	ND	ND	ND	ND
	IB-2-15	4/4/2001	G-Logics	15	**1.6**	ND	ND	ND	ND
IB-3	IB-3-5	4/4/2001	G-Logics	5	**35**	ND	ND	ND	ND
	IB-3-9	4/4/2001	G-Logics	9	**0.16**	ND	ND	ND	ND
	IB-3-15	4/4/2001	G-Logics	15	**0.72**	ND	ND	ND	ND
	IB-3-20	4/4/2001	G-Logics	20	**2.9**	ND	ND	ND	ND
IB-4	IB4-10	12/6/2004	Farallon	10	**0.57**	< 0.0011	< 0.0011	< 0.0011	< 0.0011
	IB4-18	12/6/2004	Farallon	18	**0.57**	< 0.0013	< 0.0013	< 0.0013	< 0.0013
IB-5	IB5-4.5	12/6/2004	Farallon	4.5	**1.6**	< 0.0012	< 0.0012	< 0.0012	< 0.0012
	IB5-18	12/6/2004	Farallon	18	**0.59**	< 0.0013	< 0.0013	< 0.0013	< 0.0013
MTCA Cleanup Levels for Soil					**0.05[3]**	**0.03[3]**	**800[4]**	**1,600[4]**	**240[4]**

Table 1
Soil Analytical Results for Selected HVOCs
Allison's Norge Village
Olympia, Washington
Farallon PN: 663-010

Location Identification	Sample Identification	Date Sampled	Sampled By	Depth (feet)[1]	Analytical Results (milligrams per kilogram)				
					PCE[2]	TCE[2]	cis-1,2-Dichloroethene[2]	trans-1,2-Dichloroethene[2]	Vinyl Chloride[2]
SB-1	SB-1-10	8/1/2001	G-Logics	10	**0.22**	ND	ND	ND	ND
	SB-1-20	8/1/2001	G-Logics	20	**0.39**	ND	ND	ND	ND
	SB-1-30	8/1/2001	G-Logics	30	**0.15**	ND	ND	ND	ND
	SB-1-35	8/1/2001	G-Logics	35	**0.16**	ND	ND	ND	ND
	SB-1-40	8/1/2001	G-Logics	40	**0.28**	ND	ND	ND	ND
	SB-1-45	8/1/2001	G-Logics	45	**0.19**	ND	ND	ND	ND
	SB-1-50	8/1/2001	G-Logics	50	ND	ND	ND	ND	ND
	SB-1-55	8/1/2001	G-Logics	55	ND	ND	ND	ND	ND
	SB-1-60	8/1/2001	G-Logics	60	ND	ND	ND	ND	ND
	SB-1-70	8/1/2001	G-Logics	70	ND	ND	ND	ND	ND
	SB-1-75	8/1/2001	G-Logics	75	ND	ND	ND	ND	ND
	SB-1-80	8/1/2001	G-Logics	80	ND	ND	ND	ND	ND
	SB-1-80	8/1/2001	G-Logics	Duplicate	ND	ND	ND	ND	ND
MTCA Cleanup Levels for Soil					**0.05[3]**	**0.03[3]**	**800[4]**	**1,600[4]**	**240[4]**

Table 1
Soil Analytical Results for Selected HVOCs
Allison's Norge Village
Olympia, Washington
Farallon PN: 663-010

Location Identification	Sample Identification	Date Sampled	Sampled By	Depth (feet)[1]	Analytical Results (milligrams per kilogram)				
					PCE[2]	TCE[2]	cis-1,2-Dichloroethene[2]	trans-1,2-Dichloroethene[2]	Vinyl Chloride[2]
SB-2	SB-2-10	8/1/2001	G-Logics	10	**0.82**	ND	ND	ND	ND
	SB-2-20	8/1/2001	G-Logics	20	ND	ND	ND	ND	ND
	SB-2-20	8/1/2001	G-Logics	Duplicate	ND	ND	ND	ND	ND
	SB-2-30	8/1/2001	G-Logics	30	ND	ND	ND	ND	ND
	SB-2-35	8/1/2001	G-Logics	35	**0.17**	ND	ND	ND	ND
	SB-2-40	8/1/2001	G-Logics	40	ND	ND	ND	ND	ND
	SB-2-45	8/1/2001	G-Logics	45	ND	ND	ND	ND	ND
	SB-2-50	8/1/2001	G-Logics	50	**0.1**	ND	ND	ND	ND
	SB-2-55	8/1/2001	G-Logics	55	**0.16**	ND	ND	ND	ND
	SB-2-60	8/1/2001	G-Logics	60	**0.13**	ND	ND	ND	ND
	SB-2-65	8/1/2001	G-Logics	65	**0.26**	ND	ND	ND	ND
	SB-2-70	8/1/2001	G-Logics	70	**0.39**	ND	ND	ND	ND
	SB-2-75	8/1/2001	G-Logics	75	**0.22**	ND	ND	ND	ND
	SB-2-80	8/1/2001	G-Logics	80	**0.77**	ND	ND	ND	ND
MTCA Cleanup Levels for Soil					**0.05**[3]	**0.03**[3]	**800**[4]	**1,600**[4]	**240**[4]

Table 1
Soil Analytical Results for Selected HVOCs
Allison's Norge Village
Olympia, Washington
Farallon PN: 663-010

Location Identification	Sample Identification	Date Sampled	Sampled By	Depth (feet)[1]	Analytical Results (milligrams per kilogram)				
					PCE[2]	TCE[2]	cis-1,2-Dichloroethene[2]	trans-1,2-Dichloroethene[2]	Vinyl Chloride[2]
MW-1	MW-1-10	8/2/2001	G-Logics	10	ND	ND	ND	ND	ND
	MW-1-10	8/2/2001	G-Logics	Duplicate	ND	ND	ND	ND	ND
	MW-1-20	8/2/2001	G-Logics	20	ND	ND	ND	ND	ND
	MW-1-30	8/2/2001	G-Logics	30	ND	ND	ND	ND	ND
	MW-1-35	8/2/2001	G-Logics	35	ND	ND	ND	ND	ND
	MW-1-40	8/2/2001	G-Logics	40	ND	ND	ND	ND	ND
	MW-1-45	8/2/2001	G-Logics	45	ND	ND	ND	ND	ND
	MW-1-50	8/2/2001	G-Logics	50	ND	ND	ND	ND	ND
	MW-1-55	8/2/2001	G-Logics	55	ND	ND	ND	ND	ND
	MW-1-60	8/2/2001	G-Logics	60	ND	ND	ND	ND	ND
MW-2	MW-2-60	8/22/2001	G-Logics	60	**0.14**	ND	ND	ND	ND
	MW-2-65	8/22/2001	G-Logics	65	**0.13**	ND	ND	ND	ND
	MW-2-70	8/22/2001	G-Logics	70	**0.08**	ND	ND	ND	ND
	MW-2-75	8/22/2001	G-Logics	75	**0.1**	ND	ND	ND	ND
	MW-2-80	8/22/2001	G-Logics	80	**0.27**	ND	ND	ND	ND
	MW-2-85	8/22/2001	G-Logics	85	0.02	ND	ND	ND	ND
	MW-2-90	8/22/2001	G-Logics	90	ND	ND	ND	ND	ND
	MW-2-95	8/22/2001	G-Logics	95	ND	ND	ND	ND	ND
	MW-2-100	8/22/2001	G-Logics	100	ND	ND	ND	ND	ND
	MW-2-105	8/22/2001	G-Logics	105	ND	ND	ND	ND	ND
	MW-2-105	8/22/2001	G-Logics	Duplicate	ND	ND	ND	ND	ND
MTCA Cleanup Levels for Soil					**0.05[3]**	**0.03[3]**	**800[4]**	**1,600[4]**	**240[4]**

Table 1
Soil Analytical Results for Selected HVOCs
Allison's Norge Village
Olympia, Washington
Farallon PN: 663-010

Location Identification	Sample Identification	Date Sampled	Sampled By	Depth (feet)[1]	Analytical Results (milligrams per kilogram)				
					PCE[2]	TCE[2]	cis-1,2-Dichloroethene[2]	trans-1,2-Dichloroethene[2]	Vinyl Chloride[2]
MW-5	MW5-36	12/9/2004	Farallon	36	**0.11**	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	MW5-46	12/9/2004	Farallon	46	**0.19**	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	MW5-73.5	12/10/2004	Farallon	73.5	**0.51**	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	MW5-99	12/10/2004	Farallon	99	0.0033	< 0.0011	< 0.0011	< 0.0011	< 0.0011
MW-6	MW6-10	12/8/2004	Farallon	10	**18**	< 0.11	< 0.11	< 0.11	< 0.11
	MW6-15	12/8/2004	Farallon	15	**0.50**	< 0.0011	< 0.0011	< 0.0011	< 0.0011
	MW6-34.5	12/8/2004	Farallon	34.5	**0.12**	< 0.0010	< 0.0010	< 0.0010	< 0.0010
MW-7	MW7-5.5	12/13/2004	Farallon	5.5	0.030	< 0.0011	< 0.0011	< 0.0011	< 0.0011
	MW7-38	12/13/2004	Farallon	38	0.0052	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	MW7-88	12/13/2004	Farallon	88	0.0038	< 0.0011	< 0.0011	< 0.0011	< 0.0011
MTCA Cleanup Levels for Soil					**0.05[3]**	**0.03[3]**	**800[4]**	**1,600[4]**	**240[4]**

NOTES:

Results in **BOLD** denote concentrations are above MTCA cleanup levels.

< denotes concentration is less than the laboratory practical quantitation limit (PQL) indicated.

[1]Depth in feet below ground surface.

[2]Analyzed by U.S. Environmental Protection Agency Method 8260B.

[3]Washington State Department of Ecology Model Toxics Control Act Cleanup Regulation (MTCA) Method A Soil Cleanup Level, Chapter 173-340 of the Washington Administrative Code, as amended February 2001.

[4]MTCA Cleanup Levels and Risk Calculations (CLARC) Method B Soil Cleanup Level, Version 3.1, updated November 2001.

Farallon = Farallon Consulting, L.L.C.

HVOCs = halogenated volatile organic compounds

ND= not detected above the laboratory PQL

PCE = tetrachloroethene

TCE = trichloroethene

Table 2
Well Construction Summary
Allison's Norge Village
Olympia, Washington
Farallon PN: 663-010

Well Identification	Date Installed	Casing Elevation (feet)[1]	Total Well Depth (feet)[2]	Casing Diameter (inches)	Depth of Screened Interval (feet)[2]
Shallow Zone SVE Wells					
MW-3	12/8/2004	—	19.79	4.0	4-20
MW-4	12/8/2004	—	24.3	4.0	8-24
MW-6	12/8/2004	—	12.81	4.0	7.5-12.5
Intermediate Zone SVE Wells					
MW-1	8/2/2001	200.46	60.44	2.0	50-60
MW-8	6/22/2005	—	60.55	4.0	35-60
Deep Zone Wells					
MW-2	8/22/2001	199.6	95.16	2.0	80-105
MW-5	12/10/2005	199.77	97.69	2.0	85-100
MW-7	12/14/2005	201.88	97.51	2.0	85-100

NOTES:

[1]Elevation of top of casing using relative datum of 200 feet. Surveyed Elevations by PLS.

[2]Depth below top of well casing.

[3]Elevation in feet relative to survey datum.

— = casing elevation not surveyed

SVE = soil vapor extraction

Table 3
Groundwater Analytical Results for Selected HVOCs
Allison's Norge Village
Olympia, Washington
Farallon PN: 663-010

Monitoring Well	Date Sampled	Sampled By	Screened Zone (feet)[1]	Analytical Results (micrograms per liter)[2]				
				PCE	TCE	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Vinyl Chloride
MW-1	8/7/2001	G-Logics	50'-60'	**480**	ND	ND	ND	ND
	8/24/2001	G-Logics		**84**	ND	ND	ND	ND
	12/14/2004	Farallon		**170**	< 1.0	< 1.0	< 1.0	< 1.0
MW-2	8/24/2001	G-Logics	80'-105'	11	ND	ND	ND	ND
	8/24/2001[3]	G-Logics		12	ND	ND	ND	ND
	12/23/2004	Farallon		27	< 0.20	< 0.20	< 0.20	< 0.20
MW-5	12/14/2004	Farallon	85'-100'	**56**	< 0.40	< 0.40	< 0.40	< 0.40
MW-7	12/14/2004	Farallon	85'-100'	**7.0**	< 0.20	< 0.20	< 0.20	< 0.20
MTCA Cleanup Levels for Groundwater				**5**[4]	**5**[4]	**80**[5]	**160**[5]	**0.2**[4]

NOTES:

Results in **BOLD** denote concentrations above the MTCA cleanup levels.

< denotes concentration is less than the laboratory practical quantitation limit (PQL) indicated.

[1]Depth in feet below ground surface.

[2]Analyzed by Environmental Protection Agency Method 8260B.

[3]Duplicate sample.

[4]Washington State Department of Ecology Model Toxics Control Act Cleanup Regulation (MTCA) Method A Groundwater Cleanup Level, Chapter 173-340 of the Washington Administrative Code, as amended February 2001.

[5]MTCA Cleanup Levels and Risk Calculations Standard Method B Formula Values, Version 3.1, updated November 2001.

Farallon = Farallon Consulting, L.L.C.

ND = analyte not detected above the PQL

PCE = tetrachloroethene

TCE = trichloroethene

Table 4
Groundwater Elevation Data Summary
Allison's Norge Village
Olympia, Washington
Farallon PN: 663-010

Well Identification	Date Measured	Casing Elevation (feet)[1]	Total Well Depth (feet)[2]	Depth to Groundwater (feet)[2]	Potentiometric Surface (feet)[3]
MW-1	8/1/2001	200.46	60.43	53.4	147.06
	8/24/2001			59.1	141.36
	12/23/2004			59.36	141.10
	1/26/2005			59.34	141.12
	6/23/2005			59.06	141.40
MW-2	8/24/2001	199.60	96.85	84.50	115.10
	12/23/2004			86.35	113.25
	1/26/2005			85.40	114.20
	6/23/2005			76.95	122.65
MW-3	12/23/2004	—	19.79	NE	NC
	1/26/2005			NE	NC
	6/23/2005			NE	NC
MW-4	12/23/2004	—	24.30	NE	NC
	1/26/2005			NE	NC
	6/23/2005			NE	NC
MW-5	12/23/2004	199.77	100.25	86.10	113.67
	1/26/2005			85.21	114.56
	6/23/2005			77.47	122.30
MW-6	12/23/2004	—	12.81	NE	NC
	1/26/2005			NE	NC
	6/23/2005			NE	NC
MW-7	12/23/2004	201.88	98.60	88.73	113.15
	1/26/2005			87.91	113.97
	6/23/2005			80.22	121.66
MW-8	6/23/2005	—	60.55	NE	NC

NOTES:

[1]Elevation of top of casing using relative datum of 200 feet. Surveyed Elevations by PLS.

[2]Depth below top of well casing.

[3]Elevation in feet relative to survey datum.

— = casing elevation not surveyed

NE = not encountered

NC = not calculated

APPENDIX A
SAMPLING AND ANALYSIS PLAN

Draft Cleanup Action Plan
Allison's Norge Village
120 Northeast Turner Street
Olympia, Washington
Facility Site ID# 14214153

Farallon PN: 663-010

APPENDIX A
DRAFT CLEANUP ACTION PLAN

DRAFT SAMPLING AND ANALYSIS PLAN

ALLISON'S NORGE VILLAGE
120 NORTHEAST TURNER STREET
OLYMPIA, WASHINGTON
FACILITY SITE ID# 14214153

Submitted by:
Farallon Consulting, L.L.C.
320 3rd Avenue Northeast
Issaquah, Washington 98027

Farallon PN: 663-010

For:
Mr. Wilbur Allison dba Allison's Norge Village Dry Cleaners
c/o Mr. David D. Cullen
West Hills Office Park
Building 11, 1800 Cooper Point Road S.W.
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December 5, 2005

Prepared by:

DRAFT

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Principal

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FIGURE

Figure A-1 Remedial Design System Layout

ATTACHMENT

Attachment A Forms

1.0 INTRODUCTION

Farallon Consulting, L.L.C. (Farallon) has prepared this Sampling and Analysis Plan (SAP) as part of the Draft Cleanup Action Plan (CAP) for the cleanup action at the former Allison's Norge Village Dry Cleaners site located at 120 Northeast Turner Street in Olympia, Washington (herein referred to as the Site). The SAP has been prepared in accordance with the Washington State Department of Ecology (Ecology) Model Toxics Control Act Cleanup Regulation (MTCA)for Sampling and Analysis Plans, as established in Chapter 173-340-820 of the Washington Administrative Code (WAC 173-340-820) for the cleanup action at the Site that is being conducted as an independent remedial action under Ecology's Voluntary Cleanup Program (VCP). The MTCA Method A soil and groundwater cleanup levels will be used as defined in WAC 173-340-740 and WAC 173-340-720, respectively.

1.1 PURPOSE

The purpose of the SAP is to ensure that sample collection, handling, and analysis conducted during the cleanup action will result in data that meet the data quality objectives (DQOs) in accordance with the requirements of WAC 173-340. The SAP includes requirements for sampling activities such as sampling frequency and location, analytical testing, documentation, and quality assurance/quality control (QA/QC) for compliance monitoring and waste characterization. A Quality Assurance Project Plan (QAPP) that identifies the DQOs and standard operating procedures for the cleanup action at the Site is provided in Appendix B of the CAP. Worker safety and health requirements are addressed in the Health and Safety Plan (HASP), provided in Appendix C of the CAP.

1.2 COMPLIANCE MONITORING

The SAP has been prepared in accordance with the requirements of MTCA to meet the requirements for compliance monitoring as described in WAC 173-340-410. Compliance monitoring consists of protection monitoring, performance monitoring, and confirmational monitoring. The purpose of each type of compliance monitoring, as defined by WAC 173-340-410, is described below.

