Geotechnical Investigation

For

The Grove @ Fairview Phase 2 Apartments

Neighborly Ventures

Salem, Oregon

MULTI / TECH

ENGINEERING SERVICES, INC.

1155 13th Street SE
Salem OR 97302
www.multitech.ws

PHONE: (503) 363-9227
FAX: (503) 364-1260
EMAIL: mgrenz@mtengineering.net

MULTI/TECH
ENGINEERING SERVICES, INC.

CONSULTANTS
1155 13th Street, S.E.
Salem, Oregon 97302
(503) 363-9227

Geotechnical Investigation

For

The Grove @ Fairview Phase 2

Apartment Project

Strong Road SE

Salem, Oregon

MTE Project

No. 7111

Prepared for
Mountain West Investments

Salem, Oregon

November 19, 2020

GEOTECHNICAL
REGISTERED PROFESSIONAL
ENGINEER
9654
OREGON
JULY 14, 1978
MARK D. GRENZ
EXPIRES: 06-30-2021

Prepared By

MULTI/TECH Engineering Services, Inc.

1155 13th Street SE

Salem, Oregon 97302

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INTRODUCTION

MULTI/TECH Engineering Services, Inc. (MTE) is pleased to submit the results of our Report of Geotechnical Investigation for the The Grove @ Fairview Phase 2 Apartment project site located in the Fairview Development area on two sites. One site is located along the west side of Reed Road, between Strong Road and Lindburg Road (Reed Rd Site). The other site is located on the south side of Strong Road west of the intersection of Lindburg Road with Strong Road (VC Site) both in South Salem. The site locations are shown on the attached Site Location, Figure 1. The purpose of our work was to explore subsurface conditions at the site in order to provide geotechnical engineering recommendations for the proposed development. Our scope of work included the following:

- Explore subsurface conditions at the site by excavating fifteen (15) test pits to depths of up to 10 feet below ground surface (bgs) using equipment and personnel provided by MTE and LeRud & Sons Construction.

- Classify the materials encountered in the explorations as per American Society for Testing and Materials (ASTM) Soil Classification Method D2488. A qualified member of MTE's staff observed the explorations and maintained a detailed log of each test.

- Provide recommendations for site preparation, grading and drainage, stripping depths, fill type for imported materials, compaction criteria, cut and fill slope criteria, trench excavation and backfill, use of on-site soils, and wet/dry weather earthwork.

- Provide geotechnical engineering recommendations for design and construction of shallow spread foundations, including an allowable design bearing pressure, and minimum footing depth and width requirements.

- Provide geotechnical engineering recommendations for design and construction of retaining walls, including lateral earth pressures, and backfill, compaction, and drainage requirements.

- Provide geotechnical engineering recommendations for design and construction of concrete floor slabs, including an anticipated value for subgrade modulus, and recommendations for a capillary break and vapor retarder.

- Estimate settlement of footings and floor slabs for the anticipated or provided design loading.

- Provide recommendations for subsurface drainage of foundations.

- Provide recommendations for pavement subgrade preparation.

- Provide results from Field infiltration tests performed.

- Provide recommendations for the International Building Code (IBC) Site Class, mapped maximum considered earthquake spectral response accelerations, site seismic coefficients, and Seismic Design Category.

- *Qualitatively* evaluate liquefaction potential of the soils encountered within the depths explored.

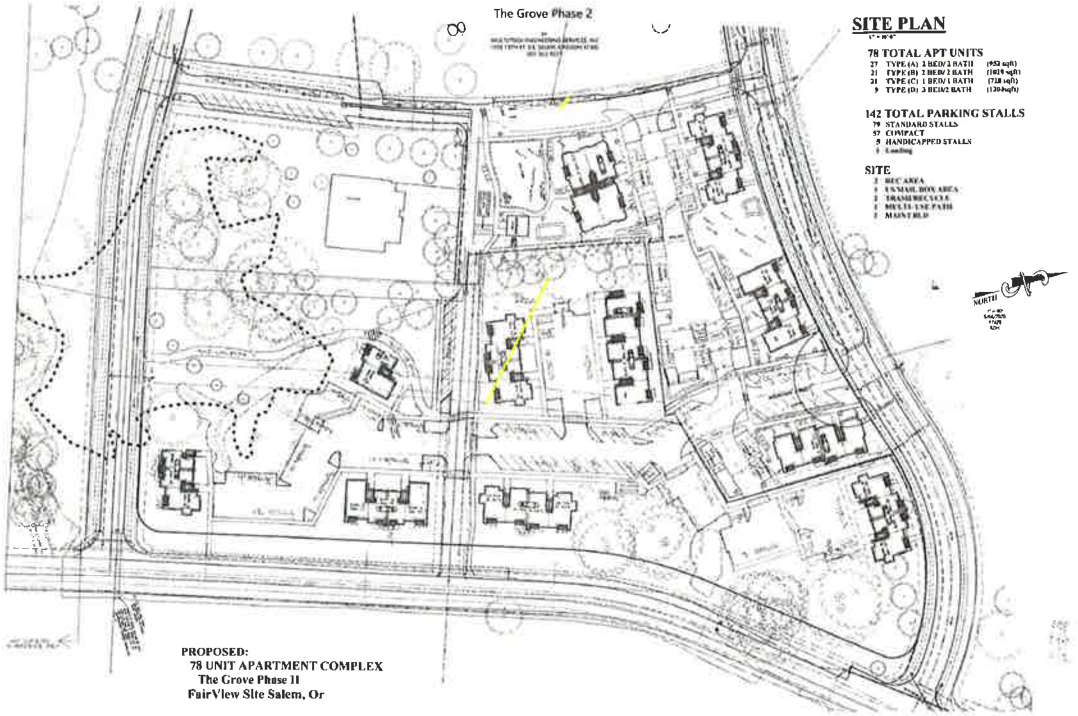
- . Provide a written report summarizing the results of our geotechnical investigation.

PROJECT INFORMATION & SITE DESCRIPTION

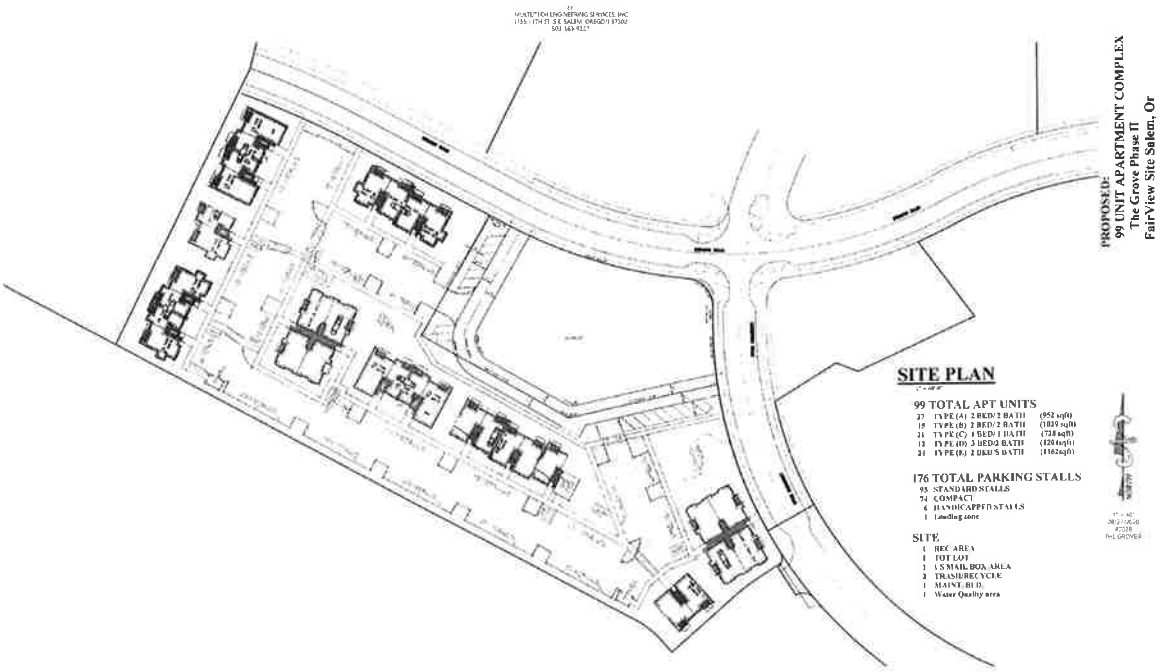
Project Information

The project will consist of the development of 177 apartment units within a total of 16 three story buildings, on two sites, adjacent to the Phase 1 project that is currently under construction. Associated with the buildings will be adjoining parking and recreation areas. The detailed construction plans and drawings have not been completed for the project at this time. Based on our knowledge of the building types, we have assumed that building loads will be typical of these types of structures, with continuous perimeter footing loads of less than 3 kips per lineal foot (klf) and interior column loads of less than 40 kips for the three-story structures. Changes in site grade are anticipated to be minimal, with cuts limited to less than 8 feet and fills limited to less than 4 feet.

Project Site



Conceptual Site Plan Reed Rd Site



Conceptual Site Plan VC Site

Site Geology

A site Geotechnical Review was completed by PBS Engineering and Environmental dated 2002 for the Fairview Training Center of which this area is a part. The Salem area geologic information has been published by Bele (1981). His information indicates the subject area is underlain by terrace deposits and basalt bedrock.

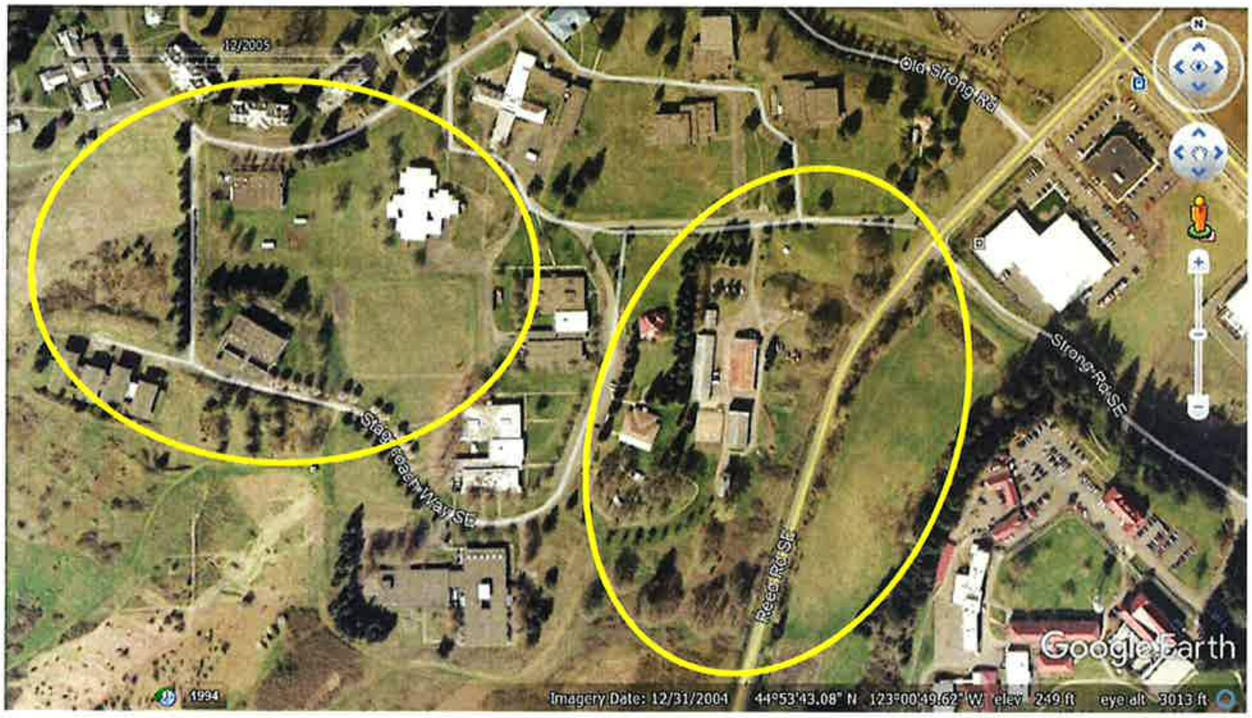
The area of this site is noted by Bela (1981) to be deposits consist of semiconsolidated sand, silt and clay. The sols may contain gravels at various locations.

Site History

The project site is a portion of the Fairview Training Center. This facility was started in 1907 by the Oregon State Legislature. As part of that facility, grading was performed for the construction of buildings and site improvements. The site improvements were initially for the development of farming activities and uses by the residents.

Buildings were developed over time, with additional structures constructed through the early 1960's.

There were three major buildings located within the limits of this project at the time the facility was closed, and care actions ended in March of 2000.



As the site areas appeared in 2005

The majority of the structures were demolished in 2009/2010.

On the Reed Rd site, there remains some old concrete storage towers, along with some concrete slabs, one is the concrete pad for a building that has been demo'd, and some asphalt pavement as well.

The area and project area in July 2010

The area and project area in July 2019

Site Surface Conditions

The Reed Road Site:

The site is bordered by New Strong Road on the north, Reed Road along the east, and Lindburg Road on the south. Passing through the site about mid-way is Chapel Drive, from Heritage to Reed Road. The site has some remnant concrete pads from old buildings that have been removed. The site has two concrete storage towers on the north side of Chapel and two on the south side of Chapel. All are proposed to be removed with this project. Present on the site are some significant trees that are to be retained as well. The concept site plan outlines the location of the trees to be retained.

The VC Site:

This site is bordered by New Strong Road on the north, Lindburg Road on the east, and vacant property along the south and west. There was a significant structure on the site that in the southwestern section that has been removed. We did not identify any other old issues to be addressed as to site surface conditions.

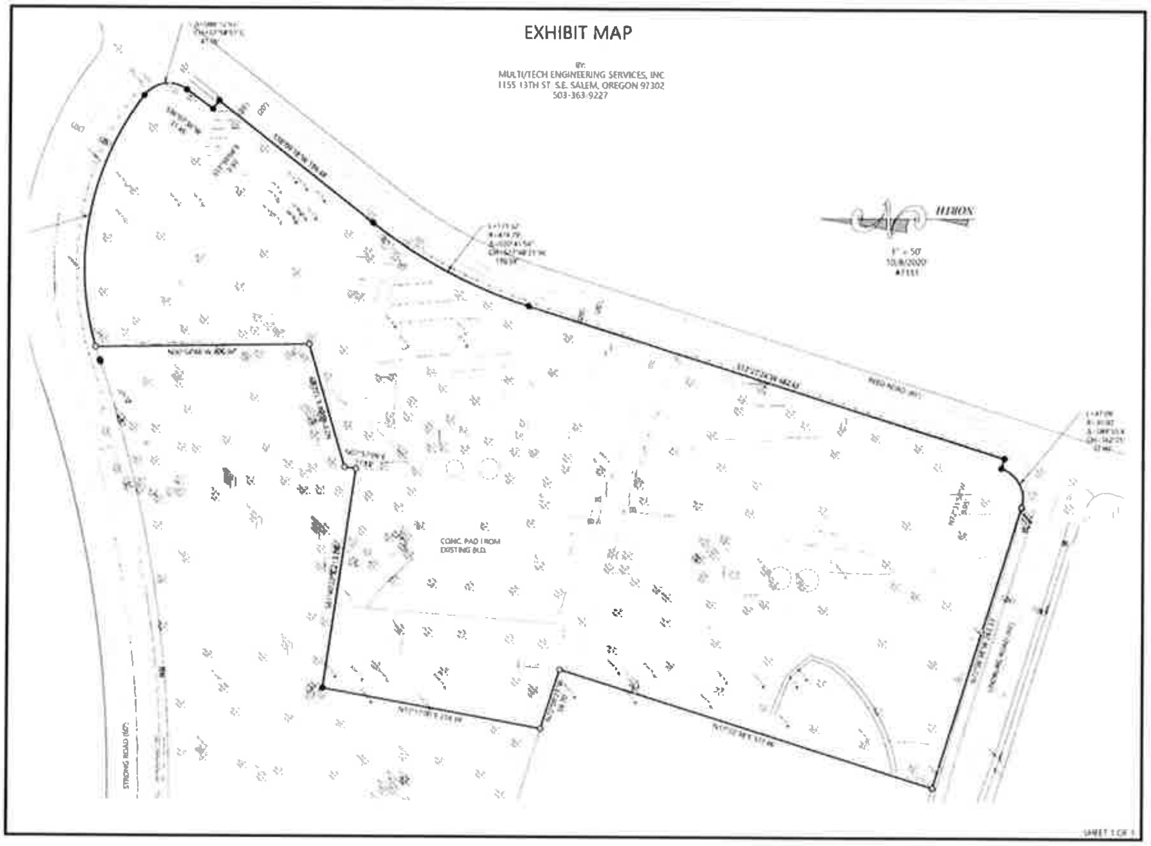
Site utilities needed for each of the sites are present in the existing roadways or stubbed to the site.

There is a Charter School located adjacent to the site at the southeast corner of Lindburg Road and Heritage Street. The balance of the area adjacent to this project is vacant.

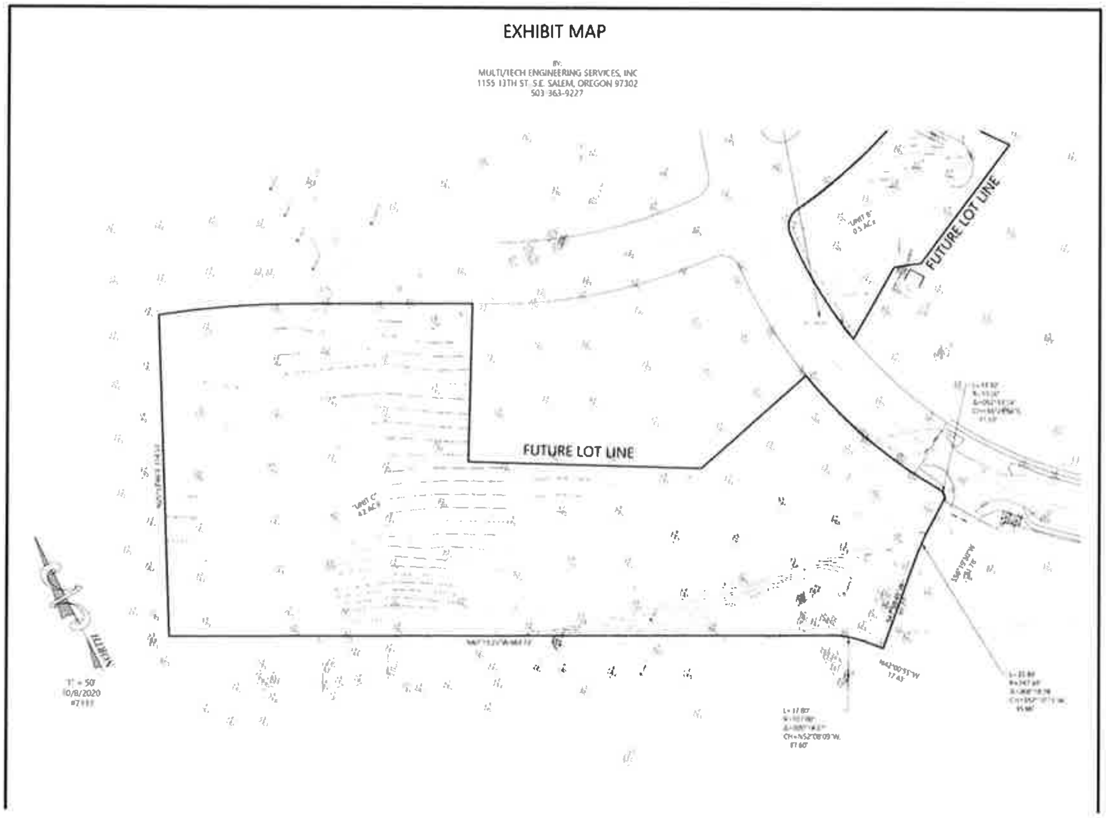
Reed Road Site

View of the sites Surface Conditions

The Reed Road site is gently sloping, with the high ground located in the western section of the site and the low area along Reed Road. The average fall over the site is 14 feet.



The VC site is also gently sloping with more slope on it then the Reed Road site has. It has approximately 25 feet of fall across the site.



