

July 28, 2023

Donna Holt Executive Director Linn Benton Housing Authority 1250 Queen Avenue SE Albany, Oregon

RE: GEOTECHNICAL ENGINEERING INVESTIGATION MULTI-FAMILY RESIDENTIAL DEVELOPMENT TAX MAP 11S-03W-08DB TAX LOT 06000 2080 QUEEN AVENUE SE ALBANY, OREGON BRANCH ENGINEERING INC. PROJECT NO. 23-321

Pursuant to your authorization, Branch Engineering Inc. (BEI) performed a geotechnical engineering investigation at the subject site located in Albany, Oregon for the proposed construction of a multi-family residential apartment complex. The accompanying report presents the results of our site research, field exploration and testing, data analyses, as well as our conclusions and recommended geotechnical design parameters for the project.

Based on the results of our study, no major geotechnical/geologic hazards were identified at the site that would impede the proposed development or adjacent lots, provided that the recommendations of this report are implemented in the design and construction of the project.

We appreciate the opportunity to be of service to you. Please contact the undersigned if you have questions or concerns regarding this report.

Sincerely, *Branch Engineering Inc.*



EXPIRES: 12/31/2023

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TABLE OF CONTENTS

1.0	INTRODUCTION	1
1.1	Purpose and Scope of Work	1
1.2	Project Location and Description	1
1.3	Site information Resources	1
2.0	GEOLOGIC SETTING	2
2.1	Regional Geology	2
2.2	Site Geology	2
2.3	Regional Seismicity	3
3.0	SITE SUBSURFACE CONDITIONS	3
3.1	Subsurface Soils	3
3.2	Laboratory Testing	4
3.3	Mapped Soils	5
3.4	Groundwater	5
4.0	GEOLOGIC HAZARDS	5
5.0	CONCLUSIONS	6
6.0	DESIGN RECOMMENDATIONS	6
6.1	Foundation Subgrade Recommendations	7
6.2	Structural Slab-On-Grades	7
6.3	Friction Coefficient and Lateral Earth Pressures	8
6.4	Private Paved Area Subgrade and Pavement Recommendations	8
6.5	Structural Fill	10
6.6	Seismic Site Classification	10
7.0	CONSTRUCTION CONSIDERATIONS	10
7.1	Wet Weather/Dry Weather Construction Practices	10
7.2	Excavations	11
7.3		
	Site Drainage	11
7.4	Site Drainage Geotechnical Construction Site Observations	11 11

FIGURE 1 – Site Vicinity Map FIGURE 2 – Site Investigation Photo with Project Overlay FIGURE 3 – 1956 Aerial Imagery of Site Vicinity FIGURE 4 – 1963 Aerial Image of Site Vicinity FIGURE 5 – Site Vicinity Geology Map

APPENDIX A – Figure A-1 USCS Soil Key, Test Pit Logs, OWRD Well Logs, NRCS Soil Survey

APPENDIX B - Recommended Earthwork Specifications

1.0 INTRODUCTION

1.1 Purpose and Scope of Work

The purpose of this work is to establish and present geotechnical engineering criteria and requirements related to the site and subsurface conditions that may influence the design and construction of the proposed project. Our scope of work included a field reconnaissance with a subsurface investigation observed by BEI personnel, an engineering data review of existing geologic and geotechnical reports in the site vicinity, infiltration testing results with results presented in a separate report, and other pertinent site research activities that culminated in the preparation of this report.

1.2 Project Location and Description

The subject site consists of rectangularly shaped lot located at the coordinates of 44.624914° North Latitude, and 123.078871° West Longitude, in Albany, Oregon (see Figure-1, Vicinity Map).

The project site is located approximately 1.3-miles south of the Willamette River, and 0.8-miles west of Interstate 5. The surrounding land use is primarily multi and single-family residential, with Willow Queen Avenue SE and single-family residences on the north, an electric substation on the west, a single-family residence and vacant field to the east, and a multi-family (senior) residential complex to the south. At the time of our site visit the vegetation was limited to a turf surface with deciduous trees along the west, north, and northeast perimeter. The majority of the site is elevated above the surrounding land by 4- to 6-feet, otherwise topography on the site, and in the site vicinity is relatively flat. (See Figure-2 for Site Investigation Photo).

Historical aerial imagery dating from 1956 and 1963 is not of a high enough resolution to show the site clearly, but it is likely agricultural land with scattered rural residential housing. Google Earth imagery from 1994 to 2022 shows a structure in the southeast area of the site, with the rest of the land appearing as a vacant grass covered field. No grading or site developments appear to have occurred on the site until sometime between 1994 and 2000, with the Google Earth image dated to July 2000 showing what appears to be construction activity. By May of 2002 Clayton Meadows Senior Apartments to the south of the site are fully constructed and the site appears much as it did at the time of our site investigation. Site topography, historical imagery, and subsurface materials logged by BEI during our site investigation indicate the site was used as a repository for soil and/or aggregate fill, no documentation for placement of the fill was presented to BEI at the time this report was prepared; however, it likely occurred during construction of the Clayton Meadows Senior Apartments (See Figures 3 and 4 for historical aerial imagery.

A preliminary site plan provided to BEI by the client shows a muti-family residential structure on the western portion of the site. A parking lot system is shown with access to the structure from the south (see Figure-2 Site Investigation Photo with Project Overlay).

1.3 Site information Resources

The following site investigation activities were performed and literature resources were reviewed for pertinent site information:

- Google Earth, earth.google.com
- Linn County GIS Surveyor Map Application Online Viewer
- Seven (7) test pits were excavated to a maximum depth of 8-feet below ground surface (BGS)

on July 11, 2023.

- Review of the Web Soil Survey, United States Department of Agricultural (USDA) Natural Resources Conservation Service (NRCS) (attached in Appendix A).
- Review of Oregon Department of Water Resources Well Logs (attached in Appendix A).
- Oregon Department of Geology and Mineral Industries (DOGAMI) web hazard viewer.
- McClaughry, J.D., Wiley, T.J., Ferns, M.L., & Madin, I.P. 2010. Geology of the Southern Willamette. DOGAMI. Open-file Report O-10-03.
- Geology of Oregon, sixth edition by Orr, Orr and Baldwin, 2012.
- Historical aerial imagery. Oregon State University library online
- USGS U.S. Quaternary Faults
- Oregon Structural Specialty Code 2022 (OSSC 2022), applicable building code criteria
- The Oregon Resilience Plan, February 2013.

2.0 GEOLOGIC SETTING

The following sections describe the regional and local site geology and a brief discussion of regional seismicity.

2.1 Regional Geology

The subject site lies within the central portion of the Willamette Valley, east of the Coast Range and west of the Cascade Mountains Provinces. In Oregon, the Willamette Valley is an elongate basin which narrows at both ends before terminating in the Calapooya Divide to the south and the Columbia River to the north. The basin is approximately 130 miles long and 40 miles wide. The valley is drained by the Willamette River and drops from an elevation of approximately 400-feet at Eugene, to near sea level at the northern end of the basin where the Willamette River drains into the Columbia River.

The Willamette River Valley in the area of the subject site is believed to be heavily influenced by historic hydrology, including the movement and sediment deposition of the Willamette River and its tributaries. The Willamette River once moved frequently throughout the valley floor and often overflowed onto the low-lying floodplains. During the last deglaciation and the resulting termination of the Last Glacial Maximum in North America, the Willamette Valley was cyclically flooded by catastrophic breaks in the ice dams of Glacial Lake Missoula. Occurring several times over an approximately 2,000-year period between 13,000 to 15,000 ago, these flood events filled the valley to an elevation of 350- to 400-feet before retreating, causing sequences of upward fining deposits of silt and clay that may or may not still be present in areas depending on erosion by subsequent fluvial actions. Much of these deposits have since become developed and urbanized.

2.2 Site Geology

The DOGAMI open file reports O-71-03 (Figure-5 Site Vicinity Geology) maps the site geologic unit as Terrace and Fan Deposits (Qtf). Described as deeply dissected, unconsolidated to semi-consolidated deposits of gravel, sand, silt, and clay that form upper alluvial terraces along the Willamette. The unit is interpreted as fluvial braid plain sediments deposited in broad fans and upland terrace complexes. These descriptions are generally consistent with our investigations findings of soils derived from alluvium beneath the undocumented fill.

2.3 Regional Seismicity

The nearest mapped active fault to the site is the Corvallis Fault, located 7.5-miles to northwest across the Willamette River. The Lebanon Fault, which is aligned northwest to southeast approximately 0.8-miles to the southwest of the site. The East Albany Fault, which is aligned southwest to northeast, is located approximately 1.2-miles to the southwest. These faults are not known to be active, as they are not listed in the online United States Geologic Survey Quaternary Faults online map; however, seismic activity is not uncommon in the Willamette Valley as evidenced by the 1993 Scotts Mills Earthquake east of Salem that registered a 5.7 moment magnitude and most recently a 4.2 magnitude earthquake about 12-miles east of Eugene.

The greatest source of potential seismicity that would affect the site is the Cascadia Subduction Zone (CSZ) located off the coast of Oregon, Washington, and the northern portion of California that has the potential to produce very large earthquakes on the order of 300 to 500 years—see the published CSZ timeline below. The last known mega-thrust CSZ earthquake (Magnitude 9.0 +/-) to take place in the Pacific Northwest occurred in January of 1700.



3.0 SITE SUBSURFACE CONDITIONS

The analyses, conclusions, and recommendations contained in this report are based on site conditions as they presently exist and assume that the results from the subsurface explorations presented in Appendix A are representative of the subsurface conditions throughout the site. If during construction the subsurface conditions differ from those encountered in the exploratory borings, BEI requests that we be informed to review the site conditions and adjust our recommendations, if necessary.

3.1 Subsurface Soils

Visual classification of the near surface soils was performed in accordance with the American Society of Testing and Materials (ASTM) Method D-2488 and the Unified Soil Classification System (USCS). BEI personnel observed seven (7) test pits excavated to a maximum depth of 8-feet BGS using a rubber tracked min-excavator equipped with a 12-inch-wide toothed bucket. The locations were selected to provide a generalized view of the subsurface soils present in the areas of proposed development. The results of our exploration activities are summarized below:

Test Pits 1, 3, 4, and 5.

