

FINDING OF NO SIGNIFICANT IMPACT (FONSI)

BACKGROUND

The Veteran's Administration Puget Sound Health Care System (VAPSHCS) proposes several improvements to the American Lake Veteran's Administration (ALVA) campus, located in Pierce County, Washington. The ALVA campus occupies a site on the western shore of American Lake, within Joint Base Lewis-McChord. The Veteran's Administration (VA) has operated a hospital facility on the site since 1923.

The VA is currently planning several expansions to the ALVA campus, including renovation of several existing buildings to promote energy efficiency and environmental sustainability, as well as construction of a new primary hospital facility. In order to provide an energy-efficient heating and cooling system capable of serving existing and future buildings, the VA is proposing installation of two ground-source heat pump systems. The current phase of improvements would also include construction of a new parking area to satisfy a portion of the campus future parking needs.

SUMMARY OF THE PROPOSED ACTION

The Proposed Action would consist of the installation of ground-source heat pump systems at two locations on the ALVA campus, including construction of associated well fields and all system components. The components of the proposed construction are described below.

Ground-Source Heat Pump System

The Proposed Action would entail construction of a ground-based heat pump system, including two geothermal well fields. The North Ground Source Field would be located in an existing overflow parking area, northwest of the main hospital building. The Building 17 Ground Source Field would be located on the west side of Musser Avenue, adjacent to Building 17. The locations of the two ground source fields and their associated buildings are shown on Figure 1. Construction of the heat pump system would entail drilling approximately 300 wells at the North Ground Source Field and approximately 156 wells at the Building 17 Ground Source Field.

Source Field Resurfacing

After installation of the ground-source heat pump system, each well field would be resurfaced. Final surface treatment for the North Ground Source Field would consist of gravel, similar to existing conditions. The Building 17 Ground Source Field would be converted to a 95-stall parking lot, using a system of pervious asphalt that would allow stormwater to infiltrate and be treated on-site.

PUBLIC INVOLVEMENT AND COMMENTS RECEIVED

A Draft Environmental Assessment was prepared and advertised for public comment on June 11, 2011. The document was made available for public digital download on the VAPSHCS website. The public was invited to comment on the Draft EA through a notice of availability published in the Tacoma News Tribune, which has a daily circulation of over 96,000 copies. The notice was published for 3 consecutive days, beginning on June 11 and ending on June 13. Per the VA NEPA Interim Guidance for Projects, the public comment period lasted for 30 days and ended on July 13, 2011. In addition to soliciting general public comment, the Notice of Availability was directly distributed via US Mail to agencies identified as having a potential interest in the project, including the Joint Base Lewis-McChord Directorate of Public Works, the US Fish & Wildlife Service, the City of Lakewood, the Pierce County Department of Planning and Land Services, the Puyallup Indian Tribe, the Washington State Department of Ecology, the Washington State Department of Natural Resources, and the Washington State Department of Fish and Wildlife.

The VA received no comments from the public or from interested agencies regarding the project. The revised Final EA is attached as part of this combined FONSI/EA.

DETERMINATION AND FINDING OF NO SIGNIFICANT IMPACT

This FONSI is based on the attached Final Environmental Assessment. The analysis performed in the EA concludes that implementation of the Proposed Action as described would not have significant unavoidable adverse impacts on the quality of the human environment within the meaning of Section 102(2)(C) of the National Environmental Policy Act of 1969, as amended. Accordingly, the preparation of an Environmental Impact Statement for the Proposed Action is not required.

 7/28/11
Date

David Elizalde
Director, VA Puget Sound Health Care
System
Seattle, Washington

 8/1/11
Date

Stephen Matthes, PE
Energy Engineer, VA Puget Sound
Health Care System
Seattle, Washington

**Department of Veterans Affairs
Office of Construction and Facilities Management
Project No. 663A4-10-351**

FINAL ENVIRONMENTAL ASSESSMENT

**American Lake Veterans Hospital Ground-Based Heat Pump System and Parking
Lot Improvements**

Prepared by:



1200 6th Avenue, Suite 1620
Seattle, WA 98101-3123

August 2011

TABLE OF CONTENTS

<u>Section</u>	<u>Page No.</u>
TABLE OF CONTENTS	i
1.0 EXECUTIVE SUMMARY	1
2.0 INTRODUCTION	3
2.1 Background	3
2.2 Purpose and Need	3
3.0 ALTERNATIVES.....	4
3.1 Alternative 1 – No Action Alternative	4
3.2 Alternative 2 – Ground Source Heat Pump System (Preferred Alternative).....	4
3.3 Alternatives Considered but Eliminated After Initial Review.....	6
4.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL IMPACTS	6
4.1 Geology and Soils	7
4.2 Water Resources.....	8
4.3 Vegetation	12
4.4 Wildlife and Habitat	13
4.5 Cultural Resources.....	16
4.6 Hazardous Materials	17
4.7 Transportation and Parking	18
4.8 Noise	20
4.9 Utilities.....	21
4.10 Cumulative Impacts.....	21
4.11 Potential for Generating Substantial Controversy	23
5.0 Public Involvement	23
5.1 Individuals Contacted	23
5.2 Distribution List.....	23
6.0 Environmental Permits/Modifications Required	24
7.0 Summary of Environmental Impacts and Mitigation.....	24
8.0 Conclusions	27
9.0 List of Preparers	27
10.0 References Cited.....	27
11.0 List of Acronyms and Abbreviations	29

1.0 EXECUTIVE SUMMARY

The VA Puget Sound Health Care System – American Lake Division (hereafter referred to as the American Lake VA) is located on the western shore of American Lake in Pierce County, Washington. The Department of Veterans Affairs (VA) operates the hospital campus under a lease from the U.S. Department of Defense. The hospital offers a variety of medical services for military veterans, including primary care, surgical services, substance abuse treatment, and mental health treatment. As part of an ongoing effort to promote environmentally sustainable design while continuing to offer high-quality medical services, the VA is proposing the construction of a ground-source heat pump system to provide energy-efficient heating and cooling for several existing buildings on the campus, as well as proposed future development.

The Preferred Alternative would include installation of heat pump systems at two locations on the ALVA campus, including construction of associated well fields and all system components. The north well field would be installed under the overflow parking lot, a graveled lot on the north side of Veterans Drive, adjacent to the primary parking area. The south well field would be installed in a lawn area adjacent to Building 17, which is located at the corner of Engle Way and Musser Avenue. The Building 17 Ground Source Field would provide heating and cooling for Buildings 17, 2, and 3. The North Ground Source Field would provide heating and cooling for the primary hospital building (Building 81) and a future hospital building (Building 201) to be constructed immediately southwest of Building 81. In addition to installation of the geothermal wells, the Preferred Alternative would include construction of a 95-space parking lot, including 5 handicapped-accessible stalls, on top of the Building 17 Ground Source Field. This parking lot would use a pervious asphalt system that will allow stormwater runoff from the parking lot to be filtered and infiltrated on-site, resulting in a marginal increase in flows to the campus drainage system.

Under the Preferred Alternative, the VA would be able to provide energy-efficient heating and cooling to multiple existing and future buildings on the ALVA campus using a system of centralized geothermal wells while partially satisfying future campus parking needs. Under the No Action Alternative, existing buildings would continue to use conventional, less energy-efficient systems for heating and cooling, and future development would likely install similar systems. Additionally, the No Action Alternative would not contribute to satisfying the campus' needs for parking.

2.0 INTRODUCTION

2.1 BACKGROUND

The American Lake VA (ALVA), part of the Veteran's Administration Puget Sound Health Care System (VAPSHCS), is located in Pierce County, Washington, just south of the city of Lakewood. The hospital occupies a site on the western shore of American Lake, consisting of 351 acres in the northwestern corner of Joint Base Lewis-McChord (JBLM), as shown on Figure 1. The Department of Veterans Affairs has leased the site from the U.S. Department of Defense since 1923 and has operated a hospital on the campus since that time. The current ALVA facility offers primary care services, ambulatory surgical services, blindness rehabilitation, treatment for substance abuse, and post-traumatic stress treatment. The hospital also includes a 76-bed nursing home, a neuro-psychiatric treatment center, a 60-bed domiciliary for the homeless, and a women's health clinic. The hospital provides medical services to over 30,000 patients per year.

The VA is currently planning several expansions to the ALVA campus, including the construction of a new primary hospital facility (Building 201). In order to promote energy efficiency and environmental sustainability, Building 201 is being designed to meet Leadership in Energy and Environmental Design (LEED) standards. A major component of the building's design is the use of an energy-efficient heating and cooling system in the form of a ground-source heat pump. This heat pump system would be capable of serving multiple buildings, including both existing and future structures.

The National Environmental Policy Act (NEPA) requires Federal agencies to evaluate their proposed actions and determine the potential for environmental impacts. This draft Environmental Assessment (EA) has been prepared per the requirements of the National Environmental Policy Act of 1969, the President's Council on Environmental Quality regulation for implementation of NEPA (40 CFR 1500-1508), and the Department of Veteran Affairs NEPA Interim Guidance for Projects (September 2010). The VA will use the findings of this EA to determine whether to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI). If the EA concludes that the project would not result in any significant unavoidable adverse effects on the natural or physical environment, a FONSI will be prepared. If the EA concludes that the proposed action would result in significant environmental impacts, NEPA requires the preparation of an EIS.

2.2 PURPOSE AND NEED

The purpose and need of the project is to provide an energy-efficient heating and cooling system capable of serving several existing buildings (Buildings 2, 3, 17, and 81), as well as anticipated future buildings on the ALVA campus. Connection of existing buildings to the new heat pump system would allow the VA to maintain existing historic buildings on the campus while increasing energy-efficiency. Construction of the ground source heat pump system would also provide the infrastructure necessary to heat and cool future buildings on the ALVA campus in an energy-efficient manner and allow the VA to satisfy its commitment to sustainable design.

The proposed project would also construct a 95-space parking lot on top of the Building 17 Ground Source Field once installation of the heat pump system is complete. A transportation study conducted in 2009 indicated that the campus would require an additional 225 parking spaces by 2017 (PBS, 2011). Use of the Building 17 Ground Source Field site for parking would satisfy a portion of the campus's future parking needs and provide greater vehicular access to Buildings 2, 3, 17, 81, and the future Building 201. Construction of the parking lot using pervious asphalt would also provide additional stormwater management and reduce water quality impacts from surface runoff.

3.0 ALTERNATIVES

3.1 ALTERNATIVE 1 – NO ACTION ALTERNATIVE

Consideration of an alternative which involves taking no action is required under NEPA; the effects of all other alternatives are compared to this No Action Alternative. Under the No Action Alternative, no geothermal wells would be installed, and no ground-source heat pump system would be available to provide heating and cooling to buildings on the ALVA campus. Heating and cooling operations would continue to be conducted using conventional Heating, Ventilating, and Air Conditioning (HVAC) technologies, which would not be as energy-efficient or environmentally sustainable as a ground-source heat pump system.

3.2 ALTERNATIVE 2 – GROUND SOURCE HEAT PUMP SYSTEM (PREFERRED ALTERNATIVE)

The VA has identified Alternative 2 – Ground Source Heat Pump System as the Preferred Alternative for meeting the goals of increasing energy efficiency for existing buildings and providing a sustainable heating and cooling method for planned future buildings. The Preferred Alternative would consist of the installation of heat pump systems at two locations on the ALVA campus, including construction of associated well fields and all system components. The project would also include the construction of a parking lot with 95 parking stalls on the site of the Building 17 Ground Source Field, as well as restoration of the ground surface at the North Ground Source Field for continued use as overflow parking. Specific components of the proposal are discussed below.

3.2.1 *Subsurface Heat Pump Components*

The Preferred Alternative would entail the construction of a ground-based heat system for the heating and cooling of buildings on the ALVA site. The North Ground Source Field, located in an existing overflow parking area northwest of the main hospital building would serve the future remodel of the existing primary hospital (Building 81) and a future ambulatory hospital facility (Building 201). The Building 17 Ground Source Field, located at the site of a recently demolished building on the west side of Musser Avenue, would serve the adjacent Building 17, as well as Buildings 2 and 3 on the east side of Musser Avenue. The locations of the ground source fields and associated buildings, as well as their positions relative to American Lake, are shown on Figure 2.

Ground source based heat systems provide heating and cooling by pumping a thermally conductive brine, composed of a mixture of propylene glycol and water, between a heat source, where heat is absorbed, and a heat sink, where the heat is released. In winter, the system would

transfer heat from the ground, which remains warmer than surface air, to the interior of a building. In summer, the function can be reversed, transferring heat from the building to the ground, which remains cooler than surface air. While the ground is gradually heated over the summer, it cools again in winter, and ground temperatures remain relatively constant compared to air temperatures.

The proposed ground source based heat systems at the ALVA site would entail installation of approximately 456 heat exchangers in wells drilled at two locations on the ALVA campus. 300 wells would be drilled at the North Ground Source Field site, and 156 wells would be drilled at the Building 17 Ground Source Field site. Installation of the heat exchangers would require clearing of the sites and excavation to a depth of approximately 4-5 feet. Clearing and excavation at the North Ground Source Field would disturb the existing gravel parking area, as well as remove a small area of grass growing between parking lanes. Several trees and a fenced tennis court are also located at the north end of the ground source field, and construction of the system would require removal of approximately 5 mature fir trees and the partial demolition of the tennis court and fence. Construction of the Building 17 Ground Source Field would disturb the existing grass lawn area and require demolition of existing sidewalks and two concrete canopy pads. Total area of surface disturbance at the north site would be approximately 110,000 square feet; disturbance at the south site would be approximately 44,000 square feet.

Each ground source well would consist of a 5.25-inch diameter vertical bore hole approximately 225 feet deep, within which would be placed a U-shaped loop of 1-inch diameter high-density polyethylene (HDPE) pipe, as illustrated in Figure 3. A propylene glycol solution would be pumped through the pipes to allow for heat exchange. The empty space in each well would be filled with a high-conductivity grout to aid in heat transfer between the ground and the brine in the pipes, and the top of each well would be capped with a bentonite plug.

Wells would be clustered in “pods” of approximately a dozen wells each; each pod would be linked to a valve manifold in an underground vault by a pair of 2-inch diameter HDPE pipes, one for outflow of brine, one for return. These connector pipes would be covered with bedding material, as well as 4-5 feet of fill material. The North Ground Source Field would require the construction of two vaults, one with 12 valve trees, and a second with 13 valve trees. The Building 17 Ground Source Field would require a single manifold vault.

3.3.2 Source Field Resurfacing

Final surface treatment for the North Ground Source Field would consist of gravel, similar to existing conditions, and the area would continue to be used for overflow parking. The Building 17 Ground Source Field site would be converted to a 40,000-square foot parking lot, designed to contain 95 parking stalls. The new parking lot would use a system of pervious asphalt underlain by a choker course of open-graded, crushed rock for stormwater collection and treatment.

Porous asphalt consists of standard hot-mix asphalt with a reduced percentage of sand and fines to create stable, interconnected air pockets that allow water to drain through the asphalt. Water flowing through the asphalt enters the lower layer of crushed stone aggregate, which structurally supports the asphalt above while providing water storage. A layer of geo-textile material would be placed beneath the aggregate to prevent the migration of fines into the subgrade while allowing water to pass through.

Several funnel drains, each consisting of a narrow trench under the choker course, would cut through the native topsoil and fill material to allow water to infiltrate into the clean sand and

gravel soils beneath. The pervious asphalt surface would require regular cleaning by vacuum to dispose of pollutants filtered from stormwater by the asphalt.

3.3 ALTERNATIVES CONSIDERED BUT ELIMINATED AFTER INITIAL REVIEW

In-Lake Geothermal Heat Pump System

Due to the proximity of the ALVA campus to American Lake, an initially considered alternative was the construction of a geothermal heat pump system using the lake as a heat source/heat sink. Under this alternative, a series of geothermal wells would be installed in the lakebed just offshore from the ALVA campus. Brine pipes laid on the lake bottom would connect the wells to on-shore pumps and heat exchange equipment.

While initial review indicated that this option was feasible from a technical standpoint, the VA decided not to proceed with this option due to the fact that their current land use agreement with the Department of Defense (DOD) for the ALVA campus does not specifically allow construction in the lake. Regulatory coordination with other federal agencies and negotiation with DOD to allow this use could potentially delay construction of the system, and this option was removed from further consideration.

4.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL IMPACTS

In the following sections, the project alternatives are evaluated for the potential to significantly impact the physical, cultural, biological, and human environment. While impacts can be either beneficial or harmful, NEPA is primarily concerned with adverse effects. This EA analyzes the potential for adverse environmental impacts with respect to the following topics: geology and soils, water resources, vegetation, wildlife and habitat, cultural resources, hazardous materials, transportation and parking, noise, and cumulative impacts. Due to the nature of the proposed project and the extremely low probability of adverse impacts, the following environmental topics are not analyzed in this EA: land use, aesthetics, and socioeconomic/environmental justice.

It is anticipated that the construction contractor would implement Best Management Practices (BMP's) and would satisfy all applicable regulatory requirements associated with design and construction of the Preferred Alternative. Such "management measures" are described for each environmental resource area and are included as design components of the Preferred Alternative. "Management measures" are defined as routine BMP's or regulatory compliance measures that commonly implemented as part of proposed projects. In general, implementation of the management measures described in the following sections would prevent the occurrence of significant unavoidable adverse impacts to the environment. Management measures differ from "mitigation measures" in that mitigation is project-specific, not routinely implemented as part of construction projects, and necessary to reduce identified significant adverse impact to less-than-significant levels.

No mitigation or management measures are identified in this EA for the following environmental resource areas: cultural resources, vegetation.

4.1 GEOLOGY AND SOILS

Geology and soils refer to the potential for loss of soil or changes in geologic conditions due to project activities, such as excavation, soil erosion, soil compaction, grading, cutting, or filling.

4.1.1 *Affected Environment*

Topography of the ALVA site is relatively flat with elevations generally between 248 and 258 feet above sea level. Each of the source field sites is likewise relatively level, with approximately 2 feet of relief. (PBS, 2011)

The geology of the ALVA site and the immediate vicinity is dominated by glacial deposits, similar to many areas within Puget Sound. The soils and geologic features of the site originated with the retreat of the Vashon Stade of the Fraser Glaciation, approximately 13,500 years ago. Recessional washing by glacial meltwater resulted in deposits of cobbly sand and gravel with very low silt and clay content. The American Lake region is within one of these broad outwash plains, which was later vegetated with conifer forests. Topsoil conditions developed from a mixture of weathering of the outwash deposits and accumulated organic debris. (PBS, 2011)

Subsurface conditions at the source field locations were established by a geotechnical study conducted at the ALVA site in 2009 (Shannon & Wilson, 2009). Field explorations included three test pits at the location of the North Source Field and four test pits at the location of the Building 17 Ground Source Field.

North Source Field

Soil sampling at the location of the North Source Field revealed sod and topsoil less than one foot thick over variable-depth fill material down to a maximum of about 2.6 feet deep. Weathered and unweathered recessional outwash material lies under the fill material, consisting of gravelly, fine sandy silt mixed with organic material at shallow depths, transitioning to sandy gravel and slightly silty sandy gravel at greater depths. Though dense at lower depths, the outwash soils at this location consist primarily of clean gravels with very little silt, which may collapse when excavated.

Building 17 Ground Source Field

Soil sampling at the location of the Building 17 Ground Source Field revealed sod and topsoil less than one foot thick over a shallow layer of fill material. Weathered and unweathered recessional outwash materials lie under the fill, starting at approximately 1.6 feet. Outwash materials consist of gravelly, fine sandy silt mixed with organic material at shallow depths, transitioning to sandy gravel and slightly silty sandy gravel at greater depths. Though dense at lower depths, the outwash soils at this location consist primarily of clean gravels with very little silt, which may collapse when excavated.

4.1.2 *Environmental Impacts and Management Measures*

Preferred Alternative

The Preferred Alternative would require extensive excavation and exposure of soils over an area of approximately 154,000 square feet (3.5 acres) to accommodate installation of the geo-well fields. Exposed soils at the construction sites would have increased vulnerability to water and wind erosion. Due to the relatively flat topography of the site, no landslide risks are anticipated, and erosion potential is generally limited by the shallow grades present in the project area.

However, stormwater runoff from areas disturbed by construction has the potential to carry sediment into the local drainage system or into American Lake.