The project sites are not located within an identified "Flood Hazzard" area shown on Federal Emergency Management Agency (FEMA) maps for the area.

Site Subsurface Conditions

In preparation for this site work, we reviewed the Preliminary Geotechnical Findings for the Fairview Community that was prepared by GeoPacific Engineering, Inc in November of 2004. That report was for the total Fairview site of which our project is a small portion. They excavated approximately 18 areas on the overall site, but the copy of the report we have does not include a sample pit location map.

They noted the presents of silty clay and clay material above a layer of fractured and hard basalt material.

Our efforts included the excavation of 15 sample pits within the limits of the proposed apartment site. The excavations were to depths ranging between 3 and 10 feet in depth.

One of the goals was to determine the expected depths to the hard-fractured basalt materials. In the excavations that we completed; we did find such material in the VC site along the southern section in the eastern area. The material was very firm and difficult to dig very far into the material when found.

Field Exploration

Fifteen test pits (designated as TP-1 through TP-15) were excavated at the site on September 25th, 2020 to depths of up to 10feet bgs using a small excavator provided and operated by LeRud & Sons Construction. The approximate exploration locations are shown on the attached Test Pit Site Plans, Figure 3a and 3b. The explorations were located in the field by our surveying staff. The goal was to conduct such exploration in the area of each of the proposed building, to the extent possible.

A member of MTE's staff logged the soils observed within the explorations in general accordance with the Unified Soil Classification System (USCS). We have provided an explanation of the USCS on the attached Soil Classification Criteria and Terminology, Figure 4. Pocket penetrometer readings were taken in the upper 3 feet of the test pits in order to aid in characterizing the consistency of the soils encountered. The pocket penetrometer is a hand-held instrument that provides an approximation of the unconfined compressive strength of cohesive soils. The correlation between pocket penetrometer readings and the consistency of cohesive soils is provided on the attached Figure 4.

Logs of the test pits and hand auger borings are presented in Appendix "A" of this report.

Subsurface Materials

The following subsurface materials were encountered at the site:

We encountered a few different site soil conditions within the excavations completed. The logs of the excavations get the best information.

We did find fill material present on a couple of areas in the VC Site, primarily on the surface in the eastern area. The depths were up to 30 inches.

The Reed Road site was dominated by the presents of Silty Clay material, with Sandy Silty Clay material in the lower elevations of the excavations.

The VC site had material that was more clay in nature, the basalts in the eastern area.

As note earlier, we did encounter very firm weathered basalt in the south east portion of the VC Site.

As noted, we did find fill material and evidence of prior grading activities on this site, consistent with the history of the area.

We did NOT find bed rock or fractured basalt in any of the excavations.

Ground Water

Ground water was not encountered in any of our explorations conducted at the site on September 25th, 2020. We reviewed the well logs in the vicinity. Based on our review of water well logs available on the Oregon Water Resources Department website, ground water depths near the site ranged from about 29 feet to 63 feet bgs. It should be noted that ground water levels are relative to the ground surface and due to local topography; the levels reported on the logs are considered generally indicative of local water levels and may not reflect actual ground water levels at the site.

CONCLUSIONS

Based on the results of our field explorations and analyses, it is our opinion that the site can be developed as described in the Project Information section of this report, provided the following recommendations are incorporated into design and construction:

That the areas of the proposed improvements be stripped of the shallow top soil and organic layer. Based on the site information this would be between 6 and 18 inches.

The eastern section of the VC Site has fill material present that was placed during recent grading activities in the area. This would need to be removed prior to any site improvements.

With the knowledge of the old building on the sites, it is critical that each building pad be reviewed during the excavation work to make sure that some unidentified materials are present.

The following paragraphs present specific geotechnical recommendations for design and construction of the development.

RECOMMENDATIONS

Site Preparation

Stripping & Over-Excavation

Surface vegetation and organic topsoil from the site. The fill material noted above that has been found on the site can remain. We recommend that after the removal of the organic layer that this material be scarified and compacted back in place. This would be true for all portions of the site at are to be improved.

Table 1. Anticipated Site Stripping & Over-Excavation

Depth Requirements

Stripped surface vegetation and organic topsoil should be transported off-site for disposal or stockpiled for later use in landscaped areas. Should any of the fill material be removed, it should be stockpiled and used for site structural or nonstructural fills with the application of moisture as needed when placed. A geotechnical representative from MTE should provide recommendations for actual stripping depths based on observations during site stripping.

Material	**Site Location**	**Approximate Thickness**
Surface Vegetation & Silt Topsoil (OL)	Site Development Areas & 5-Foot Margins	6 to 18 inches*
Topsoil (OL) [where present]	to be confirmed in the field during construction.	

**Actual depths will need to be determined in the field during over-excavation.*

Subgrade Preparation

After site stripping and over-excavation as recommended above and prior to excavation of footings or placement of new structural fill, a representative from MTE should probe and/or observe a proof-roll of the exposed subgrade soils in order to identify areas of excessive yielding. If areas of soft soil or excessive yielding are identified, the affected material should be over-excavated to firm, stable subgrade, and replaced with compacted materials as recommended for structural fill. Areas that appear too soft and wet to support proof rolling equipment should be prepared in general accordance with the recommendations for wet weather construction given below.

Erosion Control

Silt fences, hay bales, buffer zones of natural growth, sedimentation ponds, and granular haul roads should be used as required to reduce sediment transport during construction to acceptable levels. Measures to reduce erosion should be implemented in general accordance with State of Oregon Administrative Rules 340-41-006 and 340-41-455 and the City of Salem regulations regarding erosion control.

Wet Weather Considerations

The on-site native silt loam (CL) to silty clay loam (CL) **are highly** susceptible to disturbance during wet weather. Trafficability of these soils may be difficult, and significant damage to subgrade soils could occur if earthwork is undertaken without proper precautions at times when the exposed soils are more than a few percentage points above optimum moisture content.

For construction that will occur during the wet season, the site preparation activities may need to be accomplished using track-mounted equipment, loading removed material into trucks supported on granular haul roads, or other methods to limit soil disturbance. A qualified geotechnical engineer should evaluate the subgrade during excavation by probing rather than proof-rolling. Soils that have been disturbed during site preparation activities, or soft or loose areas identified during probing, should be over excavated to firm, stable subgrade, and replaced with structural fill.

Main Access and haul roads subjected to repeated heavy construction traffic will require a minimum of 12 inches of imported granular material. Additional granular material and/or geo-grid reinforcement may be recommended based on site conditions and/or loading at the time of construction. Ten inches of imported granular material should be sufficient for light staging areas. A minimum of 2 to 4 inches of imported granular material is recommended to protect footing subgrades from foot traffic and inclement weather. The imported granular material should consist of crushed rock that is well graded between course and fine, contains no organic matter, debris, or particles larger than 1 inch, and has less than 5 percent material by weight passing the U.S. Standard No. 200 Sieve. For footing areas, particles should be limited to less than 1-1/2 inches in diameter. The imported granular material should be placed in one lift over the prepared, undisturbed subgrade, and compacted using a smooth-drum, non-vibratory roller.

It may be necessary to install a geotextile separation / filter fabric as a barrier between the subgrade and imported fill in areas of repeated construction traffic. The geotextile fabric, if used, should have a minimum Mullen burst strength of 250 pounds per square inch for puncture resistance, and an apparent opening size (AOS) between the U.S. Standard No. 70 and No. 100 Sieves.

Structural Fill

On-Site Materials

Use of the on-site, fill (CL) and native soils as structural fill may be difficult in wet weather because these soils are sensitive to small changes in moisture content and are difficult, if not impossible, to adequately compact during wet weather. The on-site soils should be free of organic matter, debris, and particles larger than 1/2 inches if used as structural fill. When used as structural fill, the on-site soils should be placed in lifts with a maximum thickness of about 8 inches, and compacted to not less than 92 percent of the materials maximum dry density, as determined in general accordance with ASTM D 1557 (Modified Proctor).

If the on-site soils cannot be properly moisture-conditioned and/or processed, we recommend using imported granular material for structural fill.

Imported Granular Structural Fill

Imported granular structural fill should consist of angular pit or quarry run rock, crushed gravel that is well-graded between coarse and fine particle sizes. The granular material should contain no organic matter, debris, or particles larger than 1/2 inches, and have less 5 percent material passing the U.S. Standard No. 200 Sieve. The percentage of fines car increased to 12 percent of the material passing the U.S. Standard No. 200 Sieve if placed during dry weather, and provided the fill material is moisture-conditioned, as necessary proper compaction. Granular fill material should be placed in lifts with a maximum thickness about 12 inches and compacted to not less than 95 percent of the materials m density, as determined in general accordance with ASTM D 1557 (Modified Proctor).

Shallow Foundations

We recommend that spread footings be founded on the native, medium stiff to very stiff, (CL) to sandy silt (CL), or on structural fill that is properly placed and compacted during construction or the native, medium stiff to stiff, silt (CL) to sandy silt material. If otherwise unsuitable soils are encountered, they should be over-excavated as recommended by the MTE geotechnical engineer. The resulting over-excavation should be brought grade with granular structural fill. All granular pads for footings should be constructed minimum of 6 inches wider on each side of the footing for every vertical foot of over-excavation.

Footing Construction

We recommend the following footing design and construction criteria for this site:

Table 2. Footing Embedment and Sizing

Footing Type	Minimum Embedment	Minimum Width for 1- to 2-Story Residential Structures	Minimum Width for 3-Story Residential Structures

Individual Spread (Column) Footings	12 inches*	24 inches	24 inches
Continuous Wall Footings	12 inches*	15 inches	18 inches

**Measured below lowest, adjacent, permanent site grade. Shallower depths may be allowed based on detailed site inspections at the time the foundation system preparation is being completed.*

Excavations near footings should not extend within a 1 H: 1V (horizontal vertical) plane projected out and down from the outside bottom edge of the footings

Bearing Pressure and Settlement:

Footings founded as recommended should be proportioned for a maximum allowable soil bearing pressure of 1.500 to 2,000 psf. This bearing pressure is a net bearing pressure and applies to the total of dead and long-term live loads and may be increased by 1.13 when considering seismic or wind loads. For the recommended design bearing pressure total settlement of footings is anticipated to be less than 1-inch, differential settlements between adjacent columns and/or bearing walls should not exceed 1/2-inch.

Lateral Capacity

We recommend using a passive earth pressure of 300 pounds per cubic foot (pcf) for design for footings confined by the native, medium stiff to very stiff silt (CL) to sandy silt (CL) or structural fill that is properly placed and compacted during construction. The recommended earth pressure was computed using a factor of safety of 1.5 which is appropriate due to the amount of movement required to develop full passive resistance

In order to develop the above capacity, the following should be understood: (1) concrete must be poured neat in excavations or the foundations must be backfilled with compacted structural fill, (2) the adjacent grade must be level, and (3) the static ground water level must remain below the base of the footings throughout the year. Adjacent floor slabs, pavements, or the upper 12-inch-depth of adjacent, unpaved areas should not be considered when calculating passive resistance.

An ultimate coefficient of friction equal to 0.30 may be used when calculating resistance to sliding for footings founded on the native, medium stiff to very stiff, silt (CL) to sandy silt (CL), or on structural fill that is properly placed and compacted on this material during construction. An ultimate coefficient of friction equal to 0.45 may be used when calculating resistance to sliding for footings founded on a minimum of 4 inches of granular structural fill that is properly placed and compacted during construction.

Drainage

Based on the site soils found, we do not recommend placing foundation drains at the base elevations of the footings on the outside of the footings. Foundation drains is installed, should consist of a 3-inch-diameter, perforated, flexible, PVC drainpipe wrapped with a geotextile filter fabric. The drains should be backfilled with a minimum of 2 cubic feet per foot of open graded drain rock, which should be encased in a geotextile fabric in order to provide separation from the surrounding silt soils. MTE should be contacted to observe the drain prior to backfilling.

Retaining Walls

Retaining wall footings should be designed and constructed in general accordance with the recommendations contained in the Shallow Foundations section of this report. For retaining walls founded as recommended, the following design parameters should be used by the project structural engineer during external stability analyses:

Table 3. Retaining Wall Design Parameters

Retaining Wall Condition	**Backfill Condition**	**Equivalent Fluid Pressure / Static Soil Lateral Load**	**Seismic! Dynamic Lateral Load***
Not Restrained from Rotation	Level	35 pcf	(8 pcf)*H*H
Restrained from Rotation	Level	60 pcf	(14 pcf)*H*H

**Acting at a point 0.6H above the base of the wall, where H is equal to the exposed wall height in feet.*

Backfilling

Retaining walls should be backfilled to a level condition with imported granular material compacted to a minimum of 92 percent of material's maximum dry density, as determined in general accordance with ASTM D 1557 (Modified Proctor). When placing fill behind walls, care must be taken to minimize undue lateral loads on the walls by keeping heavy compaction equipment at least 3 feet from the back of the walls. Light mechanical or hand tamping equipment should be used for compaction of backfill materials within 3 feet of the back of the walls.

Drainage

MTE recommends placing drains behind the walls at their base. Wall drains should consist of a 4-inch-diameter, perforated, flexible, PVC drainpipe wrapped with a geotextile filter fabric, the drains should be backfilled with a minimum of 2 cubic foot per foot of open graded drain rock, which should be encased in a geotextile filter fabric in order to provide separation from the surrounding soils. MTE should be contacted to observe the drains prior to backfilling.

Limitations

The above design recommendations are based on the assumptions that: (1) the walls consist of conventional cantilevered retaining walls, (2) the walls are less than 10 feet in height, (3) the backfill is level, drained and consists of imported granular material, (4) no surcharges are imposed behind the walls, and (5) the grade in front of the wall is level. Re-evaluation of our recommendations will be required if the retaining wall design criteria for the project vary from these assumptions.

Floor Slabs

General

Satisfactory subgrade support for floor slabs constructed on grade (if used), supporting up to 150 psf area loading, can be obtained from the native, medium stiff to very stiff silt loam (CL), or on structural fill that is properly placed and compacted on these materials during construction. The native, medium stiff to very stiff silt loam materials were encountered at depths ranging from about 8 inches to 16 inches bgs in our explorations. If soft or otherwise unsuitable soils are encountered, they should be over-excavated as recommended by the MTE geotechnical engineer. The resulting over-excavation should be brought back to grade with granular structural fill.

A minimum 6-inch-thick layer of crushed rock base, compacted to not less than 95 percent of the materials maximum dry density, as determined in general accordance with ASTM D 1557, should be placed over the prepared subgrade to provide a more uniform surface for placing concrete and supporting the slab. Base rock material placed directly below the slab should be 3/4-inch maximum or less. The surface of the base rock should be choked with sand just prior to concrete placement. Choking the base rock surface reduces the lateral restraint on the bottom of the concrete during curing. For floor slabs constructed as recommended, a subgrade modulus of 150 pounds per cubic inch can be used for the design of the floor slab. Floor slabs constructed as recommended will likely settle less than 1/4-inch. We recommend that slabs be jointed around columns and walls to permit slabs and foundations to settle differentially.

Subgrade Moisture Considerations

Due to the presence of on-site, fine-grained, materials near the surface of the site, liquid moisture and moisture vapor should be expected at the subgrade surface. A capillary break, consisting of at least 6 inches of crushed rock base having less than 5 percent of the material passing the U.S. Standard No. 200 Sieve, typically provides protection against liquid moisture. Where moisture vapor emission through the slab must be minimized, e.g. impervious floor coverings, storage of moisture sensitive materials directly on the slab surface, etc., a vapor retarding membrane or vapor barrier below the slab should be considered. Factors such as cost, special considerations for construction, floor coverings, and end use suggest that the decision regarding a vapor retarding membrane or vapor barrier be made by the architect and owner.

If a vapor retarder or vapor barrier is placed below the slab, its location should be based on current American Concrete Institute (ACI) guidelines, ACI 302 Guide for Concrete Floor and Slab Construction. In some cases, this indicates placement of concrete directly on the vapor retarder or barrier. Please note that the placement of concrete directly on impervious membranes increases the risk of plastic shrinkage cracking and slab curling in the concrete. Construction practices to reduce or eliminate such risk, as, described in ACI 302 should be employed during concrete placement.

Utility Trenches

Utility Trench Excavation

Trench cuts should stand near vertical to depths of approximately 4 feet in the native material, provided no ground water seepage is observed in the sidewalls. If seepage is encountered that undermines the stability of the trench, or caving of the sidewalls is observed during excavation, the sidewalls should be flattened or shored.

Trench dewatering may be required to maintain dry working conditions if the invert elevations of the proposed utilities are below the ground water level. Pumping from sumps located within the trench will likely be effective in removing water resulting from seepage. If ground water is present at the base of utility excavations, we recommend placing trench stabilization material at the base of the excavations. Trench stabilization material should consist of 1-foot of well- graded gravel, crushed gravel, or crushed rock with a maximum particle size of 4 inches, and less than 5 percent material passing the U.S. Standard No. 4 Sieve. The material should be free of organic matter and other deleterious material and should be placed in one lift and compacted until well-keyed.

While we have described certain approaches to the trench excavation, it is the contractor's responsibility to select the excavation and dewatering methods, to monitor the trench excavations for safety, and to provide any shoring required to protect personnel and adjacent improvements. All trench excavations should be in accordance with applicable OSHA and state regulations.

Trench Backfill Material

Trench backfill for the utility pipe base and pipe zone should consist of well-graded granular material containing no organic matter or debris, have a maximum particle size of 3/4-inch, and have less than 8 percent material passing the U.S. Standard No. 200 Sieve.

Backfill for the pipe base and within the pipe zone should be placed in maximum 12-inch-thick lifts, and compacted to not less than 90 percent of the materials maximum dry density, as determined in general accordance with ASTM D 1557, or as recommended by the pipe manufacturer. Backfill above the pipe zone should be placed in maximum 12-inch-thick lifts and compacted to not less than 92 percent of the material's maximum dry density, as determined in general accordance with ASTM D 1557. Trench backfill located within 3 feet of finished subgrade elevation should be placed in maximum 12-inch-thick lifts, and compacted to not less than 95 percent of the materials maximum dry density, as determined in general accordance with ASTM D 1557.

Asphalt Pavements

Satisfactory subgrade support for asphalt pavements constructed on grade can be obtained from the native medium stiff to very stiff silt loam, or on structural fill that is properly placed and compacted on these materials during construction. The native medium stiff to very stiff materials were encountered at depths ranging from about 8 inches to 16 inches bgs in our explorations. If soft or otherwise unsuitable soils are encountered, they should be over-excavated as recommended by the MTE geotechnical engineer. The resulting over-excavation should be brought back to grade with granular structural fill.

The flexible pavement design for the project was determined on the basis of the expected and anticipated traffic volumes and loading conditions relative to the expected subgrade soil strength ("R" value) characteristics. Based on a laboratory subgrade "R" value of 26 (Resilient Modulus = 5,252) and utilizing the asphalt Institute Flexible Pavement Design Procedures we recommend a pavement section for this project is 3 inches of A.C. Pavement on a minimum of 9 inches of compacted crushed base rock. In areas within the project sites that will be subject to heavy truck traffic, such as fire trucks or garbage trucks, the section should be increased to 3 inches of A.C. on 12 inches of compacted crushed base rock.

Infiltration Testing and Analysis

While on site, we conducted four (4) field infiltration tests as required by the City of Salem for site drainage analysis. The infiltration tests were performed in Test Pits 2, 5, 6, & 10 as shown on the site in Figure 3a and 3b at a depth of approximately 5 feet. The soils in the lower level of each of the test pits were the silty clay materials noted in the Test Pit Logs.

The field infiltration testing was performed in general conformance with the EPA Falling Head Method and/or the City of Salem Design Standards. Specifically, water was discharged into the test holes and allowed to penetrate the exposed subgrade soils at depth within the excavations. The water level was adjusted over a two (2) hour period and allowed to achieve a saturated subgrade soil condition. At the end of the saturation period, water was added to the test holes and the time and rate at which the water level dropped was monitored and recorded. The water level changes were monitored until a consistent infiltration rate was observed and repeated.

Based on the results of this testing, we have found that the silty clay material in Test Pits 2 & 5 possess an ultimate infiltration rate of about 1.0 inches per hour (in/hr). This should provide a reasonable infiltration rate for the disposal of storm water from the site.