- Sparse grass surface then brown silt with roots to a maximum depth of 0.25-feet BGS.
- Undocumented fill primarily consisting of brown silt with subangular and angular gravel. Some plastic and asphalt. A 3-inch diameter metal pipe was found at 4-feet BGS in Test Pit 4, and at 3-feet BGS in Test Pit 5, alignment suggested it was the same pipe encountered in both test pits. The undocumented fill generally averaged 4-feet in depth on the raised area of the site.
- Brown clay (CL) with some silt and very fine-grained sand, slight to very heavy oxidation staining. Interpreted as native alluvial deposits from a low energy fluvial environment. In Test Pit-3 we logged gray-blue clay at approximately the same elevation as we encountered the brown clay in the other excavations. The gray-blue clay extended to the maximum depth the excavator could achieve at 8-feet below the adjacent ground surface. The material appeared native.

Test Pit 2, and Infiltration Test Pits 1 and 2

- Topsoil Bare or sparse grass surface overlying brown clay (OL-OH) with some fine roots, from the surface to 1.5-feet BGS.
- Brown clay (CL) with some silt and very fine-grained sand, slight to very heavy oxidation staining. Interpreted as native alluvial deposits from a low energy fluvial environment.

Well logs in the site vicinity were obtained from the Oregon Department of Water Resources online database are attached in Appendix A. The logs are similar, showing fine-grained soils overlying coarse-grained soil which were found at 19-feet in Well L18999 located 400-feet to the north. The alternating fine- and coarse-grained soils shown in the well logs are consistent with an alluvial depositional history.

3.2 Laboratory Testing

Representative soil samples were collected at the site for laboratory testing. The resulting in-situ moisture contents (ASTM D2216) and Free Swell (IS-2720) test results are tabulated below.

Test Location	Depth BGS (feet)	Soil Description	Moisture Content (%)	Free Swell (%)	Swell Rating
TP-1	3	Brown clay (CL)	9 %	20%	Low
TP-2	4	Brown-gray clay (CL)	19 %	20%	Low
TP-3	5	Gray-blue clay (CL)	22%	30%	Low

Table 1: Lab Testing Results

Results show the underlying soils have a low shrink/swell potential which is consistent with testing of similar soil by BEI in the site vicinity.

3.3 Mapped Soils

The USDA NRCS map, shown in Appendix A, shows that the project site has one soil unit present and is summarized below. These descriptions are in general agreement with our site observations.

• Concord silt loam. Described as terrace deposits of silt loam, and silty clay derived from a parent material of silty and clayey alluvium derived from mixed sources. The soil unit is described as poorly drained and having a hydric soil rating. This description is consistent with the soil observed underlying the undocumented fill.

3.4 Groundwater

BEI staff observed the test pit excavations for the infiltration tests and the geotechnical test pits, which were advanced to a maximum depth of 8-feet BGS for deeper soil observations. We did not encounter the regional groundwater table in any of the site excavations. The attached well logs indicate that groundwater was measured between 6- and 13-feet BGS at the well's locations. The depth at which water was first found varied from 12- to 54-feet BGS, which indicates the presence of confined aquifer systems in the site vicinity.

We expect that groundwater levels (from the regional water table or perched lenses) will fluctuate with the seasons and should be expected to be highest during the late winter and spring months when rainstorms are more intense and frequent, and soils are near saturation. The presence of groundwater is not expected to impact shallow foundations, but perched lenses may occur during the wetter months of year.

4.0 GEOLOGIC HAZARDS

OSSC 2022 (1803.5.11) required criteria for hazards the geotechnical investigation shall address for seismic site class designations C through F are listed below with slope stability being addressed in the following section.

- <u>Slope Instability</u>: The DOGAMI geohazard viewer maps the site has having low landslide hazard present on the site. The viewer does not show any mapped landslides present on, or around, the site due to the relatively gentle slopes present on the site. It is our opinion that because of a lack of slopes susceptible to landslides, the risk to the site is low.
- <u>Liquefaction</u>: Liquefaction is caused by a rapid increase in porewater pressure within a saturated soil that reduces the interparticle friction between soil grains that can lead to the sudden loss of shear strength within the soil. This can cause a loss of bearing capacity, densification of subsurface soils that can lead to large surficial settlements, and the migration of soil particles to the surface in the form of sand boils. Loose, granular sands with a low fine-grained soil content and a recent depositional history are especially vulnerable to liquefaction.

The DOGAMI online hazard viewer map shows a high liquefaction risk at the site. During our explorations we observed primarily fine-grained soils that are not usually susceptible to liquefaction. Because of the depth to groundwater and the low probability of saturation occurring simultaneously with a large seismic event, it is our opinion that there is little risk for liquefaction to occur that would impact site structures. The Oregon Resilience Plan shows

the potential for greater than 1-foot of ground movement because of liquefaction in the general site vicinity.

- <u>Expected Earthquake Shaking</u> The site is mapped within the zone of severe shaking that would typically be associated with very large earthquakes generated from the CSZ off the Oregon coastline.
- <u>Surface Displacement Due to Faulting or Seismically Induced Lateral Spreading or Lateral</u> <u>Flow</u>: There are no known faults on the site that could cause large surficial displacements. The site soils are at a low risk for liquefaction that would allow for lateral spreading to occur, and this would likely be localized to developments along the river frontage to the south of the site. Surface displacement or seismically induced lateral spreading is not expected at the site.
- <u>Tsunami/seiche</u>: No major bodies of water capable of generating a Tsunami or seiche are near enough to the site to effect it. Therefore, risk of a tsunami or seiche affected the site is nonexistent.
- <u>Shrink/swell</u>: As discussed in section 3.2, our laboratory testing found that site soils have a low potential for expansion.
- <u>Flood Hazard:</u> Based on the DOGAMI HazVu viewer, the site is not mapped within a flood hazard zone.

5.0 CONCLUSIONS

Based on our field observations, subsurface explorations, and data analyses, we conclude that the site is geologic and geotechnically suitable for the proposed development provided that the recommendations of this report are incorporated into the design and construction of the project.

Our investigation revealed the presence of undocumented fill material over much of the site, with thicknesses ranging from 2- to 4.25-feet. The fill does not appear to contain sufficient organic material that would necessitate its complete removal to mitigate future settlement; however, the fill is not homogeneous and some settlement should be expected with the addition of loads on the fill material. The following recommendation is presented to address the presence of undocumented fill and the variables grades throughout the site. No site grading plan was made available to BEI at the time this report was prepared.

6.0 DESIGN RECOMMENDATIONS

The following sections present site-specific recommendations for site preparation. Earthwork shall be performed in general accordance with the standard of practice as generally described in Appendix J of the Uniform Building Code and the Oregon Structural Specialty Code, and as specified in this report. General material and construction specifications for the items discussed herein are provided in Appendix B.

The subsurface conditions observed in our site investigation only represent specific locations on the site. Should soft or unsuitable soils extend to a depth or extent greater than that described herein, or areas of distinct soil variation be discovered, this office shall be notified to perform site

observations and additional excavation may be required. Once finalized plans for the site are prepared BEI asks that they be notified so that we may address any changes to our recommendations.

6.1 Foundation Subgrade Recommendations

The undocumented fill areas shall be scraped free of organics and fine-roots systems; this material can be set aside for use as fill in non-structural areas if desired. We then recommend the removal of at least 3-feet of undocumented fill material, which can either be removed from the site, stockpiled and reintroduced as structural fill, or used as structural fill in other areas of the site that require fill. Areas of the site, primarily along the northern boundary that will likely require structural fill. Areas pf native ground where structural fill will be placed shall be scraped free of vegetation and topsoil, with an estimated depth to suitable subgrade of 6- to 12-inches. Approved structural fill, consisting of either excavated on-site material, or material brought to the site shall be moisture conditioned and compacted with a padfoot roller (for soil) (minimum drum weight 7,500 lb) in loose lifts not exceeding 8-inches in height. Proper benching and mixing of fill materials shall be performed. We recommend this step of the construction process be performed during the dry season to better manage fill moisture content.

If soft soils are observed, improvement methods shall be used such as removal and replacement with crushed aggregate fill that may be underlain by geotextile fabric or geogrid composites. If foundation areas are accessible, and if performed during the dry months of the year (May through October), subgrades may be proof rolled using a loaded, tandem-axle dump truck. Areas yielding excessively shall be scarified and re-compacted, or otherwise improved at the discretion and direction of the GER. A BEI representative shall approve exposed subgrade soils, fill placement methods, and compaction testing or observation of proof rolling activities.

Due to the variability of the fill/native subgrade, a minimum of 12-inches of compacted aggregate fill shall be placed beneath all foundation elements, this may consist of existing aggregate fill, or material brought into the site. The aggregate shall extend a minimum of 2-feet beyond the perimeter of the foundations or proposed building area.

Fill compaction shall be performed with an adequately sized smooth drum vibratory roller on aggregate in conformance with the requirements in Section 6.6 of this report. The prepared building pad with aggregate cover shall have an allowable bearing capacity of 1,500 psf that may be increased by 1/3 for short term loading, such as wind or seismic events. The maximum total and differential settlement for this option is estimated at 1-inch and 3/4-inch, respectively.

6.2 Structural Slab-On-Grades

After site preparation to expose suitable subgrade or documented structural fill, load bearing concrete slabs shall be underlain by a minimum of 12-inches of compacted, crushed aggregate underlain by an undisturbed bi-axial geogrid. The geogrid layer may be "ramped" up from the depth below footings on a 3:1 (H:V) slope to minimize excavation below the slab if subgrade is suitable. If soft or saturated subgrade is encountered over-excavation and replacement with engineered fill will be required. A free draining aggregate is recommended beneath structural slabs. The modulus of subgrade reaction (K) of the native clay soils is 100 lb/in^{3.}

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6.3 Friction Coefficient and Lateral Earth Pressures

For use in design of subsurface structures or retaining walls the following parameters are given based on an internal angle of friction of 26° for the silty sand and silt. The Coefficient of Friction for Concrete on Compacted Aggregate is 0.50. The following parameters assume there is no hydrostatic pressure or surcharge loads on the walls.

1	
Active Earth Pressure	45 pcf
Passive Earth Pressure	280 pcf
Lateral Earth Pressure (at Rest)	60 pcf
Coefficient of Friction	0.32

Table 2: Earth pressures and Friction Coefficient

6.4 Private Paved Area Subgrade and Pavement Recommendations

We recommend the following subgrade preparation for paved areas. Undocumented fill areas shall be scraped free of organics and fine-roots systems. This material can be set aside for use as fill in non-structural areas. We then recommend the removal of at least 2-feet of material, which can either be stockpiled and reintroduced as structural fill, or used as structural fill in other areas of the site that require fill. Areas of the site, primarily along the northern boundary that will require structural fill shall be scraped free of vegetation and topsoil, with an estimated depth to suitable subgrade of 6- to 12-inches. Slopes along the perimeter of the undocumented fill will need to cleared of vegetation and fine-roots, then benched in such a way that compaction equipment can span the entire width of the bench. Approved structural fill, consisting of either excavated on-site material, or material brought to the site shall be moisture conditioned and compacted with a padfoot roller (minimum drum weight 7,500 lb) in loose lifts not exceeding 8-inches in height. We recommend this step of the construction process be performed during the dry season to better manage fill moisture. Prior to placing compacted crushed aggregate for the roadway structural section, the exposed subgrade shall be approved by the GER, or approved representative.