1.2.1 Protection Monitoring

The purpose of protection monitoring is to confirm that human health and the environment are adequately protected during construction and the operation and maintenance of the SVE system. The protection monitoring plan for the cleanup action at the Site will include collection and analysis of groundwater samples, soil samples, and emissions from the soil vapor extraction (SVE) system.

1.2.2 Performance Monitoring

The purpose of performance monitoring is to confirm that the cleanup action has attained cleanup standards and, if appropriate, remediation levels or other performance standards such as monitoring that are necessary to demonstrate compliance with a permit or, where a permit exemption applies, the substantive requirements of other laws. Performance monitoring for the cleanup action will include collection and analysis of groundwater samples and emissions from the SVE system.

1.2.3 Confirmational Monitoring

The purpose of confirmational monitoring is to confirm the long-term effectiveness of the cleanup action once cleanup standards and, if appropriate, remediation levels or other performance standards have been attained. Confirmation monitoring for the cleanup action will include collection and analysis of soil and groundwater samples.

1.3 ORGANIZATION

The SAP includes a description of the compliance monitoring program for groundwater, soil and SVE system emissions for the cleanup action and is organized as follows:

- **Section 2—Groundwater Compliance Monitoring:** This section describes sampling locations and frequency, sample identification, sample collection and handling procedures, and analytical procedures for groundwater compliance monitoring. The QA/QC procedures for groundwater compliance monitoring also are included.
- **Section 3—Soil Compliance Monitoring:** This section describes sampling locations and frequency, sample identification, sample collection and handling procedures, and

analytical procedures for soil compliance monitoring. The QA/QC procedures for soil compliance monitoring also are included.

- **Section 4—Soil Vapor Extraction System Emissions Compliance Monitoring:** This section describes sampling locations and frequency, sample identification, sample collection and handling procedures, and analytical procedures for SVE system emissions compliance monitoring. The QA/QC procedures for SVE system emissions compliance monitoring also are included.
- **Section 5—Waste Characterization:** This section summarizes the handling and disposal procedures for waste soil and wastewater generated during the cleanup action.
- **Section 6—Field Documentation:** This section presents a summary of the field documentation for the cleanup action.

2.0 GROUNDWATER COMPLIANCE MONITORING

The compliance monitoring for the cleanup action will include protection, performance, and confirmational monitoring of groundwater.

2.1 GROUNDWATER PROTECTION MONITORING

Protection monitoring for groundwater may occur during construction and installation of the SVE system. However, it is not expected that groundwater will be encountered during SVE system installation. If groundwater is encountered, groundwater samples will be collected for laboratory analysis to evaluate handling and disposal requirements. Specific requirements for groundwater sampling and analysis are not included in the SAP, because it is not anticipated that groundwater protection monitoring will be conducted.

Groundwater performance monitoring will be conducted throughout the operation and maintenance period of the SVE system, and will be a component of the long-term protection monitoring program. The details of groundwater performance monitoring are presented in the following subsections.

2.2 GROUNDWATER PERFORMANCE MONITORING

Groundwater samples will be collected for laboratory analyses for performance monitoring to evaluate the effectiveness of the selected cleanup action at the Site. Groundwater performance monitoring will include evaluation of groundwater conditions to assess whether monitored natural attenuation through biodegradation, dispersion, dilution, sorption, volatilization, or other geochemical reactions (e.g., hydrolysis) is occurring at the Site. The data from this evaluation may be used to assess the timeframe for achieving the groundwater cleanup objectives in areas down-gradient of the on-Site points of compliance.

2.2.1 Groundwater Sampling Frequency

Groundwater performance sampling will be performed quarterly following start-up of the SVE system. After 1 year of sampling, groundwater performance sampling will be conducted biannually. Groundwater performance monitoring will continue until the data indicate that the cleanup level at the point of compliance at the Site have been met, at which point confirmation monitoring will be

initiated. If confirmation monitoring indicates that concentrations of tetracholoethene (PCE) increase above the selected cleanup level, the SVE system may be restarted, and performance monitoring would continue at a quarterly or biannual frequency pending reevaluation of performance monitoring data. Any change in the sampling program will be described in an addendum to the SAP.

2.2.2 Groundwater Sample Locations

The performance groundwater monitoring program initially will include Deep Zone monitoring wells MW-2, MW-5, and MW-7 at the Site (Figure A-1). Any change in the sampling program will be described in an addendum to the SAP.

2.2.3 Groundwater Sample Identification

The groundwater samples collected for performance monitoring from monitoring wells at the Site will be assigned a unique sample number. The number will include the well identification (e.g., MW2) and the sample date (e.g., 090105).

For example, the groundwater sample from groundwater monitoring well MW-2 sampled on September 1, 2005 would be numbered MW2-090105. The sample identification will be placed on the sample label, the Field Report form, and the Chain of Custody form.

2.2.4 Groundwater Sample Collection and Handling Procedures

Groundwater samples for performance monitoring will be collected and handled in accordance with the procedures described below:

- The locking well cap will be removed from each monitoring well and the groundwater level will be allowed to equilibrate to atmospheric pressure;
- The depth-to-groundwater will be measured from the surveyed location at each monitoring well casing to the nearest 0.01 foot using an electronic water level measuring device. The depth to the monitoring well bottom also will be measured to evaluate siltation of the monitoring wells, and to calculate the estimated purge water volume. All reusable equipment will be decontaminated between uses;

- Each monitoring well will be purged at a low-flow rate using a pumping device (centrifugal or bladder pump), with the intake placed approximately 2 to 3 feet above the bottom of the well. Temperature, pH, and conductivity will be monitored while purging to determine when these parameters stabilize. Dissolved oxygen and redox also will be measured as a component of the monitored natural attenuation evaluation;
- Groundwater samples will be collected following stabilization of temperature, pH, and conductivity. The samples will be collected directly from the low-flow pump outlet, where practical. If the monitoring well is completely dewatered during purging, samples will be collected when sufficient recharge has occurred to allow filling of all sample containers;
- If low-flow sampling methods are not practical, the monitoring wells will be allowed to recharge for no greater than 2 hours from cessation of purging, and will be sampled using a dedicated disposable polyethylene double-check valve bailer and sampling cord;
- Sample containers will be filled directly, if pumped, or water samples will be transferred immediately from the bailer into laboratory-supplied sample containers, taking care to minimize turbulence. Care will be taken not to handle the seal or lid of the container when placing the sample into the containers. The containers will be filled to eliminate any headspace, and the seal/lid will be secured;
- The sample container will be labeled with the date, time sampled, well identification and number, project name, project number, and preservative(s), if any;
- Information will be logged on a Chain of Custody form, and the sample will be placed in a chilled cooler at approximately 4 degrees Celsius for transport to the laboratory;
- Chain-of-custody protocols will be maintained during sample transport and submittal to the laboratory;
- QA/QC samples (e.g., field duplicates, rinsate blanks, trip blanks) will be collected at the frequency described in Section 2.4, Groundwater Confirmation Monitoring;
- All purge water will be placed in a labeled container on the Site pending receipt of waste profiling results;

- All disposable sampling, and health and safety supplies, and equipment will be disposed of in an appropriate waste dumpster at the Site; and
- All wells caps and monuments will be secured following sampling. Any damaged or defective well caps or monuments will be noted, and scheduled for replacement, if necessary.

2.2.5 Analytical Testing

Analytical testing of groundwater samples during implementation of the cleanup action will include field measurements at the time of sample collection, and laboratory analysis of groundwater performance samples for PCE. Groundwater performance samples will be submitted to an Ecology-certified analytical laboratory for analysis on a standard 5- to 10-day turnaround or within the applicable holding time for the requested analysis. All samples will be submitted to the laboratory within 48 hours of sample collection.

The groundwater performance samples will be placed in a minimum of three 40-milliliter volatile organic analysis (VOA) glass containers with a hydrochloric acid preservative. The groundwater samples will be submitted for analysis of HVOCs by EPA Method 8260B.

In addition to the analyses for PCE, groundwater samples collected from monitoring wells MW-2, MW-5, and MW-7 will include field measurement of the following parameters:

- pH;
- Temperature;
- Conductivity;
- Dissolved oxygen; and
- Redox/oxidation-reduction potential (ORP).

2.3 GROUNDWATER CONFIRMATION MONITORING

Once performance monitoring results indicate that the cleanup objectives described in the CAP have been achieved, confirmation monitoring will be initiated to confirm that the cleanup objectives have been met.

2.3.1 Groundwater Sampling Location and Frequency

Groundwater confirmation samples will be collected at Deep Zone monitoring wells MW-2, MW-5, and MW-7 (Figure A-1). The sampling locations may be modified based on the results of groundwater performance sampling. Additional groundwater monitoring wells may be installed and sampled, if necessary, as part of the groundwater confirmation monitoring program to demonstrate that the cleanup objectives have been met.

Once the performance monitoring results indicate that the cleanup objectives have been achieved, groundwater confirmation sampling will be performed on a quarterly basis for a minimum of 1 year. After 1 year of confirmation sampling, the data will be evaluated to assess whether additional groundwater confirmation sampling is necessary to confirm that groundwater quality meets the cleanup levels identified in the CAP.

2.3.2 Groundwater Sample Identification

The groundwater confirmation monitoring samples will be assigned a unique sample number following the procedures described in the performance monitoring program (Section 2.2.3, Groundwater Sample Identification).

2.3.3 Groundwater Sample Collection and Handling Procedures

Confirmation groundwater samples will be collected and handled in accordance with the procedures described for the groundwater performance monitoring program (Section 2.2.4, Groundwater Sample Collection and Handling Procedures).

2.3.4 Analytical Testing

The groundwater confirmation samples will be submitted for analysis of HVOCs by EPA Method 8260B. The groundwater samples will be placed in a minimum of three, 40-milliliter VOAs with a hydrochloric acid preservative.

2.4 GROUNDWATER QUALITY ASSURANCE/QUALITY CONTROL

QA/QC samples will be collected during the course of the cleanup action to provide for data validation as detailed in the QAPP (Appendix B of the CAP). QA/QC samples will include field duplicates, equipment rinsate, and/or trip blanks. QA/QC samples will be collected and

transported to the laboratory with the other samples. The exact number of QA/QC samples will depend on the number of samples collected during the Site cleanup. The anticipated frequency is one QA/QC sample per 20 samples submitted for laboratory analysis (i.e., 10 percent), or one QA/QC sample per monitoring round, if fewer than 10 samples are collected per round. The frequency for equipment rinsate blanks and trip blanks will be one each for every other performance monitoring round (alternating rinsate blanks and trip blanks for each round).

The QA/QC samples will be assigned a unique sample number similar to that for the groundwater samples. The number will include a prefix of "FD" for field duplicates, "RB" for equipment rinsate blanks, or "TB" for trip blanks. For example, a field duplicate collected on September 1, 2005 would be labeled FD-090105.

3.0 SOIL COMPLIANCE MONITORING

The cleanup action will not include protection or performance monitoring of soil conditions at the Site unless they are necessary to provide data to meet handling and disposal requirements, or to protect human health and the environment during installation of the SVE system. Soil confirmation monitoring will be conducted to confirm that the cleanup goal established in the CAP has been attained.

3.1 SOIL PROTECTION MONITORING

Soil containing concentrations of PCE will be excavated, handled and temporarily contained on Site during trenching activities for installation of the SVE system. The laboratory analytical results of soil samples collected during subsurface investigations at the Site will be used to evaluate the quality of soil in the planned excavation areas. If necessary, soil samples will be collected from stockpiled soil and/or excavation limits to provide data for handling and disposal requirements. Specific soil sampling requirements are not included in the CAP. because it is not anticipated that soil protection monitoring will be conducted.

3.2 SOIL PERFORMANCE MONITORING

Soil sampling and analysis to evaluate the performance of the SVE system will not be conducted. Groundwater and air quality performance monitoring results will be used to evaluate the progress of the cleanup action. Soil samples will be collected during the soil confirmation monitoring phase of the cleanup action, described below.

3.3 SOIL CONFIRMATION MONITORING

Once the cleanup standards for groundwater have been attained at the points of compliance, confirmation soil sampling will be performed to confirm the long-term effectiveness of the final cleanup action. Confirmation soil sampling locations will be selected based on the results of the previous subsurface investigations and the performance groundwater monitoring results. Sampling locations will include the areas beneath the Dry Cleaner suite and other suspected source areas at the Site that detected concentrations of PCE above the MTCA Method A cleanup level for PCE in soil. Laboratory analytical results for soil samples collected during previous

subsurface investigations will be compared to confirmation soil sample analytical results and the cleanup objectives identified in the CAP to confirm that the results of the cleanup action comply with the applicable MTCA Method A soil cleanup levels. The following subsections detail the soil confirmation sampling program.

3.3.1 Soil Sampling Locations and Frequency

Confirmation soil samples will be obtained using direct-push or hollow-stem auger drilling methods, as appropriate. The soil samples will be collected from locations inside the Site building and the area outside the building where concentrations of PCE above the MTCA Method A soil cleanup levels were detected previously.

The borings may be advanced to depths of 80 feet bgs to evaluate residual PCE concentrations. Soil samples will be collected continuously; up to two soil samples per boring will be submitted for analysis, based on the results of field observations and field screening for volatile organic vapors.

3.3.2 Sample Identification

The soil samples collected from borings for confirmation monitoring will have a unique sample identifier. The number will include a prefix of "CSB" and the boring number, the date, and the depth interval at which the sample was collected.

For example, the third soil sample collected from boring SB-30 on July 1, 2005 at a depth interval of 10 to 12 feet bgs would be identified as CSB30-070105-10/12. The sample identification will be placed on the sample label, Field Report form, and Chain of Custody form.

3.3.3 Soil Sample Collection and Handling Procedures

Soil confirmation samples will be collected using direct-push or hollow-stem auger drilling methods, and will be handled in accordance with the procedures described below:

- Soil samples will be collected directly from either stainless steel split-spoon samplers or dedicated plastic sample liners. All non-dedicated drilling and sampling equipment will be decontaminated between uses, as appropriate;

- Information logged during drilling will include at a minimum: sample depth, Unified Soil Classification System descriptions; sample recovery; soil moisture and occurrence of groundwater; physical indications of PCE such as odors or staining; and field-screening results using a photoionization detector;
- The sample will be transferred immediately into laboratory-supplied sample containers, taking care to minimize disturbance. Care will be taken not to handle the seal or lid of the container when placing the sample into the containers. The containers will be filled to eliminate any headspace, and the seals/lids will be secured. Custody seals will be placed on each container. The containers that will be used are a 4-ounce glass jar with a Teflon-lined cap and no preservative, and a 40-milliliter vial with no preservative;
- The sample container will be labeled with the media, date, time sampled, sample identification and number, project name, project number, and sampler's initials, in accordance with the QAPP;
- The sample will be logged on a Chain of Custody form, and placed into a chilled cooler at 4 degrees Celsius for transport to the laboratory under chain-of-custody protocols within 24 hours of sample collection;
- QA/QC samples (i.e., field duplicates, rinsate blanks, trip blanks) will be collected at the frequency presented in Section 3.4, Soil Quality Assurance/Quality Control;
- All waste soil will be placed into labeled containers on the Site pending receipt of waste profiling results;
- All disposable sampling, health and safety supplies, and equipment will be discarded in an appropriate waste dumpster at the Site;
- The boring location will be plotted on a scaled site map using a measuring tape or other measuring device to determine the boring location; and
- The borings will be backfilled with bentonite. Cold-patch asphalt or concrete will be used as a surface completion to maintain the integrity of the asphalt or concrete cap.

3.3.4 Analytical Testing

Soil confirmation samples will be analyzed for HVOCs by EPA Method 8260B. The samples will be analyzed on a standard laboratory turnaround time of 10 days.

3.4 SOIL QUALITY ASSURANCE/QUALITY CONTROL

QA/QC samples will be collected during soil compliance monitoring to provide for data validation as detailed in the QAPP (Appendix B of the CAP). QA/QC samples will include field duplicates and equipment rinsate blanks (if applicable). The QA/QC samples will be collected and transported to the laboratory with the other samples. The exact number of QA/QC samples will depend on the number of soil compliance monitoring samples collected during the cleanup action. The anticipated frequency will be one field duplicate sample per 20 samples submitted for laboratory analysis (i.e., 10 percent).

The type of QA/QC sample submitted will be dictated by the quantity of soil available for collection of field duplicates. The QA/QC samples will be assigned a unique sample number. The number will include a prefix of "FD" for field duplicates, "RB" for equipment rinsate blanks, or "TB" for trip blanks. For example, a field duplicate collected on July 1, 2005, from boring SB-20 at a depth interval of 8 to 10 feet bgs would be labeled FD-070105-SB20-8/10.

4.0 SOIL VAPOR EXTRACTION SYSTEM EMISSIONS COMPLIANCE MONITORING

Protection and performance monitoring will be conducted as part of the compliance monitoring program for SVE system emissions. Protection monitoring will be conducted during the initial start-up of the SVE system to ensure that concentrations of PCE in emissions from the SVE system are below levels that would require treatment to protect human health and the environment prior to discharge to the atmosphere. Performance monitoring will be conducted during the operation and maintenance of the SVE system to evaluate the progress of the cleanup action, and to ensure that concentrations of PCE remain below levels that would require treatment to protect human health and the environment.

4.1 SOIL VAPOR EXTRACTION SYSTEM EMISSIONS PROTECTION MONITORING

Protection monitoring will include collection and laboratory analysis of air emissions from the SVE system during the initial hours of operation, and evaluation of the analytical results of the air emissions from the SVE system to determine whether additional actions are required to protect human health and the environment. The laboratory results of the SVE system emissions protection monitoring will be used to evaluate the need for treatment of emissions prior to discharge.

4.1.1 Air Emission Sampling Frequency

Samples of the emissions from the SVE system will be collected during the first 3 hours of SVE system operation. Any modification to the sampling frequency will be described in an addendum to the SAP.

4.1.2 Air Emission Sample Locations

The air emission samples for protection monitoring will be collected at a sampling port installed at each SVE well pipe in the remediation compound, and at a sampling port installed at the total SVE system outflow point to ambient air.