Management measures incorporated into the Preferred Alternative include the use of a Temporary Erosion and Sedimentation Control (TESC) Plan and a Stormwater Pollution Prevention Plan (SWPPP), which implement Best Management Practices (BMP) to prevent erosion and control transport of sediment outside the limits of the construction area. These BMP's consist of the following:

- Installation of silt fences and hay bales to capture silt-laden runoff;
- Covering and stabilization of soil stockpiles using plastic covering, mulching, and temporary hydroseed application;
- Application of temporary erosion control seed mix to disturbed areas that have reached final grade or that will remain unworked for more than 30 days; and
- Application of mulch to disturbed areas to protect hydroseed applications and prevent seed and sediment loss due to runoff.
- Installation of catch basin sediment protection to prevent sediment-laden runoff from entering existing drainage conveyance system.

With management measures incorporated, the Preferred Alternative is not anticipated to result in any significant unavoidable adverse impacts to geology or soils.

No Action Alternative

Under the No Action Alternative, no geo-well field construction or associated soil disturbance would occur. As a result, the No Action Alternative would have no impacts to geology or soils.

4.2 WATER RESOURCES

4.2.1 Affected Environment

Water resources include a variety of topics, such as surface waters, floodplain areas, groundwater, wetlands, and water quality. Additionally, projects undertaken by federal agencies must comply with state Coastal Zone Management programs to the greatest extent practical.

Surface Waters

American Lake, which borders the eastern side of the ALVA campus, is the only surface water feature in the vicinity of the project area; no other lakes or streams occur on the campus. American Lake is approximately 825 feet southeast of the North Ground Source Field site and approximately 460 feet east of the Building 17 Ground Source Field site. American Lake is located within the Chambers Creek-Clover Creek Drainage Basin. Hydrologic inputs come from Murray Creek, across the lake from the ALVA campus, as well as from surface runoff and direct precipitation. (PBS, 2011) However, the primary hydrologic source for American Lake is groundwater flow, and the lake drains an area of approximately 25.4 square miles. (Pierce County, 2001)

Floodplains

According to FEMA Flood Insurance Rate Maps for the area, most of the ALVA campus is designated as Flood Zone C, which is an area of minimal flood hazard. American Lake's 100-year floodplain consists of a narrow strip of land along the lakeshore extending approximately 50-100 feet inland. The portions of the campus affected by the proposed project do not lie within the 100-year floodplain, as illustrated on Figure 4.

Wetlands

The National Wetlands Inventory has documented three wetlands within 0.5 mile of the project area (PBS, 2011), but none are located within the proposed limits of disturbance, as illustrated on Figure 5. Field reconnaissance on May 18, 2011 confirmed that no wetlands are present in the project area.

Water Quality

The Department of Ecology currently includes American Lake on the Washington State Section 303(d) list of impaired waterbodies due to excess total phosphorus, polychlorinated biphenyls, dieldrin, and 2,3,7,8-Tetrachlorodibenzo-p-Dioxin.. Excess phosphorus has triggered toxic blooms of blue-green algae that have resulted in animal poisonings and public health advisories. (Department of Ecology, 2008) High phosphorus levels in the lake are likely caused by upland gardening and lawn care practices that use fertilizers. Water quality in American Lake is also degraded from residential stormwater runoff containing sediment, heavy metals, petroleum products, and herbicides/pesticides. Residences surrounding American Lake in the Tillicum area currently use on-site septic systems, and water quality may be impacted by substandard or failing septic systems on these properties.

Groundwater

Soil borings conducted on the ALVA campus indicate that the local water table is located approximately 15-18 feet below the surface, though this is subject to seasonal fluctuation. American Lake receives recharge from surrounding groundwater, and the direction of groundwater flow is toward the lake. (PBS, 2011) The ALVA campus is located within mapped recharge zone for the Clover/Chambers Creek Aquifer. (Pierce County, 2003) Recharge zones are areas where surface water infiltrates and replenishes the local groundwater supply. Recharge zones are typically characterized by relatively permeable soils, which create a high potential for groundwater contamination.

Wellhead protection zones are areas surrounding a groundwater well for a public water system. Wellhead protection zones are divided into sub-zones based on the time necessary for a contaminant entering the aquifer to reach the wellhead, typically 6 months, 1 year, 5 years, and 10 years. The Washington State Department of Health has established several wellhead protection areas in Pierce County, including most of American Lake and large portions of JBLM. The outer boundary of a 10-year wellhead protection area lies to the southwest of ALVA campus, but neither of the proposed construction sites is located within a defined wellhead protection zone. (Department of Health, 2011)

Groundwater also serves as the primary source of drinking water for many residents of western Pierce County. The Lakewood Water District, which serves the nearby city of Lakewood and serves as a wholesale water purveyor to the Town of Steilacoom (Lakewood Water District

2009), and the City of DuPont both draw their water supply from underground aquifers. (City of DuPont, 2011)

Coastal Zone Management Consistency

The Coastal Zone Management Act (CZMA) requires all federal activities to be consistent with approved state coastal zone management programs to maximum degree possible. Pierce County is one of fifteen coastal counties included in the Washington State Coastal Zone Management Program and subject to the CZMA. However, the CZMA specifically excludes lands that are owned, leased, or held in trust by the federal government from regulation, and Washington's state program specifically excludes Fort Lewis, which includes the ALVA campus. In addition, all proposed construction work would occur outside the 200-foot shoreline management area associated with American Lake.

4.2.2 Environmental Impacts and Management Measures

Preferred Alternative

Surface Waters

The Preferred Alternative would not directly impact any surface waters. As described under Section 4.1.2, soil erosion BMP's will be implemented to prevent sediment-laden runoff from entering the existing stormwater system, which discharges to American Lake. Following installation of the geo-wells, the North Ground Source Field site will be restored to a gravel surface treatment, similar to current conditions. The Building 17 Ground Source Field site will be covered with pervious pavement, which will allow for infiltration of stormwater and will not substantially increase the amount of surface runoff entering the drainage system; runoff from interior sidewalks will drain into the parking lot. The pervious paving system will also provide all necessary treatment for stormwater infiltrating through, requiring only regular cleaning by vacuum.

As a result of the Preferred Alternative, no additional stormwater flows or pollutant loads are anticipated to enter any surface waters.

Floodplains

The Preferred Alternative would involve no construction within designated floodplains, and no impacts to frequently flooded areas would occur.

Wetlands

No wetlands are located within the project area, and the Preferred Alternative would not result in disturbance, fill, or discharge to any wetlands outside the project area. Therefore, the Preferred Alternative is anticipated to result in no adverse impact to wetlands.

Water Quality

The Preferred Alternative would not directly impact any surface waters. However, construction would require the disturbance of approximately 154,000 square feet of surface area, which has the potential to result in erosion and sediment transport into the drainage system, which discharges to American Lake. Increased sedimentation or pollutant load could further degrade the water quality in American Lake.

As described in Geology & Soils, management measures incorporated into the Preferred Alternative would include implementation of a TESC Plan and SWPPP to limit erosion and transport of sediment from disturbed areas, including implementation of BMP's such a mulching

and hydroseeding to stabilize disturbed soils, as well as covering and hydroseeding of any soil stockpiles used for fill.

Construction of the Building 17 Ground Source Field parking lot would result in a marginal net increase in impervious surface due to the use of pervious pavement and infiltration trenches. The Building 17 Ground Source Field site is currently occupied by a mixture of lawn area, concrete sidewalks, and an abandoned concrete tennis court. These surfaces would be removed and replaced with pervious paving, allowing stormwater runoff from the Building 17 Ground Source Field to be treated by drainage through the pervious asphalt to infiltrate on-site; only non-pervious surfaces, such as new perimeter sidewalks, would contribute to increased stormwater drainage flows from the site. With management measures incorporated, the Preferred Alternative is not anticipated to result in any significant unavoidable adverse impacts to water quality.

Groundwater

The heat exchange system that would be installed under the Preferred Alternative would circulate a brine through a series of underground pipes to facilitate heat transfer. The geothermal wells would be drilled to a depth of approximately 225 feet, well below the level of the local water table. As such, if any of the circulation pipes were to develop leaks, brine from the system could potentially enter the water table and make its way into the local aquifer.

The proposed system uses a thermally conductive brine composed of a propylene glycol/water solution. Propylene glycol is used commercially for a variety of applications, including coolants, aircraft deicing fluids, solvents, cosmetics, food additives, and pharmaceuticals. It is recognized as safe by the U.S. Food and Drug Administration, and it is often used in antifreeze solutions as a less toxic alternative to ethylene glycol. Propylene glycol can cause gastrointestinal discomfort and nausea if the pure product is ingested in quantities larger than several mouthfuls, but it is not acutely toxic to humans. The compound may cause irritation if introduced to the eyes or lungs, and inhalation of propylene glycol fumes should be avoided. While propylene glycol is readily soluble in water, it biodegrades quickly via both aerobic and anaerobic processes and is non-toxic to aquatic life except in very high concentrations. (Dow Chemical, 2006) Were brine leakage to occur, any propylene glycol that entered the water table would be extremely diluted, and the health risks would be relatively minor.

Brine piping within the geothermal wells would be surrounded by a high-conductivity grout to facilitate heat transfer. This grout would also act to protect the brine pipes and impede transfer of brine to the surrounding groundwater in the event of a leak. The greatest potential for leakage would occur where brine piping was outside the wells. Pipes connecting wells would be installed parallel to the ground surface, approximately 4-5 feet below grade. While these pipes would be more susceptible to damage than in-well pipes, they would be located above the level of ground water, and any leaked brine would have to penetrate over 10 feet of soil before entering the water table.

Because the brine system is a closed-loop, any leaks in the system can be detected by monitoring the usage of make-up water. Make-up water refers to water drawn from the potable water system to mix with the propylene glycol and create the thermal conduction brine. Make-up water is used to initially pressurize the system, but no further inputs are necessary for daily operations. Excessive use of make-up water during system operation would indicate the presence of a leak. A water meter will be installed to monitor the usage of make-up water, and

an alarm will alert maintenance staff if a leak is detected. Maintenance staff will then isolate the leak and shut down that portion of the system. Based on the design of the brine system, including the leak detection systems, as well as the low toxicity of the brine solution, no significant unavoidable adverse impacts to groundwater are anticipated to occur.

Coastal Zone Management Consistency

As described in Section 4.2.1, the Coastal Zone Management Act excludes federally-owned, leased, or trust lands from regulation under the Act (16 U.S.C § 1453), and Washington's state program exempts military installations, such as Fort Lewis (Department of Ecology, 2001). As such, the Preferred Alternative would have no impacts on consistency with the Coastal Zone Management Act. All construction activities would occur outside the 200-foot shoreline management area established around American Lake, and the proposed project would not result in any modifications or disturbance of the shoreline area.

No Action Alternative

Under the No Action Alternative, no geo-well field construction would occur, and there would be no adverse impacts on water resources.

4.3 VEGETATION

The purpose of the Endangered Species Act (ESA) is to protect and recover imperiled species and the ecosystems upon which they depend. The ESA prohibits projects that impact species of plants that are in danger of extinction or that endanger the designated critical habitat of these species.

4.3.1 Affected Environment

The project area was historically prairie habitat and mixed Douglas Fir/Oregon White Oak habitat that was modified with development of the site with the Veterans Administration Hospital in 1923. There is no undisturbed native vegetation in the project area footprint. Vegetation in the project area is limited and includes a mowed lawn strip 10 feet wide in the North Ground Source Field, and mowed lawn with a mixed Douglas fir (*Pseudotsuga menziesii*) and a single Oregon White Oak (*Quercus garryana*). Oregon White Oak stands are considered a priority habitat by WDFW because of their importance to several wildlife species, including the western gray squirrel. Surrounding vegetation north of the North Ground Source Field includes a Washington State Department of Fish and Wildlife documented oak stand, and mowed lawn. Vegetation to the south of the North Ground Source Field includes a gravel road with a stand of mature fir trees beyond the road. Vegetation to the east includes a paved parking lot, and vegetation to the west includes a gravel road with a stand of fir trees and a grassy unmowed field.

The Building 17 Ground Source Field is located at the site of a recently demolished building on the west side of Musser Avenue, and vegetation includes nine ornamental hawthorn trees, one ornamental holly shrub and mowed lawn. Surrounding the Building 17 Ground Source Field to the north and south are stands of mature fir trees and mowed lawn. The area to the west of the Building 17 Ground Source Field is unvegetated with buildings, and Musser Avenue lies to the east.

According to the Washington State Department of Natural Resources, Natural Heritage Information System website, updated November 5, 2010, no rare plants or high quality ecosystems are located in the specific township, range and section of the project area (Section 17, Township 19 North, Range 2 East, W.M.).

4.3.2 Environmental Impacts and Management Measures

Preferred Alternative

The Preferred Alternative will remove five mature fir trees with mowed lawn understory in the north source field, 7 ornamental hawthorn trees, mowed lawn and one ornamental holly shrub in the Building 17 Ground Source Field. The single oak tree within the North Ground Source Field will be retained and drilling will not occur under the drip line of the tree branches. The mowed lawn areas will be converted to pervious surface gravel or asphalt. No areas of previously undisturbed native vegetation will be disturbed, and no listed plant species will be impacted.

Management measures incorporated into the Preferred Alternative include the use of a Temporary Erosion and Sedimentation Control (TESC) Plan and a Stormwater Pollution Prevention Plan (SWPPP), which implement Best Management Practices (BMP) to prevent (a) removal of vegetation outside the clearing limits, (b) control erosion and transport of sediment outside the limits of the construction area that could impact surrounding vegetation. These BMP's consist of the following:

- Installation of silt fences to define the clearing limits of the project.
- Covering and stabilization of soil stockpiles using plastic covering, mulching, and temporary hydroseed application;
- Application of temporary erosion control seed mix to disturbed areas that have reached final grade or that will remain unworked for more than 30 days; and
- Application of mulch to disturbed areas to protect hydroseed applications and prevent seed and sediment loss due to runoff.
- Installation of catch basin sediment protection to prevent sediment-laden runoff from entering existing drainage conveyance system.

With management measures incorporated, the Preferred Alternative is not anticipated to result in any significant unavoidable adverse impacts to vegetation.

No Action Alternative

Under the No Action Alternative, no vegetation would be impacted and there would be no adverse impact on vegetation.

4.4 WILDLIFE AND HABITAT

The Endangered Species Act prohibits projects that impact species of fish or wildlife that are in danger of extinction, or that endanger the designated critical habitat of these species. The Migratory Bird Treaty Act makes it illegal to “take” migratory birds or their eggs, feathers or nests. The Bald Eagle Protection Act of 1940 prohibits the taking, possession, or commerce of both bald and golden eagles. Bald eagles were delisted under the Endangered Species Act in

2007 but are still protected under the federal Bald Eagle Protection Act, the Migratory Bird Treaty Act, and the Washington State Bald Eagle Protection Act (RCW 77.12.655). The state of Washington Department of Fish and Wildlife (WDFW) identifies Priority Habitats and Species that warrant additional protection or special management.

4.4.1 Affected Environment

The project area currently contains gravel parking, paved areas and limited wildlife habitat in the form of ornamental trees, mowed lawn and Douglas fir trees. Undisturbed habitat does not exist on the project site. American Lake is located approximately 460 feet southeast of the Building 17 Ground Source Field and 825 feet from the North Ground Source Field. Protected species that have potential to be located in the immediate vicinity of the project location and could possibly be affected by direct or indirect impacts associated with the project are listed in Table 1.

Table 1. Protected Wildlife Species Potentially Located in the Vicinity of the Project Area

Common Name	Scientific Name	Federal Status	State Status	Detected at ALVA Campus
Western Toad	Anaxyrus boreas	Species of Concern	Candidate	No
Western Gray Squirrel	Sciurus griseus	Species of Concern	Threatened	Historically
Mazama pocket gopher	Thomomys mazama ssp. glacialis and tacomensis	Candidate	Threatened	No
Long-eared myotis	Myotis evotis	Species of Concern	None	No
Long-legged myotis	Myotis volans	Species of Concern	None	No
Townsend's western big-eared bat	Corynorhinus townsendii townsendii	Species of Concern	Candidate	No
Bald Eagle	Haliaeetus leucocephalus	Species of Concern	Sensitive	Yes, but not in regulated distance

The most recent WDFW Priority Habitat and Species (PHS) data documents the presence of bald eagles nests, a great blue heron rookery, past western gray squirrel presence in the vicinity of the site and large waterfowl concentrations in American Lake. (WDFW, 2011)

There are four bald eagle nests along the shores of American Lake within a ½-mile of the project area. Three nests are located northeast of the project area in the forested area at Picnic Point. One nest is located south along the lake. None of these nests are within 2,000 feet of the project area. A Washington State designated eagle management zone extends 800 feet from nest trees and 250 feet inland from the shoreline of American Lake. The project area is not within the eagle management zone.

A great blue heron rookery is located approximately 1,300 feet south of the project area near the wetland in Marsh Park. Great blue herons are a Washington State Monitored species and have no federal status. Over 75 nests were documented in 2000 (WDFW, 2011). There have been reports of a decrease in the number of heron nest at the rookery. If active heron nests are present at the time of construction, Washington State typically restricts logging or heavy construction within 3,280 feet of the nest from February 15 to July 31. This would include the entire project area.

The western gray squirrel is generally associated with the oak and conifer woodlands. A western gray squirrel was sighted in 1978 at the base of a large fir tree near the golf course on the north side of Veteran's Drive near the project area. In 1986, eastern gray squirrels, a Western Washington non-native species, were occupying the site, indicating that western gray squirrels would not use the area. However, WDFW felt that there might still be potential for western gray squirrels to reclaim this area.

Other sensitive bird species that have a state documented presence near the site include large waterfowl concentrations in American Lake.

In addition, the local region is considered important as a corridor for marbled murrelets between coastal feeding grounds and nesting grounds in the Cascades. It is also considered important for spotted owls as a location between Olympic Peninsula and western Cascade populations. However, no spotted owls or marbled murrelets have been seen near the Veterans Administration Campus for many years, and it is highly unlikely that either spotted owls or murrelets would utilize the campus. The same is true of northern goshawks, which occupy similar habitats to the spotted owl.

No federally listed fish species are present in American Lake or in the upper reaches of Sequelitchew Creek which drains out of the lake. Species that are documented in American Lake include rainbow trout (*Oncorhynchus mykiss*), kokanee salmon (*Oncorhynchus nerka*), cutthroat trout (*Oncorhynchus clarki*), largemouth bass (*Micropterus salmoides*), yellow perch (*Perca flavescens*), rock bass (*Ambloplites rupestris*), brown bullhead (*Ameiurus nebulosus*), and black crappie (*Pomoxis nigromaculatus*). Rainbow trout, Kokanee salmon, and resident cutthroat trout are all Washington State Priority Species.

ALVA campus is within the Pacific flyway for migratory birds. Migratory birds may pass through the campus while traveling between breeding areas to the north and wintering areas to the south or they may winter or breed at the ALVA.

4.4.2 Environmental Impacts and Management Measures

Preferred Alternative

The Preferred Alternative is not expected to have an impact on any federally listed threatened or endangered species. The majority of the project area is currently parking lot, roads, buildings and lawns, with no undisturbed native vegetation and a relatively high level of human activity. Wildlife species that currently utilize the site are likely urban-adapted species that are tolerant of human activity. The noise associated with construction could cause temporary disruption to wildlife in the vicinity, which are likely to simply avoid the area during construction.

Removal of mature trees could impact species that use these trees for roosting, nesting, feeding, or cover. WDFW has determined that western gray squirrels are not currently in the project area. Eagles may use some of the larger trees for perch or roost trees. Migratory birds are likely to nest

or roost in the trees. To minimize impacts to migratory birds, trees to be removed will be cut down outside of the active nesting season. Currently, eagle nests are not located in the project area and construction will not occur within 250 feet of the shoreline of the lake where eagles may forage. The heron rookery should be inspected for active nesting prior to construction. If great blue herons are nesting at the rookery, WDFW should be contacted regarding specific measures the project could take to minimize disruption.

Fish species in American Lake should not be impacted by the project since best management practices will be employed to prevent runoff from exposed soils reaching the lake through the storm system or direct runoff. Following construction, most runoff from the project area will be infiltrated through pervious asphalt or returned to existing conditions as a gravel parking area, reducing the potential for turbid or contaminated water reaching the lake through the storm system.