Proof rolls with a loaded 10 cubic yard haul truck, or equivalent vehicle, shall be conducted on the prepared aggregate section and any observed areas of deflection under load shall be corrected prior to placement of pavements. Structural fill shall be placed in accordance with Section 6.6 of this report.

If present, expansive soil beneath pavements can reduce its life. If encountered in pavement areas, we recommend that the soils not be allowed to dry out and should be covered with crushed rock in a timely manner to prevent moisture swings. Soils can be periodically wetted to maintain its in-situ moisture content if excavation takes place during the drier months. Sources of water should be prevented from saturating subgrades or becoming trapped below pavement surfaces. Drainage structures should also not be located adjacent to pavement or other hardscapes.

For new asphalt concrete (AC) pavement installation we recommend a minimum pavement thickness of 4-inches of AC over a minimum of 10-inches of compacted crushed aggregate base material (ABM). In parking areas the AC thickness can be reduced to 3-inches. A separation fabric placed on the approved subgrade surface should be considered.

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Prior to placement of base rock any soft soil, wet soil, or organic soil shall be removed from the parking subgrade. We recommend that the subgrade be moisture conditioned and compacted to at least 90% of the material's maximum dry density as determined by AASHTO T-180/ASTM D-1557 (modified Proctor). Based on an estimated California Bearing Ratio of 3 for the soil subgrade the following asphalt concrete pavement sections are recommended for the anticipated wheel loading for this type of facilitity.

Pavement Criteria	Asphalt Concrete (Inches)	Aggregate Base Material Section (Inches)
Parking Lot Access	4	10
Route		
Parking Stalls and	3	10
Light Vehicles Routes		

Table 3: Recommended Structural Pavement Section for private road section

The pavement recommendations discussed above are designed for the type of vehicle use on the site after construction completion, not for construction vehicle traffic which is generally heavier, occurs over a short time, and impacts the site before full pavement sections are constructed. The construction traffic may cause subgrade failures and the site contractor should consider overbuilding designated haul routes through the site to mitigate soft areas at the time of final paving.

Proof rolls with a loaded 10 cubic yard haul truck shall be observed on the compacted ABM prior to pavement installation and any areas of deflection under wheel loads shall be corrected by over-excavation replacing subgrade material with additional compacted aggregate. The ABM shall be compacted to at least 95% relative compaction as determined by ASTM 1557/AASHTO T-180 (modified Proctor). The compaction of the ABM shall be tested prior to placement of asphalt concrete.

Construction traffic should not be allowed to drive directly on exposed subgrade and will require thicker rock sections to mitigate subgrade failure. Positive site drainage away from any public streets shall be maintained if site paving will not occur before the on-set of the wet season.

Mitigation of Wet and Soft Subgrade, if Encountered

Depending on the timing for the project, any soft subgrade found during proof-rolling or by visual observation can either be removed and replaced with compacted crushed aggregate, removed and dried or dried in-place and recompacted, or an area of sufficient size (generally at least 6-feet beyond the edge of soft material) may be covered with a bi-axial geogrid and covered with compacted crushed aggregate.

Consideration of Shrink/Swell and Frost Heave Conditions

The soil encountered at or below the anticipated subgrade level has a low shrink/swell potential and frost heave potential is also low provided that the subgrade does not become saturated and standing water is not trapped below the pavement surface.

6.5 Structural Fill

All engineered fill placed on the site shall consist of homogenous material and shall meet the following recommendations.

- The recommended compaction level for crushed aggregate and soil fill is 90% of the maximum dry density as determined by ASTM D-1557 (modified Proctor).
- Prior to placement onsite, the aggregate or soil to be used shall be approved by the GER. If no recent Proctor curve (moisture-density relationship) is available for the material, a material sample will be required for testing to determine the maximum dry density and optimum moisture content of the aggregate or fill material. Use of the onsite soils for fill will require careful moisture conditioning and appropriate compaction equipment selection. Compaction of clayey soils during the wet season (November through May) will be difficult, if not impossible, to achieve due to insitu moisture contents being significantly higher than optimum moisture contents.
- Compaction shall be measured by on site testing with a nuclear densometer (ASTM D-6938), or sand cone method (ASTM D-1556) on structural fill with thicknesses in excess of 12-inches. If compaction testing is not feasible for any onsite or imported material due to factors such as oversize rock content or variable material, proof rolls with a fully loaded 10 cubic yard haul-truck or equivalent equipment shall be observed at regular intervals. Any observed areas of excessive yielding or rutting will require removal and replacement with granular fill or moisture conditioning and recompaction.
- The structural fill shall be moisture conditioned to within +/- 2% of optimum moisture content and compacted in lifts with loose thicknesses not exceeding 8-inches. Periodic visits to the site to verify lift thickness, source material, and compaction effort shall be conducted by the GER, or designated representative, and documented.
- Utility trenches excavated to depths below the top of the subgrade elevation shall be backfilled with approved material and compacted to at least 90% of the maximum dry density.

6.6 Seismic Site Classification

Based on the soil properties encountered in our explorations and from nearby well logs, we recommend a Seismic Site Class D, Stiff Soil (Table 20.3-1 ASCE 7-16) for the design of site structures.

7.0 CONSTRUCTION CONSIDERATIONS

7.1 Wet Weather/Dry Weather Construction Practices

The near surface soils, if left exposed to prolonged precipitation, will become saturated and soften. Exposed subgrade soils in structural areas should not be allowed to dry out, or allow standing water to pool over them. Subgrade soil that will be below foundations, slabs, and pavements shall be covered with compacted aggregate in a timely manner after excavation to minimize moisture fluctuations. BEI recommends that foundation subgrade preparation and general site earthwork be performed during the dry season—generally May through October.

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Construction during the wet season may require special drainage considerations, such as covering of excavations, pumping to mitigate standing water in footing excavations, or over-excavation of moisture softened soils. Construction traffic should not be allowed to drive directly on exposed subgrades. Construction traffic routes will also be more susceptible to "pumping" and rutting during the wet season and will likely require thicker rock sections.

7.2 Excavations

We recommend that shoring or benching be employed for in-ground excavation and utility work. Utilities deeper than 5-feet BGS will likely require shoring or laying back of sidewalls at a slope of 1:1 (H:V). The site soils are classified as typically OSHA Type B soils. Heavy equipment or stored materials should not be stored within 10-feet of open excavations. Permanent slopes (fill or cut) should not exceed a gradient of 2:1 H:V unless specifically evaluated for stability.

7.3 Site Drainage

Alteration of existing grades for this project will likely change drainage patterns that should not adversely affect adjacent properties. Perimeter landscape and hardscape grades shall be sloped away from foundations and water shall not be allowed to pond adjacent to footings during or after construction. Infiltration testing was conducted by BEI during the investigation and a separate report detailing our findings and results will be provided to the client.

7.4 Geotechnical Construction Site Observations

Periodic site observations by a geotechnical representative of BEI are recommended during the construction of the project; the specific phases of construction that should be observed are shown in the following table.

Recommended Construction Phases to	be Observed by the Geotechnical Engineer
At completion of subgrade excavation	Subgrade observation by the geotechnical engineer before aggregate and geogrid (if applicable) placement.
Imported fill material	Observation of material or information on material type and source.
Placement or Compaction of fill material	Observation by geotechnical engineer or test results by qualified testing agency.

8.0 **REPORT LIMITATIONS**

This report has presented BEI's site observations and research, subsurface explorations, geotechnical engineering analyses, and recommendations for the proposed site development. The conclusions in this report are based on the conditions described in this report and are intended for the exclusive use of Linn Benton Housing Authority and their designated representatives for use in design and construction of the development described herein. The analysis and recommendations may not be suitable for other structures or purposes.

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Services performed by the geotechnical engineer for this project have been conducted with the level of care and skill exercised by other current geotechnical professionals in this area. No warranty is herein expressed or implied. The conclusions in this report are based on the site conditions as they currently exist and it is assumed that the limited site locations that were physically investigated generally represent the subsurface conditions at the site. This report represents our findings and should site development or site conditions change, or if a substantial amount of time goes by between our site investigation and site development, we reserve the right to review this report for its applicability and adjust our recommendations. If you have any questions regarding the contents of this report, please contact our office.







Site Investigation Photo with Project Overlay Queen Ave Multi-Family Residential Development 2080 Queen Avenue SE Albany, Oregon FIGURE-2 6-24-2023



Image from Oregon State University Libraries, Not scaled



1956 Aerial Image of Site Vicinity Queen Ave Multi-Family Residential Development 2080 Queen Avenue SE Albany, Oregon

FIGURE-3 6-24-2023



Image from Oregon State University Libraries, Not scaled



1963 Aerial Image of Site Vicinity Queen Ave Multi-Family Residential Development 2080 Queen Avenue SE Albany, Oregon

FIGURE-4 6-24-2023



Map from DOGAMI



Queen Ave Multi-Family Residential Development 2080 Queen Avenue SE Albany, Oregon

FIGURE-5 6-24-2023

APPENDIX A:

- USCS SOIL KEY - TEST PIT LOGS - OWRD WELL LOGS - USDA SOIL SURVEY



EIE ATIVE DENSITY SPT N-VALUE (140 bis harmer) DAM SAMPLER (300 bis harmer) INES < 4202.1020 Model <th>RELATIVE DE</th> <th>NSITY - COA</th> <th>RSE GRAINED S</th> <th>OILS</th> <th></th> <th>USCS GRAIN S</th> <th>IZE</th>	RELATIVE DE	NSITY - COA	RSE GRAINED S	OILS		USCS GRAIN S	IZE						
DENSITY (140 lbs hammer) (300 lbs hammer) SAND Fine #200 - #40 - #10 (2 mm) VER LOOSE < 4 Course #10 - #10 (2 mm) Medium Medium <t< th=""><th>RELATIVE</th><th>SPT N-VALUE</th><th>D&M SAMPLER</th><th>D&M S</th><th>AMPLER</th><th>FINES</th><th>< #200 (.075 mm)</th></t<>	RELATIVE	SPT N-VALUE	D&M SAMPLER	D&M S	AMPLER	FINES	< #200 (.075 mm)						
VERY LOOSE <.4	DENSITY		(140 lbs hammer)	(300 lbs	hammer)	SAND Fir	ne #200 - #40 (.425 mm)						
VERT LOOSE < 4						M	edium #40 - #10 (2 mm)						
LOOSE 4 - 10 11 - 26 4 - 10 CRAVEL Fine # 4 - 0.275 - 3 inch DENKE 30 - 50 7 - 120 30 - 47 COBILES 3 - 12 inches CONSISTENCY FINE GRAINED SOLS	VERY LOOSE	< 4	< 11	<	: 4	C	oarse #10 - #4 (4.75 mm)						
Coarse 0.75 - 3 inch 3 - 12 inches DENSE 3 - 3 - 20 3 - 44 10 - 40 Coarse 0.75 - 3 inch CONSISTENCY FINE GRAINED SOLIS 3 - 12 inches 3 - 12 inches CONSISTENCY SPT N-VALIE DAM SAMPLER DAM SAMPLER Nanuel (Inches) VERY SOFT 2 - 4 3 - 4 - 4 - 2 - 0.50 Easy several inches by film VERY SOFT 2 - 4 3 - 4 2 - 5 0.55 - 0.50 Easy several inches by filmmb SOFT 2 - 4 3 - 6 2 - 5 0.50 Easy several inches by filmmb MEDIUM STIFF 4 - 8 6 - 12 5 - 9 19 - 0.00 2.00 Readily indented by filmmbooli VERY STIFF 1 - 3.0 2 - 6.5 3 - 12 2.00 - 4.00 Readily indented by filmmbooli UNHED SOL CLASSIFICATION CHART GROUP SYMBOLS AND TYPICAL NAMES Group sevels gravels and reades and mixtures. Iffle or no fines. Solis: Graves Graves Gravels gravels and reades and gravels and reades and mixtures. Iffle or no fines. Solis:		4 - 10	11-26	4 -	- 10	GRAVEL Fir	ne #4 - 0.75 inch						
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THE-GRAINED SOLS: Less than 50% retained on No. 200 sieve SLT AND CLAY LIQUID LIMIT LESS THAN 50 Inorganic silts, rock flour, clayey silts. CL Inorganic silts, rock flour, clayey silts. CL MH Inorganic silts, rock flour, clayey silts. OL Organic silts, rock flour, clayey silts. 0 OR GREATER UUUD LIMIT 50 OR GREATER OL Organic clays of how to medium plasticity, fat clays. HIGHLY ORGANIC SOILS PT Peat, muck, and other highly organic soil. MH MOISTURE CONTENT Inorganic clays of medium to high plasticity. FT DRY: Absence of moisture, dusty, dry to the touch DAMP: Some moisture on hand STRUCTURE STRUCTURE VET: Visble free water, usually saturated TOUGHNESS IL wor to Med. Med. Med. Med. Med. Med. None to Slow Low to Med. Low to Med. None to Slow Low to Med. High Low to Med. None to Slow Low to Med. High SUCKENSIDED: Striated, polished, or glossy fracture planes. SLICKENSIDED: Striated, polished, or glossy fracture planes. SLICKENSIDED: Striated, polished, or glossy fracture planes. HOMOGENEOUS: Same color and appearance throughout. SPT Standard Penetration Test split barrel sampler LL Atterberg Liquid Limit P Pocket Penetrometer G Grab sample MC Mc issue Compressive Strength VA tabeker g Plastic Limit P Pocket Penetrometer Vane Shear Unconfined Compressive Strength	216.46	the No. 4 siev		SC SC	Claves	rias, sana sin mixter	nixtures						
INPLE-GRAINED SOILS: Less than 50% retained on No. 200 SILT AND CLAY ILQUID LIMIT LESS THAN 50 ILQUID LIMIT CL Inorganic clays of low to medium plasticity, lean clays. IQUID LIMIT 50 or No. 200 sieve ILQUID LIMIT 50 OR GREATER MH Inorganic clays of low to medium plasticity, lean clays. HIGHLY ORGANIC SOLLS PT Peat, muck, and other highly organic soil. MOISTURE CONTENT DRY: Absence of moisture, dusty, dry to the touch DAMP: Some moisture but leaves no moisture on hand STRUCTURE VET: Visible free water, usually saturated TOUGHNESS STRATIFIED: Alternating layers of material or color > 6mm thick. LAMINATED: Alternating layers < 6mm thick.				MI	Inoraa	nic silts, rock flour, c	lavev silts						
SUBJ. Less than Less than SILT AND CLAY Solver SILT AND CLAY LESS than UQUID LIMIT 50 Sive IQUID LIMIT 50 No. 200 No Sive IQUID LIMIT 50 No Repairs Silver Solver Solv			LIQUID LIMI		Inorga	nic clays of low to r	medium plasticity, lean clays						
SUCTION SILT AND CLAY In organic silts, clayer silts,	Less than		LESS THAN 5		Oraan	ic silt and organic s	ilty clays of low plasticity.						
On No. 200 sieve LIQUID LIMIT 50 OR GREATER Inorganic clays of high plasticity, fat clays. HIGHLY ORGANIC SOILS PT Peat, muck, and other highly organic soil. MOISTURE CONTENT DRY: Absence of moisture, dusty, dry to the touch DAMP: Some moisture but leaves no moisture on hand MOIST: Leaves moisture on hand STRUCTURE VET: Visble free water, usually saturated TOUGHNESS ILCKENSIDED: Striated, polished, or glossy fracture planes. SLICKENSIDED: Striated, polished, or glossy fracture planes. BLOCKY: Cohesive soil that can be broken down into small angular lumps which resist further breakdown. Low to Med. Med. to High None to Slow MH Med. to High Low to Med. None to Slow Low to Med. to High None to Slow Hedium Low to Med. to High None to Slow Hedium Low to Med. High Low content Slow Low to Med. High VETS OF ABBREVIATION & EXPLANATIONS SPT Standard Penetration Test split barrel sampler D&M Dames and Moore sampler LAtterberg Plastic Limit G Grab sample MC Moisture Content UC Unconfined Compressive Strength PP Pocket Penetrometer VS Vane Shear G Grab sample MC Moisture Density UC Unconfined Compressive Strength	50% retained	SILT AND CLA	λΥ 	мн	Inoraa	nic silts. clavev silts.							
sieve OR GREATER OH Organic clays of medium to high plasticity. HIGHLY ORGANIC SOILS PT Peat, muck, and other highly organic soil. MOISTURE CONTENT Structure DRY: Absence of moisture, dusty, dry to the touch None AMP: Some moisture but leaves no moisture on hand STRUCTURE WET: Visble free water, usually saturated STRUCTURE PLASTICITY DRY STRENGTH DILATANCY ML Non to Low Non to Low Slow to Rapid Low to Med. Medium Low to Med. H Med. to High ligh to V.High None Standard Penetration Test split barrel sampler D&M Dames and Moore sampler Mc Moisture Content ML Atterberg Liquid Limit MD Moisture Content ML Atterberg Reaction MC Moisture Content ML Atterberg Reaction MD Moisture Content ML Atterberg Reaction MD Moisture Content ML Atterberg Reaction MD Moisture Content MD And Sandard Penetration Test split barrel sampler G Grab sample MA Mct is there the other to meter MD Moisture Content ML Mct is there there the other to meter MD Moisture Content MD And sand More sampler MC Moisture Content	on No. 200			50 CH	Inoraa	nic clays of high pla	asticity, fat clays,						
HIGHLY ORGANIC SOILS PT Peat, muck, and other highly organic soil. MOISTURE CONTENT Structure DRY: Absence of moisture, dusty, dry to the touch Structure DAMP: Some moisture on hand Structure WEI: Visble free water, usually saturated Structure planes. PLASTICITY DRY STRENGTH DIATANCY Non to Low Non to Low Structure planes. NL Non to Low Stow to Rapid Low to Med. Med. to High None to Slow Low, can't roll MH Med. to High to V.High None to Slow Low to Med. To High High to V.High None to Slow Low to Med. To High High to V.High None to Slow Let Med. to High High to V.High None to Slow Let Med. to High High to V.High None to Slow Let Atterberg Liquid Limit Low to Add. Moore sampler LA Atterberg Plastic Limit MD Moisture Content LA Atterberg Plastic Limit UC PP Pocket Penetrometer VS Vane Shear	sieve		OR GREATE	R OH	Oraan	ic clavs of medium	to high plasticity						
MOISTURE CONTENT DRY: Absence of moisture, dusty, dry to the touch DAMP: Some moisture but leaves no moisture on hand MOIST: Leaves moisture on hand WET: Visble free water, usually saturated PLASTICITY DRY STRENGTH DILATANCY TOUGHNESS ML Non to Low Non to Low Slow to Rapid CL Low to Med. Med. to High None to Slow MH Med. to High Low to Med. None to Slow CH Med. to High High to V.High None WET SPT Standard Penetration Test split barrel sampler D&M Dames and Moore sampler L Atterberg Plastic Limit P Pocket Penetrometer VS Vane Shear	н	I IGHLY ORGANI		PT	Peat, r	nuck, and other hic	phly organic soil.						
DRY: Absence of moisture but leaves no moisture on hand STRATIFIED: Alternating layers of material or color > 6mm thick. DAMP: Some moisture but leaves no moisture on hand STRATIFIED: Alternating layers of material or color > 6mm thick. MOIST: Leaves moisture on hand STRATIFIED: Alternating layers of material or color > 6mm thick. WET: Visble free water, usually saturated STRATIFIED: Alternating layers < 6mm thick.					STRU	CTURE							
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DAMP: Some moisture but leaves no moisture on hand MOIST: Leaves moisture on hand WET: Visible free water, usually saturated PLASTICITY DRY STRENGTH DILATANCY Low to Med. Non to Low Non to Low Slow to Rapid Low to Med. to High Low to Med. None to Slow CH Med. to High High to V.High None to Slow CH Med. to High High to V.High None to Slow CH Med. to High High to V.High None to Slow CH Med. to High High to V.High None to Slow CH Med. to High High to V.High None to Slow CH Med. to High High to V.High None to Slow CH Med. to High High to V.High None to Slow CH Med. to High High to V.High None to Slow CH Med. to High High to V.High None to Slow CH Med. To High High to V.High None to Slow CH Med. To High High to V.High None to Slow CH Med. To High High to V.High None to Slow CH Med. To High High to V.High None to Slow CH Med. To High High to V.High None to Slow CH Med. To High High to V.High None to Slow CH Med. To High High to V.High None to Slow CH Med. To High High to V.High None to Slow CH Med. To High High to V.High None to Slow CH Med. To High High to V.High None to Slow CH Med. To High High to V.High None The Slow CH Med. To High High to V.High None The Slow CH Med. To High High to V.High None The Slow CH Med. To High High to V.High None The Slow CH Med. To High High to V.High None The Slow CH Med. To High High to V.High None The Slow CH Med. To High High to V.High None The Slow CH Med. To High High to V.High None The Slow SPT Standard Penetration Test split barrel sampler LL Atterberg Plastic Limit P Pocket Penetrometer VS Vane Shear CH MED No Slow CH Might Slow to Repaid CH Mig	DRT: Absence	oi moisiure, au	isty, ary to the touc	n Ja ava al	SIRAI	IFIED: Alternating la	yers of material of color > 6mm inick						
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WEI: Visible free water, usually saturated Successible free water, usually saturated PLASTICITY DRY STRENGTH DILATANCY TOUGHNESS ML Non to Low Non to Low Slow to Rapid Low, can't roll MH Med. to High Low to Med. None to Slow None to Slow Low, can't roll MH Med. to High Low to Med. None to Slow None to Slow Medium CH Med. to High High to V.High None Book Medium Low to Med. None None Bio Medium Low to Med. High None to Slow None Book SPT Standard Penetration Test split barrel sampler G G arab sample D&M Dames and Moore sampler MC Mo oisture Content LL Atterberg Plastic Limit MD MO oisture Density UC PL Atterberg Plastic Limit UC Unconfined Compressive Strength PP Pocket Penetrometer V3 Vane Shear TABLE A-	MOIST: Leaves	moisture on na	na		FISSOR	ED: Breaks along a	efinate tracture planes.						
PLASTICITY DRY STRENGTH DILATANCY TOUGHNESS ML Non to Low Non to Low Non to Low Slow to Rapid Low, can't roll MH Med. to High Low to Med. None to Slow None to Slow None to Slow Medium Low to Med. None to Slow Medium Low to Med. None to Slow Medium Low to Med. None to Slow None to Slow Medium Low to Med. None to Slow None to Slow Medium Low to Med. High Medium Low to Med. None to Slow None to Slow Medium Low to Med. High Low to Med. High Medium Low to Med. High Medium Low to Med. High MOGENEOUS: Same color and appearance throughout. Standard Penetration Test split barrel sampler G Grab sample MC Mc Moisture Content LL Atterberg Liquid Limit MD Moisture Density UC Unconfined Compressive Strength MEdium PP Pocket Penetrometer Vane Shear <	WEI: Visble free	e water, usually	' saturated			ENSIDED: Striated, p	olished, or glossy tracture planes.						
And the low is the low of the low	PLASTICITY	DRY STRENGTH	DILATANCY TO	UGHNESS	BLOCK	(Y: Cohesive soil the	at can be broken down into small						
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LIST OF ABBREVIATION & EXPLANATIONS SPT Standard Penetration Test split barrel sampler G Grab sample D&M Dames and Moore sampler MC Moisture Content LL Atterberg Liquid Limit MD Moisture Density PL Atterberg Plastic Limit UC Unconfined Compressive Strength PP Pocket Penetrometer VS Vane Shear	CH Med. to Hig	gh High to V.High	None	High									
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PP Pocket Penetrometer VS Vane Shear TABLE A-	PL Atterber	g Plastic Limit			UC	, Unconfined Con	npressive Strength						
VS Vane Shear TABLE A-	PP Pocket P	enetrometer					-						
TABLE A-	VS Vane She	ear											
TABLE A-													
TABLE A-													
							TABLE A						