Within Test Pits 6 & 10 the material had higher clay content and exhibited a slower infiltration rate, with a rate of 0.70 inches per hour.

Additional Drainage Considerations

We recommend that subsurface drains be connected to the nearest storm drain or other suitable discharge point. We also recommend that paved surfaces and ground near or adjacent to the residential structures be sloped to drain away from the structures. Surface water from pavement surfaces and open spaces should be collected and routed to a suitable discharge point. Surface water should not be routed to foundation or wall drains.

Permanent Slopes

Permanent slopes should not exceed 2H:1V (horizontal: vertical).

Seismic Design

Design Criteria

Based on the results of our subsurface explorations and analyses, the following design criteria has been developed using ASCE 7-10 Standards

Table 4. Design Criteria

Coefficient	Value	
Site Class	D	Table 1613.5.2
S_S	0.914	USGS US Seismic Design Maps
S_1	0.431	USGS US Seismic Design Maps
S_{MS}	1.037	Equation 16-37
S_{M1}	0.677	Equation 1 USGS US Seismic Design Maps 6-38
S_{DS}	0.691	USGS US Seismic Design Maps
S_{D1}	0.451	USGS US Seismic Design Maps
Category*	II	Table 1604.5
Seismic Design Category	D	Tables 1613.5.6(1), and 1613.5.6(2)

**If this is not correct, please inform us if warranted in writing so that changes to our recommendations can be made.*

Liquefaction

In general liquefaction occurs when deposits of loose saturated soils generally sands and sand-silt mixtures are subjected to strong earthquake shaking. If these deposits cannot drain rapidly, there will be an increase in the pore water pressure. With increasing oscillation, the pore water pressure can increase to the value of the overburden pressure. The shear strength of a cohesionless soil is directly proportional to the effective stress, which is equal to the difference between the overburden pressure and the pore water pressure. When the pore water pressure increases to the value of the overburden pressure, the shear strength of the soil reduces to zero and the soil deposit turns into a liquefied state.

The following parameters are generally used to designate non-liquefiable, fine-grained soils:

- Fines content (percent passing the U.S. Standard No. 200 Sieve) greater than 80 percent
- Clay content (particle size less than 0.005 mm) exceeding 20 percent
- Liquid limit greater than 35 percent
- Water content less than 90 percent of the liquid limit

Based on the fine-grained nature of the native, medium stiff to very stiff, silt (CL) to sandy silt (CL), and lack of ground water with the depths explored, these soils are considered to be non- liquefiable.

Additional Seismic

Slope Instability

Due to the relatively flat surface topography, the pre- construction risk of slope instability due to seismic forces is considered negligible. Provided newly constructed slopes in excess of 5 feet on existing gradients of 20% or greater, if any, incorporate appropriate keying and benching and do not exceed 2 horizontal to 1 vertical gradients, the risk of seismic slope instability is considered negligible.

Surface Rapture

Although the site is situated in a region of the country known for seismic activity, no known faults exist on or immediately adjacent to the site. Additionally, no large bodies of water exist within 500 feet of the site. Accordingly, the risk of surface rapture due to faulting and lateral spread is considered negligible.

OBSERVATIONS OF CONSTRUCTION

Satisfactory earthwork and pavement performance depends to a large degree on the quality of construction. Sufficient observation of the contractor's activities is a key part of determining that the work is completed in accordance with the construction drawings and specifications. Subsurface conditions observed during construction should be compared with those encountered during subsurface explorations, and recognition of changed conditions often requires experience. We recommend that qualified personnel visit the site with sufficient frequency to detect whether subsurface conditions change significantly from those observed to date and anticipated in this report.

We recommend that site stripping, rough grading, foundation, floor slab, and pavement subgrades, and placement of engineered fill are observed by the project geotechnical engineer or their representative. Because observation is typically performed on an on-call basis, we recommend that the earthwork contractor be held contractually responsible for scheduling observation. The schedule of Construction Observations is set out in Table 5.

LIMITATIONS

We have prepared this report for use by the owner/developer and other members of the design and construction team for the proposed development. The opinions and recommendations contained within this report are not intended to be, nor should they be construed, as a warranty of subsurface conditions, but are forwarded to assist in the planning and design process.

We have made observations based on our explorations that indicate the soil conditions at only those specific locations and only to the depths penetrated. These observations do not necessarily reflect soil types, strata thickness, or water level variations that may exist between explorations. If subsurface conditions vary from those encountered in our site exploration, MTE should be alerted to the change in conditions so that we may provide additional geotechnical recommendations if necessary. Observation by experienced geotechnical personnel should be considered an integral part of the construction process. The owner/developer is responsible for insuring that the project designers and contractors implement our recommendations. When the design has been finalized, we recommend that the design and specifications be reviewed by our firm to see that our recommendations have been interpreted and implemented as intended. If design changes are made, we request that we be retained to review our conclusions and recommendations and to provide a clarifications, modifications, or verification.

The scope of our services does not include services related to construction safety precautions, and our recommendations are not intended to direct the contractor's methods, techniques, sequences, or procedures, except as specifically described in our report for consideration in design.

Within the limitations of scope, schedule, and budget, our services have been executed in accordance with the generally accepted practices in this area at the time this report was prepared. No warranty or other conditions expressed or implied should be understood.

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Table 5

Schedule of Construction Observations

Item	**Appropriate Point to Contact MTE**	**Report Reference**
Site Stripping, Grubbing & Over-Excacation	During the Construction Activity and prior to Placement of Materials	Refer to the Site Preperation Section of the Geotech Report for Recommended Depths of Stripping
Subgrade Preperation for Foundation, Retaining Walls, pavement, and Floor Slabs	During the Construction Activity and prior to Placement of Structural Fills or Base Rock	See Recommendations Section of Geotech Report
Placement of Fills	Prior to the start of filling and during the preperation of the fill areas	Refer to the Site Prepertion Section of the Geotech Report
Placement & Compaction of Utility Trench Backfill	During the installation of the Backfill	Refer to Utility Trenches section of the Geotech Report for Testing and Compaction percentages
Pavement Base Rock	Prior to the Placement and During the Placement of the Material	Refer to the Pavement Section of the Geotech Report for Recommendations of Rock and Pavment Depths
Pavement Asphalt	Prior to the start of Paving	Refer to the Pavement Section of the Geotech Report for Recommendations of Rock and Pavment Depths
Retaining Wall Backfilling	Prior to the start of the Backfilling and and during Placement	Refer to the Retaining Wall section of the Geotech Report for Discussion of Wall Construction and Drainage
Final Site Grading	Prior to the Start of the final Grading	Check to make sure that Proper Site Grading is considered to remove Site drainage

Figure 1 – Site Arial

Figure 2 – Arial Vicinity Map

MULTI / TECH
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Figure 3a - Test Pits

BY:
MULTI/TECH ENGINEERING SERVICES, INC.
1155 13TH ST. S.E. SALEM, OREGON 97302
503-363-9227

Reed Road Site

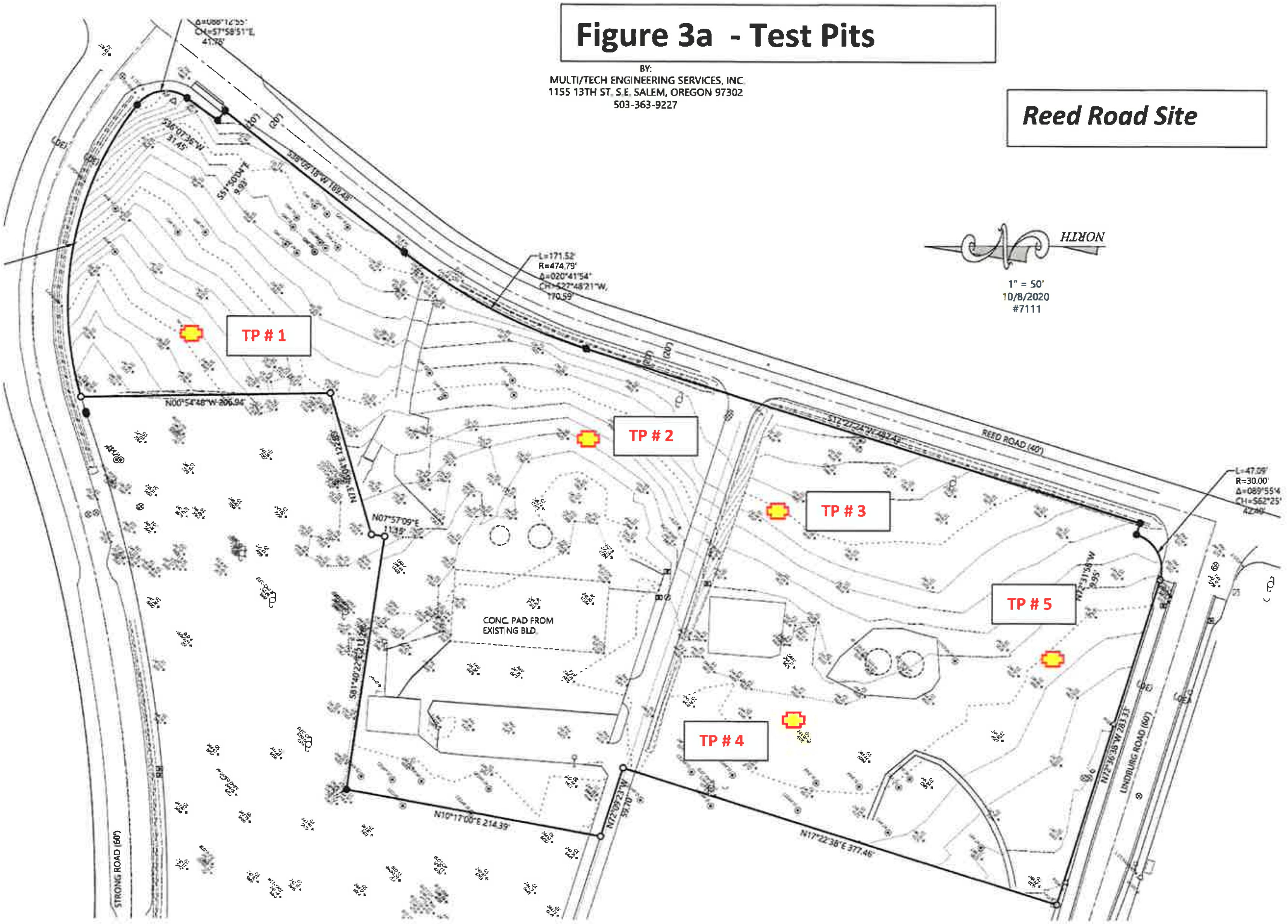

Figure 3b - Test Pits

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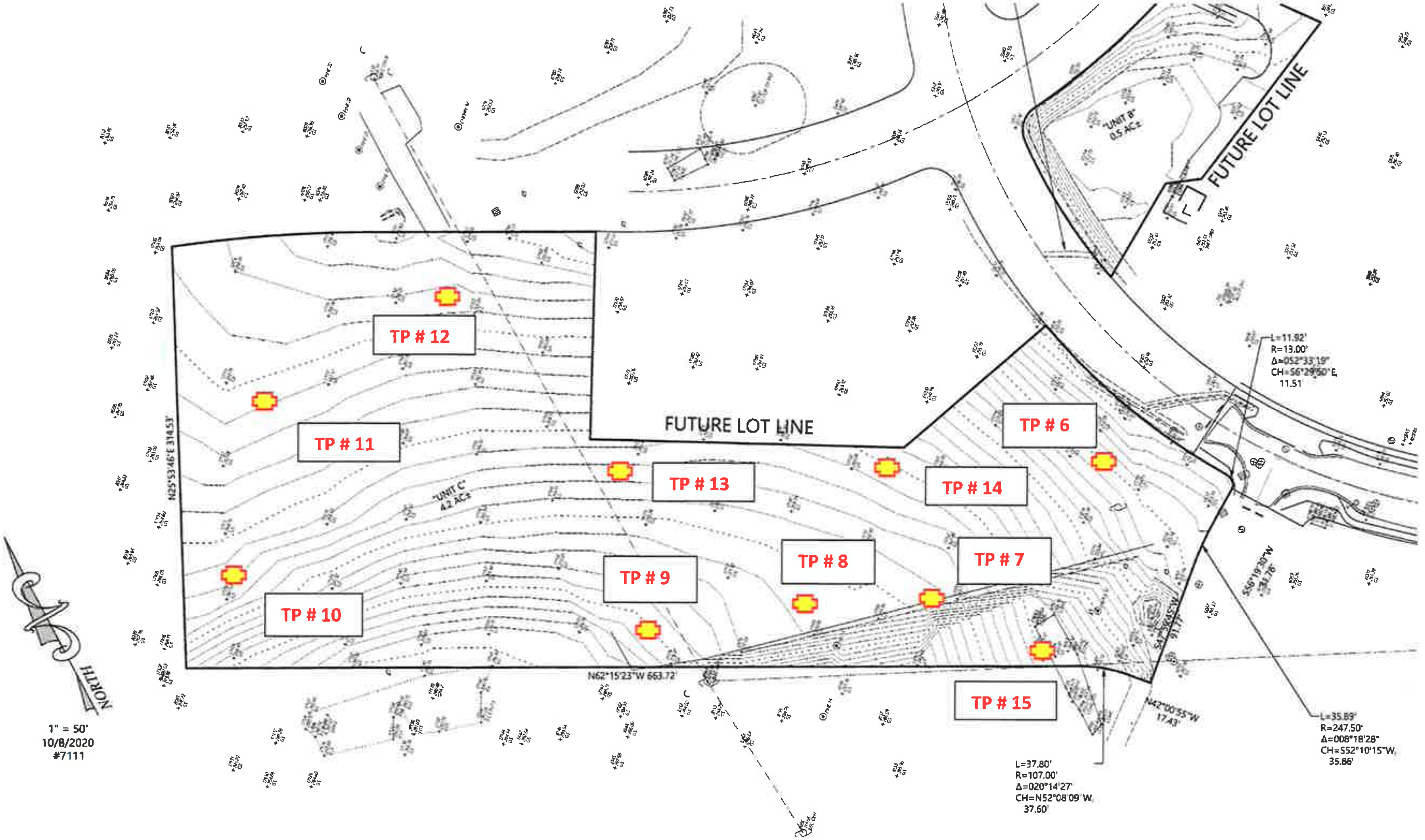
1155 13TH ST. S.E. SALEM, OREGON 97302
503-363-9227

VC Site



ENGINEERING SERVICES, INC.

UNIFIED SOIL CLASSIFICATION SYSTEM

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

COARSE-GRAINED SOILS (more than 50% of material is larger than No. 200 sieve size.)		
	Clean Gravels (Less than 5% fines)	
GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size	GW	Well-graded gravels, gravel-sand mixtures, little or no fines
	GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
	Gravels with fines (More than 12% fines)	
	GM	Silty gravels, gravel-sand-silt mixtures
	GC	Clayey gravels, gravel-sand-clay mixtures
	Clean Sands (Less than 5% fines)	
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size	SW	Well-graded sands, gravelly sands, little or no fines
	SP	Poorly graded sands, gravelly sands, little or no fines
	Sands with fines (More than 12% fines)	
	SM	Silty sands, sand-silt mixtures
	SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (50% or more of material is smaller than No. 200 sieve size.)		
SILTS AND CLAYS Liquid limit less than 50%	ML	Inorganic silts and very fine sands, rock flour, silty of clayey fine sands or clayey silts with slight plasticity
	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
	OL	Organic silts and organic silty clays of low plasticity
SILTS AND CLAYS Liquid limit 50% or greater	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
	CH	Inorganic clays of high plasticity, fat clays
	OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS	PT	Peat and other highly organic soils

LABORATORY CLASSIFICATION CRITERIA

GW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3	
GP	Not meeting all gradation requirements for GW	
GM	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
GC	Atterberg limits above "A" line with P.I. greater than 7	
SW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3	
SP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" line or P.I. less than 4	Limits plotting in shaded zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols.
SC	Atterberg limits above "A" line with P.I. greater than 7	

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

Less than 5 percent	GW, GP, SW, SP
More than 12 percent	GM, GC, SM, SC
5 to 12 percent	Borderline cases requiring dual symbols

PLASTICITY CHART

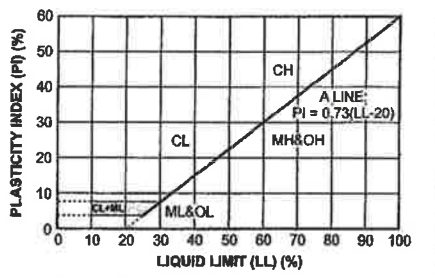


FIGURE 4 *Unified Soil Classification System*

EXHIBIT MAP

BY:
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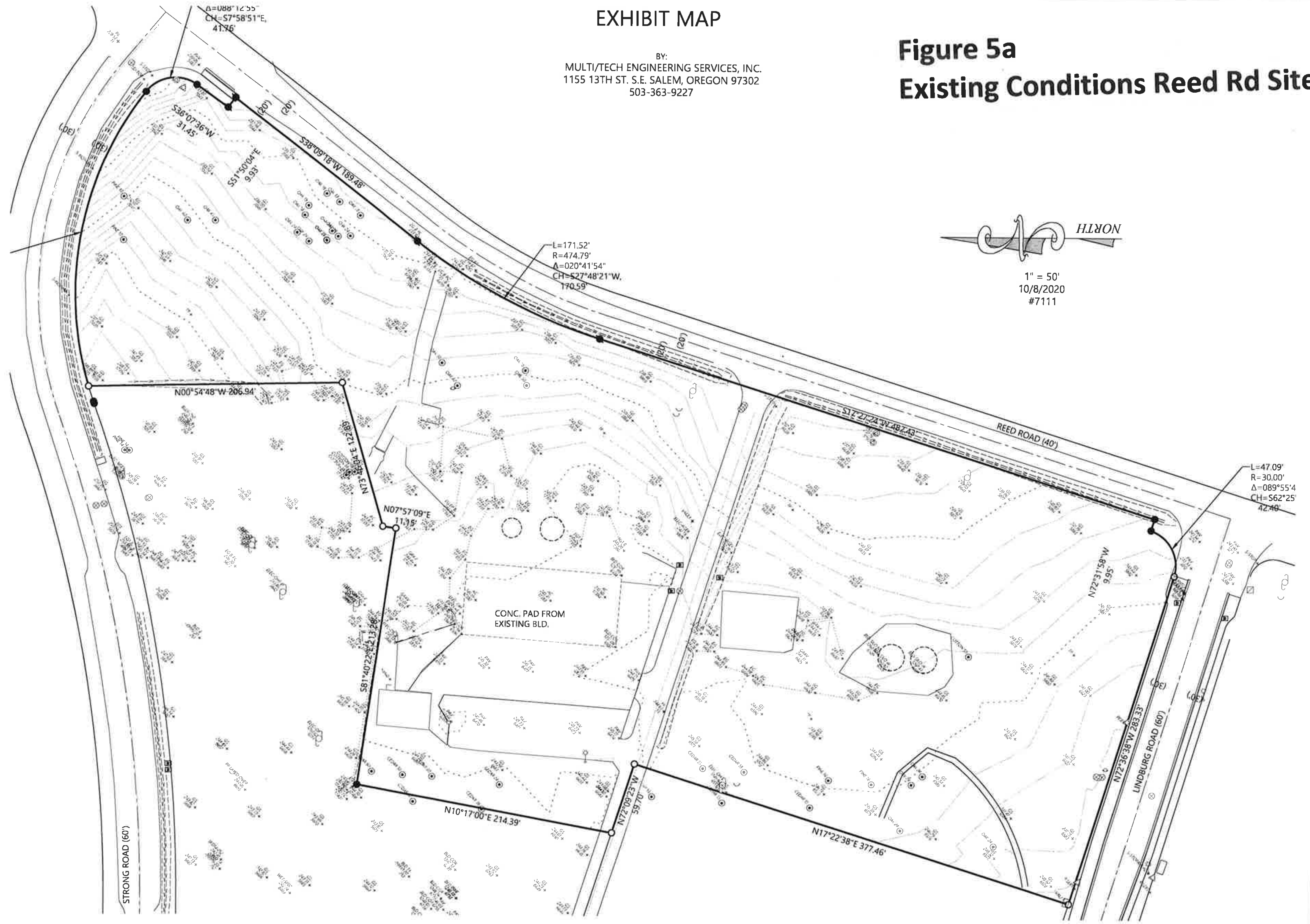
1155 13TH ST. S.E. SALEM, OREGON 97302
503-363-9227