Analytical results of samples collected from the SVE system discharge will be used to estimate and document the mass of contaminants discharged to the atmosphere.

4.1.3 Air Emission Sample Identification

The air emission sample identification will be designated by sampling location and date. The sampling location will include the SVE well identification, or the total SVE system outflow point, which will be identified as "SVET."

For example, an air emission protection monitoring sample collected from SVE system discharge from SVE well SVE-3 on July 1, 2005 would be identified as SVE3-070105. Field duplicate samples for QA/QC will be labeled with the prefix "DUP" and the date.

4.1.4 Air Emission Sample Collection and Handling Procedures

Air emission protection samples will be collected and handled in accordance with the procedures described below:

- The appropriate sampling port will be located and slowly opened;
- A Tedlar bag will be used to collect an air sample from each sampling point, and a PID will be used to screen the air emissions for volatile compounds;
- The Tedlar bag will be labeled with the date, time sampled, sample identification and number, project name, project number, and sampler's initials;
- The sample will be logged on a Chain of Custody form and the Tedlar bag(s) will be placed immediately in a cool, dark area for transport to the laboratory within 24 hours of sample collection under chain of custody protocols;
- QA/QC samples (i.e., field duplicates) will be collected as described in Section 4.4, Soil Vapor Extraction System Emissions Quality Assurance/Quality Control;
- Each sampling port will be secured in a locked position; and
- All disposable sampling, health and safety supplies, and equipment will be discarded in an appropriate waste dumpster at the Site.

4.1.5 Analytical Testing

Air emission performance samples will be submitted to an Ecology-certified analytical laboratory for analysis of HVOCs by EPA Method 8260B modified. The analytical testing may

be modified, as dictated by the analytical results or the requirements of the air operating permit, if required. Any modifications will be described in an addendum to this SAP.

4.2 SOIL VAPOR EXTRACTION SYSTEM EMISSIONS PERFORMANCE MONITORING

Performance monitoring for air quality will be used to evaluate the progress of the cleanup action, and to ensure that emissions from the SVE system are protective of human health and the environment, and comply with the Site-specific requirements defined by the Olympic Region Clean Air Agency. The SVE system emissions performance monitoring program is described in detail below. The protection monitoring program for SVE system emissions will be modified, if necessary, to meet the requirements of the air operating permit from the Olympic Region Clean Air Agency, if required to operate the SVE system.

4.2.1 Air Emission Sampling Frequency

The frequency of air emission performance monitoring is provided below:

- Samples of the emissions from the SVE system will be collected monthly during the first 3 months of SVE system operation;
- Following the first 3 months of operation, samples of the emissions from the SVE system will be collected quarterly during the first year of operation; and
- After the first year of SVE system operation, the frequency of emission performance monitoring will be determined following evaluation of air emission data from the initial year of SVE operation.

Any modifications to the sampling frequency will be described in an addendum to the SAP.

4.2.2 Air Emission Sample Locations

The air emission sample identification will be designated by the sampling location and date. The sampling location identifications will include the SVE well identification, or the total SVE system outflow point, which will be identified as "SVET."

For example, an air emission performance monitoring sample collected from the SVE system discharge from SVE well SVE-3 on July 1, 2005 would be identified as SVE3-070105. Field

duplicate samples for QA/QC will be labeled with the prefix "DUP" and the date. Analytical results of samples collected from the SVE system discharge will be used to document the mass of contaminants discharged to the atmosphere to evaluate the progress of the cleanup action.

4.2.3 Air Emission Sample Identification

The air emissions sample identification for performance monitoring will be the same as that used for protection monitoring, as described in Section 4.1.3, Air Emission Sample Identification.

4.2.4 Air Emission Sample Collection and Handling Procedures

Air emission performance samples for performance monitoring will be collected and handled in accordance with the procedures described below:

- The appropriate sampling port will be located and slowly opened;
- A GasTec pump and PCE-specific colorimetric detection tube will be used to collect a sample per the detection tube instructions;
- The results will be logged on the Field Report form;
- QA/QC samples (i.e., field duplicates) will be collected as described in Section 4.4, Soil Vapor Extraction System Emissions Quality Assurance/Quality Control;
- Each sampling port will be secured in a locked position; and
- All disposable sampling, health and safety supplies, and equipment will be discarded in an appropriate waste dumpster at the Site.

Air emission performance samples will be collected annually, beginning after 1 year of SVE system operation, using the sample collection and handling procedures described in Section 4.1.4, Air Emission Sample Collection and Handling Procedures. The samples will be used to evaluate the trends in concentrations of PCE over time, and to assess the performance of the SVE system and the progress made toward the cleanup goals.

4.2.5 Analytical Testing

Air emission performance samples will be collected and analyzed in the field using colorimetric tubes specifically designed for the measurement and quantification of PCE concentrations in air.

The analytical testing may be modified, as dictated by the analytical results or the air operating permit, if required by the Olympic Region Clean Air Agency. Any modifications will be described in an addendum to the SAP.

4.3 SOIL VAPOR EXTRACTION SYSTEM EMISSIONS CONFIRMATION MONITORING

The confirmation monitoring program will not include monitoring of air emissions, because the SVE system will be shut down, eliminating any source of airborne emissions.

4.4 SOIL VAPOR EXTRACTION SYSTEM EMISSIONS QUALITY ASSURANCE/QUALITY CONTROL

SVE system emissions samples will be collected for QA/QC during the course of the cleanup action to provide for data validation, as detailed in the QAPP (Appendix B of the CAP). QA/QC samples will include field duplicate samples collected each quarter at either the sampling port for an individual SVE well, or at the total SVE system outflow. The QA/QC samples will be collected with the other samples.

The QA/QC samples will be assigned a unique sample number similar to the air emission samples. The number will include a prefix of "FD" for field duplicates. For example, a field duplicate collected on July 1, 2005, would be labeled FD-SVE2-070105-if the sample was a field duplicate of the air emission sample collected from the sampling port located at SVE well SVE-2 on that date.

5.0 MANAGEMENT OF INVESTIGATION-DERIVED WASTE

Waste soil, wastewater, and other products generated during the cleanup action may be contaminated, and will be containerized and disposed of properly upon receipt of analytical results. The specific criteria for tracking sampling and analysis of the wastes to select an appropriate disposal option for each of the expected waste streams are discussed below.

5.1 WASTE SOIL

Waste soil will be generated by the following activities:

- Installing the SVE wells;
- Trenching for the installation of underground conveyance piping;
- Advancing the confirmation soil sample borings; and
- Decommissioning the SVE system.

To the extent practical, waste soil that does not contain concentrations of PCE will be reused as backfill on the Site prior to asphalt capping of the piping trenches. Surplus soil generated from the cleanup action will be placed in a mobile storage container or 55-gallon drums provided by the treatment, storage, and disposal facility (TSDF) pending sampling and profiling. The waste soil will be segregated based on the anticipated concentrations of PCE present in the area where the soil is generated. The mobile storage containers or other containers used for waste storage will be labeled with the container content, date, origin, and level of personal protective equipment used during waste generation (e.g., Level C or Level D). Waste soil temporarily stored on Site will be tracked using a Waste Inventory form.

The number of soil samples collected to profile the waste soil generated during installation of the SVE system will depend on the volume of waste soil generated, and is expected to be three samples or fewer. The soil samples will be submitted for analysis of HVOCs by EPA Method 8260B. Soil analytical data from confirmation borings may be used to develop a waste profile for the soil generated during the confirmation soil sampling. The soil samples will be collected in a manner generally consistent with soil sampling procedures presented in Section 3.3.3, Soil

Sample Collection and Handling Procedures. No contaminated waste will remain at the Site longer than 90 days following its generation.

The waste soil profiles will be provided to the TSDF or an appropriate landfill facility. Waste profiles and manifests will be provided to the generator for approval prior to the transporting of the materials off Site. All waste soil will be placed into labeled U.S. Department of Transportation (DOT)-approved containers and removed by a licensed transporter. All documentation for waste soil disposal will be maintained in the project file.

5.2 WASTEWATER

Wastewater will be generated by the following activities:

- Performance and confirmation groundwater sampling;
- Collection of condensate in the SVE knockout tank; and
- Equipment decontamination.

Wastewater will be segregated as suspected clean and contaminated wastewater, and stored in 55-gallon drums on the Site. No wastewater will remain on the Site longer than 90 days after its generation. Wastewater generated during the cleanup action will be documented on a Waste Inventory form.

Waste profiles will be developed using the groundwater analytical data from performance and confirmation monitoring. Based on the analytical data, an appropriate disposal option will be selected. Waste profiles and manifests will be provided to the generator for approval prior to transporting of the materials off Site. The waste profiles will be provided to the TSDF. All wastewater will be removed by a licensed transporter using labeled DOT-approved containers. All documentation for wastewater will be maintained in the project file.

Disposable personal protective clothing (e.g., Tyvek suits, rubber gloves, boot covers) and disposable sampling devices (e.g., plastic scoops, bailers) will be cleaned, placed in plastic garbage bags, and disposed of as nonhazardous waste.

6.0 FIELD DOCUMENTATION

Documentation of field activities will be included on Field Report forms, Log of Borings/Well forms, Well Purging and Sampling Data forms, an Air Emission Sampling form, Waste Inventory forms, sample and waste material labels, and Chain of Custody forms. Documentation generated during the field program will be retained in the project file and included in the reports prepared, as appropriate.

6.1 FIELD REPORT FORM

Field personnel will be required to keep a daily log of field activities on a Field Report form. Field notes will be as descriptive and as inclusive as possible, so as to allow an independent party to reconstruct the sampling situation from the recorded information. Language will be objective, factual, and free of inappropriate terminology. A summary of each day's events will be completed on a Field Report form. At a minimum, field documentation will include the date, job number, project identification and location, weather conditions, sample collection data, personnel present and responsibilities, field equipment used, and any activities performed in a manner other than as specified in the SAP or the CAP. In addition, if other forms or documents are completed or used (e.g., well-head survey, maps), they will be cited in and attached to the Field Report form. Field personnel will sign the Field Report form. A copy of the Field Report form is provided in Attachment A.

6.2 LOG OF BORING LOG/WELL FORM

A Log of Borings/Well form will be prepared by the field Scientist for each boring during drilling for installation of the SVE wells and drilling for soil confirmation sampling. The log will include hydrologic conditions, lithologic descriptions using the Unified Soil Classification System, and information on the potential presence of contamination. Well construction details for the SVE wells also will be documented these forms. A copy of the Log of Boring/Well form is provided in Attachment A.

6.3 WELL PURGING AND SAMPLING DATA FORM

A Well Purging and Sampling Data form will be used to record the depth to groundwater, well purging information, and other pertinent hydrologic measurements and supplementary information collected during groundwater performance and confirmation sampling at each monitoring well. The form will be completed by the field Scientist at the time of sample collection. These forms will be maintained in the project files. A copy of the Well Purging and Sampling Data form is included in Attachment A.

6.4 AIR EMISSION SAMPLING FORM

An Air Emission Sampling form will include a record of the field-screening results, observations, sample data, and other pertinent and supplementary information collected during air emission performance monitoring. The Air Emission Sampling form will be completed by the field Scientist at the time of sample collection. A copy of the Air Emission Sampling form will be included in the operation and maintenance manual for the SVE system.

6.5 WASTE INVENTORY FORM

A Waste Inventory form will be used to document and track wastes generated during the cleanup action. The form will include information on the type of waste, origin of the waste, sample container, date generated, date removed from the site, transporter, and disposal location. A copy of the Waste Inventory form is included in Attachment A.

6.6 SAMPLE LABEL

Sample labels will be completed in indelible ink and affixed to the appropriate sample container immediately prior to sample collection. The label will include the following information: media, date, time sampled, sample identification and number, project name, project number, sampler's initials, and analyte preservative(s), if any.

6.7 WASTE MATERIAL LABEL

Waste material labels will be filled out in indelible ink and affixed to the appropriate waste container immediately upon filling. The label will include the following information: job

number and name, address where waste was generated, contents of the container, operation, date, consultant's name and phone number, and sampler's initials.

6.8 CHAIN-OF-CUSTODY

The procedures to be followed whenever samples are collected, transferred, stored, analyzed, or destroyed have been designed to create an accurate written record that traces possession and handling of a sample from the moment of its collection through analysis and reporting of analytical values. This written record, the Chain of Custody form, will be completed by the field sampling team at the time a sample is obtained.

All samples submitted to the laboratory are accompanied by the Chain of Custody form. This form is checked for accuracy and completeness, signed, and dated by the laboratory sample custodian accepting the sample. At the laboratory, each sample is assigned a unique, sequential laboratory identification number that is stamped or written on the Chain of Custody form.

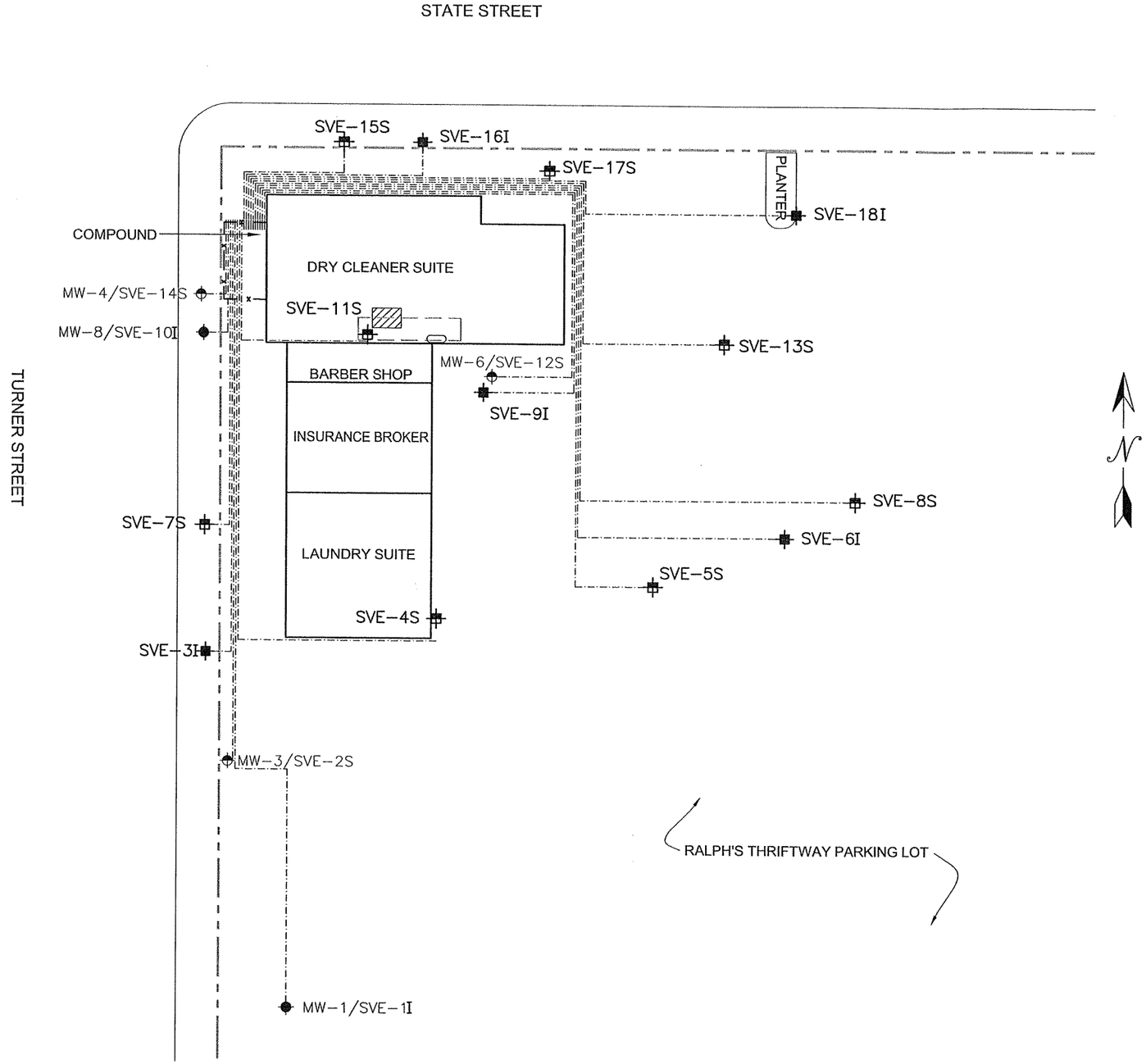
All samples are held in the Sample Control room in accordance with internal chain-of-custody protocols under appropriate storage conditions (e.g., ambient, refrigeration, frozen). The laboratory Project Manager assigned to a particular client is responsible for tracking the status of the samples throughout the laboratory. Samples signed out of the Sample Control room are recorded in a sample control logbook by the analyst who will prepare the samples for analysis.

The Chain of Custody form includes the following information: site name, sample identification number (assigned by the sampler in the field), sample date, sample location, and type of analysis required (if any). Whenever a sample is transferred from one party to another, both parties sign the Chain of Custody form and record the date and time of the transfer. Adherence to these protocols ensures sample integrity from collection through analysis.