Branch GEOTECHNICAL SITE INVESTIGATION EXPLORATORY KEY

since 1977 310 5th Street Springfield, Oregon | p: 541.779.2577 | www.branchengineering.com

Br	anc NEERIN Since							Test Pit ID: TI Sheet 1	P-1 of 1
structur s u Client	al·geotechni RVEYING	n Benton Housing Authority	Project Name:	Queen Ave	enue A	partmer	nts		
Projec	t Num	ber: 23-321	Project Location:	2080 Q	lueen	Ave Alba	any, O	regon	
Date S	Started	Jul 11 2023 Completed: Jul 11 2023	Logged By:	SPR		Check	ed By	: RJD	
Drillir	ng Com Ng Meth	nd: Test Pit Excavation	Cround Water Lev	Long	illude.				
Equip	ment:	Rubber Tracked Mini-Excavator	$\overline{\nabla}$						
Hamn	ier Typ								
Notes	:								
Depth	Graphic	Material Descriptio	n		Sample	ocket Pen. (tsf)	ree Swell	Moisture Content PL and LL: ●-■	t: ⊗ ∎
						ď	ш.	10 20 30 40 50 60 70 80	30 90
-		Soft, dry, brown silt with roots. Topsoil							
1	00000000000000000000000000000000000000	Dense, dry, brown silt with subangular and angul separation fabric. Interpreted as undocumented f	ar gravel, plastic ill.						
2 -	₿₽₽₽	Medium stiff, dry to damp, brown clay (CL) with s	ome silt and fine-gr	rained					
		sand, slight to heavy reduish-brange-black oxidat	ion stannig.						
3									
	$//\Lambda$								
4 -									
_									
5 -	$//\Lambda$								
-									
		Medium stiff, moist, brown-gray clay (CL) with so grained sand, slight reddish-orange oxidation sta	me silt and trace fir ining.	ie-					
6 -									
	$\langle / / \rangle$								
7 –									
-									
8 -	///								
9 -									