Figure 5a
Existing Conditions Reed Rd Site



SHEET 1 OF 1

EXHIBIT MAP

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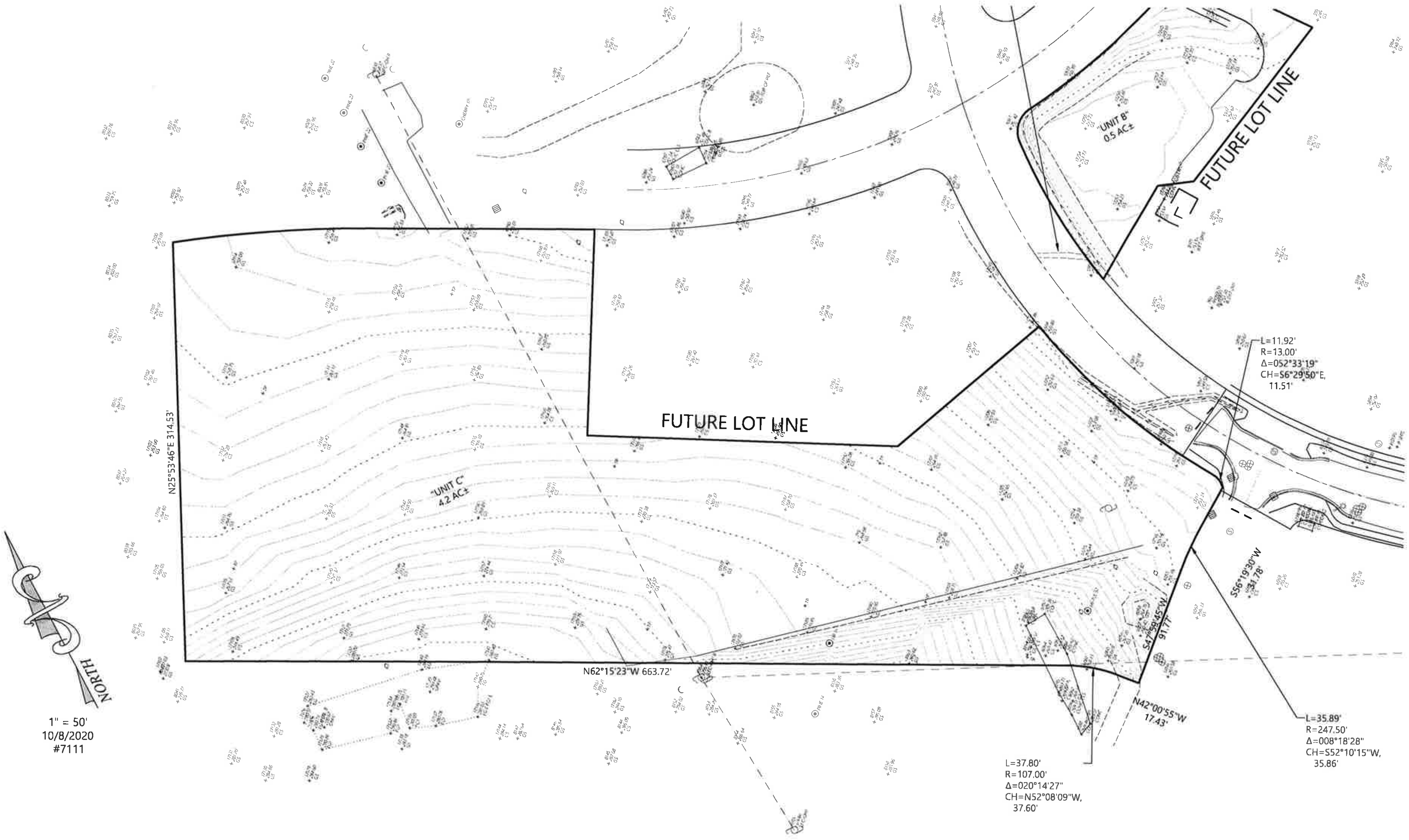
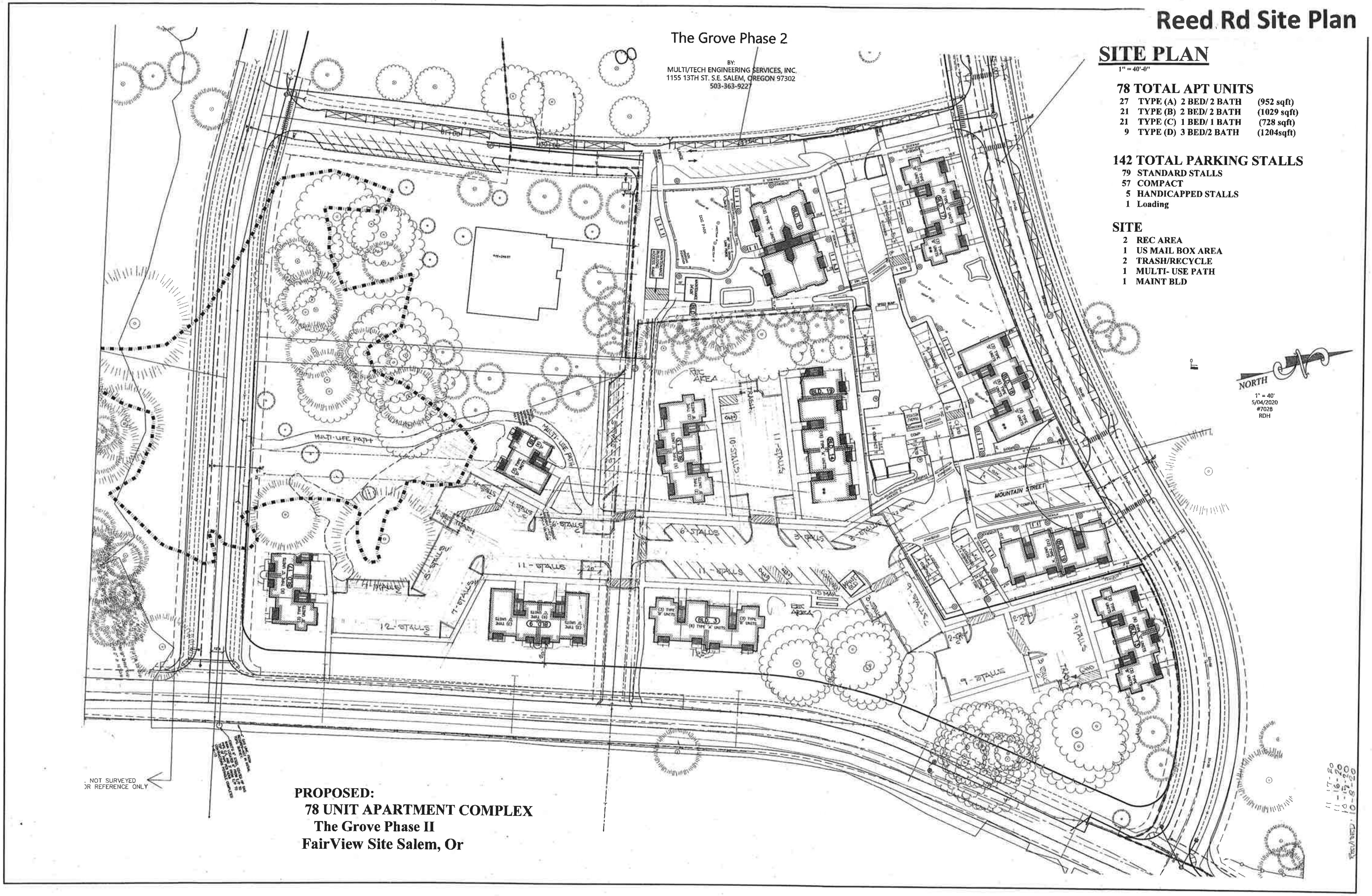
Figure 5b
Existing Conditions VC Site



1" = 50'
10/8/2020
#7111

SHEET 1 OF 1

Figure 6a
Reed Rd Site Plan



The Grove Phase 2

BY:
MULTI/TECH ENGINEERING SERVICES, INC.
1155 13TH ST. S.E. SALEM, OREGON 97302
503-363-9227

SITE PLAN
1" = 40'-0"

78 TOTAL APT UNITS
27 TYPE (A) 2 BED/ 2 BATH (952 sqft)
21 TYPE (B) 2 BED/ 2 BATH (1029 sqft)
21 TYPE (C) 1 BED/ 1 BATH (728 sqft)
9 TYPE (D) 3 BED/2 BATH (1204sqft)

142 TOTAL PARKING STALLS
79 STANDARD STALLS
57 COMPACT
5 HANDICAPPED STALLS
1 Loading

SITE
2 REC AREA
1 US MAIL BOX AREA
2 TRASH/RECYCLE
1 MULTI- USE PATH
1 MAINT BLD

1" = 40'
5/04/2020
#7028
RDH

PROPOSED:
78 UNIT APARTMENT COMPLEX
The Grove Phase II
FairView Site Salem, Or

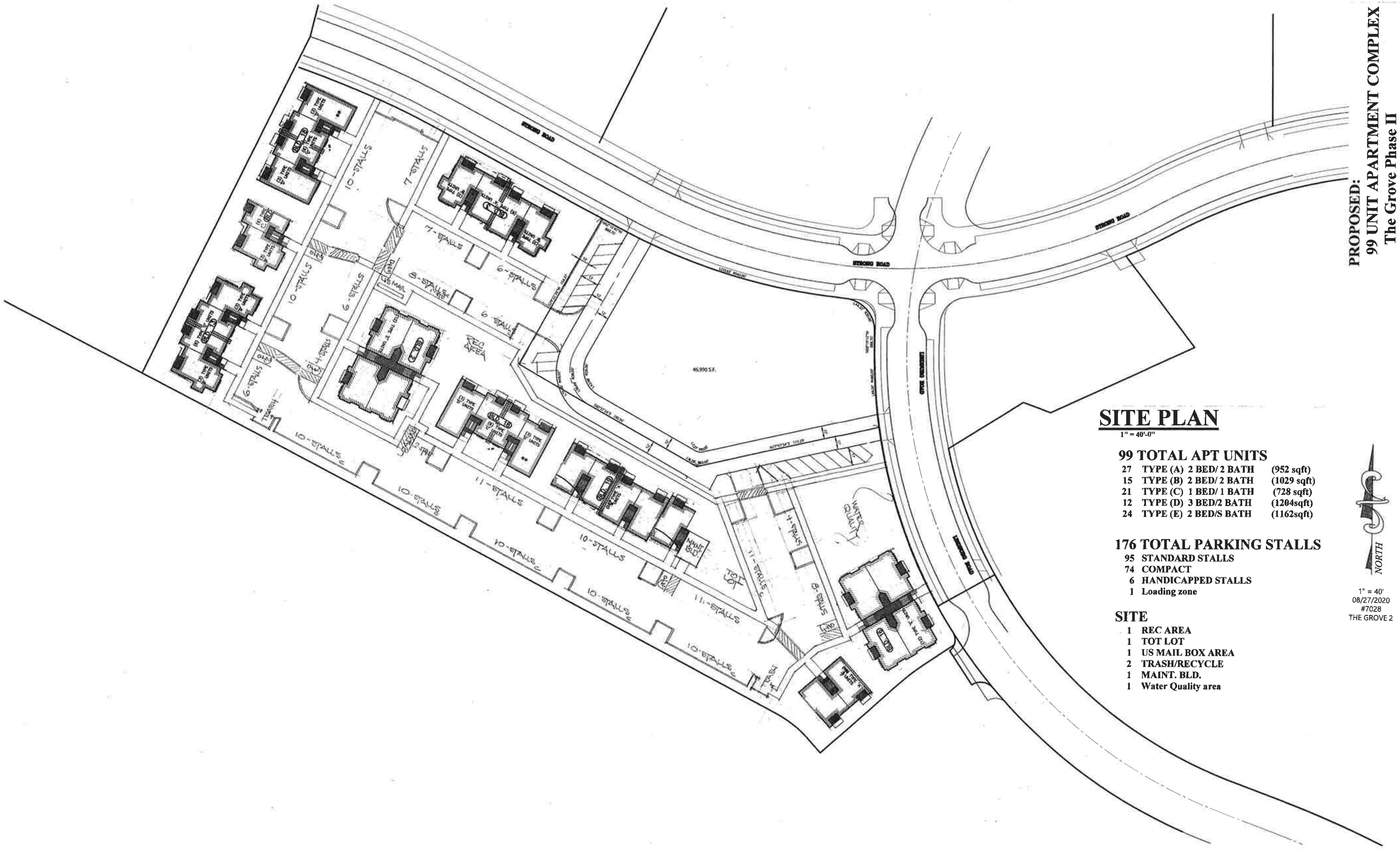
REVISED: 10-8-20
10-15-20
11-16-20
11-17-20

Figure 6b
VC Site Plan

EXHIBIT MAP

BY:
MULTI/TECH ENGINEERING SERVICES, INC.
1155 13TH ST. S.E. SALEM, OREGON 97302
503-363-9227

PROPOSED:
99 UNIT APARTMENT COMPLEX
The Grove Phase II
FairView Site Salem, Or



SITE PLAN

1" = 40'-0"

99 TOTAL APT UNITS

27	TYPE (A)	2 BED/ 2 BATH	(952 sqft)
15	TYPE (B)	2 BED/ 2 BATH	(1029 sqft)
21	TYPE (C)	1 BED/ 1 BATH	(728 sqft)
12	TYPE (D)	3 BED/2 BATH	(1204sqft)
24	TYPE (E)	2 BED/S BATH	(1162sqft)

176 TOTAL PARKING STALLS

95	STANDARD STALLS
74	COMPACT
6	HANDICAPPED STALLS
1	Loading zone

SITE

1	REC AREA
1	TOT LOT
1	US MAIL BOX AREA
2	TRASH/RECYCLE
1	MAINT. BLD.
1	Water Quality area

1" = 40'
08/27/2020
#7028
THE GROVE 2

REVISED 10-8-20

Appendix "A"

MULTI TECH
ENGINEERING SERVICES, INC.

MULTI / TECH
ENGINEERING SERVICES, INC.

Site Test Pit Log **Pit No. 1**

Depth Feet	Sample	Moisiture Content	Soil Class	Discription
0				
1				Organic Layer , top soil
2				Silty Clay Loam, damp Dark Brown Medium Stiff
3				
4				Light Brown Silty Clay, slightly sandy, Stiff, Dry
5				Terminated Excavationwork at 48 inches No ground water encountered at the time of the excavation
6				
7				
8				
9				
10				

MULTI/TECH
ENGINEERING SERVICES, INC.

Site Test Pit Log **Pit No. 2**

Depth Feet	**Sample**	**Moisiture Content**	**Soil Class**	**Discription**
0				
1				Organic Layer , top soil
2				Silty Clay Loam, damp Dark Brown Medium Stiff
3				
4				
5				Light Brown Silty Clay, Stiff, Dry
6				light Brown in Color Sandy Silty Clay material, moist, stiff
7				Terminated Excavationwork at 72 inches No ground water encountered at the time of the excavation
8				
9				
10				

MULTI TECH
ENGINEERING SERVICES, INC.

Site Test Pit Log **Pit No. 3**

Depth Feet	Sample	Moisiture Content	Soil Class	Discription
0				
1				Organic Layer , top soil
2				Silty Clay Loam, damp Dark Brown Medium Stiff
3				Silty Clay Loam, damp Dark Brown Stiff
4				
5				Light Brown Silty Clay, Stiff, Dry
6				
7				light Brown in Color Sandy Silty Clay material, moist, stiff There appears to be more clay present at the bottom of the excavation
8				
9				Terminated Excavationwork at 84 inches No ground water encountered at the time of the excavation
10				

Site Test Pit Log **Pit No. 4**

Depth Feet	**Sample**	**Moisiture Content**	**Soil Class**	**Discription**
0				Organic material, root zone
1 13"				Noted Top Soil and fill material in this range
2 32"				Silty Clay Loam, damp Gray/Brown
3 4 5 6 78"				Light Brown Silty Clay, Stiff, Dry Material Sandy Silt Clay in bottom of excavation, medium stiff
7 8 9 10				Terminated Excavationwork at 78 inches No ground water encountered at the time of the excavation

MULTI TECH
ENGINEERING SERVICES, INC.

Site Test Pit Log **Pit No. 5**

Depth Feet		Sample	Moisiture Content	Soil Class	Discription
0					Organic material, root zone
1					Noted Top Soil, Dark Brown, soft
2	32"				Silty Clay Loam, damp Gray/Brown
3					
4					Light Brown Silty Clay, Stiff, Dry
5					
6					Material Sandy Silt Clay in bottom of excavation, medium stiff
7					
8					Terminated Excavationwork at 80 inches No ground water encountered at the time of the excavation
9					
10					

MULTI / TECH
ENGINEERING SERVICES, INC.

Site Test Pit Log **Pit No. 6**

Depth Feet	Sample	Moisiture Content	Soil Class	Discription
0				Organic fill material present
1				
2				Organic material, root zone
3				Light Brown Silty Clay, Stiff, Dry
4				
5				
6				
7				
8				Terminated Excavationwork at 96 inches No ground water encountered at the time of the excavation
9				
10				

Site Test Pit Log **Pit No. 7**

Depth Feet	Sample	Moisiture Content	Soil Class	Discription
0				
1				Organic material, root zone
2				Fractured Basalt Material, very hard
3				
4				Terminated Excavationwork at 24 inches No ground water encountered at the time of the excavation
5				
6				
7				
8				
9				
10				

MULTI TECH
ENGINEERING SERVICES, INC.

Site Test Pit Log **Pit No. 8**

Depth Feet		Sample	Moisiture Content	Soil Class	Discription
0					
1					A fractured rock surface material
	14"				
2					
3					
4					A Red Clay material, very firm
5					
6					Weathered Basalt material, fractured
7					Terminated Excavationwork at 72 inches No ground water encountered at the time of the excavation
8					
9					
10					

MULTI TECH
ENGINEERING SERVICES, INC.

Site Test Pit Log **Pit No. 9**

Depth Feet	Sample	Moisiture Content	Soil Class	Discription
0				
1				Top Soil material
2				
3				
4				Sandy Silt Material
5				
6				Red Clay material very firm
7				
8				Terminated Excavationwork at 84 inches No ground water encountered at the time of the excavation
9				
10				

MULTI / TECH
ENGINEERING SERVICES, INC.

Site Test Pit Log **Pit No. 10**

Depth Feet	Sample	Moisiture Content	Soil Class	Discription
0				
1				Top soil - fill material
2				
3				
4				
5				
6				Red Clay material very firm
7				
8				Very Firm Clay material
9				
10				Terminated Excavationwork at 108 inches No ground water encountered at the time of the excavation

Site Test Pit Log **Pit No. 11**

Depth Feet	Sample	Moisiture Content	Soil Class	Discription
0 8"				Organic material, root zone
1 20"				Noted Top Soil, Dark Brown, soft
2 3 4 5 6				Light Brown Silty Clay, Stiff, Dry
7 8 9 10				Terminated Excavationwork at 80 inches No ground water encountered at the time of the excavation

Site Test Pit Log **Pit No. 12**

Depth Feet		Sample	Moisiture Content	Soil Class	Discription
0					
	9"				Organic Layer , top soil
1					
2					
3					
4					Light Brown Silty Clay material, Stiff
5					
6					light Brown in Color Clay material
7					
8					Terminated Excavationwork at 84 inches No ground water encountered at the time of the excavation
9					
10					

MULTI TECH
ENGINEERING SERVICES, INC.

Site Test Pit Log **Pit No. 13**

Depth Feet	Sample	Moisiture Content	Soil Class	Discription
0				
1				
14"				Top soil - fill material
2				
3				
4				
5				
6				Cilty Clay - light Brown - Stiff
7				
8				Terminated Excavationwork at 72 inches No ground water encountered at the time of the excavation
9				
10				

MULTI TECH
ENGINEERING SERVICES, INC.