FIGURE

SAMPLING AND ANALYSIS PLAN
Appendix A of the Cleanup Action Plan
Allison's Norge Village
120 Northeast Turner Street
Olympia, Washington
Facility Site ID# 14214153

Farallon PN: 663-010



LEGEND

MW–4/SVE–14S	EXISTING SHALLOW ZONE SVE WELL
SVE–8S	PROPOSED SHALLOW ZONE SVE WELL
MW–1/SVE–1	EXISTING INTERMEDIATE ZONE SVE WELL
SVE–16I	PROPOSED INTERMEDIATE ZONE SVE WELL
	DRY CLEANING MACHINE
	165-GALLON ABOVE-GROUND STORAGE TANK
	FORMER COIN-OPERATED DRY CLEANING AREA
	SOIL VAPOR EXTRACTION LINE
	PROPERTY BOUNDARY
SVE	SOIL VAPOR EXTRACTION

NOTE:

1. ALL LOCATIONS ARE APPROXIMATE
2. SOURCE MAP: G-LOGICS, INC.

0 30

APPROXIMATE SCALE IN FEET

DRAFT

FARALLON CONSULTING
320 3rd Avenue NE
Issaquah, WA 98027

FIGURE A-1

REMEDIAL SYSTEM DESIGN LAYOUT
ALLISON'S NORGE VILLAGE
120 NORTHEAST TURNER STREET
OLYMPIA, WASHINGTON

FARALLON PN: 663–010

Drawn By:DEW	Checked By: RC	Date: 11/7/05	Disk Reference: 663010

ATTACHMENT A
FORMS

SAMPLING AND ANALYSIS PLAN
Appendix A of the Cleanup Action Plan
Allison's Norge Village
120 Northeast Turner Street
Olympia, Washington
Facility Site ID# 14214153

Farallon PN: 663-010

To be included in the FINAL Sampling and Analysis Plan

Not Included in this DRAFT

APPENDIX B
QUALITY ASSURANCE PROJECT PLAN

Draft Cleanup Action Plan
Allison's Norge Village
120 Northeast Turner Street
Olympia, Washington
Facility Site ID# 14214153

Farallon PN: 663-010

APPENDIX B
DRAFT CLEANUP ACTION PLAN
DRAFT QUALITY ASSURANCE PROJECT PLAN

ALLISON'S NORGE VILLAGE
120 NORTHEAST TURNER STREET
OLYMPIA, WASHINGTON
FACILITY SITE ID# 14214153

Submitted by:
Farallon Consulting, L.L.C.
320 3rd Avenue Northeast
Issaquah, Washington 98027

Farallon PN: 663-010

For:
Mr. Wilbur Allison
dba Allison's Norge Village Dry Cleaners
c/o Mr. David D. Cullen
West Hills Office Park
Building 11, 1800 Cooper Point Road S.W.
Olympia, Washington 98502

December 5, 2005

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Principal

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1.0 INTRODUCTION

This Draft Quality Assurance Project Plan (QAPP) has been prepared by Farallon Consulting, L.L.C. (Farallon) for the planned cleanup action at the Allison's Norge Village Dry Cleaners site located at 120 Northeast Turner Street in Olympia, Washington (herein referred to as the Site) to provide specific requirements for quality assurance/quality control (QA/QC) procedures. This Draft QAPP is part of the Draft Cleanup Action Plan (CAP). The overall objective of the cleanup action is to protect human health and the environment and restore beneficial use of soil and groundwater.

This Draft QAPP has been prepared in accordance with the Washington State Department of Ecology (Ecology) Model Toxics Control Act Cleanup Regulation (MTCA) as established in Section 350 of Chapter 173-340 of the Washington Administrative Code (WAC 173-340-350). As stated in Ecology's *Guidelines for Preparation of Quality Assurance Project Plans for Environmental Studies* (Ecology Publication No. 01-03-003, February 2001) the purpose of this Draft QAPP is to:

- Assist the project manager and project team to focus on the factors affecting data quality during the planning stage of the project;
- Facilitate communication among field, laboratory, and management staff as the project progresses;
- Document the planning, implementation, and assessment procedures for QA/QC activities for the cleanup action;
- Ensure that the data quality objectives (DQOs) are achieved; and
- Provide a record of the project to facilitate final report preparation.

The DQOs for the project include both qualitative and quantitative objectives, which define the appropriate type of data, and specify the tolerable levels of potential decision errors that will be used as a basis for establishing the quality and quantity of data needed to support the cleanup action. To ensure that the DQOs are achieved, this Draft QAPP details aspects of sample collection and analysis including analytical methods, QA/QC procedures, and data quality

reviews. This Draft QAPP describes both quantitative and qualitative measures of data to ensure that the DQOs are achieved.

1.1 SITE DESCRIPTION AND BACKGROUND

A detailed description of the Site and Site historical operations, and a summary of previous environmental investigations conducted at the Site by others are presented in Section 2 of the Draft CAP. A summary of the subsurface investigations conducted at the Site by Farallon, including the results of feasibility testing, is presented in Section 3 of the Draft CAP. Subsurface investigations conducted by Farallon and others have confirmed the release of the dry cleaning solvent tetrachloroethene (PCE) to soil and groundwater at the Site.

1.2 PROJECT OBJECTIVES

The purpose of the cleanup action is to protect human health and the environment, and to restore beneficial uses of soil and groundwater at the points of compliance identified in the CAP.

The overall objectives of the cleanup action include:

- Reducing the mass of PCE in soil and soil vapor at the Site;
- Reducing the potential for direct human contact with soil containing concentrations of PCE above the MTCA Method A cleanup level;
- Reducing the potential for direct human contact with and ingestion of groundwater with concentrations of PCE above the MTCA Method A cleanup level; and
- Monitoring groundwater to assess the influence of natural attenuation on groundwater quality.

2.0 PROJECT ORGANIZATION

The project organization for completion of the cleanup action, including identification of key personnel and their responsibilities, is described below.

The cleanup action will be conducted for the operator of the former dry cleaners, Mr. Wilbur Allison dba Allison's Norge Village Dry Cleaners. Farallon has been contracted by Mr. Wilbur Allison dba Allison's Norge Village Dry Cleaners to plan and implement the cleanup action. The project contact for Mr. Wilbur Allison dba Allison's Norge Village Dry Cleaners is:

Mr. Wilbur Allison dba Allison's Norge Village Dry Cleaners
c/o Mr. David D. Cullen
West Hills Office Park, Building 11
1800 Cooper Point Road S.W.
Olympia, Washington 98502
Telephone: (360) 786-6500
Fax: (360) 352-3118

The current Site owner is:

Stormans Inc., Mr. Kevin Stormans
c/o Mr. Paul Carey
Betts Patterson & Mines, P.S.
One Convention Place, Suite 1400
701 Pike Street
Seattle Washington 98101-3927
Telephone: (206) 268-8637
Fax: (206) 343-7053

The Project Manager and primary contact for Farallon is Mr. J. Riley Conkin, L.G., L.H.G., Principal Geologist. The QA/QC Officer is Ms. Carla Brock, L.G., Project Geologist. The technical advisor for the cleanup action is Mr. Clifford T. Schmitt, L.G., L.H.G., Principal. The document control clerk is Ms. Catherine Fulbright, Administrative Supervisor. The contact information for Farallon is:

Farallon Consulting, L.L.C.
320 3rd Avenue Northeast
Issaquah, Washington 98027
Telephone: (425) 427-0061
Fax: (425) 427-0067

Ecology has jurisdiction over the cleanup action, as stipulated in Chapter 70.105 of the Revised Code of Washington, and the Model Toxics Control Act. The cleanup action will be conducted as an independent cleanup action under Ecology's Voluntary Cleanup Program (VCP). The Project Manager for Ecology is:

Mr. Bob Warren
Washington State Department of Ecology
Southwest Regional Office
P.O. Box 47775
Olympia, Washington 98504-7775
Telephone: (360) 407-6361
Fax: (360) 407-6305

2.1 RESPONSIBILITIES OF KEY PERSONNEL

The responsibilities of the key personnel involved in the cleanup action are described in the subsections below.

2.1.1 Project Manager

The Project Manager has overall responsibility for developing the Draft QAPP, monitoring the quality of the technical and managerial aspects of the project, and implementing the Draft QAPP and corresponding corrective measures, where necessary.

2.1.2 Project QA/QC Officer

The QA/QC Officer has the responsibility to monitor and verify that the work is performed in accordance with the Draft CAP, including the Draft SAP and the Draft QAPP, and other applicable procedures. The QA/QC Officer also has the responsibility to assess the effectiveness of the QA/QC program, and to recommend modifications to the program, when applicable. The QA/QC Officer is responsible for ensuring that the personnel assigned to the project are trained relative to the requirements of the QA/QC program, and for reviewing and verifying the disposition of nonconformance and corrective action reports.

2.1.3 Project Staff

Members of the project staff are responsible for understanding and implementing the QA/QC program as it relates to the cleanup action project objectives.

2.1.4 Regulatory Agency

Ecology will be the lead regulatory agency. The cleanup action is being conducted in accordance with MTCA (WAC 173-340-350). The Site cleanup will be conducted under Ecology's VCP in a manner that is substantially equivalent to a cleanup action conducted by Ecology consistent with obtaining a No Further Action determination for the Site. The Site was entered into the VCP program in 2001, and is identified as "FS ID 14214153 Eastside Laundry."

3.0 DATA QUALITY OBJECTIVES

The DQOs for this project will be used to develop and implement procedures to ensure that the data collected are of sufficient quality to adequately address the objectives of the cleanup action at the Site, as defined in the Draft CAP. All observations and measurements will be made and recorded in such a manner as to yield results representative of the media and conditions observed and/or measured. Representativeness will be achieved through strict adherence to the Draft Sampling and Analysis Plan (SAP), provided in Appendix A of the CAP. Goals for representativeness will be met by ensuring that sampling locations are selected properly, that a sufficient number of samples are collected, and that field-screening and laboratory analyses are conducted properly.

The quality of the laboratory data will be assessed on the bases of precision, accuracy, representativeness, completeness, and comparability. Definitions of these parameters and the applicable QC procedures are described in Sections 3.1 through 3.5 below. Quantitative DQOs for applicable parameters (e.g., precision, accuracy, completeness) are provided following each definition. Laboratory DQOs have been established by the analytical laboratory, and are specified in the analytical laboratory's Quality Assurance Plan, which is kept on file at the Farallon office.

3.1 PRECISION

Precision measures the reproducibility of measurements under a given set of conditions. Specifically, it is a quantitative measure of the variability of two or more measurements compared to their average values. Precision is calculated from results of duplicate sample analyses. Precision is quantitatively expressed as the relative percent difference (RPD), and is calculated as follows:

$$RPD = \frac{(C_1 - C_2)}{(C_1 + C_2)/2} \times 100$$

Where:

RPD = relative percent difference

C_1 = larger of the two duplicate results (i.e., the highest detected concentration)

C_2 = smaller of the two duplicate results (i.e., the lowest detected concentration)

Quantitative RPD criteria for laboratory duplicate results have been developed by the U.S. Environmental Protection Agency (EPA) for inorganic chemical analysis. The criteria are ± 20 percent for water samples, and ± 35 percent for soil samples. There are no specific RPD criteria for organic chemical analyses.

3.2 ACCURACY

Accuracy is a measure of the closeness (bias) of the measured value to the true value. The accuracy of chemical analytical results is assessed by "spiking" samples in the laboratory with known standards (a surrogate or matrix spike [MS] of known concentration), and determining the percent recovery. Accuracy is measured as the percent recovery (%R), and is calculated as follows:

$$\%R = \frac{(M_{sa} - M_{ua})}{C_{sa}} x\ 100$$

Where:

%R = percent recovery

M_{sa} = measured concentration in spiked aliquot

M_{ua} = measured concentration in unspiked aliquot

C_{sa} = actual concentration of spike added

Laboratory matrix spikes and surrogates will be carried out at the analytical laboratory in accordance with EPA SW-846 requirements for organic and inorganic chemical analyses. The frequency for both matrix spikes and matrix spike duplicates will be one each per batch of 20 samples or less for both soil and groundwater samples. Quantitative percent recovery criteria have been developed by EPA for laboratory matrix spikes for inorganic analysis. The criteria are 75 to 125 percent when the sample concentration exceeds the spike concentration by a factor of four or more. There are no specific accuracy criteria for organic analyses. Where EPA and

Ecology have not provided data validation guidelines, laboratory-derived control limits will be used to assess surrogate recovery and matrix spike results.

The accuracy of sample results can be affected also by introduction of contaminants to the sample during collection, handling, and/or analysis. Contamination of the sample can occur because of improperly cleaned sampling equipment, exposure of the samples to chemical concentrations in the field or during transport to the laboratory, or exposure to chemical concentrations in the laboratory. To ascertain that the samples collected are not contaminated, laboratory method blank samples will be analyzed.

3.2.1 Laboratory Method Blanks

The laboratory will run method blanks at a minimum frequency of 5 percent, or one per batch, to assess potential contamination of the sample at the laboratory.

3.2.2 Trip Blanks

Laboratory-supplied trip blanks will accompany each shipment containing samples from the field to the analytical laboratory for analysis of volatile organic compounds by EPA Method 8260B to assess the integrity of the sample containers during transport.

3.2.3 Duplicate Samples

Duplicate samples will be used to measure field variability and sampling consistency. Duplicate samples will be obtained using identical sampling protocols for the appropriate medium sampled. The duplicate sample will be submitted to the laboratory with a "blind" sample identifier such that the laboratory cannot recognize the sample as a duplicate. The collection of the duplicate sample and the selected "blind" identifier will be stated in the field documentation for sample collection.

3.3 REPRESENTATIVENESS

Representativeness is a qualitative assessment of how closely the measured results reflect the actual concentration or distribution of the constituent concentrations in the matrix sampled. The sampling plan design, sample collection techniques, sample handling protocols, sample analysis methods, and data review procedures have been developed to ensure that the results obtained are

representative of Site conditions. These issues are addressed in detail in the Draft SAP (Appendix A of the Draft CAP), and in this document.

3.4 COMPLETENESS

Completeness is defined as the percentage of measurements judged to be valid. Results will be considered valid if they are not rejected during data validation (see Section 6, Data Management, Reduction, Review, and Reporting). Completeness (C) is calculated as follows:

$$C = \frac{(Number\ of\ Valid\ Measurements)}{(Total\ Number\ of\ Measurements)} x\ 100$$

The target completeness goal for the cleanup action will be 95 percent for a given analysis.

3.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. The use of standard EPA, Ecology, American Society for Testing Materials (ASTM), and American Petroleum Institute (API) methods and procedures for both sample collection and laboratory analysis will make the data collected comparable to both internal and other data generated.

4.0 DATA COLLECTION APPROACH

Procedures that will be used to collect, preserve, transport, and store samples are described in the Draft SAP (Appendix A of the Draft CAP). All sampling protocols will be performed in accordance with generally accepted environmental practices, and will meet or exceed current regulatory standards and guidelines. Sampling procedures may be modified, if necessary, to comply with amendments to current regulations, methods, or guidelines.

5.0 ANALYTICAL PROCEDURES

Chemical and physical analyses to be conducted during this project are discussed in the Draft SAP (Appendix A of the Draft CAP). Container types, holding times, analytical methods, practical quantitation limits, and method detection limits will be in accordance with current regulatory guidelines, and will be modified, if necessary, to comply with amendments to current regulations, methods, or guidelines.

OnSite Environmental Inc. of Redmond, Washington (OnSite) has been selected as the laboratory to conduct the analysis of the samples collected for the cleanup investigation. OnSite will conduct analysis for halogenated volatile organic compounds (HVOCs) in groundwater samples for performance and confirmation monitoring, in air samples for protection and performance monitoring, and in soil samples for confirmation monitoring. OnSite is certified by Ecology, and meets the QA/QC requirements of Ecology and EPA. The contact for OnSite is:

Mr. David Baumeister
OnSite Environmental Inc.
14648 NE 95th Street
Redmond, Washington 98052
(425) 883-3881

A copy of the Laboratory Quality Assurance Manual from OnSite is on file at Farallon's offices for review and reference, and will be followed throughout the cleanup action. Ecology will have access to laboratory personnel, equipment, and records pertaining to sample collection, transportation, and analysis.

The analytical method for HVOCs will be EPA SW846 Method 8260B with a capillary column. This method has the lowest detection limits of available EPA-approved analytical methods for HVOCs. Media-specific preparation standards are discussed below. Water samples will be prepared for analysis by the laboratory using preparation Method 5030/8260B, which provides the lowest detection limits. For soil samples, preparation Method 5035A/8260B provides the lowest method detection limits. The sensitivity of these preparation methods may be adversely impacted by matrix interference in highly contaminated samples. In such cases, the detection limits and column usability may be affected. The specific analytical method, sample

preservation method, and container requirements are defined in the Draft SAP (Appendix A of the Draft CAP).

6.0 DATA MANAGEMENT, REDUCTION, REVIEW, AND REPORTING

This section outlines the procedures to be followed for the inventory, control, storage, and retrieval of data collected throughout the cleanup action. The procedures contained in the Draft QAPP are designed to ensure that the integrity of the collected data is maintained for subsequent use. Moreover, project-tracking data (e.g., schedules, progress reports) will be maintained to monitor, manage, and document the progress of the cleanup action.

6.1 DATA TYPES

A variety of data will be generated by the cleanup action, including laboratory analytical data and manually recorded field data. Laboratory analytical data will be transmitted to Farallon both as an electronic file and a hard copy laboratory data report, which will facilitate subsequent validation and analysis of these data while avoiding transcription errors that may occur with computer data entry.

6.2 DATA TRANSFER

Procedures controlling receipt and distribution of incoming data packages to Farallon and outgoing data reports from Farallon are outlined in the subsections below.

6.2.1 Receipt of Data and Reports

Incoming documents will be date-stamped and filed. Correspondence and transmittal letters for all reports, maps, and data will be filed chronologically. Data packages such as those from field personnel, laboratories (e.g., groundwater, air, and soil analytical data), and surveyors (e.g., well-head location and elevation data); will be filed by project task, subject heading, and date. If distribution is required, the appropriate number of copies will be made and distributed to appropriate persons or agencies.

6.2.2 Outgoing Data and Reports

A transmittal sheet will be attached to all outgoing project data and reports. A copy of each transmittal sheet will be kept in the administrative and project files. The Project Manager and QA/QC Officer will review all outgoing reports and maps.

6.3 DATA INVENTORY

Procedures for the filing, storage, and retrieval of project data and reports are discussed below.

6.3.1 Document Filing and Storage

As previously discussed, project files and raw data files will be maintained at Farallon's office. Files will be organized by project tasks or subject heading, and maintained by the document control clerk. Hard copy project files will be archived for a minimum of 3 years after completion of the project. Electronic copies of files will be maintained in a project directory, and backed up on a daily, weekly, and monthly basis.

