ATTACHMENT L

Geotechnical Site Investigation and Critical Areas/Geohazards Report

Northern, Inc.
Consulting Engineers Environmental Scientists Geologists
Construction Materials Testing Geophysical Services

GEOTECHNICAL SITE INVESTIGATION AND CRITICAL AREAS / GEOHAZARDS REPORT

GOOSE PRAIRIE PHOTOVOLTAIC (PV) SOLAR ARRAY PROJECT
STATE ROUTE 24 & DESMARAIS CUTOFF
MOXEE, YAKIMA COUNTY, WASHINGTON

GNN PROJECT NO. 220-1274

DECEMBER 2020

Prepared for

OER WA SOLAR 1, LLC
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Prepared by

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At GN Northern our mission is to serve our clients in the most efficient, cost effective way using the best resources and tools available while maintaining professionalism on every level. Our philosophy is to satisfy our clients through hard work, dedication and extraordinary efforts from all of our valued employees working as an extension of the design and construction team.

December 14, 2020

OER WA Solar 1, LLC
2003 Western Avenue, Suite 225
Seattle, Washington 98121

Attn: Blake Bjornson, Manager, Project Development

Subject: Geotechnical Site Investigation and Critical Areas / Geohazards Report
Goose Prairie, Photovoltaic (PV) Solar Array Project
State Route 24 & Desmarais Cutoff, Moxee, Yakima County, Washington

GNN Project No. 220-1274

Dear Mr. Bjornson,

As requested, GN Northern (GNN) has completed a geotechnical site investigation for the proposed Goose Prairie, Photovoltaic (PV) Solar Array Project to be constructed at the ~791-acre site located north and east of the intersection of Desmarais Cutoff and State Route 24 near Moxee, in Yakima County, Washington.

Based on the findings of our subsurface study, we conclude that the site is suitable for the proposed construction provided that our geotechnical recommendations presented in this report are followed during the design and construction phases of the project.

This report describes in detail the results of our investigation, summarizes our findings and presents our recommendations concerning earthwork and the design and construction of foundations for the proposed project. It is important that GN Northern provide consultation during the design phase as well as field compaction testing and geotechnical monitoring services during the earthwork phase to ensure implementation of the geotechnical recommendations.

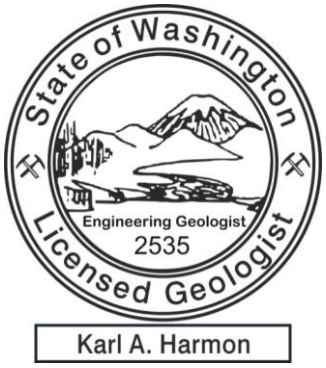
If you have any questions regarding this report, please contact us at 509-248-9798.

Respectfully submitted,

GN Northern, Inc.

Max Barnett, GIT
Staff Geologist

Karl A. Harmon, LEG, PE
Senior Geologist/Engineer



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APPENDICES

1.0 EXCECUTIVE SUMMARY

GN Northern (GNN) has prepared this executive summary to provide a general overview of this Geotechnical Site Investigation and geologic hazards / critical areas assessment report for the proposed Goose Prairie PV Solar Array Project in Yakima County, Washington. The report itself should be relied upon for information about the findings, conclusions, recommendations, and other concerns. The intent of this report is to assess various geologic hazards that may impact the proposed development and provide our recommendations for mitigation. Our site assessment has been prepared in general accordance with the requirements outlined by Yakima County Critical Areas Ordinance Title 16C, specifically regarding Chapter 16C.08 Geologically Hazardous Areas.

Development on sloping ground poses an inherent risk related to global and local stability of the slopes. Surface soils are generally considered to be erodible. Portions of the project site are identified by Yakima County to lie within areas mapped to be at risk from geology hazards, including steep slopes and erosion hazards.

Our site assessment was performed to identify common geologic conditions in the project region, including soil and bedrock conditions, groundwater, slopes, drainage, erosion, and geologic hazards. A review of selected information pertaining to the subject property and surrounding region was performed that included published technical literature, published geologic maps, available aerial photographs, and previous geotechnical/geologic studies prepared for other sites in the vicinity. Site specific geologic and geotechnical data was obtained from our field exploration program conducted at the project site.

Based on our site evaluation and analyses, our findings indicate that the proposed project may be constructed as planned, provided that the recommendations in this report are incorporated in the final design and construction of this project. The existing site slope conditions are generally considered stable. The proposed development will require appropriate design and construction for proposed reconfigured slopes as well as drainage/erosion control measures to further reduce the risk from geologic site constraints.

The subject property is situated in an area where sheet flow and erosion may occur and near-surface site soils are known to exhibit a risk for erosion. Erosion concerns will require mitigation with appropriate best management practices (BMPs), including proper drainage design as well as

collection and disposal (conveyance) of water to approved points of discharge in a non-erosive manner.

In our professional opinion, the proposed project may be developed as planned, provided that the recommendations in this report are incorporated in the final design and construction. Based on our site evaluation and analysis, the existing native slope conditions are considered stable, however proposed cut and fill slopes for the planned development will require appropriate grading measures as recommended within this report to minimize the risk of slope instability and increase safety factors of the reconfigured slopes. Additionally, based on our evaluation, near surface site soils will not be subject to a significant threat of erosion, provided that the recommendations within this report are incorporated during site grading operations along with appropriate project design, construction, and maintenance.

In our professional opinion, the proposed development, as depicted on the conceptual site layout plan (dated October 28, 2020), will not pose a threat to the public health, safety, or general welfare of the citizens, or increase the risk from geologic hazards on the site or to the surrounding properties, provided the recommendations in this report are followed in the design and construction of the project.

2.0 PURPOSE AND SCOPE OF SERVICES

This report has been prepared for the proposed Goose Prairie PV Solar Array Project to be constructed on the approximately 791-acre site located north and east of the intersection of Desmarais Cutoff and State Route 24 near Moxee, in Yakima County, Washington; site location is shown on the *Vicinity Map* (Figure 1, Appendix I). Our investigation was conducted to collect information regarding subsurface conditions and present recommendations for suitability of the subsurface materials to support the proposed ground-mounted PV solar array facilities and geotechnical design parameters for foundation design and construction.

GN Northern, Inc. has prepared this report for use by the client and their design consultants in the design of the proposed development. Do not use or rely upon this report for other locations or purposes without the written consent of GN Northern, Inc.

Our study was conducted in general accordance with our *Proposal for Geotechnical Site Investigation* dated July 7, 2020; you provided notice to proceed on August 3, 2020 in the form of a signed copy of the *Professional Services Agreement for Geotechnical Engineering Services*.

You provided:

- A topographic survey (*One Energy – Goose Prairie Solar* dated 3/17/2020) for the project site prepared by Gray Surveying & Engineering, Inc. provided via email on August 27, 2020.
- A Google Earth KMZ file showing the site boundaries, the proposed substation location, suggested boring locations, and areas to avoid for subsurface exploration.
- A Statement of Work (SOW) document outlining the minimum requirements for completion of our geotechnical services was provided via email on June 25, 2020.
- An additional electrical resistivity test location provided via email on July 31, 2020.
- A Conceptual Layout Plan (Sheet A-001, dated October 28, 2020) was provided on November 17th depicting the proposed layout of new solar arrays and other planned project improvements.

An initial first round of field exploration, consisting of ten (10) exploratory test pits and three (3) infiltration tests, was completed on August 26, 2020. A second round of exploration, consisting fourteen (14) exploratory borings was conducted between September 15th and the 21st. The various locations of our points of explorations and testing are shown on the *Site & Exploration Maps* (Figures 2 & 3, Appendix I), and detailed boring and test pit logs are presented in Appendix II. Upon receiving the conceptual solar array layout, GNN completed an additional site reconnaissance on November 20th to review site condition and evaluate potential areas of steep slopes that could impact the proposed development.

This report has been prepared to summarize the data obtained during this study and to present our recommendations based on the proposed construction and the subsurface conditions encountered at the site. Results of the field exploration were analyzed to develop recommendations for site development, earthwork, pavements and foundation bearing capacity. Design parameters and a

discussion of the geotechnical engineering considerations related to construction are included in this report.