Once the well fields are constructed, impacts to wildlife should be very similar to current conditions.

No Action Alternative

Under the No Action Alternative, no wildlife or critical wildlife habitat would be impacted.

4.5 CULTURAL RESOURCES

4.5.1 Affected Environment

Prehistoric

Human occupation of the Puget Sound region may date as far back as 14,000 years, and the vicinity of American Lake was once home to a variety of native tribes, including the Nisqually, Puyallup, Squaxin, and Steilacoom. The nearby prairies served as important food sources for the numerous native villages. Archaeological studies have been conducted on or near the ALVA site, the most recent of which (2009) covered the entire campus. While several prehistoric sites and isolates were identified northeast of the main hospital campus, no prehistoric evidence was found in the project area. (AMEC, 2009)

Historic

Europeans began settlement of the Puget Sound area in the 1830s when the British Hudson Bay Company established a trading outpost at the mouth of the Nisqually River. Euro-American settlers began moving into the area, and the United States military established a series of forts, the nearest of which was Fort Steilacoom, built in the 1850s. By the end of the 19th Century, most of the native tribes had lost their original territory in the area, and American Lake was a summer recreation destination for wealthy city residents. Pierce County granted the rights to the Fort Lewis reservation, including the ALVA site, to the U.S. military in 1917. (AMEC 2009)

Construction on the ALVA campus began in 1923, and by February 1924, the site consisted of 19 buildings. A major expansion occurred from 1927-1939, and a second building campaign was launched in the 1940s. The current primary hospital facility, Building 81, was built as part of this effort, and construction was completed in 1947. Few expansions were made to the campus for several decades until the construction of the canteen in 1980 and the addition of a receiving wing to the north side of Building 81 in the 1990's.

In 2008, a 115-acre portion of the ALVA campus was listed on the National Register of Historic Places (NRHP) as a historic district. The Preservation Plan for the campus, prepared in 2010, contains an inventory of significant site features that contribute to the character and integrity of the historic district, including both structures and landscapes. The Preservation plan establishes vegetation management zones throughout the campus to preserve native forest canopy, historic ornamental plantings, and shoreline vegetation, all of which contribute to the character of the district. The proposed site of the Building 17 Ground Source Field lies within the historic district, adjacent to Building 17, which is listed in the Preservation Plan building inventory as one of the original structures built when the hospital campus was established in 1923. The lawn area where the wells would be installed, however, has been modified over the years and is neither within a vegetation management zone, nor listed as a contributing feature of the district. (Artifacts, 2010) The North Ground Source Field site lies outside the historic district. The proposed source field sites and the boundary of the NRHP district are shown on Figure 6.

4.5.2 Environmental Impacts and Management Measures

Preferred Alternative

Construction activities associated with the Preferred Alternative would occur entirely within areas classified as having minimal archaeological resource concerns, so the potential for impacts to archaeological resources is low. However, as a precautionary measure, it is recommended that the construction contractor prepare an inadvertent discovery plan and that an archaeologist be present during excavation of the well fields to monitor construction activities.

Construction activities associated with the Preferred Alternative would occur partially within a historic district listed on the NRHP, but no new buildings would be constructed that would alter the historic character of the area, and no existing historic buildings would be altered or demolished. The Building 17 Ground Source Field would convert a currently vacant lawn area adjacent to Building 17 into a parking lot, which would not result in significant degradation to the character of the historic district. Construction of the North Ground Source Field would require demolition of an existing tennis court that has been classified as historic, though it is in poor condition and is not currently used for recreation. AHBL visited the site in May, 2011 and observed safety warning signs to keep out of the tennis court posted by the Seattle District of the U.S. Army Corps of Engineers. The tennis court is also located outside the historic district and was identified in the 2009 cultural resources study as having minimal historic significance (AMEC, 2009). With implementation of the management measure identified above, no significant adverse impacts to cultural resources would occur.

No Action Alternative

Under the No Action Alternative, no geo-well installation would occur on the ALVA campus, and no impacts to cultural resources would occur.

4.6 HAZARDOUS MATERIALS

4.6.1 Affected Environment

PBS Engineering performed a Phase I Environmental Site Assessment and a Hazardous Materials Survey on the ALVA campus in late 2010 and identified the locations of several underground storage tanks (UST) on the site, including decommissioned, operational, and closed

in-place tanks. The site assessment identified two 30,000-gallon underground heating oil tanks on the east side of Building 21, which is across the street from the Building 17 Ground Source Field site. The site assessment also identified an underground 5,000-gallon heating oil tank at the fenced electrical substation southwest of the North Ground Source Field site. This tanks powers backup generators that serve as an emergency power supply for the ALVA campus in the event of a power failure. (PBS, 2011) None of these tanks are located in areas that would be disturbed by the proposed project.

Building 112, a small shed immediately west of the North Ground Source Field site, was used for pesticide storage in the past but has been vacant since 2003. No chemical mixing was conducted, and no bulk spillage was recorded. The site assessment prepared by PBS Engineering categorized this structure as a low concern. (PBS, 2011)

4.6.2 Environmental Impacts and Management Measures

Preferred Alternative

The Preferred Alternative would not entail the excavation or removal of any underground storage tanks. In the event that undocumented storage tanks are uncovered during site excavation and well drilling, the project will incorporate appropriate BMPs to ensure that any underground storage tanks, their contents, and accessory connector pipes are removed in a manner that does not cause damage that may result in leakage. If any tanks are removed, surrounding soils and groundwater will be tested for contamination. Contaminated soils will be removed from the site and disposed of at an approved landfill.

The heat pump system design specifies the use a thermally conductive brine composed primarily of propylene glycol, which is known to be mildly toxic to humans. A discussion of the potential impacts associated with brine leakage and necessary management measures is included in Section 4.2.2 – Groundwater. With incorporation of the identified management measures, no significant adverse impacts associated with hazardous materials are anticipated to occur.

No Action Alternative

Under the No Action Alternative, no subsurface construction would occur, and no underground storage tanks would be disturbed. None of the tanks identified in the PBS site assessment were determined to be leaking; therefore, leaving these tanks in place under the No Action Alternative is not anticipated to result in any impacts from exposure to hazardous materials.

4.7 TRANSPORTATION AND PARKING

4.7.1 Affected Environment

The only traffic access to or from the ALVA campus is along Veteran's Drive SE, which enters the campus from the northeast via the City of Lakewood. Vehicular access to the various campus buildings is available by several loop roads that return traffic to Veteran's Drive SW. The North Ground Source Field site currently operates as an overflow parking area and is accessible by traveling through the main parking area, which is immediately adjacent to Veteran's Drive SW. While officially designated as overflow parking, the North Ground Source Field site is extensively used during daytime hours by hospital visitors and outpatients.

The Building 17 Ground Source Field site is accessible from Veteran's Drive SW by traveling southeast on Engle Way and turning left onto Musser Avenue. A small parking lot of 3 spaces is located adjacent to Building 17 on the northeast side of the building.

4.7.2 Environmental Impacts and Management Measures

Preferred Alternative

Under the Preferred Alternative, the available parking supply on the ALVA campus would increase by approximately 95 spaces. The North Ground Source Field site would return to its present use and parking capacity, and 95 new spaces would be provided when the Building 17 Ground Source Field is resurfaced as a parking lot. Adverse effects on parking and vehicle travel routes would be temporary in nature and would occur primarily during construction.

Construction activities at the North Ground Source Field site would preclude its use for parking while well drilling is underway, creating a temporary shortage of parking on the campus. The North Ground Source Field site, which is currently used for overflow parking, and the main parking area, which is adjacent to the southeast side of North Ground Source Field, have a combined parking capacity of approximately 527 spaces (PBS, 2011). Based on relative size, closure of the North Ground Source Field site may result in the temporary loss of up to 250 parking spaces. Construction at the North Ground Source Field would be limited to two drilling rigs at any one time, and drilling would be phased to only require closure of one half of the gravel parking lot at a time, allowing the other half to be used for parking.

Construction at the North Ground Source Field would also temporarily disrupt use of a gravel access road between the parking lot and several storage buildings located to the southwest. Several geothermal wells would be drilled within the current road footprint, and the roadbed would be restored once the wells were in place. In addition, access to the storage building is available via Engle Way and another dirt access road that approaches from the north and lies outside the construction zone.

Additional recommended management measures to reduce temporary impacts to parking capacity include the following:

- Schedule project construction to complete the Building 17 Ground Source Field prior to beginning construction on the North Ground Source Field. The new parking lot on the southern site could then be used to partially offset closure of the north site.
- Designate an alternate traffic route while the gravel access road is closed for well drilling, thus allowing ALVA staff to continue access to campus facilities.

With implementation of the described management measures, no significant adverse environmental impacts associated with transportation and parking are anticipated to occur.

No Action Alternative

Under the No Action Alternative, no disruptions to on-campus traffic patterns or parking capacity would occur.

4.8 NOISE

4.8.1 Affected Environment

The ALVA campus is relatively isolated from surrounding land uses, and no significant sources of ambient noise are located on or near the ALVA campus, making the area relatively quiet. The campus is separated from residential uses on American Lake by forested areas and is surrounded on the north and west by a mix of farm fields, forests, and golf course. Primary noise sources include on-site mechanical equipment (fans, the steam plant, grounds keeping equipment), vehicles, and recreational noise from the lake (motor boats, jet skis, etc.). The nearby McChord Airfield and Fort Lewis training areas are sources of occasional noise. (PBS, 2011)

4.8.2 Environmental Impacts and Management Measures

Preferred Alternative

The Preferred Alternative would result in temporary increases in noise levels for portions of the ALVA campus near demolition and construction zones. Noise levels will vary with location and activity, as well as with distance from the noise source. The primary source of construction noise will be from vehicles, heavy equipment, such as excavators, and drilling rigs used for installation of the geothermal wells. Limited use of demolition equipment, such as jackhammers, will be necessary for removal of the tennis court at the North Ground Source Field site, and the concrete sidewalks and canopy pads at the south field site. Some patients at ALVA suffer from post-traumatic stress disorder (PTSD) and can be adversely affected by sudden loud noises. Installation of the geothermal wells could be accomplished using a variety of drilling techniques, including hydraulic rotary drilling or sonic vibratory drilling. Noise from drilling operations would be relatively steady and low-frequency, with no large variations or spikes in noise production anticipated. Drilling rigs would be powered by diesel engines that would produce noise levels comparable to portable diesel-powered electric generators. (Klinge, pers. comm.) Conventional rotary drilling rigs typically produce steady noise levels that attenuate to approximately 65-75 decibels (dB) at a distance of 200 feet. Sonic vibratory drilling would be slightly louder but would likewise result in a relatively steady noise level. (Snorsky, pers. comm.)

Construction and demolition noise can be reduced through the use of quieter equipment, turning off equipment that is not in use, and installing mufflers on construction machinery. Work hours should also be restricted to minimize adverse impacts on patients, particularly at the Building 17 Ground Source Field site, which is located near several patient-occupied buildings.

As described in Section 4.4, a great blue heron rookery lies within 1,300 feet of the project area, and prolonged construction noise has the potential to disrupt breeding and nesting activities. As recommended in that discussion, WDFW should be contacted prior to construction to identify specific management measures to minimize disruption. With the incorporation of the described management measures, no significant adverse impacts associated with noise generation are anticipated.

No Action Alternative

Under the No Action Alternative, no construction or demolition activities would take place, and no new sources of noise would be introduced. No adverse noise impacts are anticipated under the No Action Alternative.

4.9 UTILITIES

4.9.1 *Affected Environment*

The ALVA campus receives its utilities from JBLM, including potable water, sanitary sewer, and power. The campus maintains two 5 kilovolt (kV) diesel generators as an emergency backup power supply. These generators are located in an electrical service yard south of the North Ground Source Field. ALVA also maintains its own stormwater collection and drainage system, which directs stormwater flows to American Lake. Currently, stormwater is not treated before discharge. (PBS, 2011)

Underground utility service lines currently cross both proposed ground source field sites. A power line crosses the North Ground Source Field near its north-south midpoint, and the southwest corner of the field contains underground electric, water, natural gas, and sewer lines. The Building 17 Ground Source Field contains underground electric, sewer, telephone, and steam lines.

4.9.2 *Environmental Impacts and Management Measures*

Preferred Alternative

While the Preferred Alternative would not add new buildings or population to the campus and would not increase demand for utility services, it would involve excavation of areas where existing utility service lines are buried. While the Preferred Alternative would not require relocation, abandonment, or temporary closure of any active utility lines, excavation in these areas could potentially cause unintentional damage to these utility lines, temporarily disrupting service.

Management measures incorporated into the Preferred Alternative include the location and marking of all on-site utilities. All active utilities in the construction areas will be protected during construction activities, and geothermal wells will be located to avoid drilling through existing utility lines. With management measures incorporated, no significant adverse impacts to utility services are anticipated.

No Action Alternative

Under the No Action Alternative, no construction or demolition activities would take place, and no utility lines would be abandoned or relocated. No adverse impacts to utility service are anticipated under the No Action Alternative.

4.10 CUMULATIVE IMPACTS

Cumulative impacts are defined under federal law as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or Non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.” (40 CFR 1508.7)

Cumulative impacts are required to be examined during the environmental review process for federal projects.

4.10.1 Affected Environment

Since initial construction in the 1920's, the ALVA campus has undergone widespread changes, including construction of new buildings and renovation or demolition of original buildings. As described in the cultural resources study and the campus preservation plan, the ALVA campus has managed to retain much of its original character through careful design and aesthetic continuity. However, as the existing historic structures continue to age, many have become or will become unsuitable for providing high-quality medical services. Seismic design deficiencies in the current primary hospital facility (Building 81) have prompted plans for the construction of a new primary hospital building at the southwest corner of Veterans Drive and Musser Avenue; this project is currently undergoing environmental review (PBS, 2011). The Building 81 replacement project area overlaps that of the current project. The North Ground Source Field will be converted from a gravel overflow parking lot to an asphalt parking lot with striped stalls, landscaping, and lighting as part of the Building 81 project, and Building 112 will be demolished.

The ALVA Master Plan also includes plans for several new development projects on the northwest and southwest edges of the campus, including a new building and redesigned parking area adjacent to the North Ground Source Field site proposed under the Preferred Alternative.

Outside the ALVA campus, the JBLM is anticipated to continue the rapid growth that it has experienced over the last decade, due to additional resident military personnel and the return of combat troops from overseas. In response, a number of capital improvement projects are planned to support this growth, including construction of a housing development near the hospital campus. (AECOM, 2010) The JBLM golf course immediately north of the campus is also planning an expansion that would nearly double its size. (PBS, 2011)

4.10.2 Environmental Impacts and Management Measures

Preferred Alternative

The Preferred Alternative would directly support future construction and renovation of buildings on the ALVA campus. As described in the Purpose and Need statement, the installation of a ground-source heat pump system would provide an energy efficient means of providing heating and cooling for new and existing buildings, primarily the future Building 201. While the future Building 201 is not strictly dependent upon the installation of a ground-based heat pump system, this feature is a key component of the building's sustainable design and provides a means for the new hospital facility to fulfill the VA's commitment to energy efficiency and environmental sustainability.

While the Preferred Alternative impacts previously developed and altered land, it does include an expansion to the northwest which will remove five Douglas fir trees, ornamental trees and mowed lawn. There will be an associated decrease in vegetated area with the loss of five trees that are not priority species. Prairie habitat has not been present at the ALVA for many years, and the project does not impact this priority plant community. The project is not expected to contribute to cumulative impacts to federally protected plant or animal species, since none have been documented as being present in the project area. Future development both on and adjacent to the campus will continue to reduce open space and potential wildlife habitat. The VA is developing a Campus Master Plan which will guide future development and the long-term management of vegetation on the campus. The Master Plan will allow for needed expansion while still preserving the park-like setting of the campus.

The Preferred Alternative would increase the available parking capacity on the ALVA campus, which will help alleviate pent-up parking demand that has resulted from the gradual expansion of the ALVA campus over time. Construction of the pervious asphalt parking lot on the Building 17 Ground Source Field site would partially mitigate increased demand from past and future development while providing a system that would offset the stormwater treatment needs normally associated with increased parking.

No Action Alternative

Under the No Action Alternative, no geothermal well fields would be installed, and future development at the ALVA campus would have to rely on conventional methods of building heating and cooling, which would not provide the energy efficiency and greenhouse gas (GHG) reduction benefits associated with a ground-source heat pump system. The No Action Alternative would also not include construction of the Building 17 Ground Source Field parking lot and would therefore not provide any relief from projected future parking shortages.

4.11 POTENTIAL FOR GENERATING SUBSTANTIAL CONTROVERSY

The proposed project is designed to support future development on the ALVA campus, as well as provide energy-efficient heating and cooling to existing buildings. The ALVA campus is relatively isolated from surrounding communities and land uses, to the degrees that on-campus activities have relatively little impact outside the campus. The project would not result in the demolition of any historic structures, nor would it cause surrounding areas to experience marked increases in traffic or noise. There has been no indication that local agencies or citizens groups are opposed to the project, and the project is not anticipated to result in any significant controversy.

5.0 Public Involvement

5.1 INDIVIDUALS CONTACTED

Thomas W. Moran, P.E., Environmental Engineer
VA Office of Construction and Facilities Management, Washington, DC.

KC Carlson, Facilities Planner
VA Puget Sound Health Care System, Tacoma, WA.

5.2 DISTRIBUTION LIST

Joint Base Lewis-McChord Directorate of Public Works, Environmental Division
PO Box 339500 MS-17
Joint Base Lewis-McChord, WA 98433

US Fish & Wildlife Service
510 Desmond Drive, Suite 101
Lacey, WA 98503-1273

City of Lakewood
 6000 Main Street SW
 Lakewood, WA 98499-5027

Pierce County Department of Planning and Land Services
 2401 South 35th Street
 Tacoma, WA 98402-2171

Puyallup Tribe of Indians
 3009 East Portland Avenue
 Tacoma, WA 98404

Washington State Department of Ecology – SW Regional Office
 PO Box 47775
 Olympia, WA 98504-7775

Washington State Dept of Natural Resources – South Puget Sound Region
 950 Farman Avenue North
 Enumclaw, WA 98022-9282

Washington State Department of Fish and Wildlife – Region 6
 48 Devonshire Road
 Montesano, WA 98563

6.0 Environmental Permits/Modifications Required

- Environmental Protection Agency Construction General Permit Notice of Intent

7.0 Summary of Environmental Impacts and Management Measures

A number of management measures have been recommended to offset potential impacts associated with the proposed project. Table 2 includes a summary of potential impacts and proposed management measures.

Table 2. Summary of Environmental Impacts and Management Measures for Project Alternatives

	Preferred Alternative	No Action
Geology and Soils		
Impacts:	Increased potential for wind and water erosion from disturbance of approximately 154,000 square feet of soil.	No adverse impacts anticipated.
Management Measures:	Temporary Erosion and Sedimentation Control (TESC) Plan and Stormwater Pollution Prevention Plan (SWPPP) will include best management practices to control erosion, including the following: <ul style="list-style-type: none"> • Installation of silt fences and hay bales to capture silt-laden runoff; • Covering and stabilization of soil stockpiles 	None

	Preferred Alternative	No Action
	<p>using plastic covering, mulching, and temporary hydroseed application;</p> <ul style="list-style-type: none"> • Application of temporary erosion control seed mix to disturbed areas that have reached final grade or that will remain unworked for more than 30 days; and • Application of mulch to disturbed areas to protect hydroseed applications and prevent seed and sediment loss due to runoff. • Installation of catch basin sediment protection to prevent sediment-laden runoff from entering drainage conveyance systems. 	
Water Resources		
Impacts:	<p>Soil disturbance has the potential to increase sediment and pollutant loads in stormwater drainage to American Lake, which may further degrade water quality.</p> <p>Leakage of propylene glycol brine from heat pump system may enter local groundwater table. Local groundwater flows to American Lake, and leakage of propylene glycol may further degrade water quality, though concentrations would likely be too low for impacts to wildlife or human health.</p>	No adverse impacts anticipated.
Management Measures:	<p>Disturbed areas will be subject to TESC and SWPPP protocols, including the following BMPs:</p> <ul style="list-style-type: none"> • Installation of silt fences and hay bales to capture silt-laden runoff; • Covering and stabilization of soil stockpiles using plastic covering, mulching, and temporary hydroseed application; • Application of temporary erosion control seed mix to disturbed areas that have reached final grade or that will remain unworked for more than 30 days; and • Application of mulch to disturbed areas to protect hydroseed applications and prevent seed and sediment loss due to runoff. <p>Brine line pressure will be monitored, and the system will be shut down in the event of a pressure drop that indicates a possible brine leak.</p>	None
Vegetation		
Impacts:	<p>No impact to listed plant species. 5 mature native fir trees removed. Conversion of mowed lawn to surface gravel or pervious asphalt.</p>	No adverse impacts anticipated.