6.3.2 Access to Project Files

Access to project files will be controlled and limited to Mr. Wilbur Allison dba Allison's Norge Village Dry Cleaners and his authorized representatives, Ecology, and Farallon personnel. When a hard copy file is removed, a sign-out procedure will be used to track custody of the file. If a document is to be used for an extended period, a copy of the document will be produced, and the original will be returned to the project file. Electronic access to final reports, tables, and figures will be write-protected in the project directory.

6.4 DATA REDUCTION AND ANALYSIS

The Project Manager and QA/QC Officer are responsible for data review and validation. Data validation parameters are outlined in Section 3, Data Quality Objectives. The particular type of analyses and presentation method selected for any given data set will depend on the type, quantity, quality, and prospective use of the data. The analysis of project data will require data reduction for preparation of tables, charts, and maps. To ensure that data are accurately transferred during the reduction process, two data reviews will be performed: one by the QA/QC Officer or Project Manager, and another by the Project Principal prior to issuing the documents. Any incorrect transfers of data will be highlighted and corrected.

6.4.1 Data Reporting Formats

Physical and chemical characterization information developed in connection with the cleanup action will be presented in the following format:

6.4.1.1 Maps

Plan maps needed to illustrate results of the cleanup action will be assembled or prepared. The maps may include but are not limited to plan maps of the Site showing chemical concentrations, groundwater elevation contour maps, and as-built drawings of the remediation system.

6.4.1.2 Summary Tables and Plots

Laboratory reports will be sorted according to various parameters to summarize gathered information for easier assimilation and presentation. Groundwater, air, and soil sampling and analysis data will be sorted several ways, including by sample point number, constituent, and date of sample collection. The sorting parameters will be chosen based on determination of the most appropriate format, and the utility of that format in demonstrating the physical and chemical characteristics of interest. Summary tables, including well construction data, groundwater levels, and operation settings of the SVE system, also will be generated.

6.4.1.3 Cross-Sections

Cross-sections or vertical profiles may be generated from field data to display Site stratigraphy or other aspects of the cleanup action.

7.0 QUALITY CONTROL PROCEDURES

This section provides a description of the QC procedures for both field activities and laboratory analysis. The field QC procedures include standard operating procedures for sample collection and handling, equipment calibration, and field quality control samples.

7.1 FIELD QUALITY CONTROL

Field QC samples (e.g., field duplicate samples) to be collected during this project are described in the Draft SAP (Appendix A of the Draft CAP). The purpose of these samples is discussed in Section 3 of this document, Data Quality Objectives. Standard operating procedures also will be implemented during field-screening activities. The procedural basis for these field data collection activities will be documented on the Field Report forms, as described in Section 6 of the Draft SAP (Appendix A of the Draft CAP). Any deviation from established protocols will be documented on the Field Report forms.

7.2 LABORATORY QUALITY CONTROL

Analytical laboratory QA/QC procedures are provided in the laboratory Quality Assurance Plan that are on file at the Farallon office.

7.3 DATA QUALITY CONTROL

All data generated by OnSite will undergo two levels of QA/QC evaluation: one by the laboratory and one by Farallon. As specified in OnSite's laboratory Quality Assurance Plan, the laboratory will perform initial data reduction, evaluation, and reporting. The analytical data will then be validated at the Farallon office under supervision of the QA/QC Officer. The following types of QC information will be reviewed, as appropriate:

- Method deviations;
- Sample transport conditions (temperature and integrity);
- Sample extraction and holding times;
- Method reporting limits;

- Blank samples;
- Duplicate samples;
- Surrogate recoveries;
- Percent completeness; and
- RPD (precision).

Farallon will review field records and the results of field observations and measurements to ensure that procedures were properly performed and documented. The following elements will be included in the review of field procedures:

- Completeness and legibility of field logs;
- Preparation and frequency of field QC samples;
- Equipment calibration and maintenance; and
- Chain of Custody forms.

7.4 DATA ASSESSMENT PROCEDURES

The Project Manager and QA/QC Officer are responsible for data review and validation. Upon receipt of each data package from the laboratory, calculations for precision, accuracy, and completeness will be performed using the equations presented in Section 3, Data Quality Objectives. Results will be compared to quantitative DQOs, where established, or qualitative DQOs. Data validation parameters also are outlined in Section 3, Data Quality Objectives.

8.0 PERFORMANCE AND SYSTEM AUDITS

Performance audits will be completed for both sampling and analysis work. Field performance will be monitored through regular review of field notebooks, field measurements, and Chain of Custody forms. The Project Manager and/or the QA/QC Officer also may perform periodic on-Site review of work in progress.

Accreditation of the analytical laboratory by Ecology for each analytical method demonstrates the laboratory's ability to properly perform the requested methods. Therefore, a system audit of OnSite will not be conducted.

The Project Manager and/or QA/QC Officer will frequently oversee communication with the analytical laboratory while samples are being processed and analyzed at the laboratory. This oversight will allow Farallon to assess the progress toward meeting the DQOs, and to take corrective measures if problems arise.

The analytical laboratory will be responsible for identifying and correcting (as appropriate) any deviation from performance standards as discussed in the laboratory Quality Assurance Plan. During sample analysis, the laboratory will communicate to the Project Manager or the QA/QC Officer any deviation to the performance standard, and the appropriate corrective measure(s). Corrective action is discussed in Section 10.

9.0 PREVENTIVE MAINTENANCE

Operation and maintenance manuals will accompany all field parameter analysis and measurement equipment. Included in these manuals will be procedures for calibration, operation, and troubleshooting. All maintenance activities will be documented in the project Field Report forms and/or equipment logbooks. A schedule of preventive maintenance activities also will be maintained. In addition, spare parts and tools will be included in each equipment storage case to minimize equipment downtime.

Preventive maintenance also will include regular inspection of SVE system equipment, and maintenance, as necessary. Regular inspection will include monitoring the operation and settings of the SVE blower to ensure that it operating with the optimum range. All aboveground piping, valves, and gauges also will be inspected, to ensure that there are no leaks from the SVE system.

10.0 CORRECTIVE ACTION

Corrective actions will be the joint responsibility of the Project Manager and the QA/QC Officer. Corrective procedures may include:

- Identifying the source of a violation;
- Reanalyzing samples if holding-time criteria permit;
- Resampling and analyzing;
- Remeasuring a parameter;
- Evaluating and amending sampling and analytical procedures; and/or
- Qualifying data to calculate the level of uncertainty.

During field sampling operations, the Project Manager and field team members will be responsible for identifying and correcting a protocol that may compromise the quality of the data. All corrective action taken will be documented in the field notes.

11.0 QUALITY ASSURANCE REPORTS

The Closure Report will include a QA section, which will summarize the data quality of the deliverables that are generated during the project. This summary will include at a minimum:

- An assessment of data accuracy and completeness;
- The results of performance and/or system audits; and
- A significant QA problem and its impact on the DQOs.

TABLE

QUALITY ASSURANCE PROJECT PLAN
Appendix B of the Draft Cleanup Action Plan
Allison's Norge Village
120 Northeast Turner Street
Olympia, Washington
Facility Site ID# 14214153

Farallon PN: 663-010

Table B-1
Analytical Methods, Container, Preservation, and Holding Time Requirements
Allison's Norge Village
Olympia, Washington
Farallon PN: 663-010

Analytical Method	Container	Number	Preservation Requirements	Holding Time
Soil Samples				
HVOCs by EPA SW-846 Method 5035A/8260B	4-oz. glass jar	1	4°C	14 days
	40-ml pre-weighed VOA vial	1		
	40-ml pre-weighed VOA vial w/stir bar	2		
Groundwater Samples				
HVOCs by EPA SW-846 Method 5030B/8260B	40-ml VOA vial	3	4°C; HCl to pH <2; no head space	14 days
Air Samples				
HVOCs by EPA SW-846 Method 8260B	Tedlar Bag	1	Cool, dark	24 hours

NOTES:

°C = degrees Celsius

EPA = U.S. Environmental Protection Agency

HCl = hydrochloric acid

HVOCs = halogenated volatile organic compounds

ml = milliliters

oz = ounce

VOA = volatile organic analysis

APPENDIX C
HEALTH AND SAFETY PLAN

Draft Cleanup Action Plan
Allison's Norge Village
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Olympia, Washington
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Farallon PN: 663-010

To be included in the FINAL Sampling and Analysis Plan

Not Included in this DRAFT

APPENDIX D
BORING/WELL CONSTRUCTION LOGS

Draft Cleanup Action Plan
Allison's Norge Village
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Olympia, Washington
Facility Site ID# 14214153

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To be included in the FINAL Sampling and Analysis Plan

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APPENDIX E
LABORATORY ANALYTICAL REPORTS

Draft Cleanup Action Plan
Allison's Norge Village
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Olympia, Washington
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Farallon PN: 663-010

To be included in the FINAL Sampling and Analysis Plan

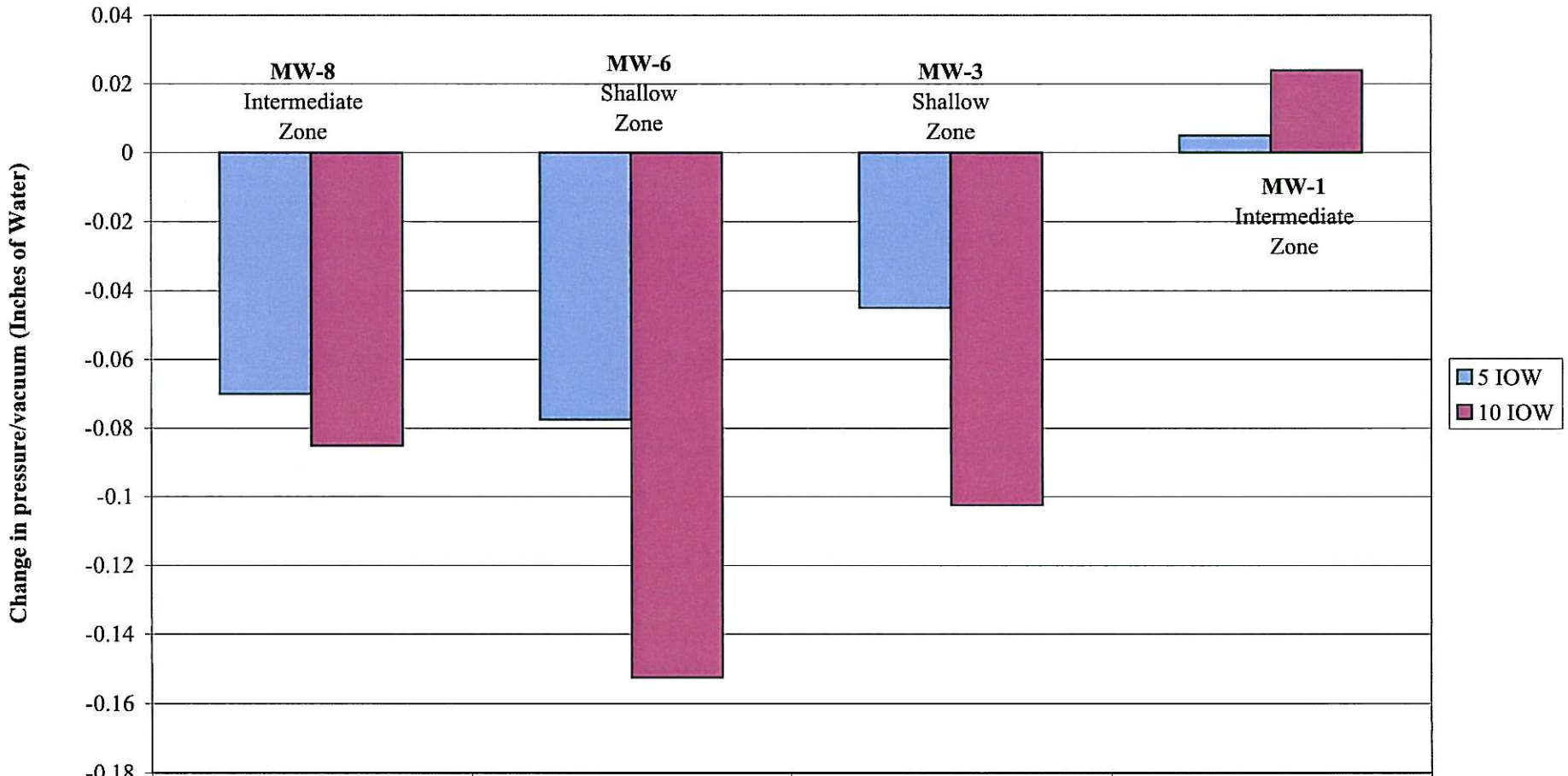
Not Included in this DRAFT

APPENDIX F
SOIL VAPOR EXTRACTION PILOT TEST RESULTS

Draft Cleanup Action Plan
Allison's Norge Village
120 Northeast Turner Street
Olympia, Washington
Facility Site ID# 14214153

Farallon PN: 663-010

Figure F-1
Changes in Pressure/Vacuum with Distance from
SVE Pilot Test Well MW-4 (Shallow Zone)



Change in pressure/vacuum (Inches of Water)

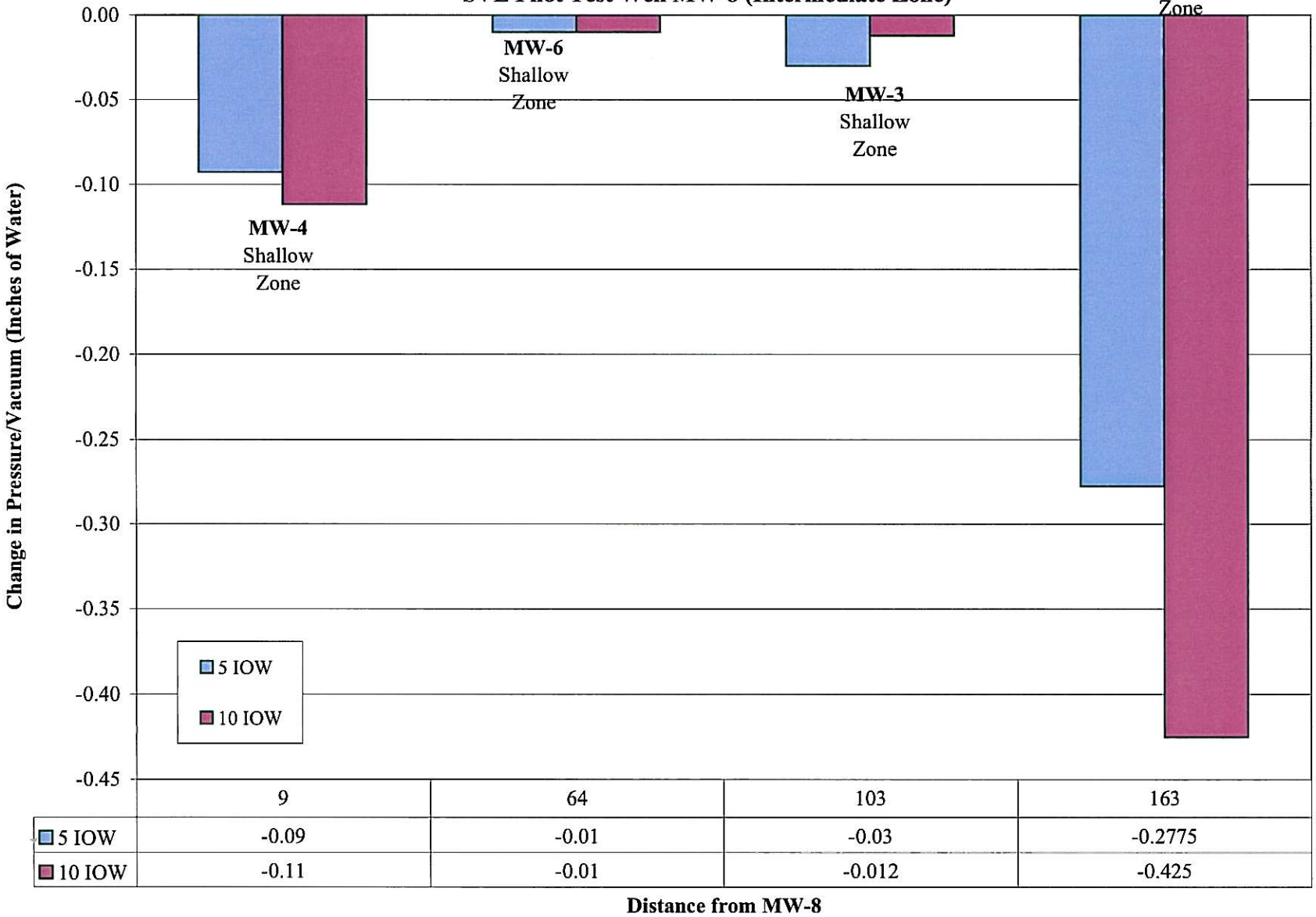
	9	72	111	171
5 IOW	-0.07	-0.0775	-0.045	0.005
10 IOW	-0.085	-0.1525	-0.1025	0.024

Distance from MW-4 (feet)

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Figure F-2
Changes in pressure/vacuum with distance from SVE Pilot Test Well MW-8 (Intermediate Zone)



	9	64	103	163
5 IOW	-0.09	-0.01	-0.03	-0.2775
10 IOW	-0.11	-0.01	-0.012	-0.425

Distance from MW-8

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Table F-1
Summary of Soil Vapor Extraction Pilot Test Data
Shallow Zone Pilot Test Well MW-4
Alison's Norge Village
Olympia, Washington
Farallon PN: 663-010