3.0 PROPOSED CONSTRUCTION

Based on our understanding of the proposed project, a fixed-rack, ground-mounted solar photovoltaic (PV) array system is proposed to be constructed at the project site. Furthermore, we understand that installation of the PV array will require installation of pile foundations, the racking system, solar panels along with associated buried conduit and wiring. Based on our review of the provided KMZ map file of the proposed project site, we understand that an Operation & Maintenance (O & M) building and electrical substation/switch gear facility will be constructed southwest of the intersection of the northern extension of Morris Lane and the eastern extension of Den Beste Road located near the northeast corner of Section 18 (Yakima County Assessor's Parcel No.: 211218-11003). Structural loading information was not available at the time of this report. We further understand that the site will also be developed with various unpaved internal access roadways.

4.0 SITE CONDITIONS

The project site is located along the north side of Highway 24, approximately 7 miles east of the city limits of Moxee, in Yakima County, Washington. Site boundaries include most of Section 18, the most of the southern half of Section 7 and the majority of the SW ¼ of Section 8 Township 12 North and Range 21 East, Willamette Meridian. The site is bound to the east/southeast by Morris Lane, to the south by Highway 24, to the west by Desmarais Cutoff, to the northwest by Den Beste Road, and to the north/northeast by undeveloped/agricultural land. Morris Lane is a north-south aligned gravel road that separates the agricultural land to the east. Den Beste Road is discontinuous on the north side but is mapped as a gravel road. Two gates that access the northern portion of the site are located near the intersection of Den Beste Road and Morris Lane.

The project site is currently undeveloped and has a natural drainage pathway that flows through the site from the northwest to the southwest. The drainage pathway is lined with cobbles and boulders deposits from wash and possible flash flooding events. The site includes a dense growth of grass and sagebrush areas. Based on a brief review of historical aerial photographs, the southwestern portion appears to be historically used for agricultural purposes. Based on the topographic survey

(*One Energy – Goose Prairie Solar* dated 3/17/2020), the site slopes down to the southwest, with surface elevations ranging from approximately 1,726' near the northeast corner of the site to ~1,386' near the southwestern corner of the site.

5.0 FIELD EXPLORATION & LABORATORY TESTING

Our field exploration included an initial round of test pits, infiltration tests and soil sampling for thermal resistivity testing was completed on August 26, 2020. A local public utility clearance was obtained prior to the field exploration. Ten (10) exploratory test pits and three (3) infiltration test pits were excavated by Valley Septic & Excavation using a Case 580 Super N backhoe to depths ranging from approximately 6 to 11 feet below existing ground surface (BGS). The test pits were logged by a GNN field geologist. Upon completion, all excavations were loosely backfilled with excavation spoils. Secondary subsurface exploration consisted of fourteen (14) exploratory borings to depths of ~20 to 41.5 feet BGS, drilled by Western States Soil Conservation, Inc. using a CME 55 track mounted drill rig. Boring, test pit, and infiltration test locations are shown on the *Site & Exploration Maps* (Figures 2 & 3).

The soils observed during our field exploration were classified according to the Unified Soil Classification System (USCS), utilizing the field classification procedures as outlined in ASTM D2488. A copy of the USCS Classification Chart is included in Appendix II. Photographs of the site and exploration are presented in Appendix V. Depths referred to in this report are relative to the existing ground surface elevation at the time of our investigation. The surface and subsurface conditions described in this report are as observed at the time of our field investigation.

Representative samples of the subsurface soils obtained from the field exploration were selected for testing to determine the index properties of the soils in general accordance with ASTM procedures. The following laboratory tests were performed:

Table 1: Laboratory Tests Performed

Test	To determine
Particle Size Distribution (ASTM D6913 & D422)	Soil classification based on proportion of sand, silt, and clay-sized particles
Natural Moisture Content (ASTM D2216)	Soil moisture content indicative of in-situ condition at the time samples were taken

Moisture-density Relationship (ASTM D698 Standard Proctor test)	The optimum moisture content for compacting soil and the maximum dry unit weight (density) for a given compaction effort
Soil pH (ASTM G51)	Electrometric procedure for measuring pH in soils
Soil Resistivity (ASTM G-187)	Measurement of soil resistivity to assist in the determination of soil's corrosive nature
Redox Potential (ASTM D1498-76)	Electrometric measurement of oxidation-reduction potential (ORP) in water
Chloride and Sulfate (ASTM D4327)	Determination of chloride and sulfate inorganic ions in soil
Sulfide (Acetate Paper)	Determination of the total Sulphur content of soil

Results of the laboratory soil testing are included in Appendix III and soil corrosivity laboratory tests are included in Appendix IV attached to the end of the report.

6.0 SOIL INFILTRATION TESTING

Infiltration testing was performed within shallow test pits at the three selected locations (see Figures 2 & 3) using a single ring infiltrometer consisting of a 10-inch diameter steel pipe driven into the ground at the test depth. After an initial pre-soak period, a constant water level was maintained in the ring with the use of a float valve and timed intervals of the water demand volumes were recorded. Continuous readings of the infiltration rates of water volumes required to maintain the constant head were recorded until a relatively constant rate was achieved. The following table presents the results of infiltration tests performed, indicative of the infiltration characteristics of the soils encountered at the test locations/depths using the specified test method:

Test ID	Test Location (Approx. GPS Coords.)	Test Depth (BGS)	Soil Tested	Field Measured Soil Infiltration Rate
P-1	46.534377°, -120.231318°	3 feet	Silt with Gravel (ML)	**0.9 inches/hour**
P-2	46.535864°, -120.234161°	3 feet	Silt (ML)	**0.2 inches/hour**
P-3	46.522976°, -120.238195°	3 feet	Silt (ML)	**0.1 inches/hour**

An appropriate factor of safety should be applied to the field infiltration rates to determine long-term design infiltration rates. Determination of safety factors for long-term infiltration design should consider the following: pretreatment, potential for bio-fouling, system maintainability,

horizontal and vertical variability of soils. A factor of safety of 2 to 3 is considered appropriate for long-term design.

7.0 SUBSURFACE CONDITIONS

Based on the findings of our field exploration, subsurface soil conditions across the site generally include a layer of aeolian (wind-blown) silts and sands atop cemented gravels and deeper siltstone and sandstone layers. These fine- to coarse-grained sedimentary rocks are mapped as the Ellensburg Formation (*Source*: Geologic Map of the East Half of the Yakima 1:100,000 Quadrangle, Washington). Interbedded gravelly layers were encountered within borings B-1, B-5, & B-7. Shallow gravel units were classified as Silty Gravel with Sand (GM) with large amounts of caliche. This hard caliche unit resulted in excavation (bucket) refusal at all test pit locations except for test pits TP-1 & TP-3. Borings extended deeper into dense and very dense cemented silts and sands. Logs of exploratory borings and test pits with detailed descriptions and stratification of the soils encountered are included in Appendix II.

7.1 NRCS Soil Survey

The soil survey map of the site prepared by the Natural Resources Conservation Service (NRCS) identifies the site soils as *Finley cobbly fine sandy loam*, *Kiona stony silt loam*, *Lickskillet very stony silt loam*, *Moxee silt loam*, *Ritzville silt loam*, *Willis silt loam*. These soils generally are sourced from parent material described as *loess, alluvium, residuum, and colluvium derived from basalt*. The typical soil profile for these units are described as *silt* to *cobbly loam* atop *cemented material*, *very gravelly loam*, and *unweathered bedrock*. Based on the NRCS map (Appendix VI), this soil unit generally consists of *well drained* materials.

7.2 Groundwater

Groundwater was not encountered within the borings and test pits at time of our exploration to a maximum depth of approximately 41 feet BGS. We reviewed the Washington Department of Ecology (DOE) Well Log database to estimate groundwater levels in the site vicinity based on nearby wells. Our review of three nearby well log indicates depth of groundwater in the site vicinity to be on the order of 100 feet BGS or greater (see Appendix VII). There is a potential for surface water percolating and perching atop the hard caliche layer. Groundwater levels likely

fluctuate throughout the year with irrigation, precipitation, drainage, and regional pumping from wells, typically highest during the irrigation season and decreasing thereafter.