	Preferred Alternative	No Action
Management Measures:	None required.	None
Wildlife and Habitat		
Impacts:	Removal of native and ornamental trees Construction noise and disruption	No adverse impacts anticipated.
Management Measures:	Trees will be cut down outside migratory bird nesting season Construction BMPs Consult with WDFW regarding timing restrictions if herons nesting	None
Cultural Resources		
Impacts:	Based on a 2009 cultural resource study (AMEC, 2009), the project sites are located in an area of very low concern for archaeological resources, and no historic structures would be demolished or altered. No adverse impacts to cultural resources are anticipated.	No adverse impacts anticipated.
Management Measures:	None required	None
Hazardous Materials		
Impacts:	No underground storage tanks are documented within the construction area. However, construction may disturb previously undocumented underground storage tanks containing petroleum products that may require removal.	No adverse impacts anticipated.
Management Measures:	If any tanks are discovered or removed, soil and groundwater testing will be conducted to identify any contamination. Contaminated soils will be removed and disposed of at an approved landfill.	None
Transportation and Parking		
Impacts:	Temporary reduction in campus parking capacity and disruption of traffic routes.	No adverse impacts anticipated.
Management Measures:	Construction will be phased to complete the Building 17 Ground Source Field and parking lot first in order to offset closure of the north parking lot. Construction of North Ground Source Field will be phased to avoid complete closure of the lot and allow parking to continue in areas not currently under construction.	None
Noise		
Impacts:	Temporary increase in ambient noise levels from construction equipment and demolition activities.	No adverse impacts anticipated.
Management Measures:	Implementation of BMPs for construction noise control, including use of mufflers and limited work	None

	Preferred Alternative	No Action
	hours. See Wildlife and Habitat section for management measures related to noise impacts on heron rookery.	

8.0 Conclusions

This EA concludes that, with the incorporation of identified management measures, the Preferred Alternative would have no significant unavoidable adverse environmental impacts.

9.0 List of Preparers

Theresa Dusek
Kevin Gifford
Lisa Klein
Gabe Snedeker

Natural Resources Ecologist
Project Planner
Planning Principal
Planning Manager

10.0 References Cited

PRINTED REFERENCES

- AECOM. 2010. Joint Base Lewis McChord Growth Coordination Plan. Prepared for City of Lakewood. Available: <<http://jblm-growth.com/plan.php>>. Accessed: May 24, 2011.
- AMEC Earth & Environmental, Inc. 2009. American Lake Veterans Hospital Historic Properties Management Archaeological Inventory and National Register Site Evaluation. Prepared for U.S. Army Corps of Engineers.
- City of DuPont. 2011. Public Works – Water. Available: <<http://www.ci.dupont.wa.us/public-works/water/index.html>>. Accessed: June 3, 2011.
- Dow Chemical Company. 2006. Product Safety Assessment – Propylene Glycol. Available: <<http://www.dow.com/productsafety/finder/prog.htm>>. Accessed: May 25, 2011.
- Lakewood Water District. 2009. Water Quality & Annual Business Report. Available: <<http://www.lakewood-water-dist.org/files/pdf/2009CCR.pdf>>. Accessed: June 3, 2011.
- PBS Engineering + Environmental. 2011. Draft Environmental Assessment – American Lake VA Hospital Building 81 Seismic Replacement. Prepared for U.S. Department of Veterans Affairs.

Pierce County Department of Public Works and Utilities. 2001. 2001 Unified Sewer Plan. Available: <<http://www.co.pierce.wa.us/pc/abtus/ourorg/pwu/sewer/unifiedplan.htm>>. Accessed: June 3, 2011.

Pierce County Department of Planning & Land Services. 2003. Aquifer Recharge Areas (Map). Available: <<http://yakima.co.pierce.wa.us/MapGallery/documents/rechdoc.pdf>>. Accessed: May 13, 2011.

Shannon & Wilson, Inc. 2009. Revised Geotechnical Report – American Lake Veterans Administration Hospital Campus Roads and Parking Areas.

Washington State Department of Ecology. 2008. Current Washington State Water Quality Assessment. Available: <<http://www.ecy.wa.gov/programs/wq/303d/2008/index.html>>. Accessed: May 20, 2011.

Washington State Department of Fish and Wildlife. 2011. Priority Habitats and Species Digital Data. July 8.

Washington State Department of Health. 2011. Source Water Assessment Program online GIS system. Available: <<https://fortress.wa.gov/doh/eh/dw/swap/maps/>>. Accessed: June 3, 2011.

Washington State Department of Natural Resources. 2010. Washington Natural Heritage Information, Sections that Contain Natural Heritage Features. November 5. http://dnr.wa.gov.Publications/amp_nh_tr.pdf.

PERSONAL COMMUNICATIONS

Klinge, Dennis. Principal. Klinge & Associates, Yakima, WA. May 5, 2011 – Telephone conversation regarding toxicity of propylene glycol thermal brine.

Klinge, Dennis. Principal. Klinge & Associates, Yakima, WA. June 7, 2011 – Telephone conversation regarding anticipated noise levels from geothermal well drilling equipment.

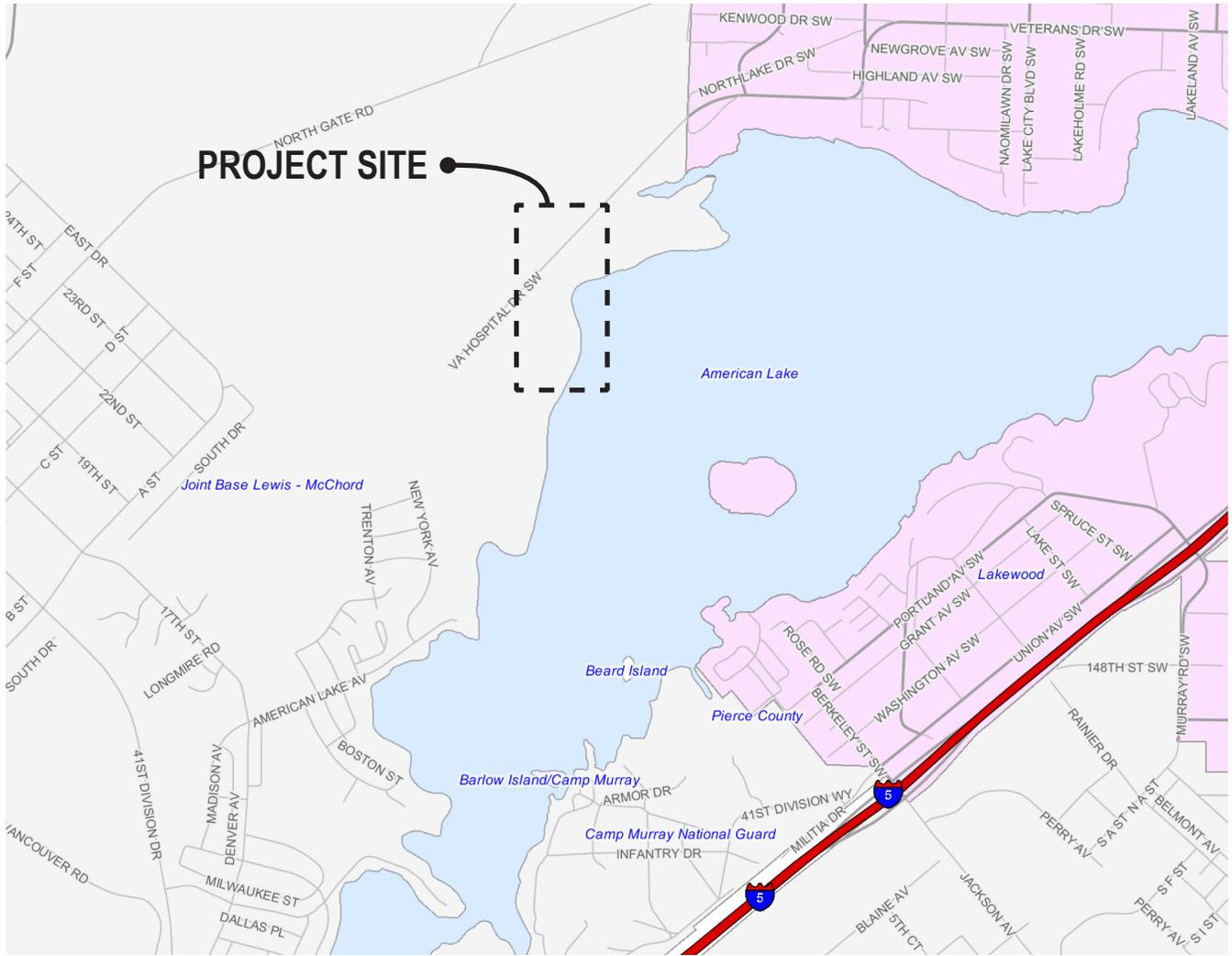
Snorsky, Steve. Vice President. Geo Loop Tech, Seattle, WA. June 7, 2011 – Telephone conversation regarding anticipated noise levels from various types of geothermal well drilling rigs.

11.0 List of Acronyms and Abbreviations

ALVA	American Lake Veterans Administration
BMP	Best Management Practices
CZMA	Coastal Zone Management Act
DOD	U.S. Department of Defense
EA	Environmental Assessment
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FONSI	Finding of No Significant Impact
GHG	Greenhouse Gas
HDPE	High Density Polyethylene
HVAC	Heating, Ventilating, and Air Conditioning
LEED	Leadership in Energy and Environmental Design
JBLM	Joint Base Lewis McChord
kV	Kilovolt
NRHP	National Register of Historic Place
NEPA	National Environmental Policy Act
SWPPP	Stormwater Pollution Prevention Plan
TESC	Temporary Erosion and Sedimentation Control
UST	Underground Storage Tank
VA	U.S. Department of Veterans Affairs
VAPSHCS	Veterans Administration Puget Sound Health Care System
WDFW	Washington Department of Fish and Wildlife

Appendix A

MAP FOLIO



NORTH

REFERENCE SOURCE: PIERCE COUNTY COUNTY VIEW WEB



Civil Engineers
Structural Engineers
Landscape Architects
Community Planners
Land Surveyors
Neighbors

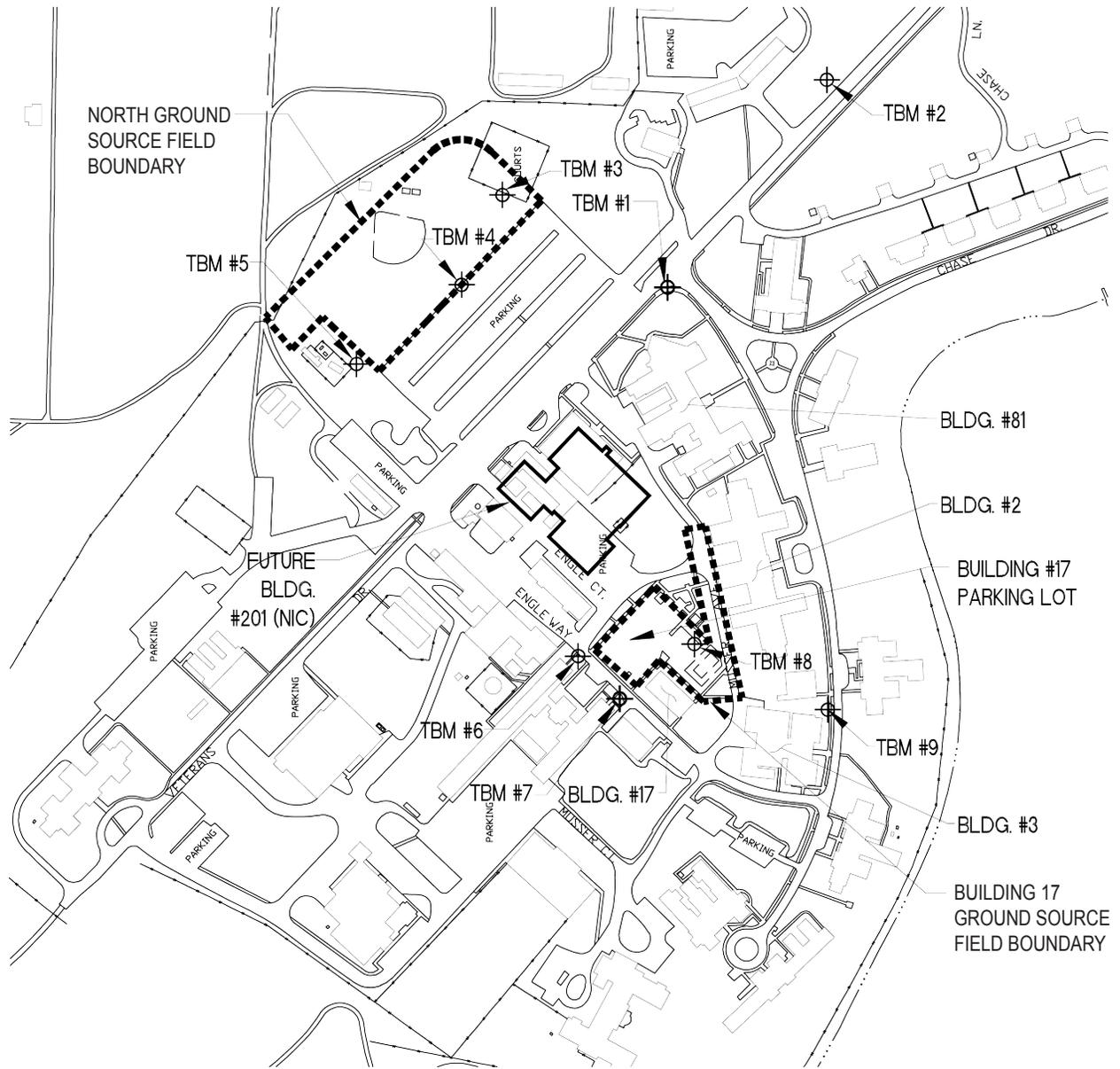
TACOMA · SEATTLE

2215 North 30th Street, Suite 300, Tacoma, WA 98403 253.383.2422 TEL
316 Occidental Avenue South, Suite 320, Seattle, WA 98104 206.267.2425 TEL

AMERICAN LAKE VETERANS HOSPITAL
GROUND BASED HEAT PUMP SYSTEM

VICINITY MAP
JUNE 2011

FIGURE
1



SITE PLAN NOT TO SCALE



NORTH



Civil Engineers
 Structural Engineers
 Landscape Architects
 Community Planners
 Land Surveyors
 Neighbors

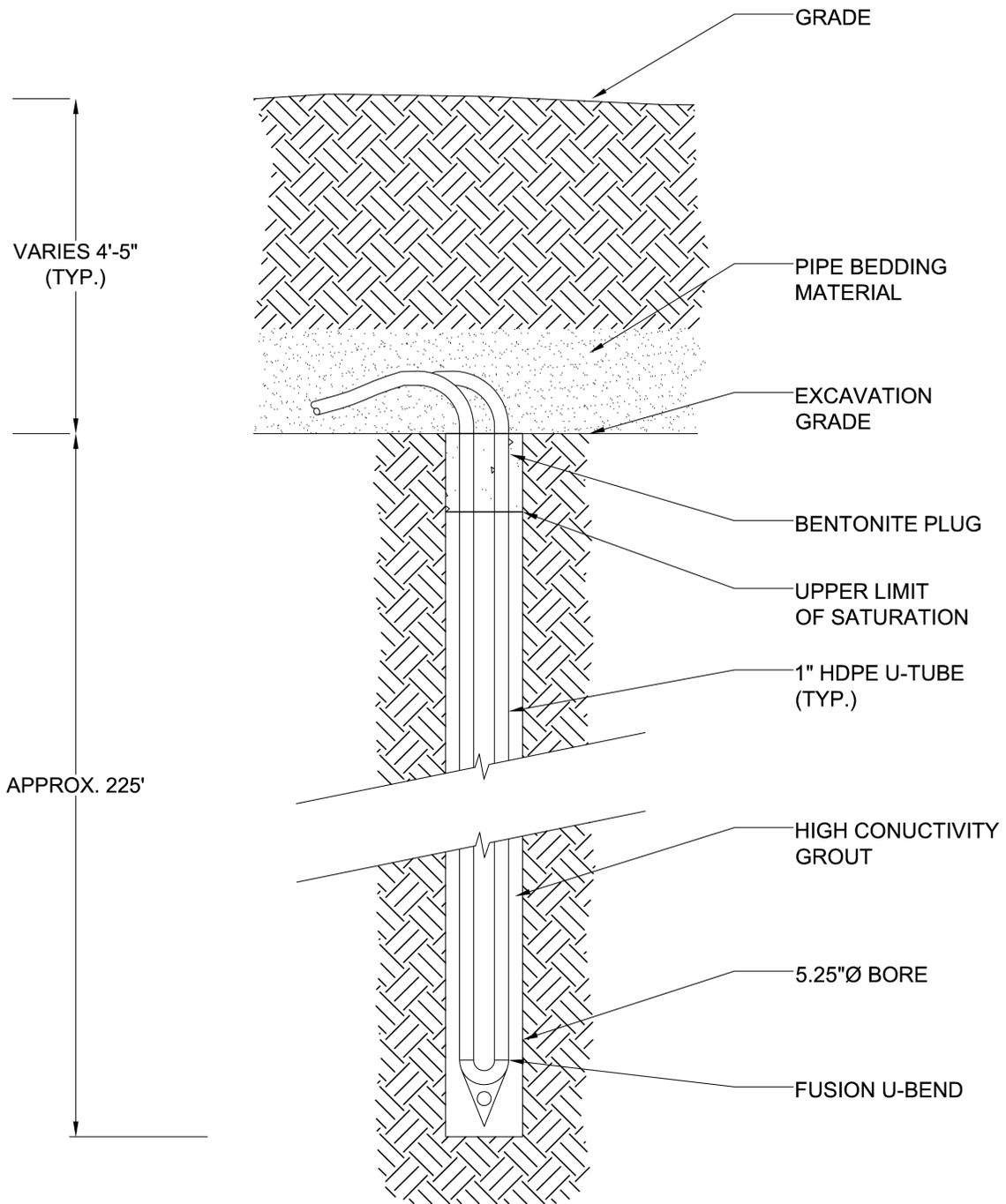
TACOMA · SEATTLE

2215 North 30th Street, Suite 300, Tacoma, WA 98403 253.383.2422 TEL
 316 Occidental Avenue South, Suite 320, Seattle, WA 98104 206.267.2425 TEL