				Observation Wells	MW-8	MW-6	MW-3	MW-1
				Screened Zone	Intermediate	Shallow	Shallow	Intermediate
				Distance from MW-4 (feet)	9	72	111	171
Shallow Zone Pilot Test Well MW-4					**MW-8**	**MW-6**	**MW-3**	**MW-1**
Time	**Vacuum (IOW)**	**Δp (IOW)**	**Flow (scfm)**	**PCE (ppm)**	**Pressure (+) and Vacuum (-) Measurements IOW**			
1115	5	NM	NM	NM	+0.15	0.00	+0.01	+0.145
1140		0.6	45.9	NM	+0.09	-0.083	+0.022	+0.099
1150		0.49	41.45	NM	+0.0775	-0.0875	-0.065	+0.10
1200		0.49	41.45	NM	+0.02	-0.0975	-0.09	+0.045
1210		NM	NM	>100	NM	NM	NM	NM
1215		0.495	41.45	NM	-0.015	-0.09	-0.0625	+0.05
1235		0.495	41.45	NM	+0.005	-0.0825	-0.0575	+0.07
1250		0.32	33.5	NM	+0.08	-0.0775	-0.035	+0.15
1305	10	1.3	67.5	NM	+0.095	-0.135	-0.055	+0.145
1317		1.6	74.9	NM	+0.0775	-0.145	-0.09	+0.16
1325		1.25	66.2	NM	+0.035	-0.16	-0.12	+0.125
1339		1.5	72.5	NM	+0.028	-0.147	-0.105	+0.113
1358		1.45	71.3	NM	+0.065	-0.1525	-0.1075	+0.14
1415		1.55	73.7	NM	+0.065	-0.1525	-0.0925	+0.169
1425		NM	NM	>100	NM	NM	NM	NM

NOTES:
Δp = pressure differential
IOW = inches of water
scfm = standard cubic feet per minute
PCE = tetrachloroethene
ppm = parts per million

Table F-2
Summary of Soil Vapor Extraction Pilot Test Data
Intermediate Zone Pilot Test Well MW-8
Alison's Norge Village
Olympia, Washington
Farallon PN: 663-010

				Observation Wells	MW-4	MW-6	MW-3	MW-1
				Screened Zone	Shallow	Shallow	Shallow	Intermediate
				Distance from MW-4 (feet)	9	64	103	163
Intermediate Zone Pilot Test Well MW-8					**MW-4**	**MW-6**	**MW-3**	**MW-1**
Time	**Vacuum (IOW)**	**Flow (Δp)**	**Flow (scfm)**	**PCE (ppm)**	**Pressure (+) and Vacuum (-) Measurements IOW**			
1505	5	NM	NM	NM	+0.06275	+0.01	+0.03	+0.24
1512		0.16	23.69	NM	+0.015	+0.005	+0.0275	+0.1925
1520		0.16	23.69	NM	0	0	+0.0275	+0.1125
1538		0.16	23.69	NM	-0.025	+0.01	+0.01	+0.005
1555		0.15	22.93	NM	-0.03	-0.001	0	-0.025
1615		0.18	25.12	NM	-0.0425	0	-0.005	-0.07
1637		0.16	23.69	NM	-0.03	0	0	-0.0375
1645		NM	NM	90	NM	NM	NM	NM
1647	10	0.32	33.5	NM	-0.03	-0.0075	+0.025	-0.0325
1654		0.34	34.53	NM	-0.036	-0.005	+0.015	-0.0825
1708		0.32	33.5	NM	-0.06	0	+0.005	-0.15
1724		0.36	35.53	NM	-0.049	0	+0.018	-0.1625
1740		0.36	35.53	NM	-0.049	0	+0.018	-0.175
1750		0.36	35.53	NM	-0.049	0	+0.018	-0.185
1801		NM	NM	>100	NM	NM	NM	-0.199

NOTES:
IOW = Inches of Water
Δp = pressure differential
PCE = tetrachloroethene
ppm = parts per million
scfm = standard cubic feet per minute

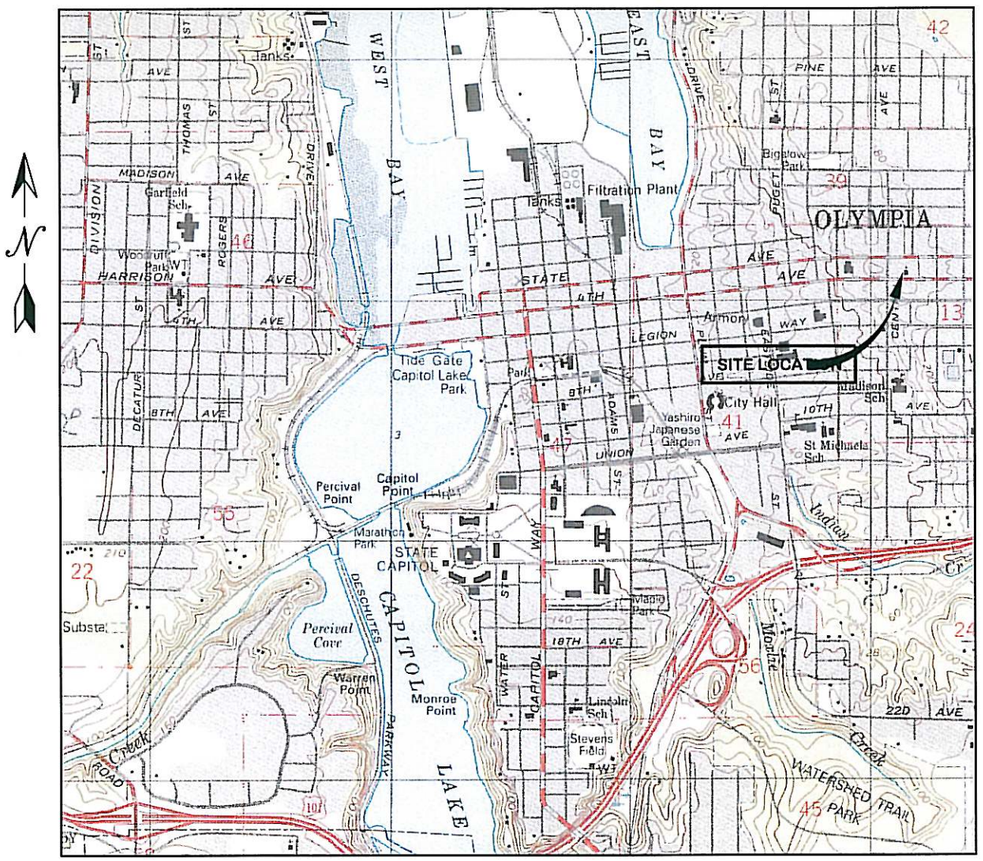
APPENDIX G
ENGINEERING DESIGN DRAWINGS

Draft Cleanup Action Plan
Allison's Norge Village
120 Northeast Turner Street
Olympia, Washington
Facility Site ID# 14214153

Farallon PN: 663-010

REMEDIATION PROJECT

ALLISON'S NORGE VILLAGE.
120 NORTH EAST TURNER STREET
OLYMPIA, WASHINGTON



REFERENCE: 7.5 MINUTE USGS QUADRANGLE TUMWATER, WASHINGTON. DATED 1997

SITE LOCATION MAP
(NOT TO SCALE)

DRAWING INDEX

SHEET NO.	DRAWING TITLE
1	TITLE SHEET, SITE LOCATION MAP, AND DRAWING INDEX
2	GENERAL NOTES, LEGEND, SYMBOLS, AND ABBREVIATIONS
3	SITE PLAN WITH PROPOSED SVE SYSTEM AND COMPOUND DETAIL
4	DETAILS
5	DETAILS
6	PROCESS AND INSTRUMENTATION DIAGRAM

DRAFT

	11/7/05	ISSUED FOR BIDDING	TM/DEW	RC/TM	RM
	DATE	DESCRIPTION	BY	CKD.	APP.

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ALLISON'S NORGE VILLAGE
REMEDIATION PROJECT
OLYMPIA, WASHINGTON
TITLE SHEET,
SITE LOCATION MAP, AND
DRAWING INDEX

SCALE	AS SHOWN
PROJECT NO.	663010
FILE NAME	SYSTEM
SHEET NO.	1
OF	6

ELECTRICAL ABBREVIATIONS

A/AMP	AMP
AC	ALTERNATING CURRENT
BD	BUS DUCT
C	CURRENT
CB	CIRCUIT BREAKER
CLG	CEILING
DC	DIRECT CURRENT
DIS	DISCONNECT
DP	DOUBLE POLE
DT	DOUBLE THROW
EG	ENCLOSED AND GASKETED
E(OH)	ELECTRICAL (OVERHEAD)
E(UG)	ELECTRICAL (UNDERGROUND)
EMER	EMERGENCY
EPO	EMERGENCY POWER OFF
EMT	ELECTRICAL METALLIC TUBING
EXP	EXPOSED
FBO	FURNISHED BY OTHERS
FLEX	FLEXIBLE METAL CONDUIT
FRN	DUAL ELEMENT FUSE
GEN	GENERATOR
GFIC	GROUND FAULT INTERRUPTER
GND	GROUND
GRC	GALVANIZED RIGID CONDUIT
HOA	HAND-OFF-AUTO SWITCH
IRD	INFRARED DETECTOR
HP	HORSE POWER
HZ	CYCLES PER SECOND
JB	JUNCTION BOX
LFMC	LIQUID TIGHT FLEXIBLE METAL CONDUIT
M	MOTOR/MOTOR STARTER COIL
MCC	MOTOR CONTROL CENTER
MCP	MOTOR CIRCUIT PROTECTOR
NC	NORMALLY CLOSED
NEC	NATIONAL ELECTRIC CODE
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
NF	NON-FUSED
NO	NORMALLY OPEN
OL	OVERLOADS
PBS	PUSHBUTTON
PF	POWER FACTOR
PL	PILOT LIGHT
PLC	PROGRAMMABLE LOGIC CONTROLLER
RC	RIGID CONDUIT
RCPT	RECEPTACLE
SN	SOLID NEUTRAL
SP	SINGLE POLE
ST	SINGLE THROW
SW	SWITCH
TF/TRAN	TRANSFORMER
UF	UNDERFLOOR
UG	UNDERGROUND
V	VOLTS
VFD	VARIABLE FREQUENCY DRIVE
VP	VAPOR PROOF
WHT	WHITE
WP	WEATHER PROOF
XP	EXPLOSION PROOF

STANDARD ABBREVIATIONS

AF	AIR FILTER
AB	AGGREGATE BASE
AC	ASPHALTIC CONCRETE
APPROX	APPROXIMATELY
AF	AIR FILTER
AS	AIR SPARGE
BF	BLIND FLANGE
B.G.S.	BELOW GROUND SURFACE
BLDG	BUILDING
BOP	BOTTOM OF PIPE
BV	BALL VALVE
CONC	CONCRETE
CPLG	COUPLING
℄ /CL	CENTERLINE
CV	CONTROL VALVE/CHECK VALVE
DC	DOUBLE CONTAINED
Ø/DIA	DIAMETER
DWG	DRAWING
DP	DUAL PHASE
DPI	DIFFERENTIAL PRESSURE INDICATOR
EF	EACH FACE
EL/ELEV	ELEVATION
ELEC	ELECTRICAL
ELB	ELBOW
EPDM	ETHYLENE PROPYLENE RUBBER
EXIST/(E)	EXISTING
EXP	EXPANSION
EW	EACH WAY
EA	EACH
FC	FAIL CLOSE
FO	FAIL OPEN
FLXC	FLEXIBLE CONNECTION
FM	FLOW METER
FL	FLOW LINE
FT	FOOT
FUT	FUTURE
FIN GR	FINISHED GRADE
FE	FLANGED END
FNPT	FEMALE NATIONAL PIPE THREAD
GA	GAUGE
GAC	GRANULAR ACTIVATED CARBON
GALV	GALVANIZED
GI	GALVANIZED IRON
GPM	GALLONS PER MINUTE
GR	GRADE
GND	GROUND
GSKT	GASKET
GW	GROUNDWATER
GV	GATE VALVE
HDPE	HIGH DENSITY POLYETHYLENE
HORIZ	HORIZONTAL
HP	HORSEPOWER/HIGH PRESSURE
HR	HOUR
HS	HOSE
HYD	HYDRANT
HOA	HAND OFF AUTOMATIC
ID	INSIDE DIAMETER
IN	INCHES
INV	INVERT
IPS	IRON PIPE SIZE
JT	JOINT
JB	JUNCTION BOX
KO	KNOCK OUT
LSHH	LEVEL SWITCH
M	MOTOR
MAX	MAXIMUM
MH	MANHOLE
MJ	MECHANICAL JOINT
MIN	MINUTE/MINIMUM
MISC	MISCELLANEOUS
MNPT	MALE NATIONAL PIPE THREAD
MP	METER PUMP
MON.PORT	MONITORING PORT
MW	MONITORING WELL
NC	NORMALLY CLOSED
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
NO.	NUMBER
N	NEW
NTS	NOT TO SCALE
OC	ON CENTER
OD	OUTSIDE DIAMETER
OSHA	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
OVHD	OVERHEAD
#/LB	POUND
PB	PULL BOX
PBF	PROVIDED BY FARALLON
PC	PORTLAND CEMENT
PCC	PORTLAND CEMENT CONCRETE
PG	PRESSURE GAS
PL	PROPERTY LINE/PIPE LINE
PO	PUMP OUT
P	PRESSURE
PRV	PRESSURE RELEASE VALVE
PSI	POUNDS PER SQUARE INCH
PSIA	POUNDS PER SQUARE INCH, ABSOLUTE
PSIG	POUNDS PER SQUARE INCH, GAUGE
PT	PRESSURE TRANSDUCER
PTW	PRESSURE TREATMENT
PVC	POLYVINYL CHLORIDE
PV	PROCESS VARIABLE
PR	PAIR
PUE	PUBLIC UTILITY EASEMENT
R	RADIUS/RISER
RC	REINFORCED CONCRETE
REQ	REQUIRED
REF	REFERENCE
SCH	SCHEDULE
SDR	STANDARD DIMENSION RATIO
SECT	SECTION
SHT	SHEET
SPEC	SPECIFICATION
SQ	SQUARE
STA	STATION
STD	STANDARD
STL	STEEL
SBO	SUPPLIED BY OWNER
ST	SAMPLE TAP
STR	STRAINER
SS	STAINLESS STEEL
STL	STEEL
SVE	SOIL VAPOR EXTRACTION
TYP	TYPICAL
TOC	TOP OF CASING/CURB
TOS	TOP OF STEEL
TOW	TOP OF WALL
UBC	UNIFORM BUILDING CODE
UGPS	UNDERGROUND PULL SECTION
UTIL	UTILITY
V	VALVE/VENT/VOLTS
VAC	VACUUM
VAR	VARIES/VARIABLE
VERT	VERTICAL
VP	VAPOR
VRV	VACUUM RELIEF VALVE
W/	WITH
W/O	WITHOUT
WS	WATER SURFACE/WATER STOP

PIPING, ELECTRICAL AND EQUIPMENT SYMBOLS

- GATE VALVE
- GLOBE VALVE
- BALL VALVE
- BUTTERFLY VALVE
- CHECK VALVE
- DIAPHRAM OPERATED VALVE
- SOLENOID VALVE (S)
- MOTOR OPERATED VALVE (M)
- PRESSURE REGULATING VALVE
- DRAIN (D)
- WELD CAP
- SCREWED CAP
- SCREWED PLUG
- FLANGE
- BLIND FLANGE
- REDUCER/INCREASER
- DIRECTION OF FLOW
- UNION
- FLEXIBLE PIPE COUPLING
- BLOWER OR FAN
- CENTRIFUGAL PUMP
- PITOT TUBE
- STRAINER
- TRAP
- FILTER (AF)
- DIAMETER (Ø)
- FEMALE ADAPTER
- SILENCER (S)
- NEEDLE VALVE
- FLOW METER
- HOSE BIB
- SAMPLE TAP/MONITORING PORT
- HEAT EXCHANGER
- PRESSURE RELIEF OR AIR RELIEF
- VACUUM RELIEF
- NO — NORMALLY OPEN
- NC — NORMALLY CLOSED
- MAGNETIC STARTER
- DUPLEX RECEPTICAL, 15A; WP-WEATHER PROOF
- ETM — ELAPSED TIME METER
- FUSE
- FUSED DISCONNECT
- CAMLOCK CONNECTION
- VERTICAL PIPERUN
- GROUND
- GROUND ROD (3/4" COPPER WELD)
- HEATER STRIP
- JUNCTION BOX, PB-PULLBOX (J)
- KWH — KILOWATT HOUR METER
- MOTOR (M)
- MOTOR OVERLOAD
- NON-FUSABLE DISCONNECT SWITCH
- PILOT LIGHT, R=RED, W=WHITE, G=GREEN
- SELECTOR SWITCH AO=AUTO OFF, HOA=HAND OFF AUTO
- SWITCH, 120-277V, 2-2POLE, 20A
- THERMOSTAT (T)
- TIME DELAY RELAY, CR=CONTROL RELAY (TD)
- TRANSFORMER
- UNDERGROUND PULLBOX
- W.P. — WEATHER PROTECTED
- 120/208V PANEL
- 277/480V PANEL
- *HIGH LIGHT STANDARD
- X — REVISION TO PLANS

INSTRUMENTATION ABBREVIATIONS AND SYMBOLS

INSTRUMENT LEGEND

FIRST LETTER INITIATING VARIABLE		SUCCEEDING LETTERS OUTPUT FUNCTIONS
A	ANALYSIS	ALARM
B	BURNER	
C	CONDUCTIVITY	CONTROL
D	DENSITY	DIFFERENTIAL
E	POTENTIAL (VOLTS)	PRIMARY ELEMENT
F	FLOW RATE	RATIO (FRACTION)
G	FIRE ALARM	GLASS (SIGHT GAUGE)
H	HAND (MANUALLY)	HIGH
I	CURRENT (AMPERES)	INDICATE
J	POWER	
K	TIME	
L	LEVEL	LEAK, LOW
M	MOISTURE/HUMIDITY	LIGHT (PILOT)
N	EQUIPMENT STATUS	
P	PRESSURE/VACUUM	POINT (TEST CONNECTION)
Q	QUANTITY	INTEGRATE (TOTALIZE)
R		RECORD/PRINT
S	SPEED	SWITCH
T	TEMPERATURE	TRANSMIT
U	MULTIVARIABLE	MULTIFUNCTION
V	VIBRATION/VOLUME	VALVE/DAMPER
W	WEIGHT/FORCE/TORQUE	
X	UNCLASSIFIED	UNCLASSIFIED
Y		RELAY/COMPUTE
Z	POSITION	DRIVE/ACTUATE

INSTRUMENT SYMBOLS

SYMBOL	DESCRIPTION
M	MOTOR
HOA	HAND-OFF-AUTO SELECTOR SWITCH
	LOCALLY MOUNTED INSTRUMENT
	CONTROL PANEL MOUNTED INSTRUMENT
I	INTERLOCK
-10	PLC SHUTDOWN ALARM

PIPE CODES

6"Ø - PVC - GW

- PIPE DIAMETER, INCHES
- SERVICE
- PIPE MATERIAL

LINE TYPES & SYMBOLS

- MW-4 — SHALLOW ZONE SVE WELL
- MW-8 — INTERMEDIATE ZONE SVE WELL
- MW-7 — DEEP ZONE GROUNDWATER MONITORING WELL
- SVE-8S — SHALLOW ZONE SVE WELL
- SVE-61 — INTERMEDIATE ZONE SVE WELL
- DRY CLEANING MACHINE
- 165-GALLON ABOVE-GROUND STORAGE TANK
- CONDENSATE PIPE
- SOIL VAPOR EXTRACTION LINE
- PROPERTY BOUNDARY
- D — D — FLOOR DRAIN
- S — SANITARY SEWER MAIN
- SS — SS — SIDE SEWER

STANDARD SYMBOLS

SECTION — DETAIL NUMBER (4 / 3|6) — CURRENT SHEET NO. — REFERENCED SHEET NO.