With regard to Yakima County Critical Areas Ordinance, Chapter 16C.09, addressing Critical Aquifer Recharge Areas (CARAs), due to the noted subsurface soil and rock conditions that prevail across the project site and significant depth to static groundwater conditions, the risk of groundwater contamination resulting from the proposed development is nil provided appropriate stormwater management facilities are incorporated into the project design.

7.3 Regional Geology

The large and irregularly shaped subject site is located within the Moxee Valley on the southern flanks of Yakima Ridge, north of the Rattlesnake Hills approximately 7 miles east of Moxee, Washington. The approximately 791-acre proposed solar project site extends from Highway 24 to approximately 1 ½ miles north and encompasses the northern portion of Section 18, the southeastern portion of Section 7, and the southwestern portion of Section 8.

The Moxee Valley is located in the Yakima Fold Belts sub-province, formed by north–south compression within the Columbia Basin physiographic province of southeastern Washington. The Columbia Basin Plateau is a broad plain situated between the Cascade Range to the west and the Rocky Mountains to the east. The Columbia Plateau is often called the Columbia Basin for the reason that it forms a broad lowland surrounded by mountains. The Columbia Plateau was formed by a thick sequence of folded Miocene-Age (17-6 million years BYP) tholeiitic basalt flows and interbedded sediments, known as the Columbia River Basalt Group (CRBG), which erupted from fissures in north-central and northeastern Oregon, eastern Washington, and western Idaho. Published geologic maps of the site vicinity generally depict Miocene basalts of the Columbia River Basalt Group (CRBG) in higher elevations north of the site along the Yakima Ridge as well as the Rattlesnake hills to the south. The subject site is situated on alluvial fan deposits underlain by middle to upper Miocene continental sedimentary deposits and rock of the Ellensburg Formation. Overlying sediments include relatively thin surficial deposits consisting of Plio-Pleistocene loess, including silt and fine-grained sands.

8.0 CRITICAL AREAS / GEOLOGIC HAZARDS

Geologic hazards that may affect the development include seismic hazards (ground shaking, surface fault rupture, soil liquefaction, and other secondary earthquake-related hazards), slope instability, flooding, ground subsidence, and erosion. A discussion follows on the specific hazards to this site.

8.1 Seismic Hazards

8.1.1 Surface Fault Rupture: For the purposes of this report, an active fault is defined as a fault that has had displacement within the Holocene epoch or last 11,000 years. Due to the lack of known active fault traces in the immediate site vicinity, surface fault rupture is unlikely to occur at the project site. While fault rupture would most likely occur along previously established fault traces, future fault rupture could occur at other locations.

8.1.2 Soil Liquefaction: Liquefaction is the loss of soil strength from sudden shock (usually earthquake shaking), causing the soil to become a fluid mass. In general, for the effects of liquefaction to be manifested at the surface, groundwater levels must be within 50 feet of the ground surface and the soils within the saturated zone must also be susceptible to liquefaction. Based on the published *Liquefaction Susceptibility Map of Yakima County, Washington* (dated September 2004- Figure 5 in Appendix I) prepared by Washington State Department of Natural Resources (DNR), the site is mapped within an area of very low to low liquefaction ssusceptibility with a few areas mapped as bedrock. Based on our site-specific evaluation, the risk of liquefaction at the subject site is considered very low.

8.1.3 Secondary Seismic Hazards: Secondary seismic hazards include tsunamis, and seiches. The site is far inland, so the hazard from tsunamis is non-existent. The potential hazard from seiches in also nil due to the lack of nearby surface water bodies and the noted low magnitudes of potential seismic shaking.

8.1.4 Seismic Conditions: The Yakima region is generally not considered to be located within an area of high seismic activity. There are no confirmed major faults in the region capable of producing strong earthquakes. Anticipated ground motions in the region due to seismic activity along faults in other parts of the Northwest are relatively low.

The two largest crustal earthquakes felt in the state of Washington included the 1872, M 6.8 quake near Lake Chelan and the 1936, M 6.0 Walla Walla earthquake. The following list provides information regarding historic earthquakes within the past 50 years for epicenters within 100 miles of the subject site (data from www.earthquake.usgs.gov) listed by magnitude:

Table 2: Earthquakes within 100-miles of site

Date of Event	Magnitude	Distance from site (miles)
May 18, 1980	5.7	96.7
May 28, 1981	5.5	55.7
December 12, 1989	4.9	89.9
May 16, 1980	4.7	96.5
May 13, 1981	4.6	97.1
October 8, 2006	4.5	68.9

8.2 Site Slope Conditions

Native slopes throughout the project site generally descend at gradients ranging from approximately less than 5% to some limited areas at greater than 75%. Site elevations range from approximately 1,386' to 1,726', for a total relief within the project boundaries of about 340 feet.

Detailed field reconnaissance of the project site was performed on August 26th and November 20th to observe site conditions and correlate the information gathered from our preliminary research. During our reconnaissance we looked for common geomorphic features of landslides as well as indications of possible signs demonstrating recent activity and instability of slide masses. Aside from noted area of potential ongoing sluffing along the over-steeped erosional slopes along the drainage wash that crosses the northern portion of the site, no evidence of any significant slope instability within the native conditions was noted at the site.

Based on the findings from our subsurface field explorations, detailed site reconnaissance, and desktop study, we can conclude that the existing native (undisturbed) site slopes are generally considered to be grossly stable with expected factors of safety against movement to be well above recommended minimums for development. The existing native onsite vegetation serves to provide some protection from shallow surficial instability and erosional forces. Ongoing long-term raveling/spalling of the exposed gravely/cobbly incised sides of the noted drainage channel will continue. No further stability analyses of the existing slope conditions appear warranted.

Based on our review of the conceptual site layout and the topographic survey, it appears that the planned layout generally avoids any areas of significantly steep slopes. It shall be noted that construction of new solar arrays or other ancillary structures should be avoided on areas of existing native slopes steeper than 2H:1V. Any proposed reconfigured cut or fill slopes should be constructed with appropriate geotechnical engineered grading practices, including keying and benching and proper placement of engineered fill at maximum gradients not to exceed 2H:1V. The design team shall prepare an overlay of the final layout on the final grading plan to ensure compliance with this requirement. GNN is available for additional review and consultation if necessary.

8.3 Flooding and Erosion

The subject property is not located in an area mapped by FEMA regarding flooding concerns. Portions of the subject property are however situated in areas where sheet flow and erosion may occur. Additionally, the project site includes a number of natural downslope drainages/gullies crossing the proposed development. A significant erosional drainage gully or wash extends from the northeast portion of the site and then drains approximately east to west through the site near the northern boundary of Section 18. The incised drainage is depicted on USGS maps as an *intermittent* stream (seasonal) / *ephemeral* stream (flow only after significant precipitation). The noted drainage path incises through the alluvial fan deposits. Yakima County has mapped the area along the well-defined drainage as geologically hazardous that is susceptible to "*alluvial fan/flash flooding*".

Erosion susceptibility from water is based on several factors including the intensity of rainfall and runoff, soil erodibility, length and steepness of slopes, and surface condition. The erodibility factor of the soils is a measure of the soils resistance to erosion based on its physical characteristics. Typically, very fine sand, silt and clay soils are generally susceptible to erosion. Based on site specific field exploration, observations, and laboratory testing, the surficial soil exposed at the project site consists primarily of sandy silt. The near surface site soils are known to exhibit a moderate to severe potential for erosion.

Soil erodibility is only one of several factors affecting the erosion susceptibility. Soil erosion by water also increases with the length and steepness of the site slopes due to the increased velocity of

runoff and resulting greater degree of scour and sediment transport. Appropriate erosion & sediment control and drainage plans shall be prepared by the project civil engineer with the final construction drawings.