Site Test Pit Log **Pit No. 14**

Depth Feet	Sample	Moisture Content	Soil Class	Discription
0				
1				Top soil - fill material
2				
3				
4				
5				
6				Cilty Clay - light Brown - Stiff
7				
8				Terminated Excavationwork at 72 inches No ground water encountered at the time of the excavation
9				
10				

MULTI / TECH
ENGINEERING SERVICES, INC.

Site Test Pit Log **Pit No. 15**

Depth Feet	Sample	Moisiture Content	Soil Class	Discription
0				
1				Top soil - fill material
2				
3				Silty Clay - very Stiff - Light Brown
4				
5				
6				Espect to find fractured basalt at some point
7				Terminated Excavationwork at 72 inches No ground water encountered at the time of the excavation
8				
9				
10				

Appendix "B"

MULTI TECH

ENGINEERING SERVICES, INC.

GeoPacific
Engineering, Inc.

Real-World Geotechnical Solutions
Investigation • Design • Construction Support

November 22, 2004

Project No. 04-9026

J.T. Smith Companies
4386 SW Macadam Ave. Suite 102
Portland, Oregon 97201
Fax: 503-657-3625

Attention: Joe Schiewe

RE: PRELIMINARY GEOTECHNICAL FINDINGS
FAIRVIEW COMMUNITY
SALEM, OREGON

This report presents our preliminary geotechnical findings, interpretations, and conclusions based on 18 exploratory test pits that were excavated at select locations on the above-referenced property. Logs of the test pits are presented in Appendix A. Their approximate locations are shown on a topographic map of the site with a contour interval of 10 feet. Preliminary streets and lots are also shown but the design may be further refined. The purpose of this preliminary report is to present subsurface information and our preliminary geotechnical interpretations assessing potentially adverse site conditions and to assist in site development, project planning, and preliminary budgeting.

SITE DESCRIPTION AND PROPOSED DEVELOPMENT

The Fairview facility opened about 1890 but reached its maximum operation potential between about 1970 and 1990. Since that time the facility operations have declined to the point that most of the 80-some buildings are closed and only maintenance and security personnel remain in charge of the property. A small group of school children still hold classes at the facility. In addition, local, state, and federal law enforcement agencies hold periodic training exercises at the facility.

The area to be developed is lies south and west of this old Fairview facility. The site area is bounded by Pringle Road on the west, Battle Creek Road on the south, and Reed Road on the east, as shown on Figure 1. The site topography is characterized by a series of elevated knobs and broad, rounded ridges, which are separated by incised valleys that drain slightly east of north. Slopes average between 10 and 15 percent grade with local maximum grades approaching about 25 percent. Native vegetation in the portion of the site that has not been cleared consists primarily of oak and Douglas fir. Oak appear to prefer areas where rock is at or near the ground surface, such as in the northwest portion of the site. Most of the southeastern portion of the development area was cleared years ago and utilized as a fruit orchard of cherry, apple, plum, and pear trees. These trees have become moss-covered and overgrown by blackberry vines to the point that much of the area is virtually impenetrable on foot without the aid of equipment.

The currently proposed plan for development includes about 1,000 lots for single-family homes, 136 townhomes, and a number of lots for smaller homes or condominimums. Associated improvements include about 24,000 lineal feet of new streets. Plans for site grading are still in their preliminary stages. Retaining walls may be added after refining of the grading plan. Storm water facilities and open space tracts are also in the planning stages.

SITE EXPLORATIONS

On November 15 and 16, 2004, GeoPacific explored subsurface conditions on the site by excavating eighteen exploratory test pits to depths ranging between 6.0 and 19.5 feet with a Link-Belt 3400 trackhoe from C&M Construction, Inc. at the locations shown on Figure 1. The test pit locations were very roughly located in the field by GeoPacific on the basis of topography, estimated distances from such features as power lines and previous test pits. Lines of test pits were aligned with distant fixed objects, such as a water tower and tall trees. After completion of logging and backfilling, the test pits were marked with a numbered stake and red flagging for later identification by WRG surveyors who will provide locations and elevations for subsequent subsurface mapping by GeoPacific, such as contours on top of weathered rock and hard rock.

SUBSURFACE CONDITIONS

The observed subsurface conditions and soil types are summarized below.

Topsoil – Based on observations at 18 test pit locations, topsoil thickness ranged between about 8 and 12 inches. It typically consisted of dark brown to red-brown clayey silt with abundant roots but generally without a significant quantity of fine organic debris, except in the bottoms of incised drainages.

Colluvial Soil – The soil horizon directly below topsoil at most test pit locations consisted of brown to red-brown clayey silt that was typically medium stiff to stiff. This transported soil generally ranged in thickness between 1.5 and 2 feet with local variations of up to about 3 feet.

Residual Soil – Residual soil in the site region generally refers to the end product of volcanic rock weathering whereby hard, fresh lava rock is weathered in-place without lateral movement or transport to become soil. This soil unit was typically very stiff and varied in thickness between a foot and less to about 3.5 feet. In test pit TP-10 an unusual thickness of colluvial/residual soil was encountered between depths of 2.5 to 13 feet. Residual soil typically provides good foundation bearing for structures.

Rock – Basalt rock was encountered in all exploratory test pits; however, it was largely absent, deep, and highly weathered in test pit TP-10. The depths of rock weathering and fracturing vary widely over relatively short horizontal distances. The test pit logs indicate progressive changes in rock characteristics with depth below the residual soil horizon. Typically, the top of rock is soft and readily excavated. It is usually highly weathered, light to dark brown with closely spaced, black stained, fractures yielding gravel-size angular rock fragments. With depth, the fractures often become more widely spaced, yielding cobble-size rock fragments. With additional depth, the basalt may become gray in color and be excavated with some difficulty (medium hard), followed by a sudden change to very hard rock with few fractures. At this point the test pit is terminated. At some locations, see TP-7, the rock may be gray and hard but will remain highly fractured. Under these conditions, the trackhoe can continue to excavate to its depth limit.

Soil Moisture and Groundwater

Soil moisture was encountered in the near surface soil horizons (Topsoil, Colluvial, and Residual); however, these soils throughout the site have an abundance of clay and characteristically low permeability. No groundwater seepage in these soils was observer or anticipated. Test pit TP-15 encountered some slow seepage of groundwater in the form of wet fracture surfaces in highly fractured basalt rock between depths of 13 to 16 feet. No significant accumulation of groundwater was observed at the bottom of the test pit.

PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

Rock

Our brief test pit exploration of the site clearly indicated the entire site to be underlain by basalt rock. The depth of weathering of this rock appears to be related to elevation and drainage. The average depth to hard rock at 18 test pit locations, including TP-10, is 13.75 feet. The average depth to top of excavatable rock is 5.36 feet. The extent and relatively shallow depth of rock at the site represents a serious consideration with regard to site grading and sanitary sewer trenching.

Topsoil Stripping

At most of the test pit locations, we recorded a topsoil thickness of 1 foot. Much of the organic debris in the topsoil horizon appeared to consist primarily of tree and berry roots. We believe that much of this debris can be mechanically removed and the total topsoil thickness to be removed can be reduced by 50% or more.

Site Grading

Site grading below an average depth of about 5.5 feet will be cutting into in-situ weathered, but generally soft, excavatable rock. Deeper cuts below 14 feet have a good chance of encountering very hard rock.
Overall grading requirements for the site should be reviewed with respect to reducing grading cuts where possible.

Infiltration Potential

While no infiltration testing has been performed at the site to date. Based on our field experience, it appears likely that infiltration testing in the near-surface clayey soil will yield very low infiltration rates. It may be that highly fractured basalt rock from about 6 to 12 feet will provide higher Infiltrations rates than on-site soils. Infiltration testing in fractured rock sections is recommended. Stormwater disposal in trenches cut into weathered rock or in drywells with a sand filtering system should be considered an alternative. On-site clayey soils should be avoided for in-ground disposal of strorm water.

On-site Rock For Construction

With the abundance of rock on the site, the possibility of enlarging the existing on-site quarry along Reed Road and setting up a site rock crusher should be considered and could reduce aggregate import costs.

UNCERTAINTY AND LIMITATIONS

We have prepared this report for the developer and engineers, for use on this project only. This report should be provided in its entirety to prospective contractors for bidding and estimating purposes; however, the conclusions and interpretations presented in this report should not be construed as a warranty of the subsurface conditions. Inconsistent conditions can occur between explorations that may not be detected by a geotechnical study. If, during future site operations, subsurface conditions are encountered which vary appreciably from those described herein, GeoPacific should be notified for review of the recommendations of this report, and revision of such if necessary.

We recommend that GeoPacific be retained to prepare a final investigation report and to review the plans and specifications and verify that our recommendations have been interpreted and implemented as intended. Sufficient geotechnical monitoring, testing and consultation should be provided during construction to confirm that the conditions encountered are consistent with those indicated by explorations.

Within the limitations of scope, schedule and budget, GeoPacific attempted to execute these services in accordance with generally accepted professional principles and practices in the fields of geotechnical engineering and engineering geology at the time the report was prepared. No warranty, express or implied, is made. The scope of our work did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous or toxic substances in the soil, surface water, or groundwater at this site.

Sincerely,

GEOPACIFIC ENGINEERING, INC.

James E. Pyne R.G.
Senior Geologist

James D. Imbrie, P.E., C.E.G.
Principal Geotechnical Engineer

Attachments:

Figure 1 – Site and Exploration Plan
Appendix A - Logs of Test Pits

cc: Richard D. Boyle – WRG Design

APPENDIX A

GeoPacific
Engineering, Inc.

7312 SW Durham Road
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 598-8705

TEST PIT LOG

Project: Fairview Village
Salem, Oregon.

Project No. 04-9026

Test Pit No. **TP- 1**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	**Material Description**
						Red-brown clayey silt with abundant roots, soft, moist (Topsoil - ML).
1						Red-brown clayey silt, medium stiff, moist (Colluvial Soil - ML).
2						
3						Light brown clayey silt with abundant fragments of completely weathered basalt, very stiff, moist (Residual Soil - ML).
4						
5						Gray to brown highly weathered and fractured basalt rock with black mineralization on fracture surfaces, soft, readily excavated.
6						
7						
8						Weathered and fractured basalt rock similar to above
9						
10						
11						
12						Rock changes to gray, medium hard, then hard at 13' depth.
13						
14						Test pit completed at 13 feet, No groundwater encountered.
15						
16						
17						

LEGEND

- 100 to 1,000 g Bag Sample
- 5 Gal. Bucket Bucket Sample
- Shelby Tube Sample
- Seepage
- ▨ Water Bearing Zone
- Water Level at Abandonment

Date Excavated: 11/15-16/04
Logged By: J. Pyne
Surface Elevation:

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Engineering, Inc.
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TEST PIT LOG

Project: Fairview Village
Salem, Oregon.

Project No. 04-9026

Test Pit No. **TP- 2**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
						Dark red-brown clayey silt, abundant roots, soft, moist (Topsoil - ML).
1						Dark red-brown clayey silt, medium stiff, moist (Colluvial Soil - ML).
2						Light brown clayey silt with inclusions of highly to completely weathered rock Residual Soil - ML).
3						
4						Rust brown highly weathered and fractured basalt rock, black mineral staining on fracture surfaces, soft rock, readily excavated.
5						
6						
7						
8						
9						Gray basalt, hard.
10						Test pit terminated at 9.5 feet, No groundwater encountered.
11						
12						
13						
14						
15						
16						
17						

LEGEND

- 100 to 1,000 g — Bag Sample
- 5 Gal. Bucket — Bucket Sample
- ▯ Shelby Tube Sample
- 💧 Seepage
- ▨ Water Bearing Zone
- ▽ Water Level at Abandonment

Date Excavated: 11/15-16/04
Logged By: J. Pyne
Surface Elevation:

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TEST PIT LOG

Project: Fairview Village
Salem, Oregon.

Project No. 04-9026

Test Pit No. **TP- 3**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	**Material Description**
						Dark red-brown clayey silt, abundant roots, soft, moist (Topsoil - ML).
1						Red-brown clayey silt, medium stiff, moist (Colluvial Soil - ML).
2						
3						Red-brown clayey silt, very stiff, moist with occasional weathered fragments of basalt (Residual Soil - ML).
4						
5						Tan to dark brown highly weathered and fractures basalt, black mineral stains on fracture surfaces, soft rock, readily excavated, very stiff, damp.
6						
7						
8						Red-brown basalt, highly weathered and fractured basalt
9						Light to dark brown and gray basalt, weathered, highly fractured basalt
10						
11						
12						
13						
14						Sudden change to hard gray basalt at 15 feet.
15						
16						Test pit terminated at 15 feet, No groundwater encountered.
17						

LEGEND

- 100 to 1,000 g Bag Sample
- 5 Gal. Bucket Bucket Sample
- Shelby Tube Sample
- Seepage
- ▨ Water Bearing Zone
- Water Level at Abandonment

Date Excavated: 11/15-16/04
Logged By: J. Pyne
Surface Elevation:

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TEST PIT LOG

Project: Fairview Village Salem, Oregon.	Project No. 04-9026	Test Pit No. **TP- 4**

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Type	In-Situ Dry Density (lb/ft^3)	Moisture Content (%)	Water Bearing Zone	**Material Description**
						Red-brown clayey silt, abundant roots, soft, moist (Topsoil - ML).
1 2						Dark red-brown clayey silt, medium stiff to stiff, moist (Colluvial Soil - ML).
3						Light brown clayey silt with abundant gravel-size fragments of highly weathered basalt, stiff, moist (Residual Soil - ML).
4 5						Brown weathered and fractured basalt, soft, readily excavated, black mineral stains on fracture surfaces.
6 7 8 9 10 11 12						Change to red, brown, and black highly weathered and fractured basalt below 6 feet depth
13 14						Gray, medium hard and fractured rock below 13 feet. Sudden change to hard gray rock at 15 feet.
15 16 17						Test pit terminated at 15 feet depth, No groundwater encountered.

LEGEND

- 100 to 1,000 g Bag Sample
- 5 Gal. Bucket Bucket Sample
- Shelby Tube Sample
- Seepage
- ▨ Water Bearing Zone
- Water Level at Abandonment

Date Excavated: 11/15-16/04
Logged By: J. Pyne
Surface Elevation:

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TEST PIT LOG

Project: Fairview Village
Salem, Oregon.

Project No. 04-9026

Test Pit No. **TP- 5**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	**Material Description**
						Dark red-brown clayey silt, abundant roots, moist, soft (Topsoil - ML).
1						
						Red-brown clayey silt, medium stiff to stiff, moist (Colluvial Soil - ML).
2						
3						
						Light brown clayey silt with abundant fragments of highly to completely weathered basalt rock (Residual Soil - ML/GM).
4						
5						
6						Light to dark brown basalt, weathered, highly fractured with black mineral stains on fracture surfaces, soft rock, readily excavated.
7						
8						
9						
10						
11						Change to brownish-gray basalt, medium hard, fractured
12						
13						Sudden change to hard, gray basalt at 14 feet.
14						
15						Test pit terminated at 14 feet, No groundwater encountered.
16						
17						

LEGEND

- 100 to 1,000 g — Bag Sample
- 5 Gal. Bucket — Bucket Sample
- ▯ Shelby Tube Sample
- 💧 Seepage
- ▨ Water Bearing Zone
- ▽ Water Level at Abandonment

Date Excavated: 11/15-16/04
Logged By: J. Pyne
Surface Elevation:

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TEST PIT LOG

Project: Fairview Village Salem, Oregon.	Project No. 04-9026	Test Pit No. **TP- 6**

Depth (ft)	Pocket Penetrometer ($tons/ft^2$)	Sample Type	In-Situ Dry Density (lb/ft^3)	Moisture Content (%)	Water Bearing Zone	**Material Description**
						Red-brown clayey silt, abundant roots, soft, moist (Topsoil - ML).
1						Red-brown clayey silt, medium stiff to stiff, moist (Colluvial Soil - ML).
2						
3						Light brown clayey silt with some highly to completely weathered basalt fragments, very stiff, moist (Residual Soil - ML).
4						Brown highly weathered basalt with black mineral staining on fracture surfaces, soft rock, readily excavated.
5						
6						
7						Sudden change to hard gray basalt at 8 feet depth.
8						
9						Test pit terminated at 8 feet, No groundwater encountered.
10						
11						
12						
13						
14						
15						
16						
17						

LEGEND

- 100 to 1,000 g Bag Sample
- 5 Gal. Bucket Bucket Sample
- Shelby Tube Sample
- Seepage
- ▨ Water Bearing Zone
- Water Level at Abandonment

Date Excavated: 11/15-16/04
Logged By: J. Pyne
Surface Elevation:

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Engineering Inc.

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TEST PIT LOG

Project: Fairview Village Salem, Oregon.	Project No. 04-9026	Test Pit No. **TP- 7**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	**Material Description**
						Brown clayey silt, abundant roots, soft, moist (Topsoil - ML).
1						Brown clayey silt, medium stiff to stiff, moist, occasional inclusion of weathered basalt (Colluvial Soil - ML).
2						
3						Light brown silt with abundant fragments of highly to completely weathered basalt and black mineral staining (Residual Soil - ML/ GM).
4						
5						Gray basalt, medium hard, weathered and closely fractured, yielding coarse gravel-size rock fragments, slow excavating progress.
6						
7						
8						
9						Gray medium hard basalt similar to above but with wider fracture spacing yielding abundant cobble-size rock fragments.
10						
11						
12						
13						Dark gray hard and highly fractured rock, slow excavating progress.
14						
15						
16						
17						Test pit terminated at 19 feet on top of hard rock with few fractures; No groundwater encountered.

LEGEND

100 to 1,000 g	5 Gal. Bucket	▯	💧	▨	▽
Bag Sample	Bucket Sample	Shelby Tube Sample	Seepage	Water Bearing Zone	Water Level at Abandonment

Date Excavated: 11/15-16/04
Logged By: J. Pyne
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Engineering, Inc.

7312 SW Durham Road
Portland, Oregon 97224
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TEST PIT LOG

Project: Fairview Village
Salem, Oregon.

Project No. 04-9026

Test Pit No. **TP- 8**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
						Brown clayey silt with abundant roots, soft, moist (Topsoil - ML).
1						Dark brown clayey silt, medium stiff to stiff, moist (Colluvial Soil - ML).
2						
3						Light brown silt with some clay, occasional inclusion of weathered basalt (Residual Soil - ML).
4						
5						
6						
7						Gray basalt, medium hard, highly fractured.
8						
9						
10						
11						Dark gray highly fractured basalt, breaks into gravel- to cobble-size rock fragments
12						
13						
14						
15						Basalt becomes less fractured below 15 feet.
16						
17						Test pit terminated at 16.5 feet, No groundwater encountered.

LEGEND

100 to 1,000 g	Bag Sample
5 Gal. Bucket	Bucket Sample
▯	Shelby Tube Sample
💧	Seepage
▨	Water Bearing Zone
▽	Water Level at Abandonment

Date Excavated: 11/15-16/04
Logged By: J. Pyne
Surface Elevation:

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TEST PIT LOG

Project: Fairview Village Salem, Oregon.	Project No. 04-9026	Test Pit No. **TP-9**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
						Red-brown clayey silt, numerous roots, soft, moist (Topsoil - ML).
1						Dark red-brown clayey silt, medium stiff to stiff, moist (Colluvial Soil - ML).
2						
3						
4						Dark red-brown clayey silt with inclusions of weathered basalt, very stiff, moist (Residual Soil - ML).
5						Light brown clayey silt with inclusions of highly to completely weathered basalt with black mineral staining, very stiff, moist.
6						Brown and black basalt, soft, highly weathered, black stained fractures; easily excavated with trackhoe.
7						
8						
9						Gray medium hard basalt changing to hard basalt at 10 feet depth.
10						Test pit terminated at 10 feet depth, No groundwater encountered.
11						
12						
13						
14						
15						
16						
17						

LEGEND

- 100 to 1,000 g — Bag Sample
- 5 Gal. Bucket — Bucket Sample
- ▯ Shelby Tube Sample
- 💧 Seepage
- ▨ Water Bearing Zone
- ▽ Water Level at Abandonment

Date Excavated: 11/15-16/04
Logged By: J. Pyne
Surface Elevation:

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Portland, Oregon 97224
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TEST PIT LOG

Project: Fairview Village Salem, Oregon.	Project No. 04-9026	Test Pit No. **TP-10**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
						Brown clayey silt with abundant roots, moist, soft (Topsoil - ML).
1 2						Brown clayey silt, medium stiff, moist (Colluvial Soil - ML).
3 4 5 6 7 8 9 10 11 12						Dark red-brown clayey silt with numerous black fragments of completely weathered basalt rock, stiff, moist (Residual/Colluvial Soil - ML). Note: due to the unusual thickness of this soil unit, there is considerable question as to its origin; additional exploration of the area may be required.
13 14 15						Change to light tan color at 13 feet depth; Soil is light tan to rust-brown, angular to rounded siltstone fragments in a matrix of light gray soft clay, soft, moist but no seepage of groundwater.
16 17						Some zones of highly weathered brown & black basalt apparently interbedded with siltstone. Test pit terminated at 19.5 feet (depth limit of trackhoe); NO groundwater encountered.