GENERAL NOTES

1. A COPY OF THE PROJECT DESIGN DRAWINGS AND SPECIFICATIONS SHALL BE MAINTAINED ON THE JOB SITE AT ALL TIMES.
2. COPIES OF ALL PERMITS SHALL BE MAINTAINED ON THE JOB SITE AT ALL TIMES. THE CONTRACTOR SHALL COMPLY WITH ALL PERMIT REQUIREMENTS.
3. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING ALL DIMENSIONS.
4. BURIED UTILITIES SHOWN ON THE DRAWINGS ARE FOR GENERAL INFORMATION ONLY. UTILITY LOCATIONS ARE APPROXIMATE AND MAY NOT BE INCLUSIVE OF ALL UTILITIES THAT EXIST ON THE PROPERTY.
5. THE CONTRACTOR SHALL HAVE A PRIVATE UTILITY LOCATE SERVICE VERIFY ALL UTILITIES AND MARK THEIR LOCATIONS ON THE GROUND PRIOR TO STARTING CONSTRUCTION. FARALLON SHALL BE CONTACTED IMMEDIATELY IF A CONFLICT IS FOUND BETWEEN EXISTING UTILITIES AND THE PROJECT DESIGN.
6. FARALLON SHALL BE NOTIFIED OF DISCREPANCIES BETWEEN CONTRACT DRAWINGS AND ACTUAL SITE CONDITIONS.
7. THE CONTRACTOR SHALL ASSUME RESPONSIBILITY FOR THE JOB SITE CONDITIONS AND ENSURE THE SAFETY OF ALL PERSONS AND PROPERTY FOR THE DURATION OF ON SITE PROJECT WORK. THE CONTRACTOR SHALL PROTECT STRUCTURES, UTILITIES, AND PAVING FROM DAMAGE, DIRECT OR INDIRECT, RESULTING FROM THE WORK. THIS REQUIREMENT SHALL APPLY CONTINUOUSLY OVER THE DURATION OF ON SITE ACTIVITIES AND NOT BE LIMITED TO NORMAL WORKING HOURS.
8. ALL EXCAVATIONS SHALL BE PERFORMED IN STRICT ACCORDANCE WITH APPLICABLE U.S. DEPARTMENT OF LABOR OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) AND THE WASHINGTON INDUSTRIAL SAFETY AND HEALTH ACT (WISHA) REGULATIONS. THE CONTRACTOR ASSUMES FULL RESPONSIBILITY FOR THE SAFETY OF ALL CONSTRUCTION OPERATIONS.
9. NO TRENCHES SHALL BE LEFT OPEN WHEN WORK IS NOT IN PROGRESS. ALL OPEN EXCAVATIONS SHALL BE FENCED.

DRAFT

	11/7/05	ISSUED FOR BIDDING	TM/DEW	RC/TM	RM
	DATE	DESCRIPTION	BY	CKD.	APP.

PREPARED BY

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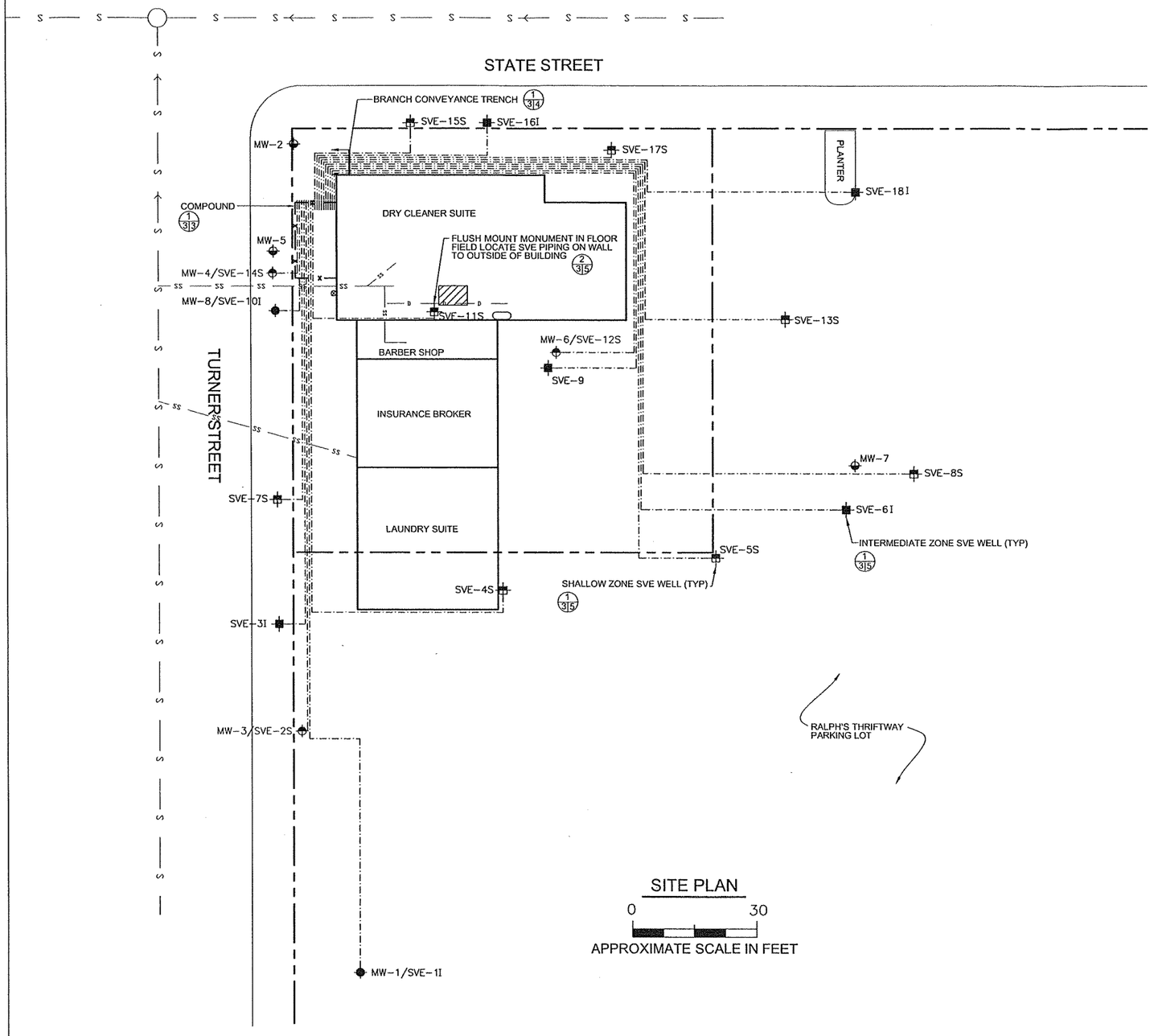
PREPARED FOR

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C/O MR. DAVID D. CULLEN
WEST HILLS OFFICE PARK, BUILDING 11
1800 COOPER POINT ROAD SOUTHWEST
OLYMPIA, WASHINGTON

ALLISON'S NORGE VILLAGE
REMEDIATION PROJECT
OLYMPIA, WASHINGTON

GENERAL NOTES, LEGEND, SYMBOLS, AND ABBREVIATIONS

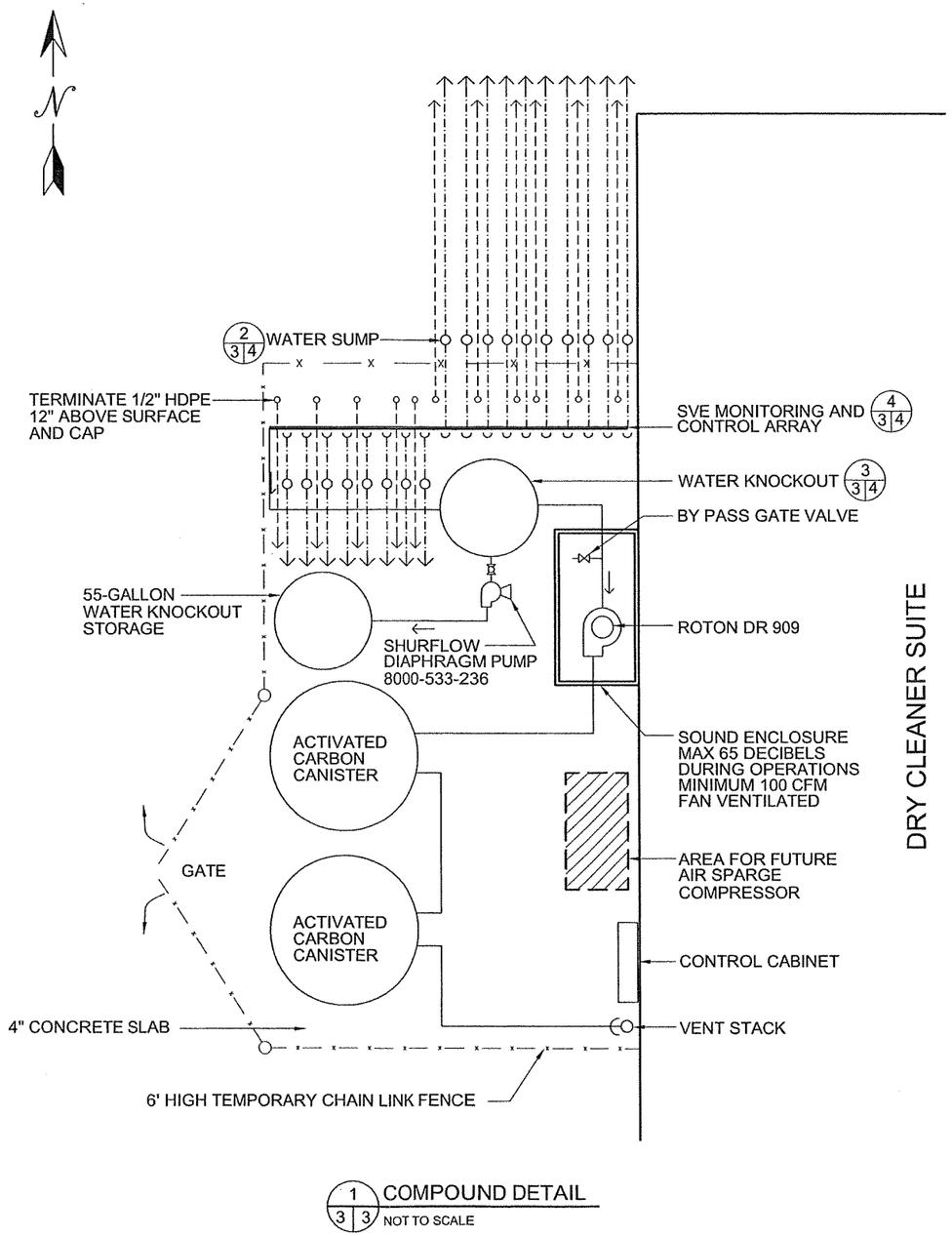
SCALE	AS SHOWN
PROJECT NO.	663010
FILE NAME	SYSTEM
SHEET NO.	2
OF	6



SITE PLAN

0 30

APPROXIMATE SCALE IN FEET



1/3|3 COMPOUND DETAIL

NOT TO SCALE

DRAFT

	11/2/05	ISSUED FOR BIDDING	TM/DEW	RC/TM	RM
	DATE	DESCRIPTION	BY	CKD.	APP.

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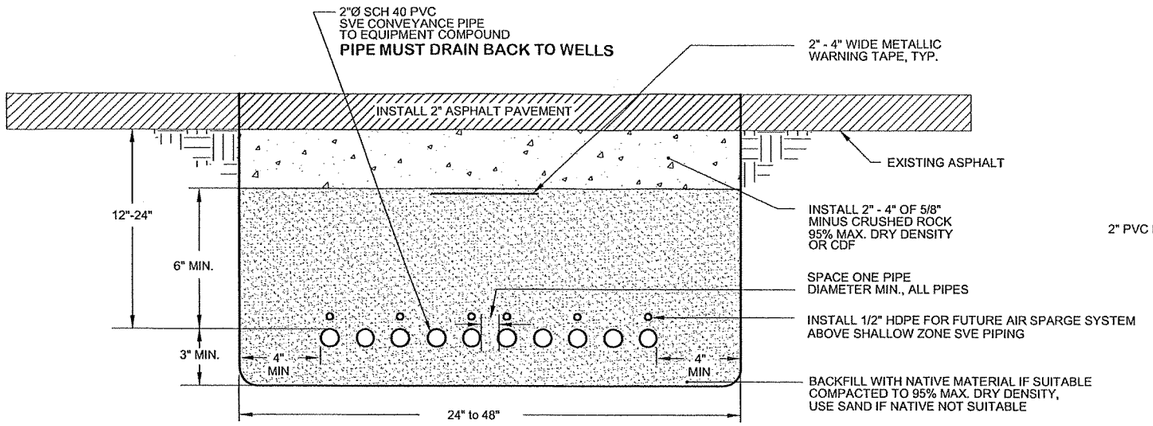
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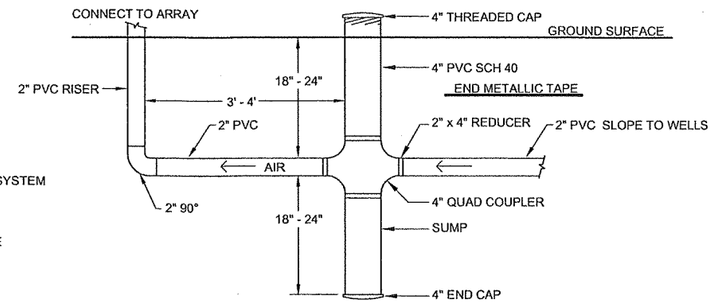
ALLISON'S NORGE VILLAGE
REMEDIATION PROJECT
OLYMPIA, WASHINGTON

SITE PLAN WITH PROPOSED SVE SYSTEM AND COMPOUND DETAIL

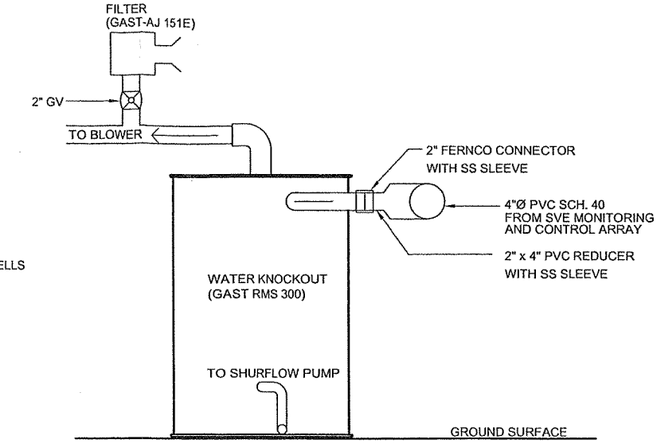
SCALE: AS SHOWN
PROJECT NO.: 663010
FILE NAME: SYSTEM
SHEET NO.: 3 OF: 6



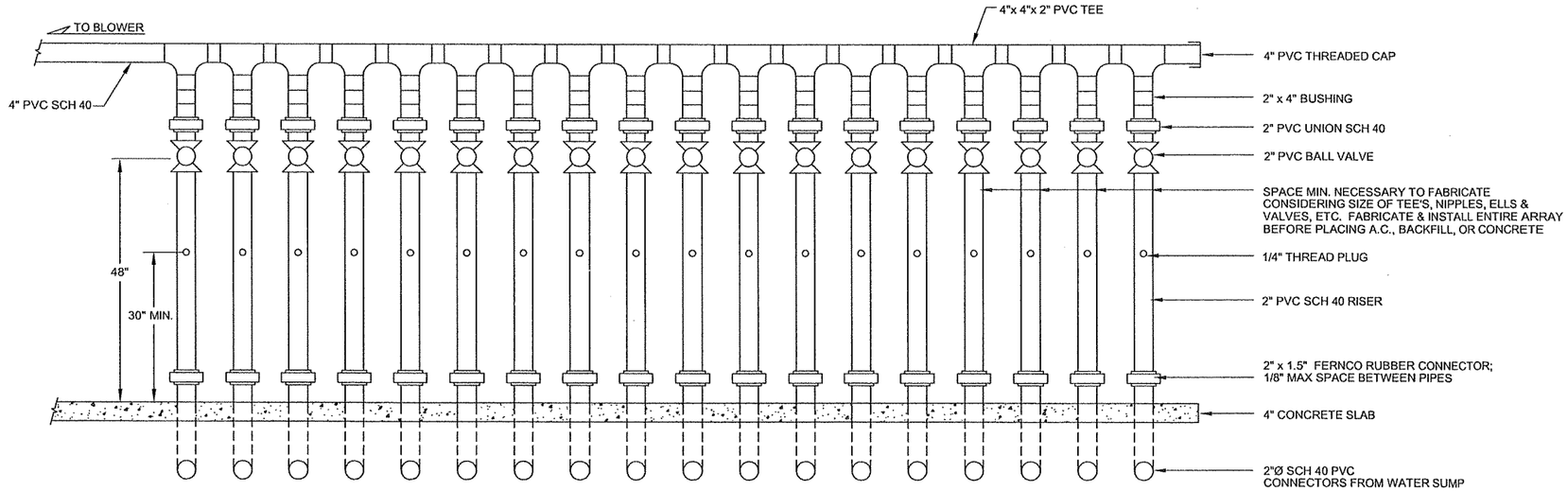
1 / 4 3 BRANCH CONVEYANCE TRENCH
NOT TO SCALE



2 / 4 3 WATER SUMP
NOT TO SCALE



3 / 4 3 WATER KNOCKOUT DETAIL
NOT TO SCALE



4 / 4 3 SVE MONITORING & CONTROL ARRAY
NOT TO SCALE

DRAFT

	11/7/05	ISSUED FOR BIDDING	TM/DEW	RC/TM	RM
	DATE	DESCRIPTION	BY	CKD.	APP.