The need for and design of flood control devices and erosion protection measures is within the purview of the design Civil Engineer. Based on a review of the conceptual layout for the proposed solar array facility, we understand that no development is planned within or in sufficiently close proximity to the noted incised drainage to pose a risk from potential flooding events. In general, erosion should be mitigated with best management practices (BMPs) consisting of proper drainage design including collecting and disposal (conveyance) of water to approved points of discharge in a non-erosive manner, installation of check dams, placement of vegetative covers and erosion control mats on slope surfaces. Appropriate project design, construction, and maintenance will be necessary to mitigate the risk from site erosion.

9.0 SEISMIC DESIGN PARAMETERS

To estimate the mapped maximum credible earthquake (MCE) spectral response accelerations with 5 percent damping at short periods (S_S) and at the 1-second period (S_1), the site's latitude and longitude coordinates were entered into the USGS Earthquake Ground Motion Application which computes values based on smoothing and averaging of the spectral response acceleration contour map data included in the IBC (International Code Council, 2015). As per the *2015 International Building Code* (IBC), a Site Class 'D' may be used for seismic design purposes. Site Class 'D' corresponds to 'still soil'.

We anticipate that the seismic design of this project will follow the procedures in 2015 IBC (ICC 2015) and ASCE 7-10 (ASCE/SEI 2010). However, we have also provided the design parameters in accordance with ASCE 7-16 (ASCE/SEI 2016). We obtained the seismic parameter from the National Seismic Hazard Maps. The following tables present the recommended seismic design parameters per ASCE 7-10 and ASCE 7-16 for a code-based response spectrum with a return period of 2,475 years.

IBC 2015 Design Response Spectra Parameters

Seismic Design Parameter	Value (unit)
S_S	0.470 (g)
S_1	0.192 (g)
F_a	1.424 (unitless)
F_v	2.030 (unitless)
S_{MS}	0.669 (g)
S_{M1}	0.391 (g)
S_{DS}	0.446 (g)
S_{D1}	0.260 (g)
PGA	0.193 (g)
F_{PGA}	1.414
PGA_M	0.273 (g)
PGA_D	0.6

IBC 2018/ASCE7-16 Design Response Spectra Parameters

Seismic Design Parameter	Value (unit)
S_S	0.438 (g)
S_1	0.182 (g)
F_a	1.449 (unitless)
F_v	2.235 (unitless)
S_{MS}	0.635 (g)
S_{M1}	0.408 (g)
S_{DS}	0.424 (g)
S_{D1}	0.272 (g)
PGA	0.195 (g)
F_{PGA}	1.410
PGA_M	0.275 (g)
PGA_D	0.5

S_S = MCE spectral response acceleration at short periods
S_1 = MCE spectral response acceleration at 1-second period
F_a = Site coefficient for short periods
F_v = Site coefficient for 1-second period
S_{MS} = MCE spectral response acceleration at short periods as adjusted for site effects
S_{M1} = MCE spectral response acceleration at 1-second period as adjusted for site effects
S_{DS} = Design spectral response acceleration at short periods
S_{D1} = Design spectral response acceleration at 1-second period
PGA = MCE_G peak ground acceleration
F_{PGA} = Site amplification factor at PGA
PGA_M = Site modified peak ground acceleration
PGA_D = Factored deterministic acceleration value

10.0 SOIL CORROSIVITY TESTING

The potential corrosive environment for metal (ductile iron or steel piping) placed beneath the ground at the project site was evaluated based on data collected during our field exploration and laboratory analytical testing based on the parameters presented in "Corrosion of Building Materials" by Dietbert Knofel. Soil samples were collected at depths of approx. 1.5 and 4 feet BGS from test pits TP-1 (substation), TP-3 (northeastern portion) and TP-8 (most southern test pit) and shipped to AMTest for laboratory testing. The corrosion suite includes pH, electrical resistivity, Redox potential, chloride, sulfate, and sulfide. The results of laboratory testing are attached in Appendix IV and summarized as follows:

Table 3: Summary of Corrosivity Testing Results

Sample, Ft. BGS	pH	Resistivity (ohms cm)	Redox Potential	Water Soluble Chloride (µg/g)	Water Soluble Sulfate (µg/g)	Sulfide
TP-1 @ 4’	8.16	3,300	359	30	<10	Negative
TP-3 @ 4’	8.35	2,400	379	64	<10	Negative
TP-8 @ 1.5’	7.33	8200	414	<10	17	Negative

The electrical resistivity of a soil is the measure of resistance to the flow of electrical current. Corrosion of buried metal is an electrochemical process in which the amount of metal loss due to corrosion is directly proportional to the flow of electrical current (DC) from the metal into the soil. As the resistivity of the soil decreases, the corrosivity generally increases. The following correlation between soil resistivity and expected corrosion attack is used in our assessment of soil aggressivity (*from Dietbert Knofel page 64, Table 6.7; Source: Waters et al.*):

Specific Resistivity (ohm-cm)	Exposed Corrosion Attack
<1000	very strongly aggressive
1000 to 3,000	strongly aggressive
3,000 to 5,000	aggressive
5,000 to 10,000	moderately aggressive
10,000 to 20,000	slightly aggressive
>20,000	virtually nonaggressive

Electrical resistivity test results indicate that the near surface soil conditions are “strongly to moderately aggressive” towards iron and other buried metal. Based on a scale published in “Corrosion of Building Materials”, the results of other parameters used in the determination of soil aggressivity i.e. soil type, water content, pH, redox potential, sulfate, chloride and sulfide indicate subsurface soils to be slightly aggressive. Other soils found across the project site may be more, less, or of a similar corrosive nature.

We recommend that additional near surface soil samples be collected from various locations across the site for laboratory testing, this would help better define the potential risk for buried metal corrosion and the need for corrosion protection.

Water Soluble Sulfates: Sulfate and other salts can attack the cement within concrete causing weakening of the cement matrix and eventual deterioration by raveling. This attack is in the form of a chemical attack, a chemical reaction between the sulfate and the cement used in the concrete.

According to ACI 318, if sulfate concentrations exceed 1000 ppm there will be special requirements.

The concentration of water-soluble sulfates measured in samples tested ranges from less than 10 ppm to 17 ppm. This concentration of water-soluble sulfates represents a negligible degree of sulfate attack on concrete exposed to these soils. The degree of attack is based on a range of negligible, positive, severe and very severe as presented in the U.S. Bureau of Reclamation Concrete Manual. We recommend that the use of ASTM Type I or Type II cement is appropriate for the project.

Chloride Ion Concentration: Chloride ions can cause corrosion of reinforcing steel. For this project, the testing results suggest a low chloride ion concentration. ACI 318 provides commentary relative to the effects of chlorides present in the soil from both internal and external sources. It is possible that long term saturation of foundations with chloride rich water could allow the chloride access to the reinforcing steel. Therefore, if the site is adequately drained in accordance with sound engineering practice and the applicable codes, this should be a low threat. A minimum concrete cover of cast-in-place concrete should be in accordance with Section 7.7 of the 2007 edition of ACI 318. Additionally, the concrete should be thoroughly vibrated during placement. The information provided above should be considered preliminary. These values can potentially change based on several factors, such as importing soil from another job site and the quality of water used during grading.

11.0 ELECTRICAL RESISTIVITY

Soil resistivity testing was performed at the substation location and the alternate test site in the northeast corner of the site on September 2, 2020.

The electrical resistivity sounding technique measures the differences in the electrical properties of geologic materials. These differences can result from variations in lithology, water content, and pore-water chemistry. The method involves transmitting an electric current into the ground between two electrodes and measuring the voltage between two other electrodes. The direct measurement is the apparent resistivity of the area beneath the electrodes. The measurements include deeper layers as the electrode spacing is increased.

Two sets of resistivity testing were performed at each location using the Wenner Four-Electrode Method. The data was acquired with an AGI Super Sting resistivity meter, along N-S and E-W directions. Eight (8) different pin spacings were used for each of the two traverses. The current and potential electrodes were driven to a uniform depth not exceeding more than 10% of the pin spacing. The four pins/electrodes were equally spaced for each set of pin spacings. Ground temperature and the moisture content of the ground (dry, moist, wet) at the time of the resistivity test was recorded. Care was taken to avoid traverses that are parallel to transmission lines or buried metallic or concrete structures.