Br ENGI	anc NEERIN Since transportat								Tes	t Pi	i t IE She): T eet 1	'P-2 1 of 1
Client	rveying : Lin	Benton Housing Authority	Project Name:	Queen Av	enue A	partmer	nts						
Projec	t Num	ber: 23-321	Project Location:	2080 0	Queen /	Ave Alba	any, O	regoi	1				
Date S	Started	: Jul 11 2023 Completed: Jul 11 2023	Logged By:	SPR	nitude [.]	Check	ed By	" F	leva	Fion [.]	<i>ι</i>]D		
Drillir	ng Met	10d: Test Pit Excavation	Ground Water Lev	els	jituuc.	·			leru				
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pth	phic	Material Description			nple	et Pen. sf)	Swell	Мс	istเ PL ส	ire (and	Con LL:	ten ●-I	it: ⊗ ∎
De	Gra				San	Pocke (t	Free	10	20.30	1 40 <i>f</i>	50 60	70 \$	80 90
=	///	Soft to medium stiff, dry, brown clay (CL) with tr	ace fine-grained san	d and								ſ	
	///	some silt. Bare surface with cracks in clay.										Ш	
1 -									+++		+++	H	
=											Ш.	Ш	
		trace fine-grained sand. Heavy reddish-orange-bl	ay (CL) with some sil lack oxidation staini	lt and ng									
2 -		from 2- to 5-feet BGS.							+++		+++	H	┼┼┼┦
-	$\langle / / \rangle$										Ш.	Ш	
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Client	: Linn	Benton Housing Authority	Project Name:	Queen Ave	enue A	partmer	nts					
Projec	t Numb	per: 23-321	Project Location:	2080 0	Queen A	Ave Alba	any, O	regon				
Date S	Started:	Jul 11 2023 Completed: Jul 11 2023	Logged By:	SPR		Check	ed By	:		RJD		
Drillir	ig Cont 1a Meth	od: Test Pit Excavation	Ground Water Lev	Long	jitude:			Ele	vatio	n:		
Equip	ment:	Rubber Tracked Mini-Excavator										
Hamn Notes	ner Typ :	e:										
Depth	Graphic	Material Descriptio	 on		Sample	Pocket Pen. (tsf)	Free Swell	Mois P	ture L and	2 Con 2 LL:	iten	it: ⊗ ∎
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			lar gravel-cobble ru	ubber								
		mats.	iai graver cobbie, ra	10001								
2 -												
											+++	
3											+++	
											+++	
4		Medium stiff moist grav-blue clay trace fine-gra	ained sand Anomalo	ous							+++	
		material for the area. Appeared native.										
5 —												
6												
7 -												
											++	
8										++++	+++	
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9											$\parallel \mid$	
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Br	anch NEERING Since P							٦	Fest	: Pit S	ID: Shee	TP	' -4 of 1
structur S U	transportatio ral - geotechnic RVEYING	6											
Client	: Linn	Benton Housing Authority	Project Name:	Queen Ave	enue A	partmei	nts						
Date S	Started:	lul 11 2023 Completed: lul 11 2023	I ogged By:	2080 C SPR	Jueen /	Check	ed By	regon /:		RI	<u>ר</u>		
Drillir	ng Cont	ractor: Branch Engineering Inc.	Latitude:	Long	gitude:			El	evati	on:			
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Equip	ment:	Rubber Tracked Mini-Excavator											
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Depth	Graphic	Material Descripti	on		Sample	ocket Pen. (tsf)	ree Swell	Moi F	istu PL a	re Co nd Ll	onte L: ●	ent: ►∎	8
						ď		10 2	0 30	40 50	60 7/	0 80	90
=		Soft, dry, brown silt with roots. Topsoil.											
		Dense, dry, brown silt with subangular and ang 3" metal pipe at 4-feet BGS. Interpreted as undo	ular gravel, some asp cumented fill.	ohalt.									
1 -													
												+	
2										++++			
3 -													
										++++		+	
4													
			fine-grained sand, slig	ght									
		reddish-orange oxidation staining.											
5 -													
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Client	t: Lin	Benton Housing Authority	Project Name:	Queen Av	enue A	partmer	nts						
Proje	ct Num	ber: 23-321	Project Location:	2080 0	Queen	Ave Alba	any, O	regor	1				
Date :	Started	: Jul 11 2023 Completed: Jul 11 2023	Logged By:	SPR	nituda	Check	ed By	/:		tion	<u></u> γD		
Drilli	ng Met	hod: Test Pit Excavation	Ground Water Leve	els	gitude.	·		- ⁻	evai				
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Depth	Graphic	Material Description	on		Sample	ocket Pen. (tsf)	ree Swell	Мо	istu PL a	ire (ເກd	Con LL:	ten ●-I	t: ⊗ ∎
						₽		10 2	20 30	40 5	50 60	70 8	30 90
-		Soft, dry, brown silt with roots. Topsoil.											
1 2 3 4 5 6 7 8	862395236239523623952362395239523952395239523952395239523952395	Medium stiff, moist, brown clay (CL) with trace f reddish-orange oxidation staining.	ine-grained sand, slig	ght									
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Client	t: Linn	Benton Housing Authority	Proiect Name:	Oueen Ave	enue A	partme	nts						
Proje	ct Numb	per: 23-321	Project Location:	2080 0	Queen /	Ave Alb	any, O	regon					
Date	Started:	Jul 11 2023 Completed: Jul 11 2023	Logged By:	SPR		Checl	ked By	:		RJE	2		
Drilli	ng Cont	ractor: Branch Engineering Inc.	Latitude:	Long	jitude:			_ Ele	evati	on:			
Fauin	ng Metri oment:	Rubber Tracked Mini-Excavator		eis									
Hamn	ner Typ	e:											
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Depth	Graphic	Material Descripti	on		Sample	cket Pen. (tsf)	ee Swell	Moi P	stu 'L a	re Co nd L	onte L: ●	ent ►∎	: ⊗
						Ро	Ē	10 20	0 30	40 50	60 7	0 80	90
		Loose, dry, brown silt with gravel. Interpreted as	s undocumented fill.										
1 -		Medium stiff, damp, brown-gray clay (CL), trace heavy reddish-orange oxidation staining.	fine-grained sand an	d silt,									
2													
3		Medium stiff, moist, brown clay (CL), trace fine-	grained sand and silt	-									
4													
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9 -										+++			+++
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Client	: Linr	n Benton Housing Authority	Project Name:	Queen Av	enue A	partme	nts						
Projec	t Num	ber: 23-321	Project Location:	2080 (Queen	Ave Alba	any, O	regon "					
Date : Drillir	na Cont	tractor: Branch Engineering Inc	Logged By: Latitude:	SPR Lone	aitude	_ Cneck	кеа ву	": 	vati	on:	ر 		
Drillin	ng Meth	nod: Test Pit Excavation	Ground Water Lev	els						•			
Equip	ment:	Rubber Tracked Mini-Excavator											
Hamn	ier Typ	De:											
Notes	:												
Depth	Graphic	Material Descripti	on		Sample	ocket Pen. (tsf)	ree Swell	Moi: P	stui 'Lai	re Co nd L	ont L: ●	ent	t: ⊗ I
						ď	ш	10 20) 30 -	40 50	60 7	70 80	0 90
-	///	Medium stiff, dry, brown clay (CL), trace fine gra	ained sand and silt, h	ieavy					TT		i T	Π	
-	$\langle / / \rangle$	reddish-orange oxidation staining.									Ш		
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and U-Mortel Description and March 1 Description and March 2 State 0 AA Description Address of Well for negrees with 3 Description Description Description Address of Well for negrees with 3 Description Description Desc	1) OWNER: / / D Well	SA Number	LEM, OREGON (9) LOCATIONOF	WELL by legal des	cription:	
Refer Marcial Sector Nors Sease Subject Sector Nors Sease Subject Subje	vame Richard Vraper a		County In	✓ Latitude	Longitude	
Status Status Tay 1 Maintain Maintain Status Stat	Address 2618 Wanesly DA	<u> </u>	Township 115	N or S Range	36 E or W.	WM.
DYECOW WOLL DecovingAlternation (repair/recordition)Abundonizment Diver Wild DecovingAlternation (repair/recordition)Abundonizment Divert	City albany State One	Zip 9732	/ Section 9	<u>NE</u> 1/4	Shr 1/4	_
PNew Weil	2) TYPE OF WORK		Tax LotI	otBlock	Subdivision	
J RAIL METHOD: J RAIL METHOD: J Cable J Coher J BORCKER LOCE CONSTRUCTION: Constant Construction approval Kein J Coher HOLE BREAT Nor Baster I Coher I Coher <td>New Well Deepening Alteration (repair/reco</td> <td>ndition) 🗌 Ábandonment</td> <td>Street Address of We</td> <td>l (or nearest address)</td> <td>1940</td> <td></td>	New Well Deepening Alteration (repair/reco	ndition) 🗌 Ábandonment	Street Address of We	l (or nearest address)	1940	
Notary Ar Colary Moll 2 Cable Jager Order Interstan pressure The pressure inch. Date PROPOSED USE: District WATER BEARING ZONES: Donorcic Dispection Dispection The community Industrial Inrigation The community Industrial Pring and the water was first found Stat BORE HOLE SEAL To To If Coll 2 Construction approval Yes ZNO Type Anorat To If Coll 2 Construction approval Yes ZNO Type Anorat To If Coll 2 Construction A construction approval Yes ZNO Type Anorat If Coll 2 Construction A construction approval Yes ZNO Type Anorat If Coll 2 Construction A construction approval Yes ZNO Type Anorat If Coll 2 Construction A construction approval Yes ZNO Type To Subscruption If Coll 2 Construction A construction approval Yes ZNO Type To Subscruption Yes ZNO Type If Coll 2 Construction A construction approval A construction approval Yes ZNO Type Yes ZNO Type Inductif functin Fr	3) DRILL METHOD:		1/ane	> C allony	op	
Joint PROPOSED USE: Joint J Z Z Z Previous indication pressure Date of the state increasing pressure increasing pressure Date of the state increasing pressure increasing presstate increasing presstate increasing press	Kotary Air Rotary Mud Cable	Auger	(10) STATIC WATE 12	RLEVEL:	7-2	22.
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Journal Jujection Juvectok Judet J BORE HOLE CONSTRUCTION: Deph at which water was first found	Domestic Community Industrial	Irrigation	(11) WATER BEAR	ID. per squ	are men. Date	
DORE HOLE CONSTRUCTION:	Thermal Injection Livestock			IIG ZOILES.		
secial Construction approval Yes No Type Amount HDLE SEAL To Estimated Flow Rate SV HDLE Secial To State components Image: Proven To To State components 16 17 SC State components Image: Proven To State components Image: Proven To State components 10 Other Image: Proven To To State components Image: Proven To State components 10 Other Image: Proven To Components State components Image: Proven To State components 10 Other Image: Proven To Components State components Image: Proven To Components Image: Proven To Components State components Image: Proven To Image: Proven To State components Image: Proven To State components Image: Proven To Image: Proven To <td< td=""><td>(5) BORE HOLE CONSTRUCTION:</td><td> etiles</td><td>Depth at which water wa</td><td>s first found 54</td><td>*</td><td></td></td<>	(5) BORE HOLE CONSTRUCTION:	etiles	Depth at which water wa	s first found 54	*	
pipolise used Yes Natorial From To Estimated Fore Rate St anster From To Material From To Estimated Fore Rate St 16 1/2 <td>Special Construction approval Yes No Depth of</td> <td>Completed Well 56 f</td> <td>t.</td> <td></td> <td></td> <td></td>	Special Construction approval Yes No Depth of	Completed Well 56 f	t.			
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was seal placed: Method A B C D Cher Ground Elevration 2.30 ackfill placed from ft. to ft. Material maxel placed from ft. to ft. Size of gravel D) CASING/LINER: Dimeter From To Switz aing: // 4 K6 SSI C Size of gravel and location of shoc(s) C C Si Size and location of shoc(s) S C Size Size D'PERFORATION/S/SCREENS: Agr Hericial Size Casing Liner Check gravitation of shoc(s) Size Casing Liner Size Casing Liner Check gravitation Size Casing Liner Size Casing Liner Dependentions Metrial Size Casing Liner Casing Liner Dependentions Metrial Size Casing Liner Casing Liner Dependentions Size Casing Liner Casing L						
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Other	How was seal placed: Method A B		Groun	d Elevation		
Balantin Jacks from It. By addetinal Prome It. Size of gravel D) CASING/LINER: Diameter From To Gauge Steed Plastic Welded Threaded asing // f. G. 2.54 It.	Other ft to ft	intervial			Energy Tra	03377
And proceed nome Interview Intervie	Gravel placed from ft to ft Si	ze of gravel	Materi	a1 7/11	O 20	SWL
Dianster From To Gauge Steel Plastic Welded Threaded asing: Image:	(6) CASING/I INFR:		- Charles Distance	a all live - la	1.20 20	
nal location of shoe(s) S6 DPERFORATIONS/SCREENS: Material Berforations Method Screens Type Material Tele/pipe Size Number Disze Disze D	Casing: I I I		Sand Very De Gang There of Gravel M	or Booun for Song Co od Blad So	40 45 40 45 45 54 45 54 54 56	13
nal location of shoe(s) S 6) PERFORATIONS/SCREENS: Image: Street in the st						
PERFORATIONS/SCREENS: Automatical production of the second product of the secon	Final location of shoe(s) 56					
□ creations Method □ Screens Type Number Diameter size Number Size Number Diameter size Casing Liner Image: Screens Size Number Diameter Screens Size Pump Bailer Air Arcsian Yield gal/min Drawdown Drawdown Drill stem at Time Intr. Imperature of water Size Depth Artesian Flow Found as a water analysis done? Yes Baily Muddy Odor Sign	7) PERFORATIONS/SCREENS: 9					
Screens Type	Perforations Method		-			
From 10 size Number Diameter size Casing Liner Image: Strain in the strain of the strain interval of the	Slot Te	lviateriai				
WELL TESTS: Minimum testing time is 1 hour Pump Bailer Pump Bailer Yield gal/min Drawdown Drill stem at Time 3.0 2.6 I hr. I hr. mperature of water SS Depth Artesian Flow Found I hr. dan strata contain water not suitable for intended use? Too little Signed Dother galty Muddy Odor Statta: WWC Number WWC Number Construction standards. This report is true to the best of my knowledge and belief. WWC Number Signed Date Signed Depth Artesian Flow Found Muddy Got is strata: WWC Number Signed Signed Date Construction standards. This report is true to the best of my knowledge and belief. Signed Depth Artesian Flow Found Date Date Signed Depth Artesian Flow	From To size Number Diameter	size Casing Line	r			
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WELL TESTS: Minimum testing time is 1 hour Pump Bailer Air Flowing Yield gal/min Drawdown Drill stem at Time 30 26 1 hr. mperature of water 53** Depth Artesian Flow Found I hr. as a water analysis done? Yes By whom Signed Date Salty Muddy Odor Other Too little Salty Muddy Odor Other WWC Number epth of strata: WWC Number WWC Number Muddy Odor Other Other WWC Number Other epth of strata: WWC Number WWC Number Other Other Plot of strata: WWC Number WWC Number Other Other Plot of strata: WWC Number Other Other Other Plot of strata: WWC Num			-	1 49		
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□ Pump □ Bailer □ Air □ Artesian Yield gal/min Drawdown Drill stem at Time 3 0 2 0 1 hr. 3 0 2 0 1 hr. as a water analysis done? Yes By whom id any strata contain water not suitable for intended use? If are intended use? geth of strata:		Flowing	(unbonded) Water Well	Constructor Certification	ation:	
Vield gal/min Drawdown Drill stem at Time 3 0 2 e 1 hr. 3 0 2 e 1 hr. mpērāture of water 0 1 hr. 'as a water analysis done? Yes By whom 0 'as a water analysis done? Yes By whom 1 to 0 'as a water analysis done? Yes By whom 0 'as a water analysis done? Yes By whom 0 'sa a water analysis done? Yes By whom 0 'as a water analysis done? Yes By whom 0 'sa a water analysis done? Yes By whom 0 'sa a water analysis done? Yes By whom 0 'sa a water analysis done? Yes By whom 0 'sa a water analysis done? Yes By whom	Pump Bailer Air	Artesian	I certify that the work	I performed on the cornect with Oregon water	struction, alteration, or aban	donme
Inr. and beliet. wmperature of water SS* Depth Artesian Flow Found 'as a water analysis done? Inc. Yes By whom 'as a water analysis done? Inc. Yes By whom 'as a water analysis done? Inc. Yes By whom 'as a water analysis done? Inc. Yes By whom 'as a water analysis done? Inc. Yes By whom 'as a water analysis done? Inc. Yes By whom 'as a water analysis done? Inc. Yes By whom 'as a water analysis done? Inc. Yes By whom 'as a water analysis done? Inc. Yes By whom 'as a water analysis done? Inc. Yes By whom 'as a water analysis done? Inc. Yes By whom 'as a water analysis done? Inc. Yes By whom 'as a water analysis done? Inc. Yes By whom 'as a water analysis done? Inc. Yes By whom 'as a water analysis done? Inc. Too little Salty Muddy Odor Otor Otor Otor 'strata: WWC Number 'as a water analysis done? Date 7-23 'as a water analysis done? Date 7-23 'as a water analysis done? Date 7-23 <td< td=""><td>Yield gal/min Drawdown Drill stem at</td><td>Time</td><td>- Materials used and inform</td><td>nation reported above a</td><td>are true to the best of my kno</td><td>wledg</td></td<>	Yield gal/min Drawdown Drill stem at	Time	- Materials used and inform	nation reported above a	are true to the best of my kno	wledg
www.c. Number www.c. Number <td< td=""><td><u>, , , , , , , , , , , , , , , , , , , </u></td><td><u> </u></td><td>and belief.</td><td></td><td></td><td></td></td<>	<u>, , , , , , , , , , , , , , , , , , , </u>	<u> </u>	and belief.			
Signed Date Depth Artesian Flow Found			Signad		w wC Number	
Importance of water year of strates of water analysis done? Importance of water year of construction construction of the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief. Isigned Beb WWC Number Other Date 7-23	Temperature of water Contraction E	low Found	- Signed (bonded) Water Wall C	metruoton Contificati	Date	
id any strata contain water not suitable for intended use? Image: Too little Salty Muddy Odor Colored Other epth of strata:	Was a water analysis done?		_ (Donueu) water well C	for the construction	un: Iteration or abandonment w	r k
Salty Muddy Odor Colored Other performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief. epth of strata: wwc Number Bigned Beb Signed Date 7-23	Did any strata contain water not suitable for intended up	se? 1 Too little	performed on this well d	uring the construction of	lates reported above. All wo	rk
epth of strata:	Salty Muddy Odor Oclored O	ther	performed during this tin	the is in compliance with the former of the termination of	h Oregon water supply well best of my knowledge and b	haliaf
Signed Bob Scheler Date 7-23	Depth of strata:				WWC Number	ð
			Signed Rock	1. lalor		- 77.
ΑΙΛΤΙΝΑΙ, Ο ΕΊΝΑΤ ΕΙΡΥΥ-ΨΑΤΕΚ ΚΕΛΟΓΙΚΕΕΝ ΠΕΡΑΚΤΜΗΝΤ΄ ΝΗΓΤΙΝΗ ΓΟΡΥ-ΓΊΛΙΝΤΙ ΤΗ Τ	RIGINAL & FIRST COPY-WATER RESOLD	ES DEPARTMENT	FCOND COPY CONSTE		COPV_CUSTOMED	>