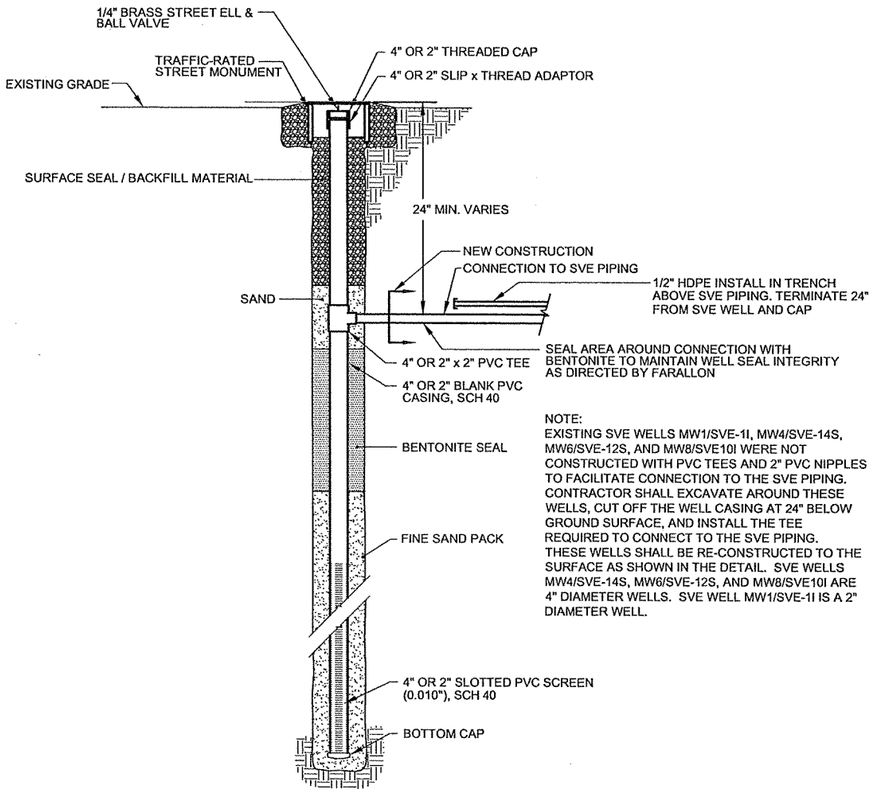
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ALLISON'S NORGE VILLAGE
REMEDIATION PROJECT
OLYMPIA, WASHINGTON

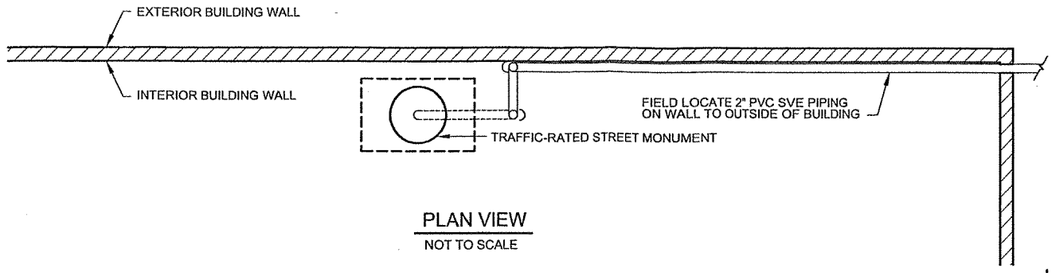
DETAILS

SCALE: AS SHOWN
PROJECT NO.: 663010
FILE NAME: SYSTEM
SHEET NO.: 4 OF: 6

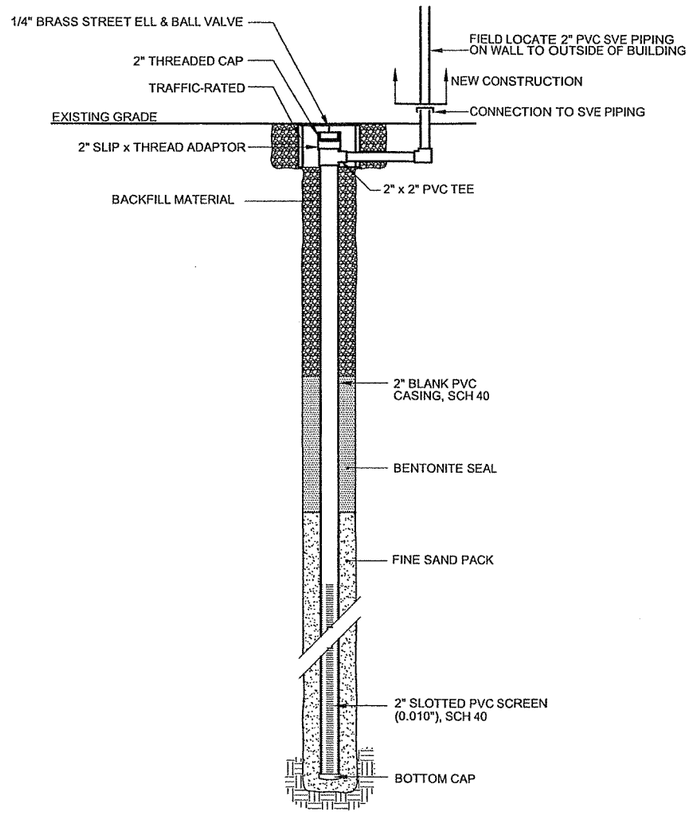


NOTE:
EXISTING SVE WELLS MW1/SVE-1I, MW4/SVE-14S, MW6/SVE-12S, AND MW8/SVE10I WERE NOT CONSTRUCTED WITH PVC TEES AND 2" PVC NIPPLES TO FACILITATE CONNECTION TO THE SVE PIPING. CONTRACTOR SHALL EXCAVATE AROUND THESE WELLS, CUT OFF THE WELL CASING AT 24" BELOW GROUND SURFACE, AND INSTALL THE TEE REQUIRED TO CONNECT TO THE SVE PIPING. THESE WELLS SHALL BE RE-CONSTRUCTED TO THE SURFACE AS SHOWN IN THE DETAIL. SVE WELLS MW4/SVE-14S, MW6/SVE-12S, AND MW8/SVE10I ARE 4" DIAMETER WELLS. SVE WELL MW1/SVE-1I IS A 2" DIAMETER WELL.

1 / 5 3 SVE WELL CONSTRUCTION DETAIL, (BY OTHERS)
NOT TO SCALE



PLAN VIEW
NOT TO SCALE



PROFILE VIEW
NOT TO SCALE

2 / 5 3 WELL SVE-11S DETAIL
NOT TO SCALE

DRAFT

	11/7/05	ISSUED FOR BIDDING	TM/DEW	RC/TM	RM
	DATE	DESCRIPTION	BY	CKD.	APP.

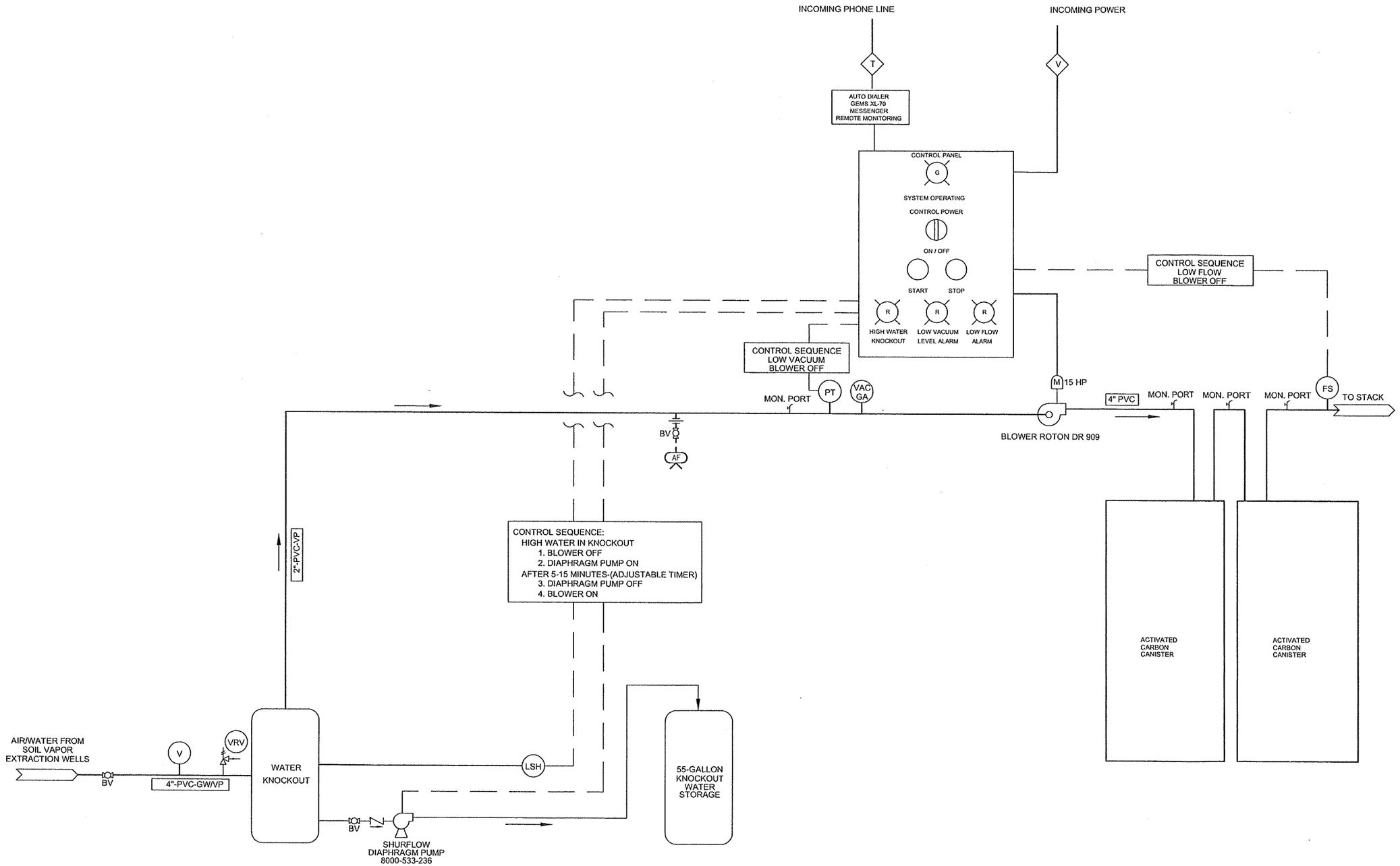
PREPARED BY
FARALLON CONSULTING, L.L.C.
320 3RD AVENUE NE
ISSAQUAH, WA 98027

PREPARED FOR
MR. WILBUR ALLISON
C/O MR. DAVID D. CULLEN
WEST HILLS OFFICE PARK, BUILDING 11
1800 COOPER POINT ROAD SOUTHWEST
OLYMPIA, WASHINGTON

ALLISON'S NORGE VILLAGE
REMEDIATION PROJECT
OLYMPIA, WASHINGTON

DETAILS

SCALE: AS SHOWN
PROJECT NO.: 663010
FILE NAME: SYSTEM
SHEET NO.: 5 OF: 6



PROCESS AND INSTRUMENTATION DIAGRAM

NOT TO SCALE

DRAFT

	11/7/05	ISSUED FOR BIDDING	TM/DEW	RC/TM	RM
	DATE	DESCRIPTION	BY	CKD.	APP.

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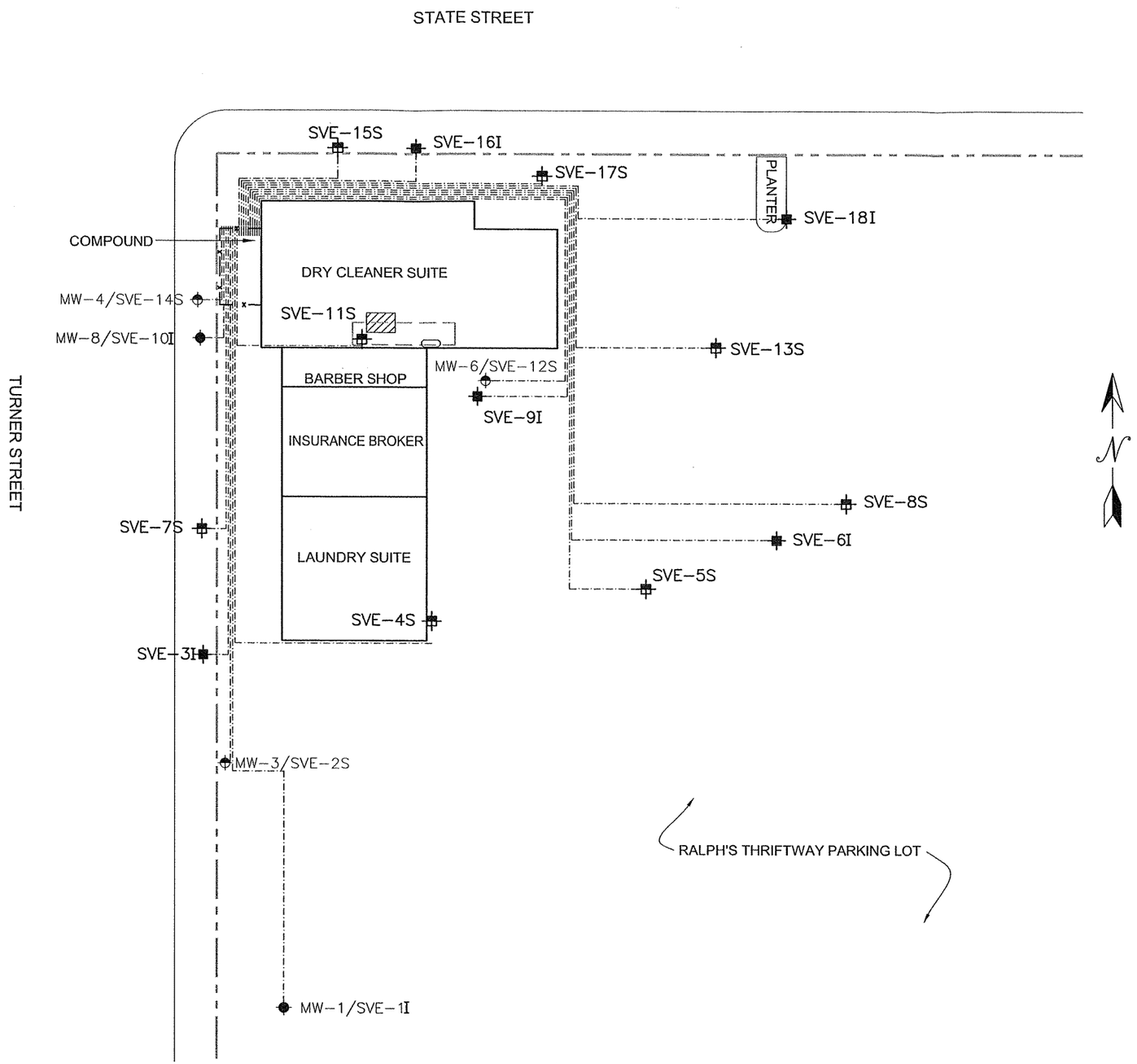
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OLYMPIA, WASHINGTON

PROCESS AND INSTRUMENTATION DIAGRAM

SCALE	AS SHOWN
PROJECT NO.	663010
FILE NAME	SYSTEM
SHEET NO.	6
OF	6



LEGEND

MW-4/SVE-14S	EXISTING SHALLOW ZONE SVE WELL
SVE-8S	PROPOSED SHALLOW ZONE SVE WELL
MW-1/SVE-1	EXISTING INTERMEDIATE ZONE SVE WELL
SVE-16I	PROPOSED INTERMEDIATE ZONE SVE WELL
	DRY CLEANING MACHINE
	165-GALLON ABOVE-GROUND STORAGE TANK
	FORMER COIN-OPERATED DRY CLEANING AREA
	SOIL VAPOR EXTRACTION LINE
	PROPERTY BOUNDARY
SVE	SOIL VAPOR EXTRACTION

NOTE:

1. ALL LOCATIONS ARE APPROXIMATE
2. SOURCE MAP: G-LOGICS, INC.

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APPROXIMATE SCALE IN FEET

DRAFT

FARALLON CONSULTING
320 3rd Avenue NE
Issaquah, WA 98027

FIGURE A-1

REMEDIAL SYSTEM DESIGN LAYOUT
ALLISON'S NORGE VILLAGE
120 NORTHEAST TURNER STREET
OLYMPIA, WASHINGTON

FARALLON PN: 663-010

Drawn By: DEW	Checked By: RC	Date: 11/7/05	Disk Reference: 663010