Apparent Resistance measurements trend downwards with increased pin spacings. The date measured confirms this trend. The date indicate low resistivity soils. The type of soil, moisture content, depth of groundwater, temperature, and soil pH (mineral/salt content) affect its resistivity.

A map showing the N-S and E-W resistivity traverses is included in Appendix I, Figures 2 and 3, and the resistivity measurements are presented in Appendix V.

12.0 THERMAL RESISTIVITY

Soil samples were collected at depth of 3 feet BGS at locations TRT #1 (northern portion), TRT #2 (substation location) and TRT #3 (southern portion) for thermal resistivity analysis and shipped to Geotherm USA. The testing was conducted in accordance with IEEE Standard 442-2017. Results of the thermal resistivity testing are shown in Appendix VI.

13.0 SUMMARY OF FINDINGS & CONCLUSIONS

Conditions imposed by the proposed development have been evaluated on the basis of assumed elevations and engineering characteristics of the subsurface materials encountered in the exploratory borings and test pits, and their anticipated behavior both during and after construction. The following is a summary of our findings, conclusions and professional opinions based on the data obtained from a review of selected technical literature and the site evaluation.

- Based on the findings of this geotechnical evaluation and our understanding of the proposed development, from a geotechnical perspective, it is our opinion that the site is suitable for the proposed development, provided the soil design parameters and site-specific recommendations in this report are followed in the design and construction of the project.

- Final design plans for the proposed development, including grading, drainage and finished elevations, were not provided at the time of this report**.** Once the plans are finalized, GNN shall be provided an opportunity to review final design plans to provide revised recommendations if/as necessary.
- GNN's findings and recommendations presented in this report are based on a limited number of widely spaced points of subsurface exploration across the project site. Due to the large nature of the site, variations in soil, bedrock, and/or groundwater conditions could exist between and beyond the areas observed and explored and may not become evident until construction.
- We recommend that additional near surface soil samples be collected from various locations across the site for laboratory testing, this would help better define the potential risk for buried metal corrosion and the need for corrosion protection.
- Site soils include generally a relatively thin layer of silty/sandy loess soil atop a shallow unit of cemented gravelly soil stratum underlain at depth by sedimentary sandstone and siltstone known as the Ellensburg Formation.
- Groundwater was not encountered within any of our explorations to a maximum depth of approximately 41 feet BGS and is not considered a factor in the design and construction at the site.
- The underlying geologic condition for seismic design is site class 'D'. The *minimum* seismic design should comply with the *2015 or 2018 International Building Code* (IBC) and ASCE 07-10 or ASCE 07-16, *Minimum Design Loads for Buildings and Other Structures*.
- The onsite silty/sandy soils, free of oversize rocks (>5 inches) and any deleterious materials, are generally suitable for reuse as engineered fill and utility trench backfill. Excavated material derived from the caliche/cemented soil unit may be considered suitable for backfill provided the material is processed and screened to create a 5-inch minus well-graded material.
- The upper fine-grained silts and sands aeolian/loess deposits (wind-blown deposits) will require over-excavation and recompaction to minimize the risk of soil collapse.
- The proposed O & M building may be supported on conventional shallow foundations bearing directly on the native caliche subgrade in accordance with the recommendations of this report.

- Site grading shall incorporate the requirements of IBC 2015, Appendix J *Grading*.
- Upon completion, all test pit excavations were loosely backfilled with excavation spoils. The contractor is responsible to locate the test pits to re-excavate the loose soils and re-place as compacted engineered fill.
- The presence of relatively shallow caliche that prevail across the majority of the project site, particularly the southern portion located south of Den Beste Road, poses a challenge/difficulty for excavation with traditional earthwork equipment. Appropriately capable rippers and/or excavator-mounted hoe-rams will be required for excavation into/through the caliche layer.
- Construction of solar arrays or other ancillary structures should be avoided on areas of existing native slopes steeper than 2H:1V. Any proposed reconfigured cut or fill slopes should be constructed with appropriate geotechnical engineered grading practices, including keying and benching and proper placement of engineered fill at maximum gradients not to exceed 2H:1V.
- The subject site is situated on alluvial fan deposits underlain by sedimentary deposits and rock of the Ellensburg Formation. Overlying sediments include relatively thin surficial deposits consisting of Plio-Pleistocene loess, including silt and fine-grained sands.
- The near-surface site soils are susceptible to wind and water erosion when exposed during grading operations. Preventative measures and appropriate BMPs to control runoff and reduce erosion should be incorporated into site grading plans, with particular attention along the numerous noted onsite natural drainage pathways throughout the project site.
- All slope faces shall be protected with appropriate erosion control measures (BMPs) to insure long-term surficial stability.
- Yakima County has mapped the area along the noted well-defined drainage as geologically hazardous and susceptible to "*alluvial fan/flash flooding*". It should be understood that there is no geologic hazards directly associate with the project site situated on alluvial fan deposits. However, development within the drainage should be avoided due to the potential risk of flooding. Based on a review of the conceptual layout for the proposed solar array facility, we understand that no development is planned within or in sufficiently close proximity to the noted incised drainage to pose a risk from potential flooding events.

- ***In our professional opinion, the proposed development at the site will not pose a threat to the public health, safety, or general welfare of the citizens, or increase the risk from geologic hazards at the site or to surrounding properties, provided the recommendations in this report are followed in the design and construction of the project.***

14.0 GEOTECHNICAL RECOMMENDATIONS

The following geotechnical recommendations are based on our current understanding of the proposed project. The report is prepared to comply with the 2015 International Building Code Section 1803, Geotechnical Investigations, and as required by Subsection 1803.2, Investigations Required. Please note that Soil Design Parameters and Recommendations presented in this report are predicated upon appropriate geotechnical monitoring and testing of the site preparation and foundation and building pad construction by a representative of GNN's Geotechnical-Engineer-of-Record (GER). Any deviation and nonconformity from this requirement may invalidate, partially or in whole, the following recommendations. We recommend that we be engaged to review grading and foundation plans in order to provide revised, augmented, and/or additional geotechnical recommendations as required.

14.1 Site Development – Grading

Site grading shall incorporate the requirements of IBC 2015 Appendix J. The project GER or a representative of the GER should observe site clearing, grading, and the bottoms of excavations before placing fills. Local variations in soil conditions may warrant increasing the depth of over-excavation and recompaction. Seasonal weather conditions may adversely affect grading operations. To improve compaction efforts and prevent potential pumping and unstable ground conditions, we suggest performing site grading during dryer periods of the year.

Soil conditions shall be evaluated by in-place density testing, visual evaluation, probing, and proof-rolling of the imported fill and re-compacted on-site soil as it is prepared to check for compliance with recommendations of this report. A moisture-density curve shall be established in accordance with the ASTM D1557 method for all onsite soils and imported fill materials used as structural fill.

To mitigate the risk of soil collapse, over-excavation and recompaction of the upper fine-grained silts and sands (wind-blown loess deposits) is required if encountered under spread footings, slabs and hardscapes areas.

The contractor shall locate all test pits indicated in the Geotechnical Site Investigation Report within the limits of Work. At each test pit, re-excavate soils loosely backfilled during prior investigation and backfill the excavation with onsite fill soils placed as engineered fill.

Earthwork during wet weather should be avoided, if possible. If earthwork operations cannot be avoided in wet weather, comply with recommendations presented in Section 13.15 "Wet Weather Conditions". If earthwork occurs during wet weather, expect disturbance to subgrades and expect to perform corrective work to repair disturbed subgrades.

14.2 Clearing and Grubbing

At the start of site grading, any vegetation, large roots, any non-engineered/artificial fill, and any abandoned underground utilities shall be removed from the proposed building and structural areas. The surface shall be stripped of all topsoil and/or organic growth (vegetation) that may exist within the proposed structural areas. The topsoil and organic rich soils shall either be stockpiled on-site separately for future use or be removed from the construction area. Depth of stripping can be minimized with real-time onsite observation of sufficient removals. Areas disturbed during clearing shall be properly backfilled and compacted as described below.