AMERICAN LAKE VETERANS HOSPITAL
 GROUND BASED HEAT PUMP SYSTEM

SITE PLAN
 JUNE 2011

FIGURE
 2



3

GEOWELL DETAIL

SCALE: NONE

REFERENCE SOURCE: KLINGELE & ASSOCIATES - 65% DESIGN DOCUMENTS

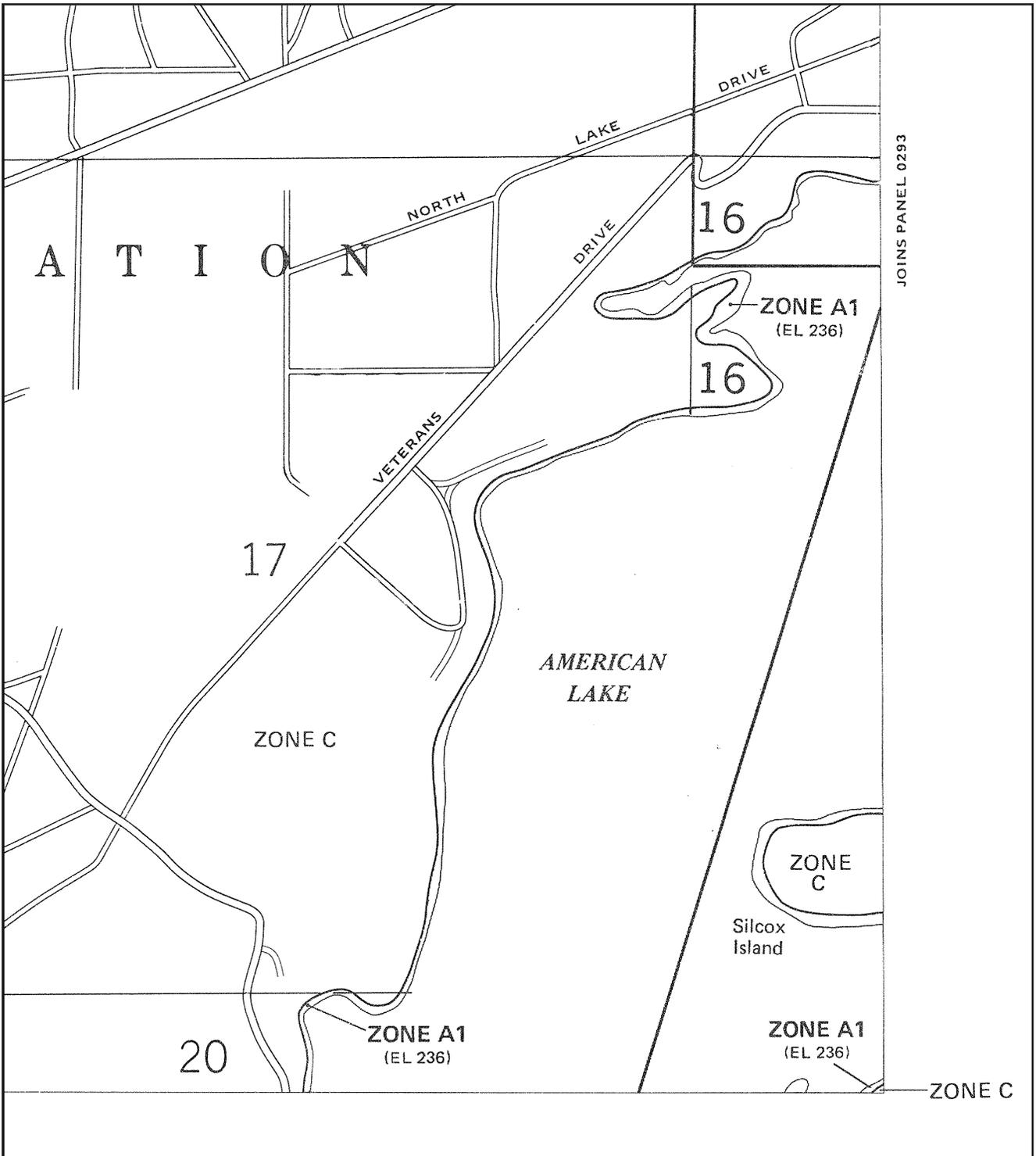


Civil Engineers
 Structural Engineers
 Landscape Architects
 Community Planners
 Land Surveyors
 Neighbors

TACOMA · SEATTLE
 2215 North 30th Street, Suite 300, Tacoma, WA 98403 253.383.2422 TEL
 316 Occidental Avenue South, Suite 320, Seattle, WA 98104 206.267.2425 TEL

AMERICAN LAKE VETERANS HOSPITAL GROUND BASED HEAT PUMP SYSTEM	
GEOTHERMAL WELL DETAIL JUNE 2011	

FIGURE 3



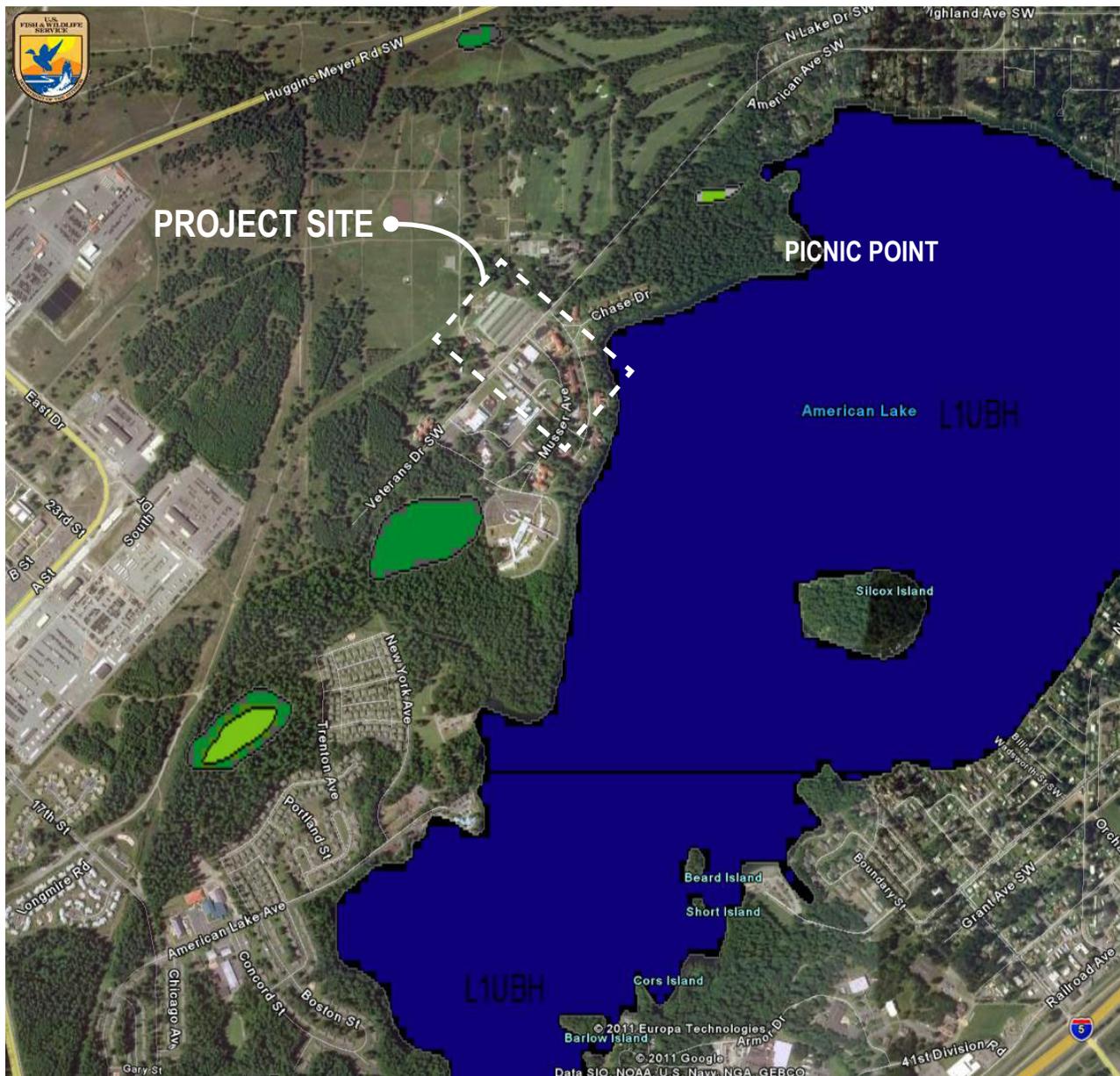
REFERENCE SOURCE: FEMA NATIONAL FLOOD INSURANCE PROGRAM - FLOOD INSURANCE RATE MAP
COMMUNITY - PANEL NUMBER 530138 0290 C



Civil Engineers
Structural Engineers
Landscape Architects
Community Planners
Land Surveyors
Neighbors

TACOMA · SEATTLE
2215 North 30th Street, Suite 300, Tacoma, WA 98403 253.383.2422 TEL
316 Occidental Avenue South, Suite 320, Seattle, WA 98104 206.267.2425 TEL

<p>AMERICAN LAKE VETERANS HOSPITAL GROUND BASED HEAT PUMP SYSTEM</p>	<p>FIGURE 4</p>
<p>FEMA FLOODPLAIN MAP JUNE 2011</p>	



LEGEND

-  Freshwater Forested/Shrub Wetland
-  Freshwater Emergent Wetland/Marsh



NORTH

REFERENCE SOURCE: U.S. FISH & WILDLIFE SERVICE – NATIONAL WETLAND INVENTORY:
WWW.FWS.GOV/NWI/WETLANDSDATA/GOOGLEEARTH.HTM



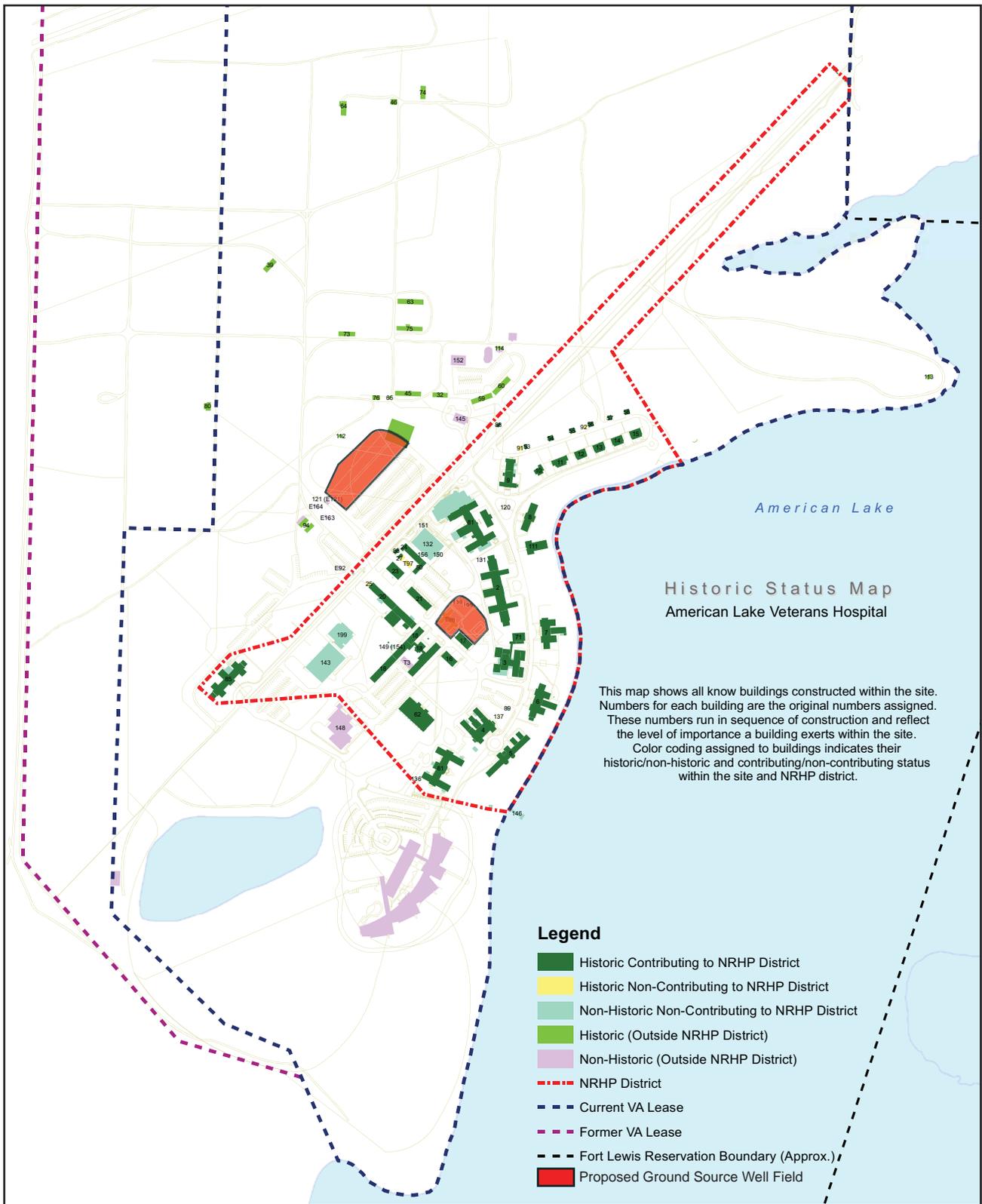
Civil Engineers
 Structural Engineers
 Landscape Architects
 Community Planners
 Land Surveyors
 Neighbors

TACOMA · SEATTLE
 2215 North 30th Street, Suite 300, Tacoma, WA 98403 253.383.2422 TEL
 316 Occidental Avenue South, Suite 320, Seattle, WA 98104 206.267.2425 TEL

AMERICAN LAKE VETERANS HOSPITAL
 GROUND BASED HEAT PUMP SYSTEM

NATIONAL WETLAND INVENTORY MAP
 JUNE 2011

FIGURE
 5



Historic Status Map
American Lake Veterans Hospital

This map shows all know buildings constructed within the site. Numbers for each building are the original numbers assigned. These numbers run in sequence of construction and reflect the level of importance a building exerts within the site. Color coding assigned to buildings indicates their historic/non-historic and contributing/non-contributing status within the site and NRHP district.

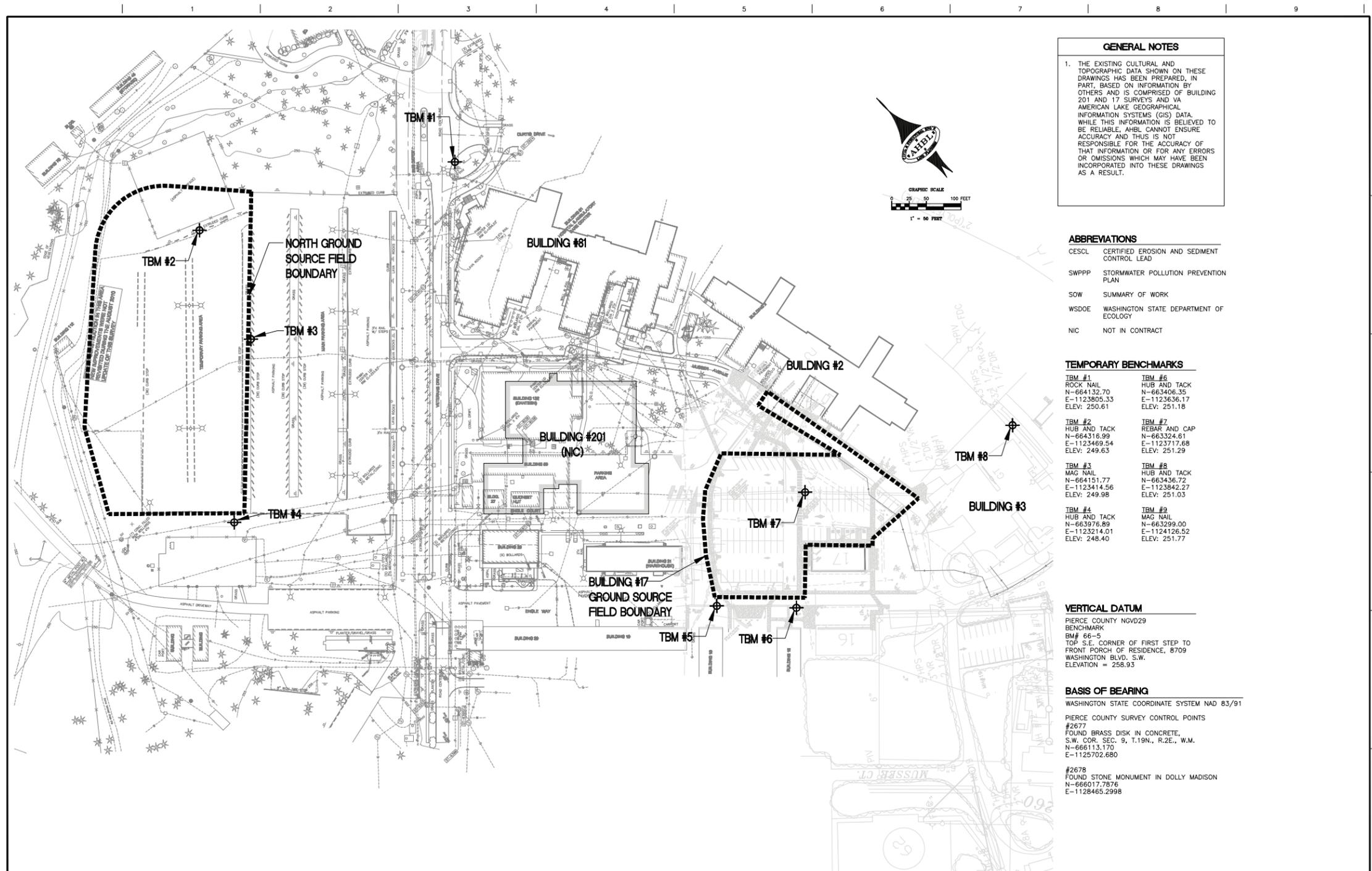
- Legend**
- Historic Contributing to NRHP District
 - Historic Non-Contributing to NRHP District
 - Non-Historic Non-Contributing to NRHP District
 - Historic (Outside NRHP District)
 - Non-Historic (Outside NRHP District)
 - NRHP District
 - Current VA Lease
 - Former VA Lease
 - Fort Lewis Reservation Boundary (Approx.)
 - Proposed Ground Source Well Field

REFERENCE SOURCE: ARTIFACTS ARCHITECTURAL CONSULTANTS & ZGF ARCHITECTS - AMERICAN LAKE VETERANS HOSPITAL PRESERVATION PLAN (2010)

Appendix B

SELECTED SHEETS FROM 95% DESIGN PLANS

CS-101
CD-101
CD-202
CD-501
CG-201
MP-171
MP-811



GENERAL NOTES

1. THE EXISTING CULTURAL AND TOPOGRAPHIC DATA SHOWN ON THESE DRAWINGS HAS BEEN PREPARED, IN PART, BASED ON INFORMATION BY OTHERS AND IS COMPRISED OF BUILDING 201 AND 17 SURVEYS AND VA AMERICAN LAKE GEOGRAPHICAL INFORMATION SYSTEMS (GIS) DATA. WHILE THIS INFORMATION IS BELIEVED TO BE RELIABLE, AHEL CANNOT ENSURE ACCURACY AND THUS IS NOT RESPONSIBLE FOR THE ACCURACY OF THAT INFORMATION OR FOR ANY ERRORS OR OMISSIONS WHICH MAY HAVE BEEN INCORPORATED INTO THESE DRAWINGS AS A RESULT.