LEGEND

- 100 to 1,000 g — Bag Sample
- 5 Gal. Bucket — Bucket Sample
- Shelby Tube Sample
- Seepage
- ▨ Water Bearing Zone
- Water Level at Abandonment

Date Excavated: 11/15-16/04
Logged By: J. Pyne
Surface Elevation:

GeoPacific Engineering Inc.

7312 SW Durham Road
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 598-8705

TEST PIT LOG

Project: Fairview Village
Salem, Oregon.

Project No. 04-9026

Test Pit No. **TP-11**

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Type	In-Situ Dry Density (lb/ft^3)	Moisture Content (%)	Water Bearing Zone	Material Description
						Dark brown clayey silt, abundant grass roots, soft, moist (Topsoil - ML).
1						Numerous subangular gravel- to boulder-size fragments of medium basalt in a matrix of light brown clayey silt. (Surface exposures of weathered rock in vicinity of large oak tree on southern tip of topographic ridge).
2						
3						Brown to gray basalt rock, weathered, medium hard, fractured.
4						Gray basalt below 4 feet, hard, fractured; very hard below 6 feet depth.
5						
6						
7						Test pit terminated at 6 feet, No groundwater encountered.
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						

LEGEND

100 to 1,000 g	5 Gal. Bucket	▯	💧	▨	▽
Bag Sample	Bucket Sample	Shelby Tube Sample	Seepage	Water Bearing Zone	Water Level at Abandonment

Date Excavated: 11/15-16/04
Logged By: J. Pyne
Surface Elevation:

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Engineering Inc.

7312 SW Durham Road
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 598-8705

TEST PIT LOG

Project: Fairview Village
Salem, Oregon.

Project No. 04-9026

Test Pit No. **TP-12**

Depth (ft)	Pocket Penetrometer ($tons/ft^2$)	Sample Type	In-Situ Dry Density (lb/ft^3)	Moisture Content (%)	Water Bearing Zone	**Material Description**
						Light brown clayey silt, some roots, soft, moist (Topsoil - ML).
1						Light brown clayey silt, medium stiff to stiff; occasional weathered fragments of basalt below 3 feet depth (Colluvial Soil - ML).
2						
3						
4						
5						Gray basalt, hard, fractured, excavated to 7 feet depth with difficulty.
6						
7						Test pit terminated at 7 feet, No groundwater encountered.
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						

LEGEND

100 to 1,000 g	5 Gal. Bucket	▯	💧	▨	▽
Bag Sample	Bucket Sample	Shelby Tube Sample	Seepage	Water Bearing Zone	Water Level at Abandonment

Date Excavated: 11/15-16/04
Logged By: J. Pyne
Surface Elevation:

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7312 SW Durham Road
Portland, Oregon 97224
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TEST PIT LOG

Project: Fairview Village
Salem, Oregon.

Project No. 04-9026

Test Pit No. **TP-13**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	**Material Description**
						Light brown clayey silt, abundant roots, soft, moist (Topsoil - ML).
1						
2						Light brown clayey silt with some isolated fragments of weathered basalt, stiff moist (Colluvial Soil - ML).
3						
4						
5						Dark red-brown clayey silt with some gray fragments of weathered basalt, stiff, moist (Residual Soil - ML).
6						
7						
8						Changes to very stiff residual soil below 7 feet depth, abundant highly to completely weathered basalt fragments with black mineral staining.
9						
10						Light rust-brown and black highly weathered basalt with occasional inclusions of light gray medium hard basalt; fracture surfaces have black mineral staining.
11						
12						
13						Brown to black highly weathered and fractured basalt with ledges of hard, gray basalt.
14						Hard gray basalt at 15 feet depth.
15						Test pit terminated at 15 feet, No groundwater encountered.
16						
17						

LEGEND

100 to 1,000 g	5 Gal. Bucket	▯	💧	▨	▽
Bag Sample	Bucket Sample	Shelby Tube Sample	Seepage	Water Bearing Zone	Water Level at Abandonment

Date Excavated: 11/15-16/04
Logged By: J. Pyne
Surface Elevation:

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Portland, Oregon 97224
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TEST PIT LOG

Project: Fairview Village
Salem, Oregon.

Project No. 04-9026

Test Pit No. **TP-14**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	**Material Description**
						Brown clayey silt, abundant roots, soft, moist (Topsoil - ML).
1						Light brown clayey silt with a basal zone of weathered basalt fragments in light gray silt (Colluvial Soil - ML).
2						
3						Red-brown clayey silt with some inclusions of weathered basalt, stiff, moist (Residual Soil - ML).
4						
5						
6						Sudden change at 6.5 feet to very hard gray basalt rock.
7						Test pit terminated at 6.5 feet, No groundwater encountered.
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						

LEGEND

- 100 to 1,000 g Bag Sample
- 5 Gal. Bucket Bucket Sample
- Shelby Tube Sample
- Seepage
- ▨ Water Bearing Zone
- Water Level at Abandonment

Date Excavated: 11/15-16/04
Logged By: J. Pyne
Surface Elevation:

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TEST PIT LOG

Project: Fairview Village Salem, Oregon.	Project No. 04-9026	Test Pit No. **TP-15**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	**Material Description**
						Brown clayey silt, abundant roots, soft, moist (Topsoil - ML).
1 2 3						Light brown clayey silt with occasional weathered fragment of basalt, medium stiff, moist (Colluvial Soil - ML).
4 5						Red-brown clayey silt, very stiff, moist (Residual Soil - ML).
6 7						Rust-brown clayey silt with abundant brown to black fragments of highly weathered basalt, very stiff, damp (very soft weathered rock- ML).
8 9 10 11 12 13						Brown basalt, weathered and highly fractured, black mineral stains on fracture surfaces, soft, readily excavated Some slow seepage of groundwater, wet on fracture surfaces.
14 15						Basalt, medium hard, highly fractured, breaks into gravel-size fragments, wet from slow seepage of groundwater Basalt changes to hard gray rock at 16 feet depth, no groundwater seepage
16 17						Test pit terminated at 16 feet.

LEGEND

100 to 1,000 g	5 Gal. Bucket	▯	💧	▨	▽
Bag Sample	Bucket Sample	Shelby Tube Sample	Seepage	Water Bearing Zone	Water Level at Abandonment

Date Excavated: 11/15-16/04
Logged By: J. Pyne
Surface Elevation:

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Engineering, Inc.

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TEST PIT LOG

Project: Fairview Village
Salem, Oregon.

Project No. 04-9026

Test Pit No. **TP-16**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	**Material Description**
						Dark brown clayey silt, abundant grass and blackberry roots, moist, soft (Topsoil - ML).
1						Dark brown clayey silt with some weathered fragments of basalt, moist, medium stiff (Colluvial Soil - ML).
2 3 4						Light brown clayey silt with numerous inclusions of brown highly weathered and fractures basalt, stiff, damp (Residual Soil - ML).
5 6 7 8 9						Brown weathered and fractured basalt, fracture faces have black mineral staining, soft, readily broken to fine to coarse, angular gravel-size fragments. Basalt suddenly changes to hard, gray rock at 10 feet depth.
10 11 12 13 14 15 16 17						Test pit terminated at 10 feet, No groundwater encountered.

LEGEND

100 to 1,000 g	5 Gal. Bucket	▯	💧	▨	▽
Bag Sample	Bucket Sample	Shelby Tube Sample	Seepage	Water Bearing Zone	Water Level at Abandonment

Date Excavated: 11/15-16/04
Logged By: J. Pyne
Surface Elevation:

GeoPacific Engineering, Inc.
7312 SW Durham Road
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 598-8705

TEST PIT LOG

Project: Fairview Village Salem, Oregon.	Project No. 04-9026	Test Pit No. **TP-17**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	**Material Description**
						Dark brown clayey silt with abundant grass roots, moist, soft (Topsoil - ML)
1						
2						Dark brown clayey silt with occasional weathered fragment of basalt, medium stiff, moist (Colluvial Soil - ML).
3						
4						Light rust-brown clayey silt with inclusions of weathered basalt, very stiff (Residual Soil - ML).
5						
6						Brown in-situ weathered basalt, black stains on fractures faces, soft , easily excavated, breaks to fine to coarse gravel-size, angular fragments
7						
8						
9						
10						
11						Basalt becomes medium hard, highly fractured
12						
13						
14						
15						Trackhoe bucket scraping on hard in-situ basalt at 16 feet depth.
16						
17						Test pit terminated at 16 feet, No groundwater encountered.

LEGEND

- 100 to 1,000 g Bag Sample
- 5 Gal. Bucket Bucket Sample
- Shelby Tube Sample
- Seepage
- ▨ Water Bearing Zone
- Water Level at Abandonment

Date Excavated: 11/15-16/04
Logged By: J. Pyne
Surface Elevation:

GeoPacific
Engineering Inc.

7312 SW Durham Road
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 598-8705

TEST PIT LOG

Project: Fairview Village
Salem, Oregon.

Project No. 04-9026

Test Pit No. **TP-18**

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Type	In-Situ Dry Density (lb/ft^3)	Moisture Content (%)	Water Bearing Zone	**Material Description**
						Dark brown clayey silt with abundant grass roots, soft, moist (Topsoil - ML).
1						Dark brown clayey silt, medium stiff, occasional fragment of highly weathered basalt (Colluvial Soil - ML).
2 3						Light brown clayey silt with abundant fragments of weathered basalt (Residual Soil - ML)
4 5 6 7 8 9 10						Top of in-situ weathered basalt, brown with black mineral staining on fracture surfaces, highly fractured, soft, easily excavated, breaks to fine to coarse gravel-size, angular fragments Basalt changes to medium hard below 11' , still highly fractured;
11						sudden change to hard rock at 12 feet depth.
12 13 14 15 16 17						Test pit terminated at 12 feet, No groundwater encountered.

LEGEND

- 100 to 1,000 g — Bag Sample
- 5 Gal. Bucket — Bucket Sample
- Shelby Tube Sample
- Seepage
- ▨ Water Bearing Zone
- Water Level at Abandonment

Date Excavated: 11/15-16/04
Logged By: J. Pyne
Surface Elevation:

Appendix "C"

PBS

Geotechnical Site Review

Fairview Training Center
2250 Strong Road, S.E.
Salem, Oregon

Prepared for:
Opsis Architecture
Portland, Oregon

October 2002
Project # 17107.000

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Portland, OR 97239
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503.248.0223 FAX
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GEOTECHNICAL SITE REVIEW

Fairview Training Center
2250 Strong Road, S.E.
Salem, Oregon

Prepared for:
Opsis Architecture
Portland, Oregon

Prepared by:
PBS Engineering and Environmental
4412 SW Corbett Avenue
Portland, OR 97239
(503) 248-1939

PBS Project No: 17107.000

October 2002

TABLE OF CONTENTS

SUPPORTING DATA

APPENDICES

1.0 INTRODUCTION

PBS Engineering and Environmental (PBS) was requested to complete a geotechnical engineering review of the Fairview Training Center (Fairview) site, located at 2250 Strong Road, S.E., Salem, Oregon, to form an opinion of subsurface soil conditions that may have an impact on proposed redevelopment of the site currently being considered. Our review was limited to research of readily accessible published geologic documents for the site and surrounding vicinity, and completion of cursory site observations on September 25, 2002. No subsurface investigation or sampling was completed to confirm our findings. Our work was done in general accordance with our proposal dated September 18, 2002, submitted to Opsis Architecture (Client) c/o Don Forbes.

The review was completed by Daniel Trisler, PE, Senior Geotechnical Engineer with PBS. Mr. Trisler's resume is attached to this document. The following summary provides our current understanding of geologic/geotechnical conditions associated with the site as well as a discussion of potential foundation issues associated with redevelopment of the site.

2.0 REGIONAL GEOLOGY

The Fairview property is situated in southern Salem in the central Willamette Valley. The valley is a structural low between the Coast Range mountains to the west and the Cascade Range mountains to the east. The region is typically underlain by sedimentary rocks of the Eocene and Oligocene period. Overlying the sedimentary bedrock is the Miocene-aged Columbia River Basalt Group. The basalt weathers to laterite (red clay), which can reach thicknesses of nearly 200 feet in the hills. Quaternary soil deposits overlie the bedrock materials in the valley floor. These soils typically consist of unconsolidated to semi-consolidated interbedded deposits of gravel, sand, silt, clay, and organic material.

3.0 SITE GEOLOGY

Geologic information regarding the Salem area has been published by Bela (1981). His mapping indicates the subject site is underlain by terrace deposits and basalt bedrock. The relevant portion of his map is included in Figure A - Local Geologic Map.

The lower, northwest corner of the property (Area A) and the area to the northeast of the property is shown by Bela (1981) to be underlain by *lower terrace deposits of alluvial bottomlands* (map symbol "Qtlb"). These soils are described as consisting of "somewhat stratified very fine sands, silty sandy clays, silty clays, and silty clay loams." He also indicates these soils may be "soft, organic and compressible...with low shear strength." Soils similar to these materials are also likely to be found within the natural drainage swales found within the upper portions of the site.

The northeast and eastern portions of the site (part of Area B and Area C) are mapped as being underlain by *higher terrace deposits* (Qth). Bela (1981) indicates these deposits consist of semiconsolidated sand, silt and clay. The soils are also noted to contain gravels at various locations.

The upper portions of the site (part of Area B and Areas D and E) are mapped as being underlain by the Columbia River Basalt Group (Tcr). The basalt is noted to weather to "reddish-brown silty clay loam and gravelly silty clay loams." These weathered soils are generally called laterite. The laterite is considered to have a low to moderate plasticity index (Williams, 1972). Unweathered basalt is typically gray to black, fine-grained basalt. Unweathered basalt bedrock was observed in the quarry pit at the southeast corner of the property.

4.0 SEISMIC HAZARDS

Seismic hazard mapping of the Salem area and the Willamette Valley was completed by Wang and Leonard (1996) and Yeats, et al (1996), respectively.

The mapping by Yeats, et al (1996) notes that traces of several earthquake faults are located within about 2¼ miles of the subject site. While there is no conclusive evidence that these nearby fault traces are active, they have been assigned a low probability of activity by Geomatrix (1995). The nearest known active fault is the Mt. Angel Fault, located approximately 12 miles northeast of the property. No fault traces are mapped as passing through, or trending towards, the subject site. A portion of the Yeats, et al (1996) map has been reproduced in Figure B - Geologic and Tectonic Map. Several traces of the potentially active faults are shown on this portion of the map.

As part of their work, Wang and Leonard (1996) produced four earthquake hazard maps, which covered the Salem area. The maps included: a Relative Earthquake Hazard Map, a Landslide Susceptibility Map, a Liquefaction Susceptibility Map, and an Amplification Susceptibility Map. The relevant portions of these maps have been reproduced in Figures C through F, respectively.

The *Landslide Susceptibility Map* (Figure D) indicates that the lower portion of the site (Areas B, C, and part of D) is an area of *high susceptibility to landsliding in areas with existing landslides*. The area indicated as an "existing landslide" is located within the area mostly mapped by Bela (1981) as being underlain by high terrace deposits (Qth). The rest of the site is mapped by Wang and Leonard (1996) as areas with gentle to moderate slopes underlain by relatively shallow bedrock, with a relatively low potential for earthquake-induced landslide. During our site visit on September 25, 2002, we did not observe any obvious signs of active or recent large-scale landsliding. Topographic features indicate subdued slopes with no obvious recent scarps or grabens. It appears as though the large-scale landslide indicated by the map may be an ancient landslide that could have occurred thousands of years ago, and is essentially stable at this point in time. Discussions with Salem's Lead Development Services Engineer (Ron Derrick) indicate that City mapping considers the area to have a relatively low slope stability hazard potential.

The *Liquefaction Susceptibility Map* (Figure E) indicates that only the lowest portions of the site, along Strong Road, are underlain by potentially liquefiable materials. The mapping indicates that as much as 12 feet of potentially liquefiable soil may be present in the northernmost corner of the site. The potentially liquefiable soils are generally limited to areas underlain by lower terrace deposits (Qtlb).

The *Amplification Susceptibility Map* (Figure F) indicates that most of the site is within areas with the potential for maximum amplification of earthquake ground shaking of less than 1.4 times the peak bedrock acceleration. In areas with competent bedrock at or near the ground surface, little or no amplification should occur.

The *Relative Earthquake Hazard Map* (Figure C) is a composite map, which combines the relative hazards due to the potential for landsliding, liquefaction, and amplification. The lower portion of the subject site (Areas B, C, and part of A and D) is generally mapped as having an intermediate to high earthquake hazard. The high hazard ranking is a result of the mapping of the existing landslide in the lower portion of the site. The upper portions of the site (Areas D and E) are mapped as having the lowest to an intermediate hazard.

5.0 MISCELLANEOUS

During PBS' recent site visit (September 25, 2002) several miscellaneous geotechnically-relevant features were noted at the site:

(1) Three developed drainage swales/creeks are present at the site. These include Pringle Creek passing through Area A, and the two unnamed broad drainage swales in the upper, southwest portion of the property. Soft, wet soils were observed in all of these drainage areas. It is likely that development within or directly below the swales will be restricted for other reasons, however, should any development occur in *or directly below* these areas, then consideration will be required for the presence of the soft, weak materials.

(2) A large stockpile of concrete and asphalt debris was placed adjacent to the top of the roadway leading to the residences in Area E. It is estimated that 3,000 to 5,000 cubic yards of debris may be present in this area. The debris will need to be removed from that area, although it could potentially by recycled for use as roadbase or backfill material.

(3) Several areas of existing fill are present around the existing buildings. The fills are generally judged to be less than 6 feet thick. There is the potential that the fills are poorly compacted and may not be suitable for future building support. Most of the fill was observed near the crest of the slope at the southern end of Area A and along the outer edge of the roadway leading to the upper, western residences. Additionally some fill was present in the pigpen area in the southeast corner of the site. However, we note that the placement of thick fills around the property does not appear to have been a widespread practice.

(4) Significant metal debris was present in the quarry site in the southeast corner of the site.

On June 14, 2001, a representative from PBS spoke with John Cooper, Director of the State Office of Developmental Disability Services, about the subject site. Mr. Cooper reported that three buildings at the site had been demolished in the past. Two of the buildings had basements, and the demolition debris was backfilled into the basements. It will be necessary to determine the location of these buildings and to remove the demolition debris. (Reference: PBS Phase One Environmental Site Assessment)

6.0 SUMMARY

Based upon our site reconnaissance and review of local geologic and earthquake hazards maps, it is apparent the Fairview property is underlain by variable soil and bedrock deposits. The vast majority of the site is underlain by basalt bedrock that would generally be considered to be an acceptable and stable building material. However, the lower terrace deposits (Qtlb) in the lower portions of the property are potentially prone to settlement, earthquake-induced liquefaction, and amplification of earthquake ground shaking. The higher terrace deposits (Qth) mapped in the northeast and eastern portions of the site should be considered transitional materials, which may be susceptible to some, though not all, of the conditions, which may affect the lower terrace deposits. Additionally, some softer soils are likely to be present within and below the existing drainage swales/creeks at the site.

The northern and eastern portions of Area A are underlain by the greatest extent of poor quality materials. It is likely that special mitigation measures may be required to stabilize these soils in order to allow new development at the site. Such measures might include: stone columns, piles, mat foundations, subsurface drainage improvements, soil grouting, etc. Some seismically sensitive soils may also exist in the eastern corner of the site (northeast corner of Area D). However, other areas of the property are unlikely to require extensive seismic mitigation efforts due to subsurface conditions.