14.3 Suitability of the Onsite Soils as Engineered Fill

The native onsite silty/sandy soils, free of oversize rocks (>5 inches) and deleterious materials, are generally suitable for reuse as engineered fill and utility trench backfill. Excavated material derived from the cemented gravelly unit may be considered suitable for backfill provided the material is processed and screened to create a 5-inch minus well-graded material meeting the following grading limits:

Sieve Size	Percent Passing
5"	100
¾"	70
#4	35-65
#200	Less than 8

Suitable onsite soils shall be placed in maximum 8-inch lifts (loose) and compacted to at least 95% relative compaction (ASTM D1557) near its optimum moisture content. The near-surface silty/sandy soils are considered moisture-sensitive; therefore, compaction of the suitable onsite soils shall be performed within a range of ±2% of optimum moisture to achieve the proper degree of compaction.

14.4 Temporary Excavations

It shall be the responsibility of the contractor to maintain safe temporary slope configurations since the contractor is at the job site, able to observe the nature and conditions of the slopes and be able to monitor the subsurface conditions encountered. Unsupported vertical cuts deeper than 4 feet are not recommended if worker access is necessary. The cuts shall be adequately sloped, shored or supported to prevent injury to personnel from caving and sloughing. The contractor and subcontractors shall be aware of and familiar with applicable local, state and federal safety regulation including the current OSHA Excavation and Trench Safety Standards, and OSHA Health and Safety Standards for Excavations, 29 CFR Part 1929, or successor regulations.

According to chapter 296-155 of the Washington Administrative Code (WAC), it is our opinion that the near-surface soil encountered at the site is classified as Type C soils. We recommend that temporary, unsupported, open cut slopes shall be no steeper than 1.5 feet horizontal to 1.0 feet vertical (1.5H:1V) in Type C soils. Excavation into the hard caliche unit may be completed at near-vertical. No heavy equipment should be allowed near the top of temporary cut slopes unless the cut slopes are adequately braced. Final (permanent) fill slopes should be graded to an angle of 2H:1V or flatter. Where unstable soils are encountered, flatter slopes may be required.

The presence of the noted relatively shallow cemented gravel stratum at the site poses a challenge/difficulty for excavation with traditional earthwork equipment. Appropriately capable rippers and/or excavator-mounted hoe-rams may be required for excavation into/through this layer.

14.5 Utility Excavation, Pipe Bedding and Trench Backfill

To provide suitable support and bedding for the pipe, we recommend the utilities be founded on suitable bedding material consisting of clean sand and/or sand & gravel mixture. To minimize trench subgrade disturbance during excavation, the excavator should use a smooth-edged bucket rather than a toothed bucket.

Pipe bedding and pipe zone materials shall conform to Section 9-03.12(3), Gravel Backfill for Pipe Zone Bedding, of the Washington State Department of Transportation (WSDOT) 2018 Standard Specifications. Pipe bedding should provide a firm uniform cradle for support of the pipes. A minimum 4-inch thickness of bedding material beneath the pipe should be provided. Prior to installation of the pipe, the pipe bedding should be shaped to fit the lower part of the pipe exterior with reasonable closeness to provide uniform support along the pipe. Pipe bedding material should be used as pipe zone backfill and placed in layers and tamped around the pipes to obtain complete contact. To protect the pipe, bedding material should extend at least 6 inches above the top of pipe.

Placement of bedding material is particularly critical where maintenance of precise grades is essential. Backfill placed within the first 12 inches above utility lines should be compacted to at least 90% of the maximum dry density (ASTM D1557), such that the utility lines are not damaged during backfill placement and compaction. In addition, rock fragments greater than 1 inch in maximum dimension should be excluded from this first lift. The remainder of the utility excavations should be backfilled and compacted to 95% of the maximum dry density as determined by ASTM D1557.

Onsite soils are considered suitable for utility trench backfill provided they are free of oversize material and can be adequately compacted. All excavations should be wide enough to allow for compaction around the haunches of pipes and underground tanks. We recommend that utility trenching, installation, and backfilling conform to all applicable federal, state, and local regulations such as OSHA and WISHA for open excavations.

Compaction of backfill material should be accomplished with soils within ±2% of their optimum moisture content in order to achieve the minimum specified compaction levels recommended in this report. However, initial lift thickness could be increased to levels recommended by the manufacturer to protect utilities from damage by compacting equipment.

14.6 Imported Crushed Rock Structural Fill

Where and as needed, imported structural fill shall consist of well-graded, crushed aggregate material meeting the grading requirements of WSDOT 2018 Standard Specifications, Section 9-03.9(3) (1-1/4 inch minus Base Course Material) presented here:

Table 4: WSDOT Standard Spec. 9-03.9(3)

Sieve Size	Percent Passing (by Weight)
1¼ Inch Square	99 - 100
1 Inch Square	80 - 100
5/8 Inch Square	50 – 80
U.S. No. 4	25 - 45
U.S. No. 40	3 – 18
U.S. No. 200	Less than 7.5

A fifty (50) pound sample of each imported fill material shall be collected by GNN personnel prior to placement to ensure proper gradation and establish the moisture-density relationship (proctor curve).

14.7 Compaction Requirements for Engineered Fill

All fill or backfill shall be approved by a representative of the GER, placed in uniform lifts, and compacted to a minimum 95% of the maximum dry density as determined by ASTM D1557. The compaction effort must be verified by a representative of the GER in the field using a nuclear density gauge in accordance with ASTM D6938. The thickness of the loose, non-compacted lift of fill shall not exceed 8 inches for heavy-duty compactors or 4 inches for hand operated compactors.

14.8 O&M Building Foundation Bearing Support

The proposed O&M building may be supported on conventional shallow foundations in accordance with the recommendations of this report. The minimum footing depth shall be 24 inches below adjacent grades for frost protection and bearing capacity considerations. All foundations shall be constructed to bear directly on the caliche layer or on 1¼-minus crushed rock structural fill extending down to the caliche layer. Foundation excavations shall be cleared of all loose soils and shall be observed by a representative of the GER to confirm the dense caliche has been exposed. Footings constructed in accordance with the above recommendations may be designed for an allowable bearing capacity of **2,500 pounds per square foot (psf)**. The allowable bearing pressure may be increased by 1/3 for short-term transient loading conditions. The estimated total settlement for footings is approximately 1-inch with differential settlement less than half that magnitude. The weight of the foundation concrete below grade may be neglected in dead load computations.

Lateral forces on foundations from short term wind and seismic loading would be resisted by friction at the base of foundations and passive earth pressure against the buried portions. We

recommend an allowable passive earth pressure for the compacted onsite soil of **200 pcf**. This lateral foundation resistance value includes a factor of safety of 1.5. We recommend a coefficient of friction of **0.40** be used between cast-in-place concrete and native caliche. An appropriate factor of safety should be used to calculate sliding resistance at the base of footings.

14.9 O&M Building Slab-on-Grade Floors

Place a minimum 6-inch layer of crushed aggregate fill beneath the slabs. The material shall meet the WSDOT 2018 Standards Specifications, Section 9-03.9(3), "Crushed Surfacing Top Course", with less than 5 percent passing the No. 200 sieve (fines). The crushed rock material shall be compacted to at least 95% of the maximum dry density as determined by the ASTM D1557 method. Prior to placing the crushed rock layer, the native subgrade shall be moisture-conditioned and compacted to minimum 95% of the maximum dry density as determined by ASTM D1557 to a minimum depth of 12 inches. Any soft spots or areas displaying pumping/deformation during compaction shall be over-excavated an additional 12 inches, backfilled with imported granular structural fill and re-compacted.

We recommend a modulus of subgrade reaction equal to **120 pounds per cubic inch (pci)** based on a value for gravel presented in the Portland Cement Association publication No. EB075.01D. Slab thickness, reinforcement and joint spacing shall be determined by a licensed engineer based on the intended use and loading.