ABBREVIATIONS

CESCL CERTIFIED EROSION AND SEDIMENT CONTROL LEAD
 SWPPP STORMWATER POLLUTION PREVENTION PLAN
 SOW SUMMARY OF WORK
 WSDOE WASHINGTON STATE DEPARTMENT OF ECOLOGY
 NIC NOT IN CONTRACT

TEMPORARY BENCHMARKS

TBM #1 ROCK NAIL N-664132.70 E-1123805.33 ELEV: 250.61	TBM #6 HUB AND TACK N-663406.35 E-1123636.17 ELEV: 251.18
TBM #2 HUB AND TACK N-664316.99 E-1123469.54 ELEV: 249.63	TBM #7 REBAR AND CAP N-663324.61 E-1123717.68 ELEV: 251.29
TBM #3 MAG NAIL N-664151.77 E-1123414.56 ELEV: 249.98	TBM #8 HUB AND TACK N-663436.72 E-1123842.27 ELEV: 251.03
TBM #4 HUB AND TACK N-663976.89 E-1123214.01 ELEV: 248.40	TBM #9 MAG NAIL N-663299.00 E-1124126.52 ELEV: 251.77

VERTICAL DATUM

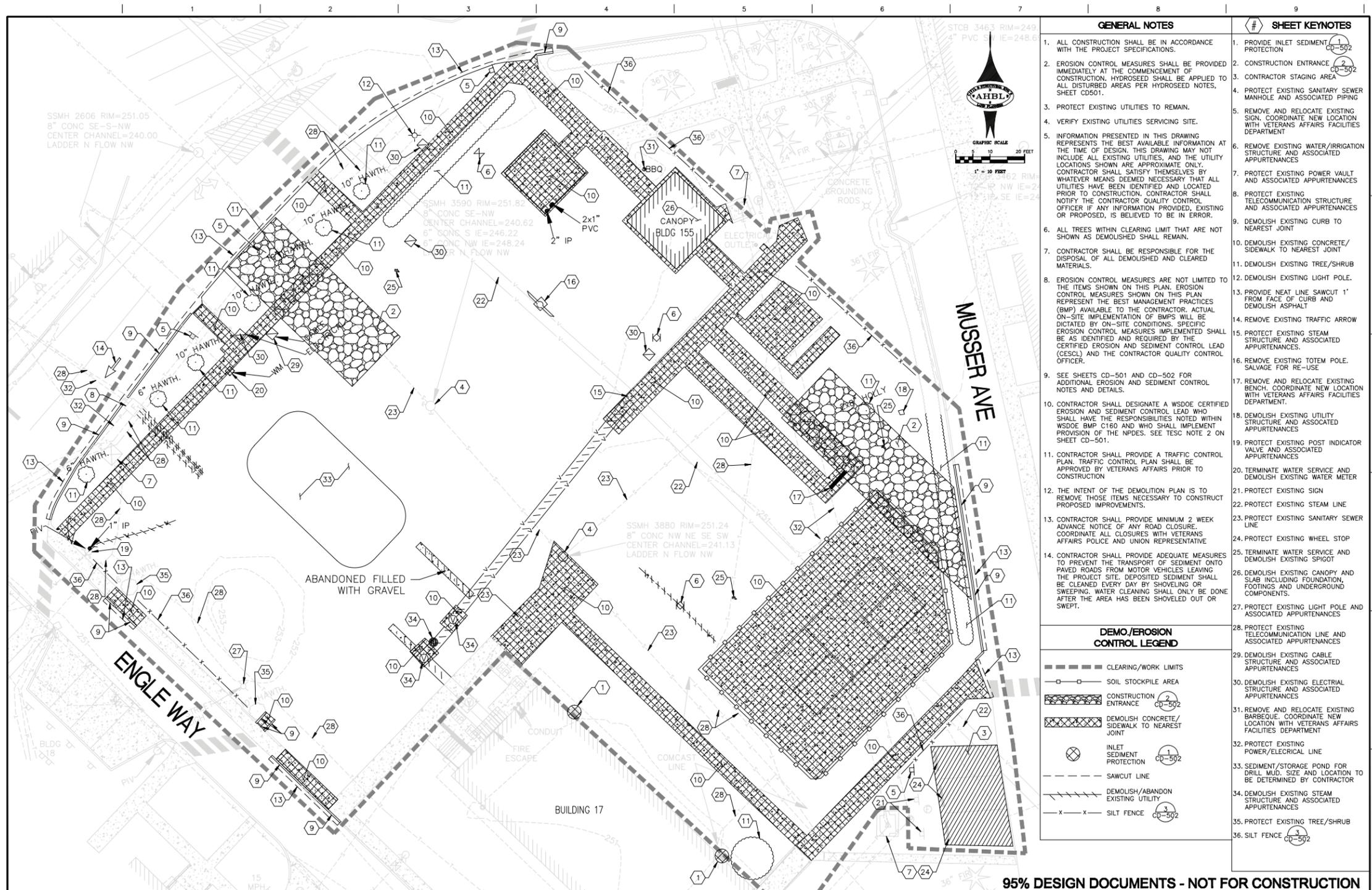
PIERCE COUNTY NGVD29 BENCHMARK
 BM# 66-5
 TOP S.E. CORNER OF FIRST STEP TO FRONT PORCH OF RESIDENCE, 8709 WASHINGTON BLVD., S.W.
 ELEVATION = 258.95

BASIS OF BEARING

WASHINGTON STATE COORDINATE SYSTEM NAD 83/91
 PIERCE COUNTY SURVEY CONTROL POINTS
 #2677
 FOUND BRASS DISK IN CONCRETE, S.W. COR. SEC. 9, T.19N., R.2E., W.M.
 N-666113.170
 E-1125702.680
 #2678
 FOUND STONE MONUMENT IN DOLLY MADISON
 N-666017.7576
 E-1128465.2985

95% DESIGN DOCUMENTS - NOT FOR CONSTRUCTION

CONSULTANT: AHBL TACOMA, SEATTLE 2000 1st Ave, Suite 1000, Tacoma, WA 98501 (253) 382-1000	PRIME: engenuity systems LLC 40 BROADWAY, SUITE 100 TACOMA, WA 98402 PH (253) 292-0387 FX (253) 292-0388 www.engenuitysys.com	Drawing Title TOPOGRAPHIC INFORMATION	Project Title GROUND BASED HEAT PUMP SYSTEM	Project Number 663A4-10-351	Office of Construction and Facilities Management	
		Approved Project Director	Location VA AMERICAN LAKE MADISON - TACOMA, WA	Building Number 23.17		Drawing Number CS-101
Revision Date			Date 05-28-11	Checked JRC	Drawn MFW/MS	Day of XXXX



GENERAL NOTES

1. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.
2. EROSION CONTROL MEASURES SHALL BE PROVIDED IMMEDIATELY AT THE COMMENCEMENT OF CONSTRUCTION. HYDROSEED SHALL BE APPLIED TO ALL DISTURBED AREAS PER HYDROSEED NOTES, SHEET CD501.
3. PROTECT EXISTING UTILITIES TO REMAIN.
4. VERIFY EXISTING UTILITIES SERVICING SITE.
5. INFORMATION PRESENTED IN THIS DRAWING REPRESENTS THE BEST AVAILABLE INFORMATION AT THE TIME OF DESIGN. THIS DRAWING MAY NOT INCLUDE ALL EXISTING UTILITIES, AND THE UTILITY LOCATIONS SHOWN ARE APPROXIMATE ONLY. CONTRACTOR SHALL SATISFY THEMSELVES BY WHATEVER MEANS DEEMED NECESSARY THAT ALL UTILITIES HAVE BEEN IDENTIFIED AND LOCATED PRIOR TO CONSTRUCTION. CONTRACTOR SHALL NOTIFY THE CONTRACTOR QUALITY CONTROL OFFICER IF ANY INFORMATION PROVIDED, EXISTING OR PROPOSED, IS BELIEVED TO BE IN ERROR.
6. ALL TREES WITHIN CLEARING LIMIT THAT ARE NOT SHOWN AS DEMOLISHED SHALL REMAIN.
7. CONTRACTOR SHALL BE RESPONSIBLE FOR THE DISPOSAL OF ALL DEMOLISHED AND CLEARED MATERIALS.
8. EROSION CONTROL MEASURES ARE NOT LIMITED TO THE ITEMS SHOWN ON THIS PLAN. EROSION CONTROL MEASURES SHOWN ON THIS PLAN REPRESENT THE BEST MANAGEMENT PRACTICES (BMP) AVAILABLE TO THE CONTRACTOR. ACTUAL ON-SITE IMPLEMENTATION OF BMPs WILL BE DICTATED BY ON-SITE CONDITIONS. SPECIFIC EROSION CONTROL MEASURES IMPLEMENTED SHALL BE AS IDENTIFIED AND NOTED BY THE CERTIFIED EROSION AND SEDIMENT CONTROL LEAD (CESCL) AND THE CONTRACTOR QUALITY CONTROL OFFICER.
9. SEE SHEETS CD-501 AND CD-502 FOR ADDITIONAL EROSION AND SEDIMENT CONTROL NOTES AND DETAILS.
10. CONTRACTOR SHALL DESIGNATE A WSDOE CERTIFIED EROSION AND SEDIMENT CONTROL LEAD WHO SHALL HAVE THE RESPONSIBILITIES NOTED WITHIN WSDOE BMP C160 AND WHO SHALL IMPLEMENT PROVISION OF THE NPDES. SEE TESC NOTE 2 ON SHEET CD-501.
11. CONTRACTOR SHALL PROVIDE A TRAFFIC CONTROL PLAN. TRAFFIC CONTROL PLAN SHALL BE APPROVED BY VETERANS AFFAIRS PRIOR TO CONSTRUCTION.
12. THE INTENT OF THE DEMOLITION PLAN IS TO REMOVE THOSE ITEMS NECESSARY TO CONSTRUCT PROPOSED IMPROVEMENTS.
13. CONTRACTOR SHALL PROVIDE MINIMUM 2 WEEK ADVANCE NOTICE OF ANY ROAD CLOSURE. COORDINATE ALL CLOSURES WITH VETERANS AFFAIRS POLICE AND UNION REPRESENTATIVE.
14. CONTRACTOR SHALL PROVIDE ADEQUATE MEASURES TO PREVENT THE TRANSPORT OF SEDIMENT ONTO PAVED ROADS FROM MOTOR VEHICLES LEAVING THE PROJECT SITE. DEPOSITED SEDIMENT SHALL BE CLEANED EVERY DAY BY SHOVELING OR SWEEPING. WATER CLEANING SHALL ONLY BE DONE AFTER THE AREA HAS BEEN SHOVELED OUT OR SWEEPED.

DEMO./EROSION CONTROL LEGEND

- CLEARING/WORK LIMITS
- SOIL STOCKPILE AREA
- CONSTRUCTION ENTRANCE CD-502
- DEMOLISH CONCRETE/SIDEWALK TO NEAREST JOINT
- ⊗ INLET SEDIMENT PROTECTION CD-502
- SAWCUT LINE
- DEMOLISH/ABANDON EXISTING UTILITY
- SILT FENCE CD-502

SHEET KEYNOTES

1. PROVIDE INLET SEDIMENT PROTECTION CD-502
2. CONSTRUCTION ENTRANCE CD-502
3. CONTRACTOR STAGING AREA
4. PROTECT EXISTING SANITARY SEWER MANHOLE AND ASSOCIATED PIPING
5. REMOVE AND RELOCATE EXISTING SIGN. COORDINATE NEW LOCATION WITH VETERANS AFFAIRS FACILITIES DEPARTMENT
6. REMOVE EXISTING WATER/IRRIGATION STRUCTURE AND ASSOCIATED APPURTENANCES
7. PROTECT EXISTING POWER VAULT AND ASSOCIATED APPURTENANCES
8. PROTECT EXISTING TELECOMMUNICATION STRUCTURE AND ASSOCIATED APPURTENANCES
9. DEMOLISH EXISTING CURB TO NEAREST JOINT
10. DEMOLISH EXISTING CONCRETE/SIDEWALK TO NEAREST JOINT
11. DEMOLISH EXISTING TREE/SHRUB
12. DEMOLISH EXISTING LIGHT POLE.
13. PROVIDE NEAT LINE SAWCUT 1' FROM FACE OF CURB AND DEMOLISH ASPHALT
14. REMOVE EXISTING TRAFFIC ARROW
15. PROTECT EXISTING STEAM STRUCTURE AND ASSOCIATED APPURTENANCES.
16. REMOVE EXISTING TOTEM POLE. SALVAGE FOR RE-USE
17. REMOVE AND RELOCATE EXISTING BENCH. COORDINATE NEW LOCATION WITH VETERANS AFFAIRS FACILITIES DEPARTMENT.
18. DEMOLISH EXISTING UTILITY STRUCTURE AND ASSOCIATED APPURTENANCES
19. PROTECT EXISTING POST INDICATOR VALVE AND ASSOCIATED APPURTENANCES
20. TERMINATE WATER SERVICE AND DEMOLISH EXISTING WATER METER
21. PROTECT EXISTING SIGN
22. PROTECT EXISTING STEAM LINE
23. PROTECT EXISTING SANITARY SEWER LINE
24. PROTECT EXISTING WHEEL STOP
25. TERMINATE WATER SERVICE AND DEMOLISH EXISTING SPIGOT
26. DEMOLISH EXISTING CANOPY AND SLAB INCLUDING FOUNDATION, FOOTINGS AND UNDERGROUND COMPONENTS.
27. PROTECT EXISTING LIGHT POLE AND ASSOCIATED APPURTENANCES
28. PROTECT EXISTING TELECOMMUNICATION LINE AND ASSOCIATED APPURTENANCES
29. DEMOLISH EXISTING CABLE STRUCTURE AND ASSOCIATED APPURTENANCES
30. DEMOLISH EXISTING ELECTRICAL STRUCTURE AND ASSOCIATED APPURTENANCES
31. REMOVE AND RELOCATE EXISTING BARBEQUE. COORDINATE NEW LOCATION WITH VETERANS AFFAIRS FACILITIES DEPARTMENT
32. PROTECT EXISTING POWER/ELECTRICAL LINE
33. SEDIMENT/STORAGE POND FOR DRILL MUD. SIZE AND LOCATION TO BE DETERMINED BY CONTRACTOR
34. DEMOLISH EXISTING STEAM STRUCTURE AND ASSOCIATED APPURTENANCES
35. PROTECT EXISTING TREE/SHRUB
36. SILT FENCE CD-502

95% DESIGN DOCUMENTS - NOT FOR CONSTRUCTION

<p>CONSULTANT:</p> <p>AHBL TACOMA, SEATTLE</p>	<p>PRIME:</p> <p>engenuity systems LLC 40 BROADWAY, SUITE 100 TACOMA, WA 98402 PH (253) 292-0387 FX (253) 292-0388 www.enginitysys.com</p>	<p>Drawing Title: BUILDING 17 GROUND SOURCE FIELD TESC AND DEMOLITION PLAN</p> <p>Approved Project Director:</p>	<p>Project Title: GROUND BASED HEAT PUMP SYSTEM</p> <p>Location: VA AMERICAN LAKE DARRIN - TACOMA, WA</p> <p>Date: 05-28-11</p> <p>Checked: JRC</p> <p>Drawn: MFWAJS</p>	<p>Project Number: 663A4-10-351</p> <p>Building Number: 23.17</p> <p>Drawing Number: CD-202</p> <p>Day of XXXX</p>	<p>Office of Construction and Facilities Management</p>
---	---	---	---	---	--

TESC NOTES

THE FOLLOWING EROSION AND SEDIMENTATION CONTROL NOTES APPLY TO ALL CONSTRUCTION SITE ACTIVITIES AT ALL TIMES, UNLESS OTHERWISE SPECIFIED ON THESE PLANS:

- APPROVAL OF THIS EROSION AND SEDIMENTATION CONTROL PLAN DOES NOT CONSTITUTE AN ACCEPTANCE OF THE PERMANENT ROAD OR DRAINAGE DESIGN.
- THE CONTRACTOR SHALL BE RESPONSIBLE AT ALL TIMES FOR PREVENTING SILT-LADEN RUNOFF FROM DISCHARGING FROM THE PROJECT SITE. FAILURE BY THE CONTRACTOR CAN RESULT IN A FINE. THE DESIGNATED CESCL MUST BE AVAILABLE FOR CONTACT BY TELEPHONE ON A 24 HOUR BASIS THROUGHOUT CONSTRUCTION AND UNTIL THE PROJECT HAS BEEN COMPLETED AND ACCEPTED BY THE DEPARTMENT OF VETERANS AFFAIRS.
- THE IMPLEMENTATION OF THESE ESC PLANS AND THE CONSTRUCTION, MAINTENANCE, REPLACEMENT AND UPGRADING OF THESE FACILITIES IS THE RESPONSIBILITY OF THE CONTRACTOR FROM THE BEGINNING OF CONSTRUCTION UNTIL ALL CONSTRUCTION IS COMPLETED AND ACCEPTED BY THE DEPARTMENT OF VETERANS AFFAIRS AND THE SITE IS STABILIZED.
- PRIOR TO BEGINNING ANY WORK ON THE PROJECT SITE, A PRECONSTRUCTION CONFERENCE MUST BE HELD, AND SHALL BE ATTENDED BY THE CONTRACTOR(S), SURVEYOR, ENGINEER, CESCL AND THE DEPARTMENT OF VETERANS AFFAIRS.
- THE BOUNDARIES OF THE CLEARING LIMITS SHOWN ON THIS PLAN SHALL BE CLEARLY FLAGGED AND INSPECTED BY THE DEPARTMENT OF VETERANS AFFAIRS PRIOR TO ANY CLEARING OR CONSTRUCTION TAKING PLACE. DURING CONSTRUCTION, NO DISTURBANCE BEYOND THE FLAGGED CLEARING LIMITS SHALL BE PERMITTED WITHOUT PRIOR APPROVAL FROM THE DEPARTMENT OF VETERANS AFFAIRS. THE FLAGGING SHALL BE MAINTAINED BY THE CONTRACTOR UNTIL ALL CONSTRUCTION IS APPROVED BY THE DEPARTMENT OF VETERANS AFFAIRS.
- ALL ROCKED CONSTRUCTION ENTRANCES SHOWN ON THIS PLAN SHALL BE INSTALLED PRIOR TO BEGINNING CONSTRUCTION. IN ADDITION, EQUIPMENT FOR THE CLEANING OF ROADWAYS SHALL BE AVAILABLE AT ALL TIMES DURING CONSTRUCTION.
- THE EROSION AND SEDIMENTATION CONTROL FACILITIES SHOWN ON THIS PLAN ARE TO BE CONSIDERED ADEQUATE BASIC REQUIREMENTS FOR THE ANTICIPATED SITE CONDITIONS. DURING CONSTRUCTION, DEVIATIONS FROM THIS PLAN MAY BE NECESSARY IN ORDER TO MAINTAIN WATER QUALITY. MINOR DEPARTURES FROM THIS PLAN ARE PERMITTED SUBJECT TO THE APPROVAL OF THE CESCL. HOWEVER, EXCEPT FOR EMERGENCY SITUATIONS, ALL OTHER DEVIATIONS FROM THIS PLAN MUST BE DESIGNED BY THE PROJECT ENGINEER AND APPROVED BY THE CONTRACTED QUALITY CONTROL OFFICER PRIOR TO INSTALLATION.
- ALL EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE INSPECTED BY THE CONTRACTOR ON A FREQUENT BASIS AND IMMEDIATELY AFTER EACH RAINFALL, AND MAINTAINED AS NECESSARY TO INSURE THEIR CONTINUED FUNCTIONING. ALL SEDIMENT MUST BE REMOVED FROM SILT FENCES, STRAW BALES, ETC. PRIOR TO THE SEDIMENT REACHING 1/2 ITS MAXIMUM POTENTIAL DEPTH.
- AT NO TIME SHALL CONCRETE, CONCRETE BY-PRODUCTS, VEHICLE FLUIDS, PAINT, CHEMICALS, OR OTHER POLLUTING MATTER BE PERMITTED TO DISCHARGE TO THE TEMPORARY OR PERMANENT DRAINAGE SYSTEM, OR TO DISCHARGE FROM THE PROJECT SITE.
- EROSION CONTROL MEASURES SHALL BE PROVIDED IMMEDIATELY AT THE COMMENCEMENT OF CONSTRUCTION OR AS ADDITIONALLY REQUIRED BY THE CESCL.
- ALL EROSION CONTROL MEASURES SHALL CONFORM TO THE APPLICABLE STANDARDS IN THE WASHINGTON STATE DEPARTMENT OF ECOLOGY STORMWATER MANAGEMENT MANUAL FOR WESTERN WASHINGTON, FEBRUARY 2005 EDITION.
- ALL DISTURBED AREAS SHALL BE STABILIZED BEFORE THE END OF CONSTRUCTION.
- PROVIDE TEMPORARY HYDROSEEDING MEASURES TO REDUCE EROSION AND SEDIMENTATION. SEE HYDROSEEDING NOTES.
- DURING THE TIME PERIOD OF OCTOBER 1 THROUGH APRIL 30, AND AT OTHER TIMES OF THE YEAR WHEN THERE ARE EXTENDED PERIODS OF INCLEMENT WEATHER, ALL PROJECT DISTURBED SOIL AREAS THAT ARE TO BE LEFT UNWORKED FOR MORE THAN 48 HOURS SHALL BE COVERED BY MULCH, SEEDING, OR PLASTIC COVERING. SEE MULCHING NOTES, HYDROSEEDING NOTES AND PLASTIC COVERING NOTES.

SOIL STOCKPILE NOTES

- STOCKPILES SHALL BE STABILIZED (WITH PLASTIC COVERING OR OTHER APPROVED DEVICE) DAILY BETWEEN OCTOBER 1 AND APRIL 30.
- IN ANY SEASON, SEDIMENT LEACHING FROM STOCK PILES MUST BE PREVENTED.
- TOPSOIL SHALL NOT BE PLACED WHILE IN A FROZEN OR MUDDY CONDITION; WHEN THE SUBGRADE IS EXCESSIVELY WET, OR WHEN CONDITIONS EXIST THAT MAY OTHERWISE BE DETRIMENTAL TO PROPER GRADING OR PROPOSED SODDING OR SEEDING.
- PREVIOUSLY ESTABLISHED GRADES ON THE AREAS TO BE TOPSOILED SHALL BE MAINTAINED ACCORDING TO THE APPROVED PLAN.