The lower, northeast half of the site is mapped by Wang and Leonard (1996) as consisting of a large existing landslide. However, this area is gently sloping with no signs of active or recent slide movements. Based upon the regional topography, it is possible the mapped area is an ancient landslide, which may have occurred thousands of years ago, when undercutting of the bedrock at the toe of the slope could have resulted from a meander of Mill Creek. (This is an on-going condition/problem on the west side of the hills, along the Willamette River.) This feature will need to be carefully investigated as part of a full-scale geotechnical investigation, however, it is our opinion there is a low probability the possible landslide feature will have a significant impact on re-development of the lower portion of the site.

The proposed developed will need to account for the presence of soft soils in lower portions of the site, and in or near the drainage swales, and for the potential presence of moderately plastic soils throughout the site. These conditions may result in the use of wider- or deeper-than-normal footings to reduce bearing pressures and improve resistance to seasonal soil shifting. In an extreme case of soft soil, the use of pin piles may be appropriate. Alternatively, conventional earthwork practices, such as removal and replacement of soft soils, can be employed.

There are also several items of relatively small consequence (e.g. old fills, debris piles, etc.) exist around the site; however, they are easily addressed via conventional methods during the development of the site.

7.0 REFERENCES

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Geomatrix, 1995, *Seismic Design Mapping State of Oregon Prepared for the Oregon Department of Transportation*, Personal Services Contract 11688

Wang, Y. and W.J. Leonard, 1996, *Relative Earthquake Hazard Maps of the Salem East and Salem West Quadrangles, Marion and Polk Counties Oregon*, GMS-105, State of Oregon, Department of Geology and Mineral Industries

Williams, L.H., 1972, *Soil Survey of Polk County Area, Oregon,* United States Department of Agriculture, Soil Conservation Service

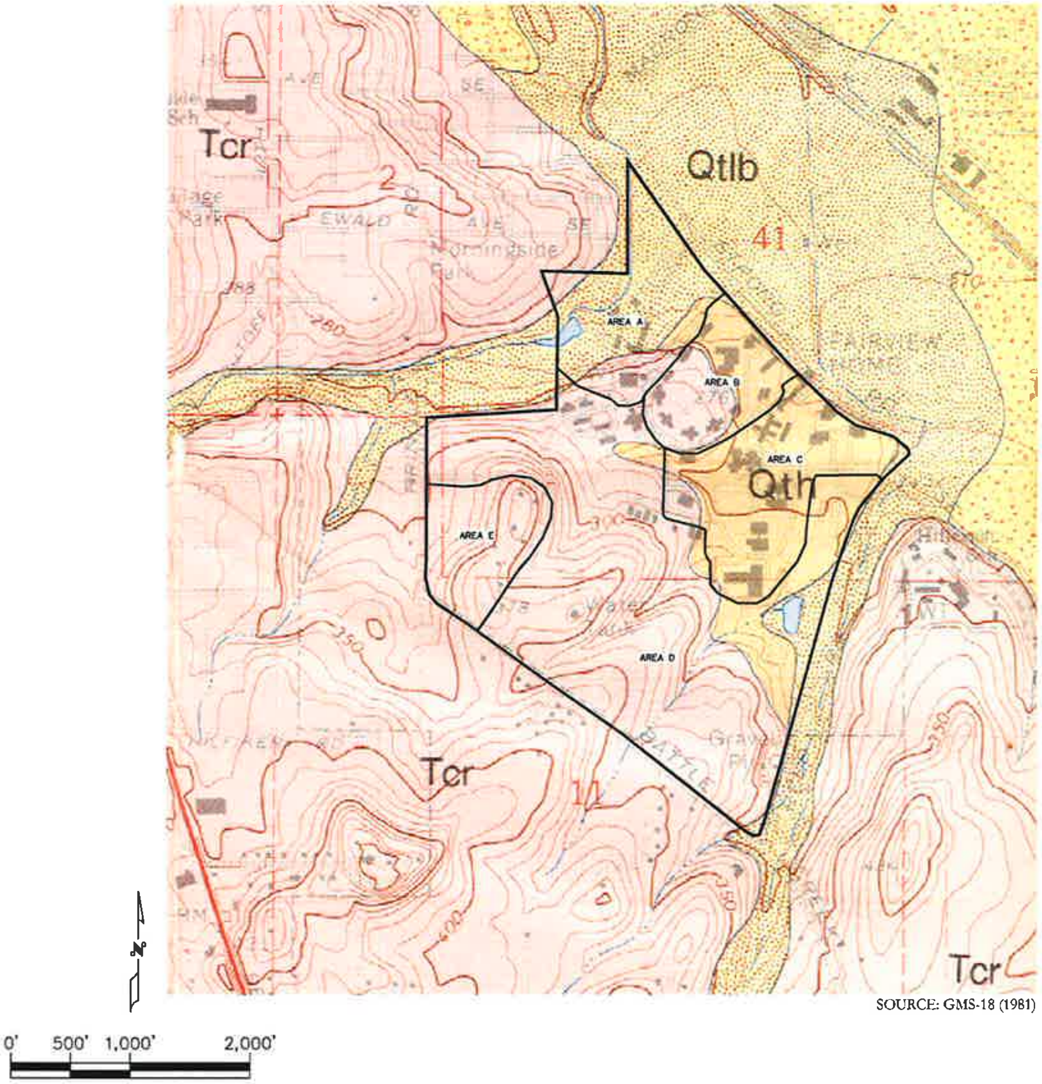
Yeats, R.S., E.P. Graven, K.S. Werner, C. Goldfinger, and T. Popowski, 1996, *Earthquake Hazards in the Pacific Northwest of the United States*, OFR 91-441-P, U.S. Department of the Interior, Geological Survey, 47 p.

Sincerely,
PBS Engineering and Environmental

Daniel J. Trisler, PE — Date
Senior Geotechnical Engineer

Guy M. Neal, PE — Date
Principal Engineer

FIGURES



SCALE: 1" = 1,000'

SOURCE: GMS-18 (1981)

LEGEND

Qtlb	[illegible]
Qtm	[illegible]
Qlg	[illegible]
Qth	**Higher terrace deposits (Quaternary-middle Pleistocene)** [illegible]
Tcr	[illegible]

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LOCAL GEOLOGIC MAP
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LOCAL GEOLOGIC MAP

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A
FIGURE

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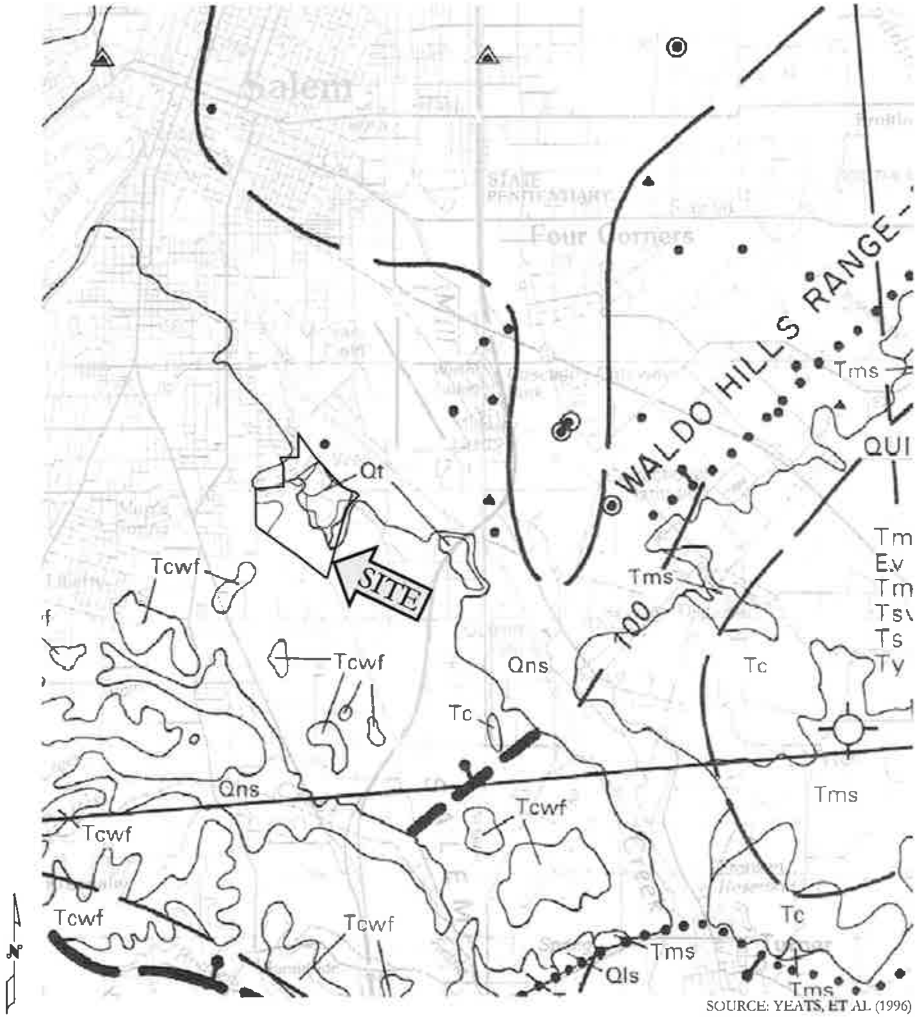

SOURCE: YEATS, ET AL (1996)

0' 2,500' 5,000' 10,000'

SCALE: 1" = 5,000'

LEGEND

Qns	Nonmarine sedimentary deposits (Holocene and Pleistocene)
Qt	High terrace gravels (Pleistocene)
Tc	Columbia River Basalt Group (Miocene), undivided Wanapum Basalt
Tcwf	Frenchman Springs Member
━┸━	Fault—Dashed where inferred; queried where uncertain; bar and ball on downthrown side. On cross sections, arrows show direction of relative movement; T, movement toward viewer; A, movement away from viewer
•••┸•••	Concealed fault—Dots grouped where location is unconstrained; bar and ball on downthrown side; queried where uncertain

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GEOLOGIC AND TECTONIC MAP
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GEOLOGIC AND TECTONIC MAP

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B

FIGURE

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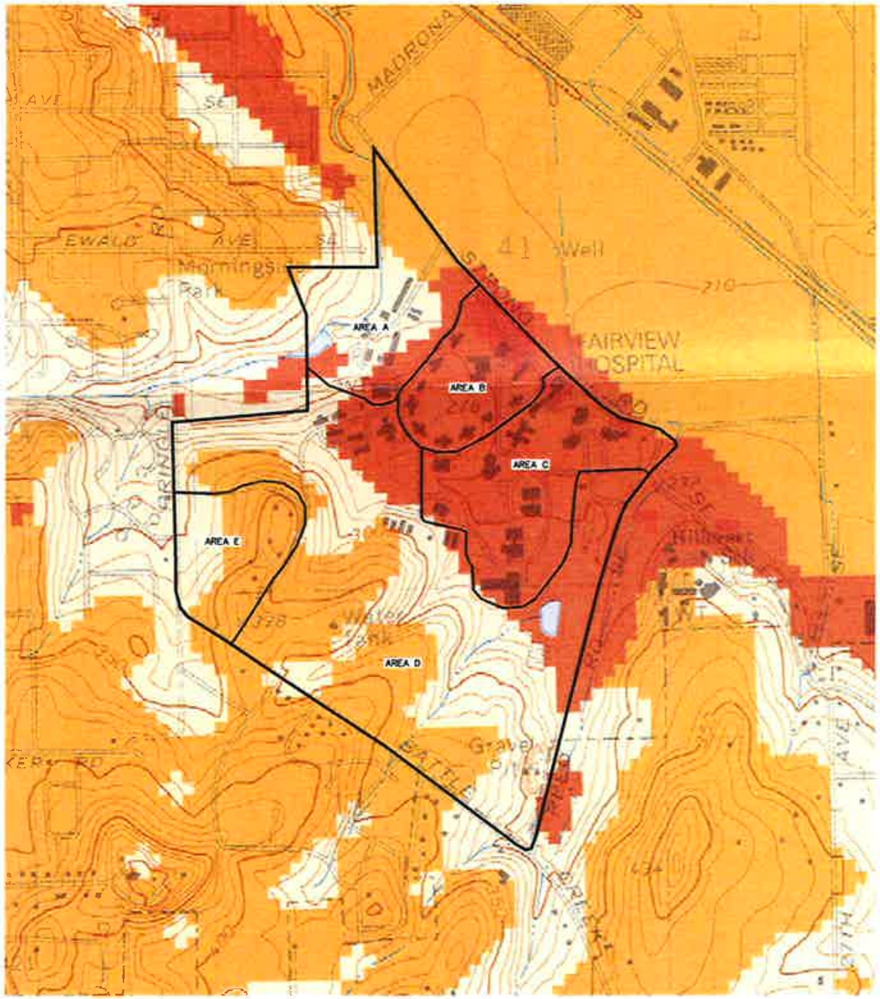

SOURCE: GMS-105 (1996)

0' 500' 1,000' 2,000'

SCALE: 1" = 1,000'

LEGEND

Zone A	🟥	Highest hazard
Zone B	🟧	Intermediate to high hazard
Zone C	🟨	Low to intermediate hazard
Zone D	⬜	Lowest hazard

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RELATIVE EARTHQUAKE HAZARD MAP
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RELATIVE
EARTHQUAKE
HAZARD MAP

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C
FIGURE

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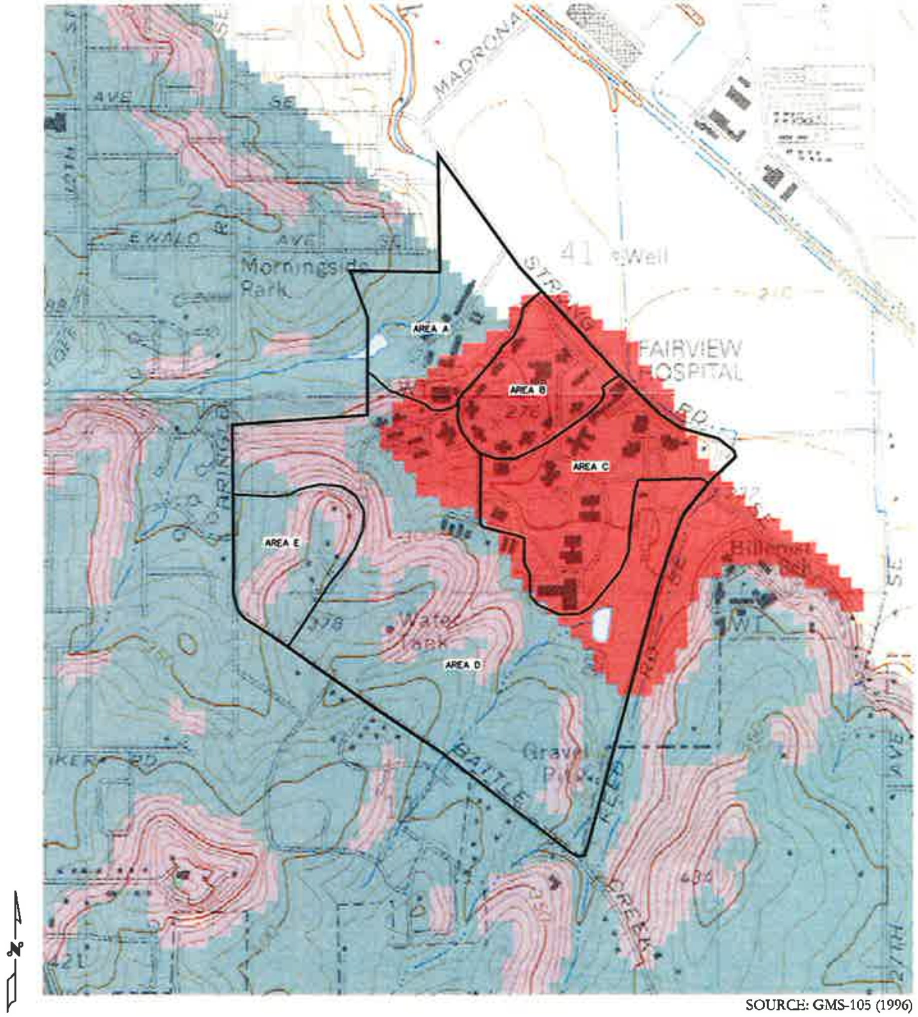

SOURCE: GMS-105 (1996)

0' 500' 1,000' 2,000'

SCALE: 1" = 1,000'

LEGEND

Category 5	🟥	High susceptibility to landsliding in areas with existing landslides
Category 4	🟥	>22 degrees of slope angle
Category 3	☐	≥14-22 degrees of slope angle
Category 2	▨	≥6-14 degrees of slope angle
Category 1	🟦	<6 degrees of slope angle in hills
Category 0	☐	<6 degrees of slope angle in valley

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LANDSLIDE SUSCEPTIBILITY MAP
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LANDSLIDE
SUSCEPTIBILITY MAP

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D
FIGURE

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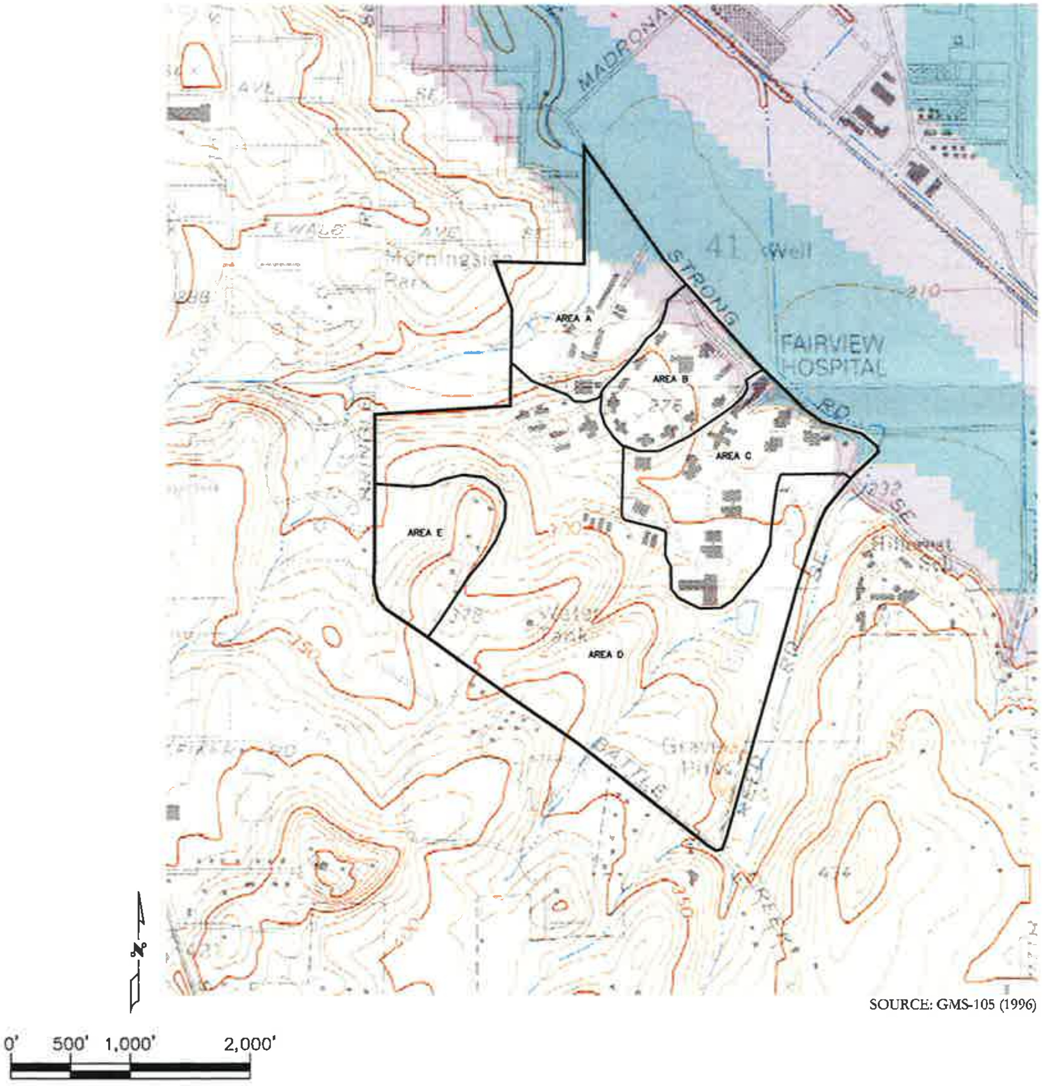