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	STATE OF	OREGON	A	AR -	3 1998	WELL I.D.#			птодд	9	
	WATER SUP	PLY WELL RE	PORT		I DATE OF P	Linn		(STAPT CAPD) #	09926	9	
	(as required by	ORS 537.765)	1211 AVV			51530		(START CARD)#.			
	Instructions for	r completing tins re									
	(1) OWNER:		W	ell Num	ber	- (9) LOCATION	OFW	ELL by legal desc	ription:		
	Name De	ke W. East	ton			_ County	nn	Latitude	Lon	gitude	
	Address 45	<u> 3 SE Powel</u>	<u>ll Ave</u>			Township 1	15	N or S Range	<u></u>	E or V	v. wm.
	City CO:	rvallis	State U	К	Zip 9733	U Section O	011	1/4	<u> </u>	1/4 hdivision	
	(2) TYPE OF W		· · · · · · · · · · · · · · · · · · ·	disi		Street Address		(or nearest address)	3u		
		THOD.	uon (repair/r	econana		2017	Sev	enteenth A	ve A	lhanv	 r
		Rotary Mud	Cable	Auge	۲.	(10) STATIC W	ATER	LEVEL:			
				8.	-	61	ft. belo	w land surface.	E	ate 2-2	4-98
	(4) PROPOSEI	D USE:				Artesian pressu	ire	lb. per squa	re inch. D	ate	
	X Domestic	Community	Industrial		rigation	(11) WATER B	EARIN	NG ZONES:			
	Thermal	 Injection	Livestock		ther	_			-		
((5) BORE HO	LE CONSTRUCT	TION:			Depth at which wa	ter was	first found <u>2</u>	3		
\sim	Special Constructi	on approval 🗌 Yes	No Dept	h of Con	pleted Well 47	ft.	···· 1	7			
	Explosives used	Yes 🗶 No Typ	e	Ar	nount	- From		10	Estimated	Flow Rate	SWL
	HOLE		SEAL	-	6 h				<u></u>	, Dan	
	Diameter From	To Materia	i From	10	Sacks or pounds						
	1.0" 0	18 cement	+ 0	18	13sacks	-					
-	6" 18'	471									
						- (12) WELL LO	G:				
	How was seal place	ced: Method		В		E	Ground	Elevation			
	Other					_]					
	Backfill placed fro	om ft. to	ft.	Materi	al		Material	<u> </u>	From	10	SWL
	Gravel placed from	n ft. to	II.	Size of	gravel	$= \frac{TOP SOI}{BROWN}$	lav		2	12	
	(6) CASING/L	INEK:		Blactic	Woldod Throads	Dark gr	av (clav	12	10	
	Diameter	From To G		Flastic		Brown	<u>ay (</u> lav	& gravel	10	23	<u>├</u>
	Casing:	4199911591				Dirty b	row	n sand &			[]
	O							gravel	23	30	6
						Browns	and	& gravel	30	44	
	Liner:					Brown c	lay		44	47	
						i	-				
	Final location of s	hoe(s) 45°04	+" <u> </u>			_					łł
	(7) PERFORA	FIONS/SCREEN	S:		_			,			
	Perforation:	s Method <u>A</u>	<u>cetyle</u>	<u>ne t</u>	orch	- [+	+
		Slot		Tele/pi	pe						+
	From To	size Number	Diameter	size	Casing Lin	er					1
\bigcap	37.4" 45	1 3/8 44	6"								
$\left(\right)$	04	"x12"									
]		···		ļ	
						-	10				
	(8) WELLTES	STS: Minimum te	esting time	is 1 ho	ur	Date started 2-	19-	<u>98</u> Com	pleted $2-2$	<u>:4-98</u>	
			—		Flowing	(unbonded) Wate	r Well (Constructor Certifica	ition:	ation or ah	andonmant
	Pump	Bailer				of this well is in co	omplian	ce with Oregon water	supply well co	nstruction s	tandards.
	<u>Yield gal/min</u>	1 20 1		mat	1 hr.	 Materials used and and belief. 	linform	ation reported above a	ire true to the b	est of my k	nowiedge
	<u> </u>			•		-			WWC Nur	nber	
						Signed				Date	
	Temperature of w	ater 54	Depth Artesi	an Flow	Found	(bonded) Water V	Vell Co	nstructor Certificatio	on:		
	Was a water analy	vsis done? Y	es By whom	1		I accept respon	sibility	for the construction, al	teration, or ab	indonment	work
	Did any strata con	tain water not suitab	le for intende	ed use?	Too little	performed on this performed during	well du this time	ring the construction d e is in compliance with	ates reported a Oregon water	oove. All w supply we!	vork Il
	Salty Mud	idy 🗌 Odor 🔲 🤅	Colored [Other		_ construction stand	ards. Tl	his report is true to the	best of my kn	owledge and	d belief.
	Depth of strata:					1. 1		12 A17	WWC Nu	nber 1	578 26 00
						Signed	the second	Alms.	<u>*</u>	Date 2	-20-98
	ORIGINAL & F	FIRST COPY-WAT	ER RESOU	JRCES	DEPARTMENT	SECOND COPY-CO	NSTR	UCTOR THIRD	COPY-CUS	IOMER	