MULCHING NOTES

- MULCH MATERIALS USED SHALL BE HAY OR STRAW, AND SHALL BE 2 TO 3 INCHES THICK; 5 BALES PER 1000 SF OR 2 TO 3 TONS/ACRE.
- MULCH SHOULD BE USED ON DISTURBED AREAS THAT REQUIRE COVER MEASURES FOR LESS THAN 30 DAYS.
- MULCH SHOULD BE USED AS A COVER FOR SEED DURING THE WET SEASON AND DURING THE HOT SUMMER MONTHS.
- MULCH SHOULD BE USED DURING THE WET SEASON ON SLOPES STEEPER THAN 3H:1V WITH MORE THAN 10 FEET OF VERTICAL RELIEF.
- MULCH MAY BE APPLIED AT ANY TIME OF THE YEAR AND MUST BE REFRESHED PERIODICALLY.
- THE THICKNESS OF THE MULCH MUST BE MAINTAINED.
- ANY AREAS THAT EXPERIENCE EROSION SHALL BE RE-MULCHED AND/OR PROTECTED WITH A NET OR BLANKET. IF THE EROSION PROBLEM IS DRAINAGE RELATED, THEN THE PROBLEM SHALL BE FIXED AND THE ERODED AREA RE-MULCHED.

PLASTIC COVERING NOTES

- PLASTIC SLOPE SHALL BE INSTALLED AS FOLLOWS:
 - A. RUN PLASTIC UP AND DOWN SLOPE, NOT ACROSS SLOPE.
 - B. PLASTIC MAY BE INSTALLED PERPENDICULAR TO A SLOPE IF THE SLOPE LENGTH IS LESS THAN 10 FEET.
 - C. MINIMUM OF 12-INCH OVERLAP AT SEAMS.
 - D. ON LONG OR WIDE SLOPES, OR SLOPES SUBJECT TO WIND, ALL SEAMS SHOULD BE TAPED.
 - E. PLACE PLASTIC INTO A SMALL (12-INCH WIDE BY 6-INCH DEEP) SLOT TRENCH AT THE TOP OF THE SLOPE AND BACKFILL WITH WASHED ROCK TO KEEP WATER FROM FLOWING UNDERNEATH.
 - F. PLACE SAND FILLED BURLAP OR GEOTEXTILE BAGS EVERY 3 TO 6 FEET ALONG SEAMS AND POUND A WOODEN STAKE THROUGH EACH TO HOLD THEM IN PLACE.
 - G. INSPECT PLASTIC FOR RIPS, TEARS, AND OPEN SEAMS REGULARLY AND REPAIR IMMEDIATELY. THIS PREVENTS HIGH VELOCITY RUNOFF FROM CONTACTING BARE SOIL, WHICH CAUSES EXTREME EROSION.
 - H. SANDBAGS MAY BE LOWERED INTO PLACE, TIED TO ROPES. ALL SANDBAGS MUST BE STAKED IN PLACE.
- PLASTIC SHEETING SHALL HAVE A MINIMUM THICKNESS OF 6 MILLIMETERS.
- IF EROSION AT THE TOE OF A SLOPE IS LIKELY, A GRAVEL BERM, RIPRAP, OR OTHER SUITABLE PROTECTION SHALL BE INSTALLED AT THE TOE OF THE SLOPE IN ORDER TO REDUCE THE VELOCITY OF RUNOFF.
- TORN SHEETS MUST BE REPLACED AND OPEN SEAMS REPAIRED.
- IF THE PLASTIC BEGINS TO DETERIORATE DUE TO ULTRAVIOLET RADIATION, IT MUST BE COMPLETELY REMOVED AND REPLACED.
- WHEN THE PLASTIC AND SAND BAGS ARE NO LONGER REQUIRED, THEY SHALL BE COMPLETELY REMOVED AND PROPERLY DISPOSED.

HYDROSEEDING NOTES

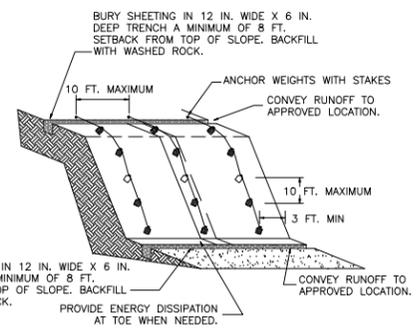
- SEEDING SHALL BE USED THROUGHOUT THE PROJECT ON DISTURBED AREAS THAT HAVE REACHED FINAL GRADE OR THAT WILL REMAIN UNWORKED FOR MORE THAN 30 DAYS.
- MULCH IS REQUIRED AT ALL TIMES BECAUSE IT PROTECTS SEEDS FROM HEAT, MOISTURE LOSS, AND TRANSPORT DUE TO RUNOFF.
- CHANNELS THAT WILL BE VEGETATED SHALL BE INSTALLED BEFORE MAJOR EARTHWORK AND HYDROSEEDED WITH A BONDED FIBER MIX (I.E., 75 PERCENT COVER) BEFORE WATER IS ALLOWED TO FLOW IN THE DITCH. WITH CHANNELS THAT WILL HAVE HIGH FLOWS, EROSION CONTROL BLANKETS SHOULD BE INSTALLED OVER THE HYDROSEED. IF VEGETATION CANNOT BE ESTABLISHED FROM SEED BEFORE WATER IS ALLOWED IN THE DITCH, SOD SHALL BE INSTALLED IN THE BOTTOM OF THE DITCH OVER HYDROMULCH AND BLANKETS.
- ALL DISTURBED AREAS SHALL BE REVIEWED IN LATE AUGUST TO EARLY SEPTEMBER AND ALL SEEDING SHALL BE COMPLETED BY THE END OF SEPTEMBER.
- AT FINAL SITE STABILIZATION, ALL DISTURBED AREAS, NOT OTHERWISE VEGETATED OR STABILIZED, SHALL BE SEEDED AND MULCHED. FINAL STABILIZATION MEANS THE COMPLETION OF ALL SOIL DISTURBING ACTIVITIES AT THE SITE AND THE ESTABLISHMENT OF A PERMANENT VEGETATIVE COVER, OR EQUIVALENT PERMANENT STABILIZATION MEASURES (SUCH AS PAVEMENT, RIPRAP, GABIONS, OR GEOTEXTILES) WHICH WILL PREVENT EROSION.
- THE OPTIMUM SEEDING WINDOWS FOR WESTERN WASHINGTON ARE APRIL 1 THROUGH JUNE 30 AND SEPTEMBER 1 THROUGH OCTOBER 1. SEEDING THAT OCCURS BETWEEN JULY 1 AND AUGUST 30 WILL REQUIRE A 75 PERCENT GRASS COVER IS ESTABLISHED. SEEDING THAT OCCURS BETWEEN OCTOBER 1 AND MARCH 30 WILL REQUIRE A MULCH OR PLASTIC COVER UNTIL 75 PERCENT GRASS COVER IS ESTABLISHED.
- TO PREVENT SEED FROM BEING WASHED AWAY, CONFIRM THAT ALL REQUIRED SURFACE WATER CONTROL MEASURES HAVE BEEN INSTALLED.
- THE SEEDBED SHALL BE FIRM AND ROUGH. ALL SOIL SHALL BE ROUGHENED, NO MATTER THE SLOPE. IF CONSTRUCTION IS REQUIRED FOR ENGINEERING PURPOSES, SLOPES MUST BE TRACK WALKED BEFORE SEEDING. BACKBLADING OR SMOOTHING OF SLOPES GREATER THAN 4:1 IS NOT ALLOWED IF THEY ARE TO BE SEEDED.
- 10-4-6 N-P-K (NITROGEN-PHOSPHORUS-POTASSIUM) FERTILIZER CAN BE USED AT A RATE OF 90 POUNDS/ACRE. SLOW RELEASE FERTILIZERS SHALL BE USED. FERTILIZER SHALL NOT BE ADDED TO THE HYDROMULCH MACHINE AND AGITATED MORE THAN 20 MINUTES BEFORE IT IS USED.
- HYDROSEED APPLICATIONS SHALL INCLUDE A MINIMUM OF 1,500 POUNDS/ACRE OF MULCH WITH 3 PERCENT TACKIFIER. MULCH MAY CONSIST OF 100 PERCENT COTTONSEED MEAL; FIBERS MADE OF WOOD; RECYCLED CELLULOSE; HEMP AND KENAF; COMPOST; OR BLENDS OF THESE. TACKIFIER SHALL BE PLANT-BASED, SUCH AS GUAR OR ALPHA PLANTAGO, OR CHEMICAL BASED, SUCH AS POLYACRYLAMIDE OR POLYMERS. ANY MULCH OR TACKIFIER USED SHALL BE INSTALLED PER MANUFACTURER'S INSTRUCTIONS. SEED AND FERTILIZER SHALL BE ADDED AT TIME OF APPLICATION.
- MULCH IS ALWAYS REQUIRED FOR SEEDING. MULCH CAN BE APPLIED ON TOP OF THE SEED OR SIMULTANEOUSLY BY HYDROSEEDING. SEE MULCHING NOTES.
- SEED MIXES SHALL BE APPLIED AT 120 POUNDS/ACRE.
- TEMPORARY EROSION CONTROL SEED MIX SHALL ADHERE TO THE FOLLOWING MIXTURE:

	% WEIGHT	% PURITY	% GERMINATION
CHEWINGS OR ANNUAL BLUE GRASS	40%	98%	90%
PERENNIAL RYE	50%	98%	90%
RED TOP OR COLONIAL BENT GRASS	5%	92%	85%
WHITE DUTCH CLOVER	5%	98%	90%
- LANDSCAPING SEED MIX SHALL ADHERE TO THE FOLLOWING MIXTURE:

	% WEIGHT	% PURITY	% GERMINATION
PERENNIAL RYE BLEND	70%	98%	90%
CHEWING AND RED FESCUE BLEND	30%	98%	90%
- ANY SEEDED AREAS THAT FAIL TO ACHIEVE AT LEAST 80 PERCENT COVER (100 PERCENT COVER FOR AREAS THAT RECEIVE SHEET OR CONCENTRATED FLOWS) SHALL BE RESEEDED. IF RESEEDING IS INEFFECTIVE, AN ALTERNATE METHOD, SUCH AS SODDING, MULCHING, OR NETS/BLANKETS SHALL BE USED.
- AFTER ADEQUATE COVER IS ACHIEVED, ANY AREAS THAT EXPERIENCE EROSION SHALL BE RESEEDED AND PROTECTED BY MULCH. IF THE EROSION PROBLEM IS DRAINAGE RELATED, THE PROBLEM SHALL BE FIXED AND THE ERODED AREA RESEEDED AND PROTECTED BY MULCH.
- SEEDED AREAS SHALL BE SUPPLIED WITH ADEQUATE MOISTURE, BUT NOT WATERED TO THE EXTENT THAT IT CAUSES RUNOFF.

CONSTRUCTION SEQUENCE

- ARRANGE AND ATTEND PRE-CONSTRUCTION MEETING WITH DEPARTMENT OF VETERANS AFFAIRS, CONTRACTOR, CESCL AND ENGINEER.
- POST NOTICE OF CONSTRUCTION ACTIVITY SIGN WITH NAME AND PHONE NUMBER OF CESCL.
- FLAG OR FENCE CLEARING LIMITS.
- PROVIDE PERIMETER PROTECTION (SILT FENCE, ETC.) WHERE SHOWN ON ESC PLANS AND/OR REQUIRED BY CESCL.
- GRADE AND PROVIDE CONSTRUCTION ENTRANCES.
- CONSTRUCT SURFACE WATER CONTROLS SIMULTANEOUSLY WITH CLEARING AND GRUBBING FOR PROJECT DEVELOPMENT.
- MAINTAIN EROSION CONTROL MEASURES IN ACCORDANCE WITH DEPARTMENT OF VETERANS AFFAIRS GUIDELINES OR MANUFACTURER'S RECOMMENDATIONS.
- RELOCATE SURFACE WATER CONTROLS AND EROSION CONTROL MEASURES OR INSTALL NEW MEASURES SO THAT AS SITE CONDITIONS CHANGE, THE EROSION AND SEDIMENT CONTROL IS ALWAYS IN ACCORDANCE WITH DEPARTMENT OF VETERANS AFFAIRS EROSION AND SEDIMENT CONTROL STANDARDS.
- ANY AREAS OF EXPOSED SOILS THAT WILL REMAIN UNWORKED FOR MORE THAN SEVEN DAYS DURING THE WET SEASON SHALL BE IMMEDIATELY STABILIZED IN ACCORDANCE WITH THE DEPARTMENT OF VETERANS AFFAIRS EROSION AND SEDIMENT CONTROL REQUIREMENTS.
- ROUGH GRADE SITE.
- CONSTRUCT GROUND BASED HEAT PUMP SYSTEM
- CONSTRUCT STORM SYSTEM.
- PAVE SITE AS SHOWN ON PLANS.
- STABILIZE ALL AREAS THAT REACH FINAL GRADE WITHIN SEVEN DAYS.
- SEED OR SOD ANY AREAS TO REMAIN UNWORKED FOR MORE THAN 30 DAYS.
- UPON SUBSTANTIAL COMPLETION OF THE PROJECT, ALL DISTURBED AREAS MUST BE STABILIZED AND BEST MANAGEMENT PRACTICES REMOVED UPON APPROVAL BY THE DEPARTMENT OF VETERANS AFFAIRS.



NOTES

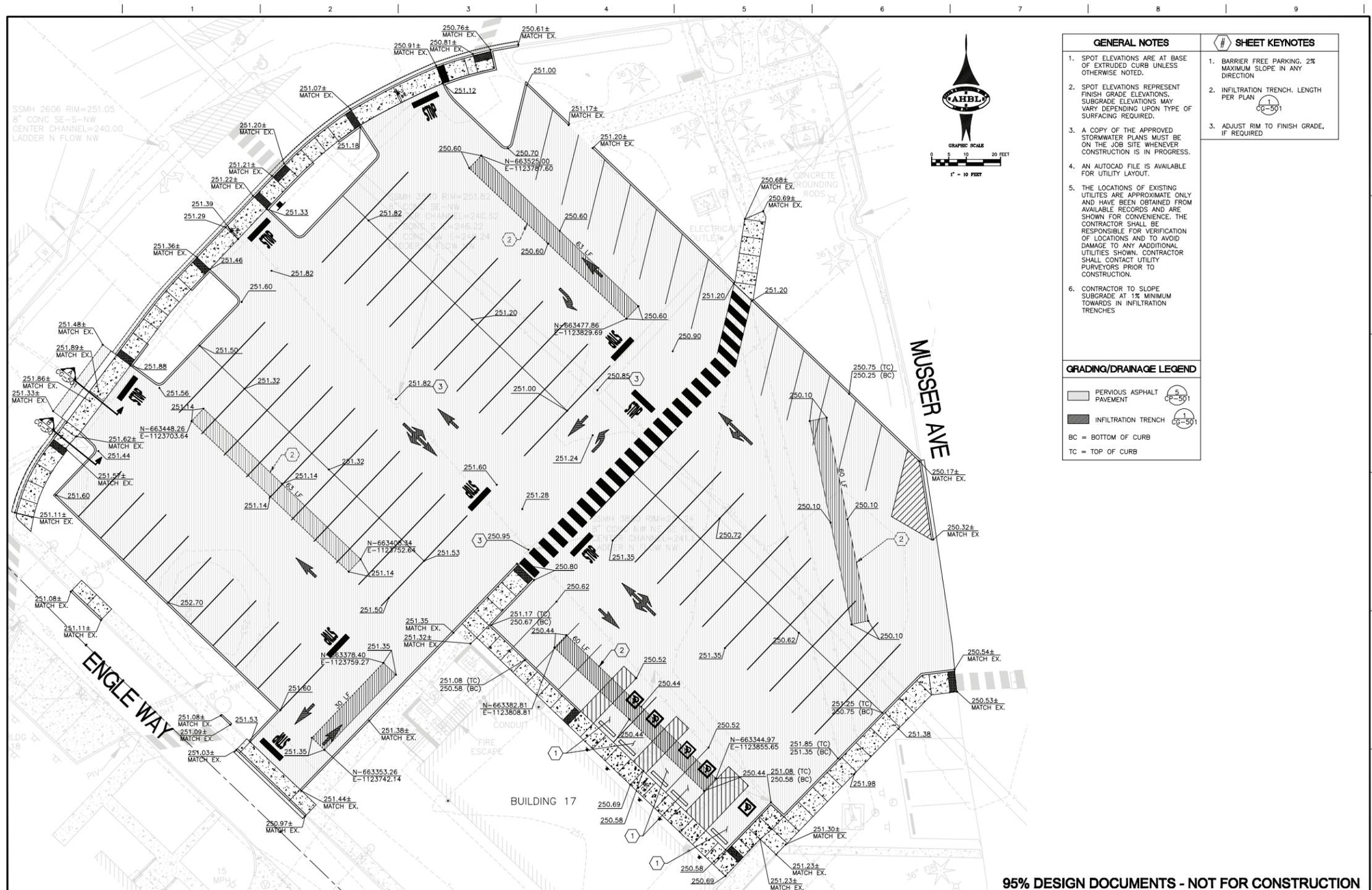
- SANDBAGS, OR EQUIVALENT MAY BE USED TO WEIGHT PLASTIC SHEETING.
- SEAMS BETWEEN SHEETS MUST OVERLAP A MINIMUM OF 12 IN. AND BE WEIGHTED OR TAPED.
- PLASTIC SHEETING SHALL HAVE A MINIMUM THICKNESS OF 6 MIL.
- DUE TO RAPID RUNOFF CAUSED BY PLASTIC SHEETING, THIS METHOD SHALL NOT BE USED UPSLOPE OF AREAS THAT MIGHT BE ADVERSELY IMPACTED BY CONCENTRATED RUNOFF.
- CONSTRUCT BERM OR SWALE AT TOP OF SLOPE AS DIRECTED BY THE CESCL.
- CONSTRUCT DITCH AT BASE OF SLOPE AS RELATED BY THE CESCL. DISCHARGE TO APPROVED LOCATION.

1 SOIL STOCKPILE
NOT TO SCALE

Scale indicators on the left margin: three inches = one foot, one and one half inches = one foot, one inch = one foot, three quarters inch = one foot, one half inch = one foot, three eighths inch = one foot, one quarter inch = one foot, one eighth inch = one foot.