SOURCE: GMS-105 (1996)

SCALE: 1" = 1,000'

LEGEND

Category 2	▨	≥6-12 feet estimated thickness of liquefiable material
Category 1	🟦	<6 feet estimated thickness of liquefiable material
Category 0	☐	No susceptibility, with possible exceptions in small, localized areas

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LIQUEFACTION SUSCEPTIBILITY MAP
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LIQUEFACTION SUSCEPTIBILITY MAP

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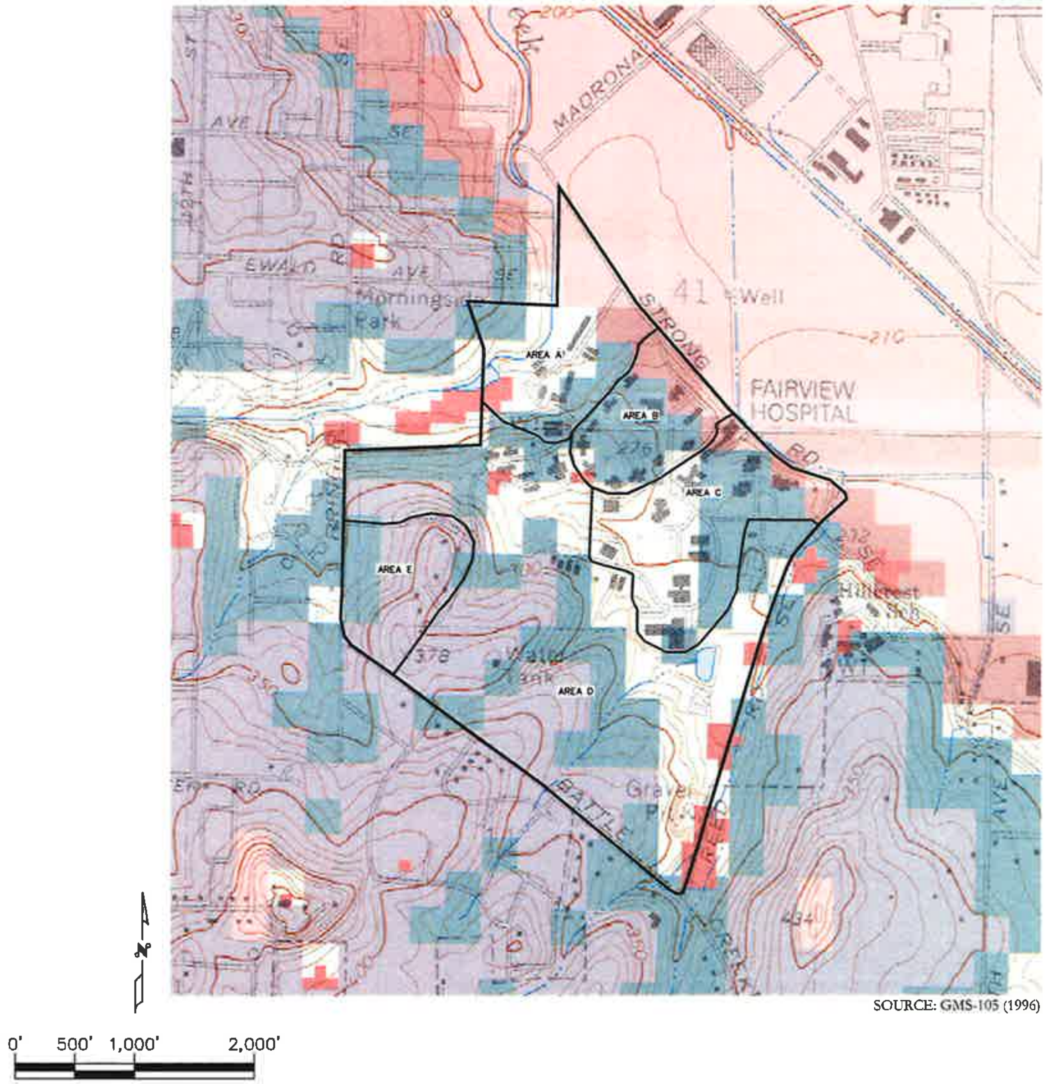
E
FIGURE



SOURCE: GMS-105 (1996)

0' 500' 1,000' 2,000'

SCALE: 1" = 1,000'

LEGEND

Category 5	🟥	Possible high susceptibility to amplification in areas of abrupt topographic changes
Category 4	🟥	>1.6 amplification factor for peak rock accelerations
Category 3	⬜	≥1.4-1.6 amplification factor for peak rock accelerations
Category 2	⬜	≥1.2-1.4 amplification factor for peak rock accelerations
Category 1	🟦	>1.2 amplification factor for peak rock accelerations
Category 0	┐	No susceptibility (stable bedrock at or near the surface), with possible exceptions in small, localized areas

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AMPLIFICATION SUSCEPTIBILITY MAP
FAIRVIEW TRAINING CENTER
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AMPLIFICATION SUSCEPTIBILITY MAP

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F
FIGURE

APPENDIX A

PBS Resumes

DANIEL J. TRISLER, P.E.

SENIOR GEOTECHNICAL ENGINEER

Education	Cornell University, M.Eng., Geotechnical Engineering, 1993. Cornell University, B.S., Civil Engineering, 1992.
Accreditations	Registered Professional Engineer, Oregon, PE#69386 Registered Civil Engineer, Washington, PE#38279 Registered Civil Engineer, California, PE#54676
Memberships	American Society of Civil Engineers (ASCE)

Daniel Trisler is a professional geotechnical engineer with experience on hundreds of projects in the Western US, including municipal wastewater, drinking water, transportation, steep slopes and stormwater management. He also has experience in land development (subdivision & mixed use), deep foundations, and seismic evaluations in high risk geographic locations. He has also overseen assessments of a number of municipal, commercial, and industrial projects along with insurance and litigation projects.

Mr. Trisler has extensive experience with "problem" soils, such as: liquefiable sands, unstable slopes, and weak alluvial deposits. He has conducted numerous site investigations, forensic studies of distressed structures, investigations for landslide repairs/stabilization, and drainage evaluations. Mr. Trisler has significant experience managing and overseeing project engineers and geologists on various-sized projects, performing field investigations, conducting construction monitoring and testing services, and preparation of reports.

Career Highlights

- Geotechnical Engineer, Geotechnical consulting for a wastewater treatment plant upgrade project for the City of Garibaldi, Oregon
- Geotechnical Enginee, Manzanita Water District; New Pile-Supported Well Pump House, Geotechncal Investigation, Manzanita, Oregon
- Geotechnical Engineer, Geotechnical engineering work related to the building of a new city water reservoir, Oakland, Oregon
- Geotechnical Engineer, Lebanon School District, Additions to Two School Buildings, Geotechnical Investigations and Seismic Hazard Studies
- Geotechnical Engineer, Walker Middle School, Salem, Oregon, New Gymnasium and School Additions with Auger-Cast Piles, Construction Monitoring
- Geotechnical Engineer, Jackson County Fire Districts #3 and #5, Two New Fire Stations with Liquefaction Mitigation, Geotechnical Investigations and Seismic Hazard Studies
- Project Engineer/Manager, Hundreds of Residential and Mixed-Use Developments, California, Oregon, and Washington, Geotechnical Investigations and Construction Monitoring
- Project Engineer, Numerous Distressed Buildings, California and Oregon, Forensic Investigations for Insurance Companies, Private Owners, and Law Firms
- Project Engineer, Numerous Projects, California, Oregon, and Washington, Design of Segmental CMU and Stone Gravity Retaining Walls
- Project Engineer/Manager, Crossings Condominiums, New Structure with Underground Parking and Dewatering System, Mountain View, California, Geotechnical Investigation and Monitoring
- Geotechnical Engineer, Desert Glade and Harvest Meadows Subdivisions, 26- and 76-Lot Subdivisions, Richland, Washington, Geotechnical Investigations
- Geotechnical Engineer, Mud Mountain Dam Maintenance and Storage Buildings, Enumclaw, Washington, Geotechnical Investigations and Construction Monitoring
- Project Engineer, Additions to and Remodel of San Mateo County Library, Redwood City, California, Geotechnical Investigation and Construction Monitoring

GUY M. NEAL, P.E.

PRINCIPAL / ENVIRONMENTAL AND CIVIL ENGINEER

Education	B.S., Construction Engineering Technology, Montana State University, 1986
Accreditation	Professional Environmental Engineer (Oregon) Professional Civil Engineer (Oregon, Washington) OSHA 40-hour (Oregon) & 80- hour (Washington) Hazardous Waste Training OSHA 24-hour Emergency Response Team Training
Memberships	American Society of Civil Engineers (ASCE) Air and Waste Management Association (AWMA) Oregon Air National Guard – Restoration Advisory Board, Co-Chair Clean Water Services – Clean Water Advisory Council, Representing District #2

Mr. Neal is the principal in charge of PBS' engineering division, which provides geotechnical, civil, environmental, and ACAD/GIS services to our clients. He oversees the civil and environmental engineering design for site development (utilities, road improvements, foundations), underground storage tank installations, treatment system design, hazardous waste management unit design, and other projects involving civil, geotechnical and environmental expertise. Mr. Neal is a civil and environmental engineer specializing in the control and treatment of storm water for new construction and retrofits of existing facilities. He has project experience for jurisdictions throughout western Oregon and Washington. His designs have included innovative approaches to detaining and treating storm water from new developments and from process areas at manufacturing facilities. He also has experience in utility design, underground storage tank systems, wastewater treatment design, and road improvements.

Representative Projects

- Department of Corrections -Various Sites. Engineer for design of several projects for DOC at existing facilities. Projects included vehicle washing facility, UST upgrades, sewer replacement, and fuel island upgrades. Project bidding, contract management, and construction inspections were provided.
- Pipeline Remediation – Precision Castparts. Project Environmental/Civil Engineer for the design of wastewater conveyance system used during the decontamination of 6,000 feet of a trunkline combined sewer system that was contaminated with Thorium oxides.
- Holden Creek Relocation Project, Tillamook, Oregon. Project Manager for planned upgrades to an operational lumber mill located in Tillamook, Oregon. Planning included upgrades to site utilities and movement of an existing creek to eliminate impacts by the facility.
- Tualatin Valley Fire & Rescue (TVF&R) Multiple Fire Stations, Washington County, Oregon. Design Engineer responsible for site development of a new fire stations located in Washington County, Oregon. Responsible for geotechnical, grading/roads, utilities, erosion control, and construction inspections during development of each site.
- City of Bend, Public Service Buildings, Bend, Oregon. Principal Engineer during geotechnical and civil design and construction observations during development of four public service buildings for the City of Bend.
- Fair Oaks Drive Project – City of Corvallis. Principal Engineer in charge of site development design for a new street located in Corvallis, Oregon. Work included wetland mitigation, new street design, bridge, grading, sewer pump station and water supply piping.
- U.S. Postal Service, Tukwila (WA) Distribution Center. Principal Engineer in charge of storm water retrofit design of an existing storm water drainage system. Work included pump station design, oil/water separators, erosion control, pond redesign, and piping layout.
- Dammasch – Sewer Treatment Plant Demolition. Principal Engineer for the design and contract oversight for demolition of the former State of Oregon hospital's sewer treatment plant located in Wilsonville, Oregon. Coordinated hazardous material studies, geotechnical review, agency permitting, and developed design and contract documents for project.

Appendix "D"

MULTI/TECH
ENGINEERING SERVICES, INC.

WIKIPEDIA

Coordinates: 44.8978981°N 123.0137063°W

Fairview Training Center

The **Fairview Training Center** was a state-run facility for people with developmental disabilities in Salem, Oregon, United States. Fairview was established in 1907 as the State Institution for the Feeble-Minded. The hospital opened on December 1, 1908 with 39 patients transferred from the Oregon State Hospital for the Insane.[3] Before its closure in 2000, Fairview was administered by the Oregon Department of Human Services (DHS).[4] DHS continued to operate the Eastern Oregon Training Center in Pendleton[5][6] until October 2009.

Fairview Training Center

State of Oregon

LeBreton Cottage at Fairview, built in 1908

Geography	
Location	Salem, Oregon, United States
Coordinates	44.8978981°N 123.0137063°W[1]
Organization	
Care system	Public
Hospital type	Psychiatric hospital
History	
Founded	1907[2]
Closed	March 01, 2000[2]
Links	
Lists	Hospitals in Oregon
Other links	Oregon State Hospital

Contents

History

Early history

In 1907, the **Oregon State Institution for the Feeble-Minded** was created by the Oregon State Legislature.[2] It was established as a quasi-educational institution charged with educating the "feeble-minded" (today known as people with intellectual disability and various other developmental and learning disabilities) and caring for the "idiotic and epileptic."[2] The facility was overseen by a Board of Trustees consisting of the Governor, Secretary of State and State Treasurer.[2] Construction had progressed enough by 1908 that the first patients were transferred from the Oregon State Insane Asylum (now the Oregon State Hospital).[2] They resided on a 670-acre (270 ha) compound consisting of an administration building (LeBreton Cottage),[7] a dormitory, a laundry and boiler house.[2] By 1913, two more cottages where constructed and the Board of Trustees was replaced by the Oregon State Board of Control.[2]

In 1917, a commitment law was passed that was to standardize admissions to the institution by insuring that valuable space was used for the "feeble-minded" and not for the "insane".[2] It also imposed an age limit on admissions to people five years of age and older.[2] The age limit was removed in 1921.[2]

The institution had a working farm that provided both food and training for its residents.[2] By 1920, most of the land to be used for farming had been cleared.[2] 400 acres (160 ha) were planted in crops and 45 acres (18 ha) in orchards.[2] The farm also raised hogs, chickens, and dairy and beef cattle.[2]

In 1923, the legislature established the Oregon Board of Eugenics, and Fairview's superintendent served as an ex-officio board member.[2] The eugenics legislation provided for the "sterilization of all feeble-minded, insane, epileptics, habitual criminals, moral degenerates, and sexual perverts who are a menace to society."[2] Sterilizations required either the person's consent or a court order.[2] By 1929, 300 residents had been sterilized.[2]

Two types of parole for residents were established in 1931: home parole and industrial parole.[2] Requirements for parole included a surety bond filed by the parolee's guardian or overseer, who had to have a net worth of at least $1000 and have lived in the state for at least six months, the parolee had to be sterilized, and the home or workplace had to be inspected.[2] Two-thirds of residents who had been sterilized were paroled, which freed up beds for new patients.[2]

In 1933 the facility was renamed **Oregon Fairview Home.**[2]

Changes in care and additions to the facility continued through the 1940s-1960s, and improvements were made to the medical care and nutrition of the residents.[2]

In 1965, Oregon Fairview Home was renamed **Fairview Hospital and Training Center.**[2]

In the late 1960s, the orchard, raising of beef, and general farm activities were eliminated.[2] The raising of hogs was eliminated in 1975 and poultry processing ended in 1977.[2] These activities had formerly provided all the ham, bacon, sausage, eggs, broiler chickens, and pork chops used by Fairview.[2]

In 1969, the Board of Control was dissolved and the Mental Health Division placed under the newly created Executive Department of the state government.[2]

In 1979, the facility changed its name from Fairview Hospital and Training Center to Fairview Training Center.[2]

Modern history

Fairview was closed on March 1, 2000.[2]

A group known as Sustainable Fairview Associates purchased 275 acres (111 ha) of the former Fairview grounds in 2002.[8] The land included several historic buildings.[9]

In 2004, Sustainable Fairview Associates sold 32 acres (13 ha) of their holdings to Sustainable Development Inc. for building Pringle Creek Community, a sustainable housing development.[9][10]

Pierce Cottage, one of several buildings remaining on the former Fairview site, was gutted by a fire of suspicious origin in January 2010.[11][12] The building had previously been slated for demolition and recycling.[13] Two men were charged with arson in connection with the fire the next month. All remaining cottages were demolished in 2016.[14]

Superintendents

H.E. Bickers 1908-1912 Frank E. Smith, M.D. 1913-1914 J.H. Thompson, M.D. 1914-1915 J.N. Smith, M.D. 1915-1929 R.D. Byrd 1930-1938 Horace G. Miller M.D. 1939-1944 Ray M. Waltz, M.D. 1944-1946 Irvin B. Hill, M.D. 1946-1959 Jim Pomeroy, M.D. 1960-1970 Larry W. Talkington, Ph.D. 1970-1976 Jerry E. McGee, Ed.D. 1977-1987 Linda K. Gustafson, Ph.D. 1989-1991 Rosemary C. Hennessy 1991-1995 Charles Farnham 1995-1997 Jon E. Cooper M.B.A. 1997-2000

Cottages

The cottages on the grounds housed both staff and patients. Some of the structures were named after Oregon governors, including:

- Benson Cottage - Frank W. Benson
- Chamberlain Cottage - George Earle Chamberlain
- Lane Cottage - Joseph Lane
- Martin Cottage - Charles Martin
- Meier Cottage - Julius Meier
- Pierce Cottage - Walter M. Pierce (*image (https://www.flickr.com/photos/9681449@N05/2177526396/in/set-72157600659175511/)*) Destroyed by fire January 27, 2010[11]
- Smith Cottage - Elmo Smith
- Snell Cottage - Earl Snell
- Withycombe Cottage - James Withycombe

Fairview in the media

- ***Where's Molly?*** is a 2007 documentary about Molly Daly who was institutionalized at the Fairview Hospital and Training Center in the 1950s[15]
- *Population: 2* is a post-apocalyptic film that features Fairview heavily as a location and contains the last footage of the center taken before its dismantling began in 2011

See also

- List of institutions for the mentally disabled

References

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2. "Fairview Training Center: Agency History" (https://web.archive.org/web/20120131193928/http://bluebook.state.or.us/state/executive. *Oregon Blue Book*. Oregon Secretary of State. 1994. Archived from the original (http://bluebook.state.or.us/state/executive/Mental_Health/fairview.htm) on 2012-01-31. Retrieved 2018-01-11.
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4. House Bill 3599, (http://www.leg.state.or.us/03reg/measures/hb3500.dir/hb3599.intro.html) Seventy-second Oregon Legislative Assembly (2003)
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12. Guerrero-Huston, Thelma; Michael Rose (January 29, 2010). "Fire raises suspicions" (http://www.statesmanjournal.com/article/20100129/NEWS/1290326/Fairview-fire-raises-suspicions). *Statesman Journal*. Retrieved 2010-01-29.
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15. "Review: "Where's Molly?"" (http://blog.oregonlive.com/madaboutmovies/2007/03/review_wheres_molly.html). OregonLive.com. March 9, 2007. Retrieved January 26, 2009.

External links

- Historic images of Fairview (http://photos.salemhistory.net/cdm4/results.php?CISOOP1=all&CISOBOX1=&CISOFIELD1=CISOSEARCHALL&CISOOP2=exact&CISOBOX2=Fairview%20Training%20Center&CISOFIELD2=CISOSEARCHALL&CISOOP3=any&CI from Salem Public Library.
- Images of abandoned structures at Fairview (http://boundless.uoregon.edu/cdm4/results.php?CISOOP1=exact&CISOFIELD1=CISOSEARCHALL&CISOROOT=/archpnw&CISOBOX1=Fairview+Training+Center++Salem%2C+Oregon+) from the University of Oregon digital archives
- *Where's Molly* (http://wheresmolly.net) official website
- "In Our Care" a 1959 film about Fairview (http://blog.oregonlive.com/oregonianextra/2007/11/video_fairview.html) from *The Oregonian*
- "Away from the Public Gaze": A History of the Fairview Training Center and the Institutionalization of People with Developmental Disabilities in Oregon (http://www.institutionwatch.ca/cms-filesystem-action?file=research/fairview_report.pdf) from The Teaching Research Institute at Western Oregon University
- Photo essay of closed Fairview site (https://www.flickr.com/photos/9681449@N05/sets/72157600659175511/) from Flickr