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(as required by ORS 537.765 &	& OAR 690-240-095)	LINN 50	6322	L73	427 71 (e		
(1) OWNER/PROJECT	WELI	L NO	(6) LOCATION	OF WELL By	legal descrip	tion:	
Name Steven Nis	skanen	······		Latitude	L	ongitude	8
City Albana	State OR	Zip 9732.1		of SE	1/4 of above sect	ion.	
(2) TYPE OF WORK			Street address of we	AK SE			
New construction	Alteration (Repa	air/Recondition)	Tax lot number of w	ell location 1200	>		
Conversion	Deepening		ATTACH MAP WIT approximate scale ar	H LOCATION IDEM	NTIFIED. Map sl	hall include	
(3) DRILLING METHO	DD		(7) STATIC WA	TER LEVEL: below land surface.	Date	10/20	204
Hollow Stem Auger	A Other Pus	n Probe	Artesian Pressure	lb/sq.	in. Date		
(4) BORE HOLE CONS	STRUCTION:		(8) WATER BE	ARING ZONES			
Special Standards	Depth of Completed	Wellft.	Depth at which wate	r was first found			
		Land surface	From	To	Est. Flov	w Rate	SWL
Vault	K		10-				12
		Water-tight cover Surface flush vault				·	
ft.) 0	⊒ ≺− 6	- Locking cap					
	So DL	Casing diameter in.	(9) WELL LOG	······································	"I <u>"</u>		_1
202	308	material FUC Welded Threaded Glued	Gr	ound Elevation			
000	000		Mat	lerial	From	To	SWL
Seal Do S	800	Liner	Silty Sar		O	35	+
	30° 30	diameter in.			· · · · · · · · · · · · · · · · · · ·	,	
		Welded Threaded Glued					
4 0000	0.50						
	C S S S S S S S S S S S S S S S S S S S	- Well seal: Material Restruct					+
		Amount 25165		Start Constant and the Address of the Constant			
0.00	0 0 0 0	Grout weight				¥.	
		Borehole diameter		NOV	1 + 000 /		
	20,50	Bentonite plug at least 3 ft. thick		NUV	1 5 2004	1	
	20,0C	Screen		WATER REA	CURRENT ST		
Filter G& G pack Se S		- material <u>PUC</u>		LSALE	CRECON	<u>] / / </u>	<u> </u>
4 85%	E 8384	interval(s):					
$-\frac{1}{10}$ ft. $\frac{1}{100}$ f		From To					+
20n) wow	0000	Slot size 100 in.					
		Filter pack:				L	
080		Material Sand	Date started 10/2	А64 Со	mpleted 10	20/04	·
		Size $\underline{10x20}$ in.	(unbonded) Monitor W	ell Constructor Certifi	cation:		
S WELL TESTS.			I certify that the we ment of this well is in a	ork I performed on the compliance with Orego	construction, alte	ration, or ab ell construct	andon- tion
Dump Ba	iler 🗌 Air	Flowing Artesian	standards. Materials us	ed and information rej	ported above are th	rue to the be	st of my
Permeability	Yield	GPM		11 a	MWC Nun	nber <u>(0</u> ,	<u>548</u>
Conductivity	PH		Signed Man	and	I	Date 11/1	104
Was water analysis done?	□ <u>1</u> °F/C Depth □ Yes □ N -No	artesian flow found II.	(bonded) Monitor Well Laccent responsibil	Constructor Certific ity for the construction	ation:	ahandonm	ent
By whom?	X		work performed on thi	s well during the cor	struction dates r	eported abo	we. All
Depth of strata to be analyz	ed. From	ft. to	work performed during standards. This report	g this time is in comp is true to the best of	mance with Ore; my knowledge	gon well co and belief.	nstruction
Remarks:					MW	C Number	1001
Name of supervising Geolo	gist/Engineer		Signed	Mms.	Dat	$\frac{1}{\sqrt{1}}$	04
ORIGINAL COP	Y - WATER RESOL	JRCES DEPARTMENT	SECOND COPY-201	STRUCTOR THE	RD COPY-CUS	TOMER	
ORIGINAL COP	Y – WATER RESOU	JRCES DEPARTMENT					

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National Cooperative Soil Survey

Conservation Service



USDA

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
3	Amity silt loam	15.9	38.3%
27	Concord silt loam	25.4	61.1%
33	Dayton silt loam	0.0	0.1%
106A	Woodburn silt loam, 0 to 3 percent slopes	0.2	0.5%
Totals for Area of Interest	·	41.6	100.0%



Linn County Area, Oregon

27—Concord silt loam

Map Unit Setting

National map unit symbol: 24wp Elevation: 200 to 400 feet Mean annual precipitation: 40 to 50 inches Mean annual air temperature: 52 to 54 degrees F Frost-free period: 165 to 210 days Farmland classification: Farmland of statewide importance

Map Unit Composition

Concord and similar soils: 85 percent Minor components: 4 percent Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Concord

Setting

Landform: Terraces Landform position (three-dimensional): Tread Down-slope shape: Concave, linear Across-slope shape: Concave, linear Parent material: Silty and clayey alluvium derived from mixed sources

Typical profile

H1 - 0 to 20 inches: silt loam *H2 - 20 to 40 inches:* silty clay *H3 - 40 to 72 inches:* silt loam

Properties and qualities

Slope: 0 to 2 percent Depth to restrictive feature: More than 80 inches Drainage class: Poorly drained Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr) Depth to water table: About 0 to 6 inches Frequency of flooding: None Frequency of ponding: Frequent Available water supply, 0 to 60 inches: High (about 11.2 inches)

Interpretive groups

Land capability classification (irrigated): 3w Land capability classification (nonirrigated): 3w Hydrologic Soil Group: C/D Ecological site: R002XC007OR - Valley Swale Group Forage suitability group: Poorly Drained (G002XY006OR) Other vegetative classification: Poorly Drained (G002XY006OR) Hydric soil rating: Yes

USDA

Minor Components

Dayton

Percent of map unit: 4 percent Landform: Terraces Landform position (three-dimensional): Tread Down-slope shape: Concave, linear Across-slope shape: Concave, linear Other vegetative classification: Poorly Drained (G002XY006OR) Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Linn County Area, Oregon Survey Area Data: Version 18, Sep 14, 2022



APPENDIX B:

Recommended Earthwork Specifications

GEOTECHNICAL SPECIFICATIONS

General Earthwork

- 1. All areas where structural fills, fill slopes, structures, or roadways are to be constructed shall be stripped of organic topsoil and cleared of surface and subsurface deleterious material, including but limited to vegetation, roots, or other organic material, undocumented fill, construction debris, soft or unsuitable soils as directed by the Geotechnical Engineer of Record. These materials shall be removed from the site or stockpiled in a designated location for reuse in landscape areas if suitable for that purpose. Existing utilities and structures that are not to be used as part of the project design or by neighboring facilities, shall be removed or properly abandoned, and the associated debris removed from the site.
- 2. Upon completion of site stripping and clearing, the exposed soil and/or rock shall be observed by the Geotechnical Engineer of Record or a designated representative to assess the subgrade condition for the intended overlying use. Pits, depressions, or holes created by the removal of root wads, utilities, structures, or deleterious material shall be properly cleared of loose material, benched and backfilled with fill material approved by the Geotechnical Engineer of Record compacted to the project specifications.
- 3. In structural fill areas, the subgrade soil shall be scarified to a depth of 4-inches, if soil fill is used, moisture conditioned to within 2% of the materials optimum moisture for compaction, and blended with the first lift of fill material. The fill placement and compaction equipment shall be appropriate for fill material type, required degree of blending, and uncompacted lift thickness. Assuming proper equipment selection, the total uncompacted thickness of the scarified subgrade and first fill lift shall not exceed 8-inches, subsequent lifts of uncompacted fill shall not exceed 8-inches unless otherwise approved by the Geotechnical Engineer of Record. The uncompacted lift thickness shall be assessed based on the type of compaction equipment used and the results of initial compaction testing. Fine-grain soil fill is generally most effectively compacted using a kneading style compactor, such as a sheeps-foot roller; granular materials are more effectively compacted using a smooth, vibratory roller or impact style compactor.
- 4. All structural soil fill shall be well blended, moisture conditioned to within 2% of the material's optimum moisture content for compaction and compacted to at least 90% of the material's maximum dry density as determined by ASTM Method D-1557, or an equivalent method. Soil fill shall not contain more than 10% rock material and no solid material over 3-inches in diameter unless approved by the Geotechnical Engineer of Record. Rocks shall be evenly distributed throughout each lift of fill that they are contained within and shall not be clumped together in such a way that voids can occur.
- 5. All structural granular fill shall be well blended, moisture conditioned at or up to 3% above of the material's optimum moisture content for compaction and compacted to at least 90% of the material's maximum dry density as determined by ASTM Method D-1557, or an equivalent method. 95% relative compaction may be required for pavement base rock or in upper lifts of the granular structural fill where a sufficient thickness of the fill section allows for higher compaction percentages to be achieved. The granular fill shall not contain solid particles over 2-inches in diameter unless special density testing methods or proof-rolling is approved by the Geotechnical Engineer of Record. Granular fill is generally considered to be a crushed aggregate with a fracture surface of at least 70% and a maximum size not exceeding 1.5-inches in diameter, well-graded with less than 10%, by weight, passing the No. 200 Sieve.
- 6. Structural fill shall be field tested for compliance with project specifications for every 2-feet in vertical rise or 500 cy placed, whichever is less. In-place field density testing shall be performed by a competent individual, trained in the testing and placement of soil and aggregate fill placement, using either ASTM Method D-1556/4959/4944 (Sand Cone), D-6938 (Nuclear Densometer), or D-2937/4959/4944 (Drive Cylinder). Should the fill materials not be suitable for testing by the above methods, then observation of placement, compaction and proof-rolling with a loaded 10 cy dump-truck, or equivalent ground pressure equipment, by a trained individual may be used to assess and document the compliance with structural fill specifications.

Utility Excavations

- 1. Utility excavations are to be excavated to the design depth for bedding and placement and shall not be over-excavated. Trench widths shall only be of sufficient width to allow placement and proper construction of the utility and backfill of the trench.
- 2. Backfilling of a utility trench will be dependent on its location, use, depth, and utility line material type. Trenches that are required to meet structural fill specifications, such as those under or near buildings, or within pavement areas, shall have granular material strategically compacted to at least the spring-line of the utility conduit to mitigate pipeline movement and deformation. The initial lift thickness of backfill overlying the pipeline will be dependent on the pipeline material, type of backfill, and the compaction equipment, so as not to cause deflection or deformation of the pipeline. Trench backfill shall conform to the General Earthwork specifications for placement, compaction, and testing of structural fill.

Geotextiles

1. All geotextiles shall be resistant to ultraviolet degradation, and to biological and chemical environments normally found in soils. Geotextiles shall be stored so that they are not in direct sunlight or exposed to chemical products. The use of a geotextile shall be specified and shall meet the following specification for each use.

Subgrade/Aggregate Separation

Woven or nonwoven fabric conforming to the following physical properties:

•	Minimum grab tensile strength	ASTM Method D-4632	180 lb
•	Minimum puncture strength (CBR)	ASTM Method D-6241	371 lb
•	Elongation	ASTM Method D-4632	15%
•	Maximum apparent opening size	ASTM Method D-4751	No. 40
•	Minimum permittivity	ASTM Method D-4491	$0.05 \mathrm{S}^{-1}$

Drainage Filtration

Woven fabric conforming to the following physical properties:

•	Minimum grab tensile strength	ASTM Method D-4632	110 lb
•	Minimum puncture strength (CBR)	ASTM Method D-6241	220 lb
•	Elongation	ASTM Method D-4632	50%
•	Maximum apparent opening size	ASTM Method D-4751	No. 40
•	Minimum permittivity	ASTM Method D-4491	0.5 S ⁻¹

Geogrid Base Reinforcement

Extruded biaxially or triaxially oriented polypropylene conforming to the following physical properties:

 Peak tensile strength lb/ft 	ASTM Method D-6637	925
Tensile strength at 2% strain lb/ft	ASTM Method D-6637	300
• Tensile strength at 5% strain lb/ft	ASTM Method D-6637	600
 Flexural Rigidity Effective Opening Size rock size 	ASTM Method D-1388 ASTM Method D-4751	250,000 mg-cm 1.5x
 Pavement areas use Hanes Geocomponets or Terragrid BX1200 or Equivalent 		Tensilte Strength of 1,300 lb-ft Recommended