14.10 Driven Posts Pile Foundation

We understand that the PV array structures will be supported on driven posts pile foundations. The selection of pile type, size, and method of installation shall be determined by the design-build racking contractor considering the geotechnical parameters presented in this report. Uplift and overturning resistance shall be factored into the foundation design.

The structural designer shall determine the pile length based on the structural demands for axial compressive loads, lateral loads and overturning moments. Pile foundations in cemented/hardpan soils units shall be socketed to a sufficient depth to satisfy structural demands to resist uplift and lateral loads and shall fulfill minimum penetration and length requirements. Foundation supported on bedrock shall penetrate a minimum 6 inches into the weathered basalt bedrock unit. Additional

penetration into the dense bearing stratum may be required to compensate for the skin friction lost due to surface disturbance caused by installation.

Axial capacity of driven piles may be estimated based on the perimeter of the pile and embedment depth. End bearing of driven piles should be neglected. For pipe piles the perimeter is the circumference, for wide flange beams, the perimeter is twice the sum of the flange width and web depth. We recommend the upper 24 inches of soil for each pile be neglected for capacity; however, the upper 18 inches may be included for overburden pressure.

Based on the findings of our subsurface investigation, we recommend that post pile foundations be supported on the underlying hardpan/bedrock unit. If design requires pile lengths to be greater 8 to 9 feet, pre-drilling of the hardpan/bedrock may be warranted.

An allowable end bearing pressure of **4,000 psf** may be used for the design of driven post/pile foundations bearing directly on the underlying hardpan/bedrock unit. This value may be increased one-third (33%) for short-term (transient) loading events.

We estimate the total settlement for piles constructed per the recommendations of this report to be less than 1-inch, with differential settlement less than half that magnitude.

Lateral forces on foundation from short term wind and seismic loading would be resisted by friction at the base of piles and passive earth pressure against the buried portions. We recommend an allowable passive earth pressure within the upper silty soils of **140 pcf and 250 pcf** for the underlying cemented soil units. This lateral foundation resistance value includes a factor of safety of 1.5. We recommend an allowable coefficient of skin friction between steel pile (assumed) and the loose native silt of **0.15**. We recommend a coefficient of skin friction of **0.35** be used between steel pile (assumed) and the underlying hardpan layer. An appropriate factor of safety should be used to calculate sliding resistance at the base of the pile. The following table provides additional geotechnical parameters for use in design:

Table 5: Geotechnical Design Parameters

Soil Type	Soil Angle of Friction	Effective Unit Weight	Apparent Cohesion	p-y modulus, k
Loose Silt with Sand	26 degrees	80 pcf	*ignore*	25 pci
Caliche/Hardpan/Silt stone/Sandstone	32 degrees	105 pcf	200 psf	300 pci
Weathered Basaltic Bedrock	40 degrees	145 pcf	400 psf	500 pci

Driven Pile Foundation Installation Considerations

If refusal is encountered during installation, the vibration action of the hammer could result in an oversized installation hole that greatly reduces axial and lateral capacity of the installed pile. If pile refusal occurs, we recommend the pile be immediately smoothly withdrawn and to predrill the installation location. The pre-drilled hole should have a diameter of at least one (1) inch smaller than the pipe pile outer diameter (O.D.) or two (2) inches smaller than the diagonal dimension of a wide flange beam. Test driving of pile should be considered to determine the proper pre-drill hole size.

A representative of the GNN should observe the driven pile installation and materials penetrated to confirm that the conditions encountered are consistent with those used in our analyses and to evaluate conditions that may affect pile capacities. We recommend that pile load testing shall be conducted before installation of production piles for this project. The pile load test shall be monitored by a geotechnical representative of GNN and the results reviewed by the GER.

14.11 Drilled & Grouted Posts Pile Foundation

Due to the presence of shallow cemented gravels that may likely prevent driven pile advancement, the PV array structures may be supported on drilled and grouted posts pile foundations

14.12 Foundation Options for Substation Equipment Pads

Based on subsurface conditions encountered at the site, we believe that shallow spread footings and/or mat foundations may both be suitable options for foundation types for the proposed substation located southeast of the intersection of Morris Lane and Den Beste Road.

Spread Footings: Structures supported on conventional spread footings shall be founded on crushed rock structural fill overlying compacted native soils. All footings should be placed at least

24 inches below exterior finished grade for frost protection. We recommend at least 12-inches of 1½" minus crushed rock fill be placed directly beneath the footing base in two lifts, with each lift compacted to at least 95% of the maximum dry density as determined by ASTM D1557. The lateral extent of crushed rock shall be 12 inches on all sides of the foundation. Prior to placing the structural gravel fill material, the native subgrade soil shall be scarified to a minimum depth of 12-inch, moisture conditioned to near optimum and compacted to at least 95% of the maximum dry density as determined by ASTM D1557. Spread footings supported on compacted structural gravel fill can be proportioned for a maximum allowable bearing pressure of **2,000 psf**.

This allowable bearing pressure include a factor of safety of 3. Allowable bearing pressure may be increased by one-third (33%) for seismic loading conditions. In our opinion, foundations constructed on compacted structural gravel fill overlying compacted native subgrade will settle less than 1-inch, with differential settlement less than half that magnitude.

Mat Foundations: Mat foundations shall be supported on a minimum 12-inches of 1½" minus crushed rock fill be placed directly beneath the mat in two lifts, with each lift compacted to at least 95% of the maximum dry density as determined by ASTM D1557. Prior to placing the structural gravel fill material, the native subgrade soil shall be scarified to a minimum depth of 12-inch, moisture conditioned (as necessary) and re-compacted to at least 95% of the maximum dry density as determined by ASTM D1557. The lateral extent of crushed rock shall be 12 inches on all sides of the foundation. A modulus of subgrade reaction of **200 pci** may considered for mat foundations supported on minimum 18-inches of imported crushed rock on prepared and compacted subgrade.

For design purposes, an allowable passive earth pressure of 220 pcf and 300 pcf (equivalent fluid unit weight) is appropriate for compacted onsite backfill and crushed rock structural fill, respectively. This lateral foundation resistance value includes a factor of safety of 1.5. A coefficient of base friction of 0.45 (mass concrete poured directly over granular structural fill) may be used for the frictional resistance against sliding. An appropriate factor of safety shall be used to calculate sliding resistance at the base of footings.

Based on the findings of our exploration, our experience with similar soils, and the results of our laboratory testing, effect of frost heave and soil expansion are considered negligible.

14.13 Subgrade Protection

The degree to which construction grading problems develop is expected to be dependent, in part, on the time of year that construction proceeds and the precautions which are taken by the contractor to protect the subgrade. The near-surface fine-grained soils currently present on site are considered to be moisture and disturbance sensitive due to their fines content and may become unstable (pumping) if allowed to increase in moisture content and are disturbed (rutted) by construction traffic if wet. If necessary, the construction access road should be covered with a layer of gravel or quarry spalls course. The soils are also susceptible to erosion in the presence of moving water. The soils shall be stabilized to minimize the potential of erosion into the foundation excavation. The site shall be graded to prevent water from ponding within construction areas and/or flowing into excavations. Accumulated water must be removed immediately along with any unstable soil. Foundation concrete shall be placed and excavations backfilled as soon as possible to protect the bearing grade. We further recommend that soils that become unstable are to be either:

- Removed and replaced with structural compacted gravel fill, or
- Mechanically stabilized with a coarse crushed aggregate (possibly underlain with a geotextile) and compacted into the subgrade.

14.14 Surface Drainage

With respect to surface water drainage, we recommend that the ground surface be sloped to drain away from the structure. Final exterior site grades shall promote free and positive drainage from the building areas. Water shall not be allowed to pond or to collect adjacent to foundations or within the immediate building area. We recommend that a gradient of at least 5% for a minimum distance of 10 feet from the building perimeter be provided, except in paved locations. In paved areas, a minimum gradient of 1% should be provided unless provisions are included for collection/disposal of surface water adjacent to the structure. Catch basins, drainage swales, or other drainage facilities should be aptly located. All surface water such as that coming from roof downspouts and catch basins be collected in tight drain lines and carried to a suitable discharge point. Surface water and downspout water should not discharge into a perforated or slotted subdrain, nor should such water discharge onto the ground surface adjacent to the building. Cleanouts should be provided at convenient locations along all drain lines.