95% DESIGN DOCUMENTS - NOT FOR CONSTRUCTION

<p>CONSULTANT:</p> <p>OHBL TACOMA, SEATTLE</p>	<p>PRIME:</p> <p>40 BROADWAY, SUITE 100 TACOMA, WA 98402 PH (253) 292-0387 FX (253) 292-0388 www.enginitysys.com</p>	<p>Drawing Title</p> <p>TESC NOTES AND DETAILS</p>	<p>Project Title</p> <p>GROUND BASED HEAT PUMP SYSTEM</p>	<p>Project Number</p> <p>663A4-10-351</p>	<p>Office of Construction and Facilities Management</p>
		<p>Approved Project Director</p>	<p>Location</p> <p>VA AMERICAN LAKE DAVISON - TACOMA, WA</p>	<p>Drawing Number</p> <p>CD-501</p>	
<p>Date</p> <p>05-20-11</p>	<p>Checked</p> <p>JRC</p>	<p>Drawn</p> <p>MFWNAS</p>	<p>Day</p> <p>of XXXX</p>		

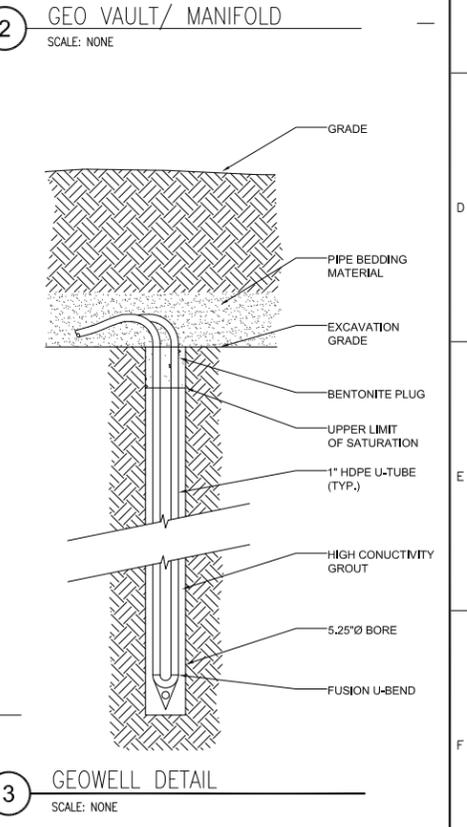
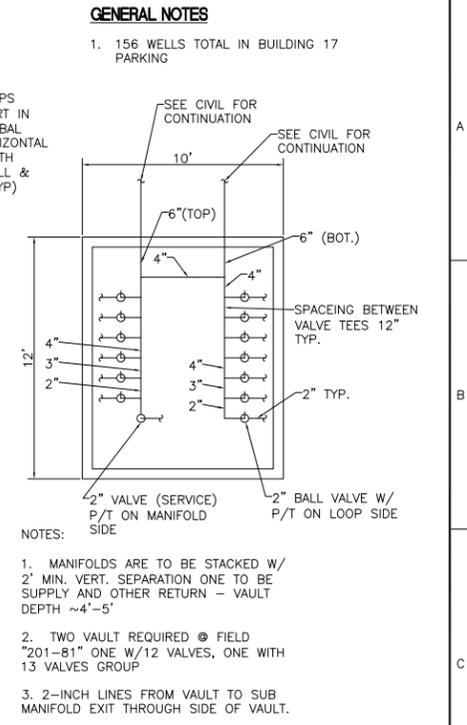
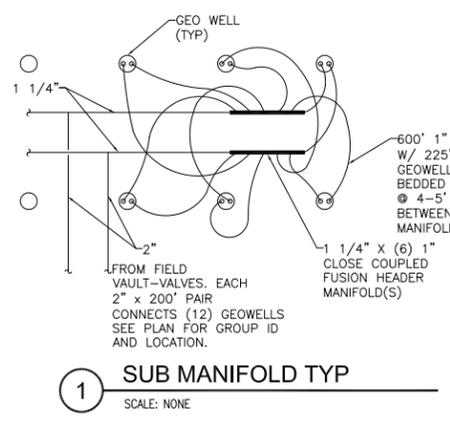
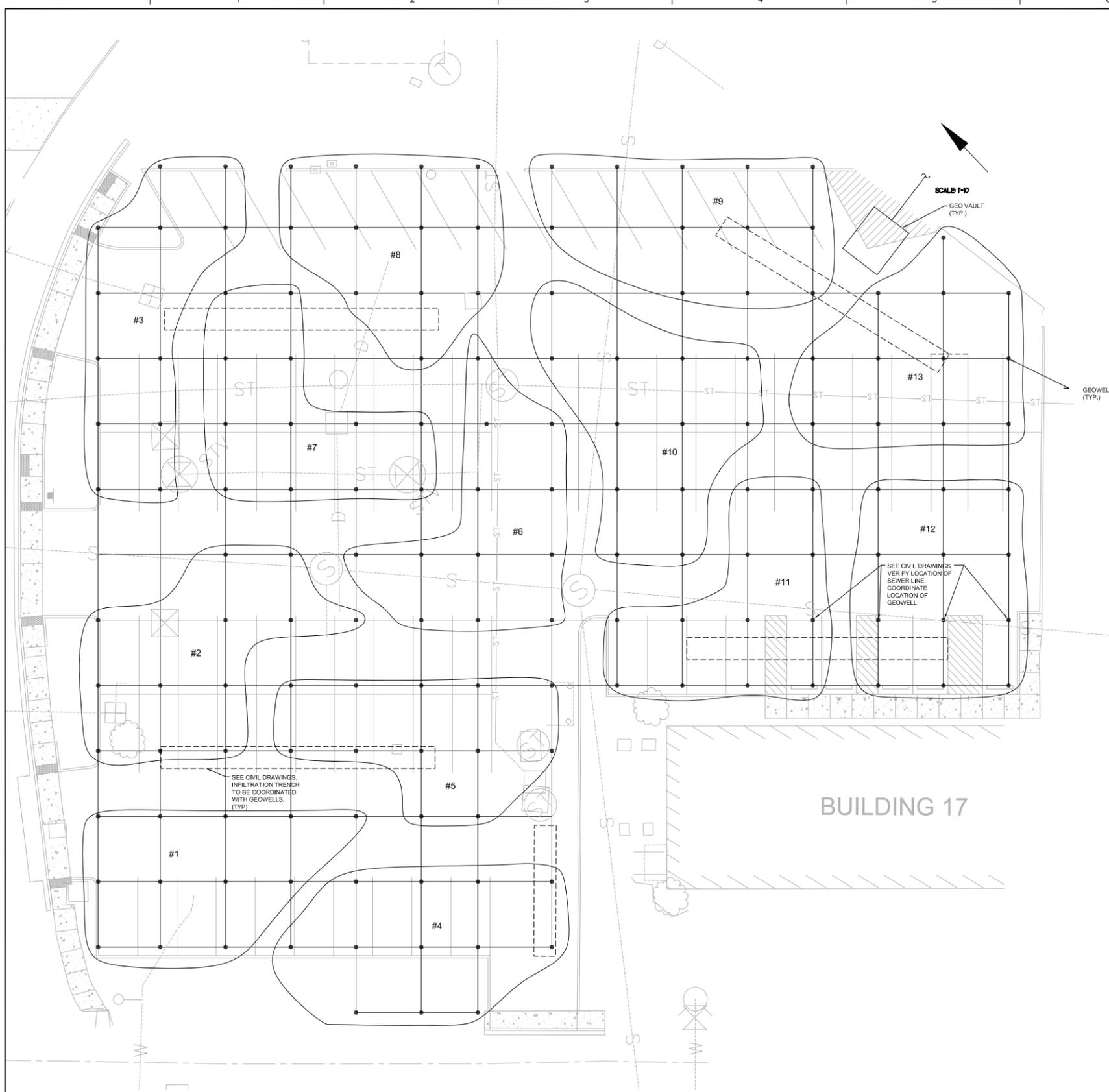


GENERAL NOTES	SHEET KEYNOTES
1. SPOT ELEVATIONS ARE AT BASE OF EXTRUDED CURB UNLESS OTHERWISE NOTED.	1. BARRIER FREE PARKING. 2% MAXIMUM SLOPE IN ANY DIRECTION
2. SPOT ELEVATIONS REPRESENT FINISH GRADE ELEVATIONS. SUBGRADE ELEVATIONS MAY VARY DEPENDING UPON TYPE OF SURFACING REQUIRED.	2. INFILTRATION TRENCH. LENGTH PER PLAN 
3. A COPY OF THE APPROVED STORMWATER PLANS MUST BE ON THE JOB SITE WHENEVER CONSTRUCTION IS IN PROGRESS.	3. ADJUST RIM TO FINISH GRADE, IF REQUIRED
4. AN AUTOCAD FILE IS AVAILABLE FOR UTILITY LAYOUT.	
5. THE LOCATIONS OF EXISTING UTILITIES ARE APPROXIMATE ONLY AND HAVE BEEN OBTAINED FROM AVAILABLE RECORDS AND ARE SHOWN FOR CONVENIENCE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION OF LOCATIONS AND TO AVOID DAMAGE TO ANY ADDITIONAL UTILITIES SHOWN. CONTRACTOR SHALL CONTACT UTILITY PURVEYORS PRIOR TO CONSTRUCTION.	
6. CONTRACTOR TO SLOPE SUBGRADE AT 1% MINIMUM TOWARDS IN INFILTRATION TRENCHES	

GRADING/DRAINAGE LEGEND	
	PERVIOUS ASPHALT PAVEMENT 
	INFILTRATION TRENCH 
BC = BOTTOM OF CURB	TC = TOP OF CURB

CONSULTANT:  TACOMA, SEATTLE 1500 1st Ave, Tacoma, WA 98402 (253) 382-1100		PRIME:  49 BROADWAY, SUITE 100 TACOMA, WA 98402 PH (253) 292-0387 FX (253) 292-0388 www.enguinitysystems.com		Drawing Title: BUILDING 17 GROUND SOURCE FIELD GRADING AND DRAINAGE PLAN	Project Title: GROUND BASED HEAT PUMP SYSTEM	Project Number: 663A4-10-351 Building Number: 23.17	Office of Construction and Facilities Management
Approved Project Director:		Location: VA AMERICAN LAKE DAMSON - TACOMA, WA	Drawing Number: CG-201	Date: 05-28-11	Checked: JRC	Drawn: MFW/MS	

three inches = one foot
 one and one half inches = one foot
 one inch = one foot
 one inch = one foot
 three quarters inch = one foot
 one half inch = one foot
 one half inch = one foot
 three eighths inch = one foot
 one quarter inch = one foot
 one quarter inch = one foot
 one eighth inch = one foot
 one eighth inch = one foot



GENERAL NOTES

- 156 WELLS TOTAL IN BUILDING 17 PARKING
- MANIFOLDS ARE TO BE STACKED W/ 2" MIN. VERT. SEPARATION ONE TO BE SUPPLY AND OTHER RETURN - VAULT DEPTH ~4'-5'
- TWO VAULT REQUIRED @ FIELD "201-81" ONE W/12 VALVES, ONE WITH 13 VALVES GROUP
- 2-INCH LINES FROM VAULT TO SUB MANIFOLD EXIT THROUGH SIDE OF VAULT.

95% DESIGN DOCUMENTS - NOT FOR CONSTRUCTION

Revisions Date	CONSULTANT: KLINGELE & ASSOCIATES 5106 West Viola Yakima, Wa 98908 (509) 966-5300 Fax (509) 966-8002	PRIME: enginuity systems LLC 49 BROADWAY, SUITE 100 TACOMA, WA 98402 PH (253) 292-0357 FX (253) 292-0358 www.enginuitysys.com	Drawing Title: GEOTHERMAL WELL PLAN BUILDING 17	Project Title: GROUND BASED HEAT PUMP SYSTEM	Project Number: 663A4-10-351 Building Number: 23.17.81.201 Drawing Number: MP171	Office of Construction and Facilities Management
	Approved Project Director:	Location: VA AMERICAN LAKE DMSION - TACOMA, WA	Date: 05-28-2011	Checked: DOK	Drawn: DOK	

Appendix C

REVISIONS TO DRAFT ENVIRONMENTAL ASSESSMENT

ERRATA AND REVISIONS TO THE DRAFT EA

The preceding Final Environmental Assessment is a refinement of the Draft Environmental Assessment released for public comment in June 2011. Minor revisions were made to the Draft EA. A summary of those revisions is presented below. Additions are denoted by double underline, and deletions are marked in ~~strike through~~. No changes were made to conclusions or the impact analysis and management measures recommended.

REVISIONS BASED ON UPDATED WDFW DATA

Wildlife habitat information was requested from the Washington Department of Fish and Wildlife during preparation of the Draft EA, but the data was not received until after publication. The Draft EA was revised to reference the updated data, as noted below.

Section 4.4.1 – Affected Environment for Wildlife and Habitat, Paragraph 2

The most recent WDFW Priority Habitat and Species (PHS) ~~map dated July 2009~~data documents the presence of bald eagles ~~nest~~nests, a great blue heron rookery, past western gray squirrel presence in the vicinity of the site and large waterfowl concentrations in American Lake. ~~This is consistent with current habitat and species data as shown by the WDFW PHS online mapping tool.~~ (WDFW, 2011)

Section 4.4.1 – Affected Environment for Wildlife and Habitat, Paragraph 4

A great blue heron rookery is located approximately 1,300 feet south of the project area near the wetland in Marsh Park. Great blue herons are a Washington State Monitored species and have no federal status. Over 75 nests were documented in 2000 (WDFW, ~~2009~~2011). There have been reports of a decrease in the number of heron nest at the rookery. If active heron nests are present at the time of construction, Washington State typically restricts logging or heavy construction within 3,280 feet of the nest from February 15 to July 31. This would include the entire project area.

Section 10.0 – References Cited, Paragraphs 11 and 12

Washington State Department of Fish and Wildlife. ~~2009~~2011. Priority Habitat Habitats and Species Digital Data. and ~~Bald Eagle Buffer Management Zone Maps~~. July 7~~8~~.

~~Washington State Department of Fish and Wildlife. 2011. Priority Habitats and Species (PHS) Interactive Mapping. Available: <<http://wdfw.wa.gov/mapping/phs/>>. Accessed: June 8, 2011.~~

REVISIONS BASED ON INTERNAL VA REVIEW

After internal VA review of the Draft EA, the following revisions were made to clarify the difference between “management measures” and “mitigation,” as well as reiterate that the management measures proposed for the Preferred Alternative will be integrated into project design.

Section 4.0 – Affected Environment and Environmental Impacts, Paragraphs 2-3

It is anticipated that the construction contractor would implement Best Management Practices (BMP's) and would satisfy all applicable regulatory requirements associated with design and construction of the Preferred Alternative. Such "management measures" are described for each environmental resource area and are included as design components of the Preferred Alternative. "Management measures" are defined as routine BMP's or regulatory compliance measures that commonly implemented as part of proposed projects. In general, implementation of the management measures described in the following sections would prevent the occurrence of significant unavoidable adverse impacts to the environment. Management measures differ from "mitigation measures" in that mitigation is project-specific, not routinely implemented as part of construction projects, and necessary to reduce identified significant adverse impact to less-than-significant levels.

No mitigation or management measures are identified in this EA for the following environmental resource areas: cultural resources, vegetation.

Section 4.1.2 – Environmental Impacts and Management Measures for Geology and Soils, Paragraphs 2-3

Mitigation Management measures incorporated into the Preferred Alternative include the use of a Temporary Erosion and Sedimentation Control (TESC) Plan and a Stormwater Pollution Prevention Plan (SWPPP), which implement Best Management Practices (BMP) to prevent erosion and control transport of sediment outside the limits of the construction area. These BMP's consist of the following:

- Installation of silt fences and hay bales to capture silt-laden runoff;
- Covering and stabilization of soil stockpiles using plastic covering, mulching, and temporary hydroseed application;
- Application of temporary erosion control seed mix to disturbed areas that have reached final grade or that will remain unworked for more than 30 days; and
- Application of mulch to disturbed areas to protect hydroseed applications and prevent seed and sediment loss due to runoff.
- Installation of catch basin sediment protection to prevent sediment-laden runoff from entering existing drainage conveyance system.

With mitigation management measures incorporated, the Preferred Alternative is not anticipated to result in any significant unavoidable adverse impacts to geology or soils.

Section 4.2.2 – Environmental Impacts and Management Measures for Water Resources, Paragraphs 6-7

As described in Geology & Soils, mitigation management measures incorporated into the Preferred Alternative would include implementation of a TESC Plan and SWPPP to limit erosion and transport of sediment from disturbed areas, including implementation of BMP's such a mulching and hydroseeding to stabilize disturbed soils, as well as covering and hydroseeding of any soil stockpiles used for fill.

Construction of the Building 17 Ground Source Field parking lot would result in a marginal net increase in impervious surface due to the use of pervious pavement and

infiltration trenches. The Building 17 Ground Source Field site is currently occupied by a mixture of lawn area, concrete sidewalks, and an abandoned concrete tennis court. These surfaces would be removed and replaced with pervious paving, allowing stormwater runoff from the Building 17 Ground Source Field to be treated by drainage through the pervious asphalt to infiltrate on-site; only non-pervious surfaces, such as new perimeter sidewalks, would contribute to increased stormwater drainage flows from the site. With ~~mitigation~~ management measures incorporated, the Preferred Alternative is not anticipated to result in any significant unavoidable adverse impacts to water quality.

Section 4.3.2 – Environmental Impacts and Management Measures for Vegetation, Paragraphs 3-4

~~Mitigation~~ Management measures incorporated into the Preferred Alternative include the use of a Temporary Erosion and Sedimentation Control (TESC) Plan and a Stormwater Pollution Prevention Plan (SWPPP), which implement Best Management Practices (BMP) to prevent erosion and control transport of sediment outside the limits of the construction area. These BMP's consist of the following:

- Installation of silt fences and hay bales to capture silt-laden runoff;
- Covering and stabilization of soil stockpiles using plastic covering, mulching, and temporary hydroseed application;
- Application of temporary erosion control seed mix to disturbed areas that have reached final grade or that will remain unworked for more than 30 days; and
- Application of mulch to disturbed areas to protect hydroseed applications and prevent seed and sediment loss due to runoff.
- Installation of catch basin sediment protection to prevent sediment-laden runoff from entering existing drainage conveyance system.

With ~~mitigation~~ management measures incorporated, the Preferred Alternative is not anticipated to result in any significant unavoidable adverse impacts to vegetation.

Section 4.5.2 – Environmental Impacts and Management Measures for Cultural Resources, Paragraphs 1-2

Construction activities associated with the Preferred Alternative would occur entirely within areas classified as having minimal archaeological resource concerns, so the potential for impacts to archaeological resources is low. However, as a precautionary measure ~~and mitigation for any inadvertent discovery~~, it is recommended that the construction contractor prepare an inadvertent discovery plan and that an archaeologist be present during excavation of the well fields to monitor construction activities.

Construction activities associated with the Preferred Alternative would occur partially within a historic district listed on the NRHP, but no new buildings would be constructed that would alter the historic character of the area, and no existing historic buildings would be altered or demolished. The Building 17 Ground Source Field would convert a currently vacant lawn area adjacent to Building 17 into a parking lot, which would not result in significant degradation to the character of the historic district. Construction of the North Ground Source Field would require demolition of an existing tennis court that

has been classified as historic, though it is in poor condition and is not currently used for recreation. AHBL visited the site in May, 2011 and observed safety warning signs to keep out of the tennis court posted by the Seattle District of the U.S. Army Corps of Engineers. The tennis court is also located outside the historic district and was identified in the 2009 cultural resources study as having minimal historic significance (AMEC, 2009). With implementation of the management measure identified above, no significant adverse impacts to cultural resources would occur.

Section 4.6.2 – Environmental Impacts and Management Measures for Hazardous Materials, Paragraph 2

The heat pump system design specifies the use a thermally conductive brine composed primarily of propylene glycol, which is known to be mildly toxic to humans. A discussion of the potential impacts associated with brine leakage and necessary ~~mitigation~~ management measures is included in Section 4.2.2 – Groundwater. With incorporation of the identified management measures, no significant adverse impacts associated with hazardous materials are anticipated to occur.

Section 4.7.2 – Environmental Impacts and Management Measures for Transportation and Parking, Paragraphs 4-5

Additional recommended ~~mitigation~~ management measures to reduce temporary impacts to parking capacity include the following:

- Schedule project construction to complete the Building 17 Ground Source Field prior to beginning construction on the North Ground Source Field. The new parking lot on the southern site could then be used to partially offset closure of the north site.
- Designate an alternate traffic route while the gravel access road is closed for well drilling, thus allowing ALVA staff to continue access to campus facilities.

With implementation of the described management measures, no significant adverse environmental impacts associated with transportation and parking are anticipated to occur.

Section 4.8.2 – Environmental Impacts and Management Measures for Noise, Paragraph 3

As described in Section 4.4, a great blue heron rookery lies within 1,300 feet of the project area, and prolonged construction noise has the potential to disrupt breeding and nesting activities. As recommended in that discussion, WDFW should be contacted prior to construction to identify specific management measures to minimize disruption. With the incorporation of the described management measures, no significant adverse impacts associated with noise generation are anticipated.

Section 4.9.2 – Environmental Impacts and Management Measures for Utilities, Paragraph 2

~~Mitigation~~ Management measures incorporated into the Preferred Alternative includes the location and marking of all on-site utilities. All active utilities in the construction areas will be protected during construction activities, and geothermal wells will be

located to avoid drilling through existing utility lines. With mitigation management measures incorporated, no significant adverse impacts to utility services are anticipated.

Section 7 – Summary of Environmental Impacts and Management Measures, Paragraph 1

A number of mitigation management measures have been recommended to offset potential impacts associated with the proposed project. Table 2 includes a summary of potential impacts and proposed mitigation management measures.

Section 8 – Conclusions, Paragraph 1

This ~~Draft~~ EA concludes that, with the incorporation of mitigation identified management measures, the Preferred Alternative would have no significant unavoidable adverse environmental impacts.