14.15 Wet Weather Conditions

The onsite fine-grained soils (Silt/Loess) are moisture sensitive during handling and compaction. Proceeding with earthwork using these soils during wet weather could add significant project costs and/or delays. The stability of exposed soils may rapidly deteriorate due to a change in moisture content. Therefore, if at all possible, complete site clearing, preparation, and earthwork during periods of warm, dry weather when soil moisture can be controlled by aeration. During or subsequent to wet weather, drying or compacting the on-site soils will be difficult. It will be necessary to either amend the on-site soils or import granular materials for use as structural fill. If earthwork takes place in wet weather or wet conditions, the following recommendations should be followed:

- Fill materials should consist of imported clean, granular soil, with less than 3 percent fines (passing the No. 200 sieve size), based on wet-sieving the soil fraction passing the ¾-inch sieve.
- Earthwork should be accomplished in small sections and carried through to completion to reduce exposure to wet weather. Soils that becomes too wet for compaction should be removed and replaced with clean, granular material.
- The construction area ground surface should be sloped and sealed to reduce water infiltration, to promote rapid runoff, and to prevent water ponding.
- To prevent soil disturbance, the size or type of equipment may have to be limited.
- Carefully stage equipment and/or stockpiles, route construction equipment away from subgrades, and implement aggressive site drainage procedures to help reduce saturating subgrades during wet weather conditions.
- Equipment with large tracks, lugs, or having toothed buckets has a significant potential to disturb the site soil prior to or following compaction. Rubber-tired vehicles should not access prepared subgrades unless the subgrade is sufficiently stiff to allow construction traffic without disturbance.
- Maintain the subgrade in a compacted condition and protect subgrades from construction traffic disturbance after they have been prepared and meet compaction requirements. Consequently, do not operate construction equipment or vehicles on prepared subgrade areas during wet weather conditions.

- Prior to rain and other events that may cause fine-grained soil (silt and silty sand) to exceed optimum moisture content, stabilize such soils to minimize potential for erosion into adjacent excavations.
- Earthwork should not be performed immediately after rainfall, or until soil can dry sufficiently to allow construction traffic without disturbing the subgrade. After inclement weather, inspect all subgrade areas prepared before the inclement weather conditions.
- For soils exhibiting pumping, rutting, weaving, or otherwise exhibiting unstable performance, moisture-condition (typically dry) and re-compact the soil to structural fill requirements, or remove and replace the unstable soils with imported free draining granular fill material acceptable to the GER
- Work areas and stockpiles should be covered with plastic. Straw bales, straw wattles, geotextile silt fences, and/or other measures should be used as appropriate to control soil erosion.
- Excavation and structural fill placement should be observed on a full-time basis by a representative of our geotechnical engineer to determine that unsuitable materials are fully removed and that suitable compaction and site drainage is achieved.

14.16 Slope Maintenance and Erosion Protection

Proper slope protection and maintenance will help minimize slope erosion and improve the stability of the project slopes. The project soils are prone to erosion and will require appropriate BMP protection and maintenance. Positive drainage should be provided at the tops of all slopes to divert runoff away from the face. Swales constructed in native soils should be lined with suitable no-erosive material. Erosion protection should be provided, especially where concentrated runoff is anticipated.

The need for and design of flood control and erosion protection measures is within the purview of the design civil engineer. In general, erosion should be mitigated with best management practices (BMPs) consisting of proper drainage design including collecting and disposal (conveyance) of water to approved points of discharge in a non-erosive manner. Appropriate project design, construction, and maintenance will be necessary to mitigate the site erosion concerns.

15.0 CONTINUING GEOTECHNICAL SERVICES

GNN recommends that the Client should maintain an adequate program of geotechnical consultation, construction monitoring, and soils testing during the final design and construction phases to monitor compliance with GNN's geotechnical recommendations. Maintaining GNN as the geotechnical consultant from beginning to end of the project will provide continuity of services. If GN Northern, Inc. is not retained by the owner/developer and/or the contractor to provide the recommended geotechnical inspections/observations and testing services, the geotechnical engineering firm or testing/inspection firm providing tests and observations shall assume the role and responsibilities of Geotechnical Engineer-of-Record.

GNN can provide construction monitoring and testing as additional services. The costs of these services are not included in our present fee arrangement, but can be obtained from our office. The recommended construction monitoring and testing includes, but is not necessarily limited to, the following:

- Consultation during the design stages of the project.
- Review of the grading and drainage plans to monitor compliance and proper implementation of the recommendations in GNN's Report.
- Observation and quality control testing during site preparation, grading, and placement of engineered fill as required by the local building ordinances.
- Geotechnical engineering consultation as needed during construction

16.0 LIMITATIONS OF THE GEOTECHNICAL SITE INVESTIGATION REPORT

This GEOTECHNICAL SITE INVESTIGATION REPORT ("Report") was prepared for the exclusive use of the Client. GN Northern, Inc.'s (GNN) findings, conclusions and recommendations in this Report are based on a limited number of widely spaced points of subsurface exploration across the project site, and GNN's understanding of the proposed project at the time the Report is prepared. Furthermore, GNN's findings and recommendations are based on the assumption that soil, rock and/or groundwater conditions do not vary significantly from those found at specific exploratory locations at the project site. Due to the large nature of the site, variations in soil, bedrock and/or groundwater conditions could exist between and beyond the areas observed and explored. The nature and extent of these variations may not become evident until during or after construction. Variations in soil, bedrock and groundwater may require additional studies, consultation, and revisions to GNN's recommendations in the Report.

In many cases the scope of geotechnical exploration and the test locations are selected by others without consultation from the geotechnical engineer/consultant. GNN assumes no responsibility and, by preparing this Report, does not impliedly or expressly validate the scope of exploration and the test locations selected by others.

This Report's findings are valid as of the issued date of this Report. However, changes in conditions of the subject property or adjoining properties can occur due to passage of time, natural processes, or works of man. In addition, applicable building standards/codes may change over time. Accordingly, findings, conclusions, and recommendations of this Report may be invalidated, wholly or partially, by changes outside of GNN's control. Therefore, this Report is subject to review and shall not be relied upon after a period of **three (3) year** from the issued date of the Report.

In the event that any changes in the nature, design, or location of structures are planned, the findings, conclusions and recommendations contained in this Report shall not be considered valid unless the changes are reviewed by GNN and the findings, conclusions, and recommendations of this Report are modified or verified in writing.

This Report is issued with the understanding that the owner or the owner's representative has the responsibility to bring the findings, conclusions, and recommendations contained herein to the

attention of the architect and design professional(s) for the project so that they are incorporated into the plans and construction specifications, and any follow-up addendum for the project. The owner or the owner's representative also has the responsibility to verify that the general contractor and all subcontractors follow such recommendations during construction. It is further understood that the owner or the owner's representative is responsible for submittal of this Report to the appropriate governing agencies. The foregoing notwithstanding, no party other than the Client shall have any right to rely on this Report and GNN shall have no liability to any third party who claims injury due to reliance upon this Report, which is prepared exclusively for Client's use and reliance.

GNN has provided geotechnical services in accordance with generally accepted geotechnical engineering practices in this locality at this time. GNN expressly disclaims all warranties and guarantees, express or implied.

Client shall provide GNN an opportunity to review the final design and specifications so that earthwork, drainage and foundation recommendations may be properly interpreted and implemented in the design and specifications. If GNN is not accorded the review opportunity, GNN shall have no responsibility for misinterpretation of GNN's recommendations.

Although GNN can provide environmental assessment and investigation services for an additional cost, the current scope of GNN's services does not include an environmental assessment or an investigation for the presence or absence of wetlands, hazardous or toxic materials in the soil, surface water, groundwater, or air on, below, or adjacent to the subject property.

APPENDICES

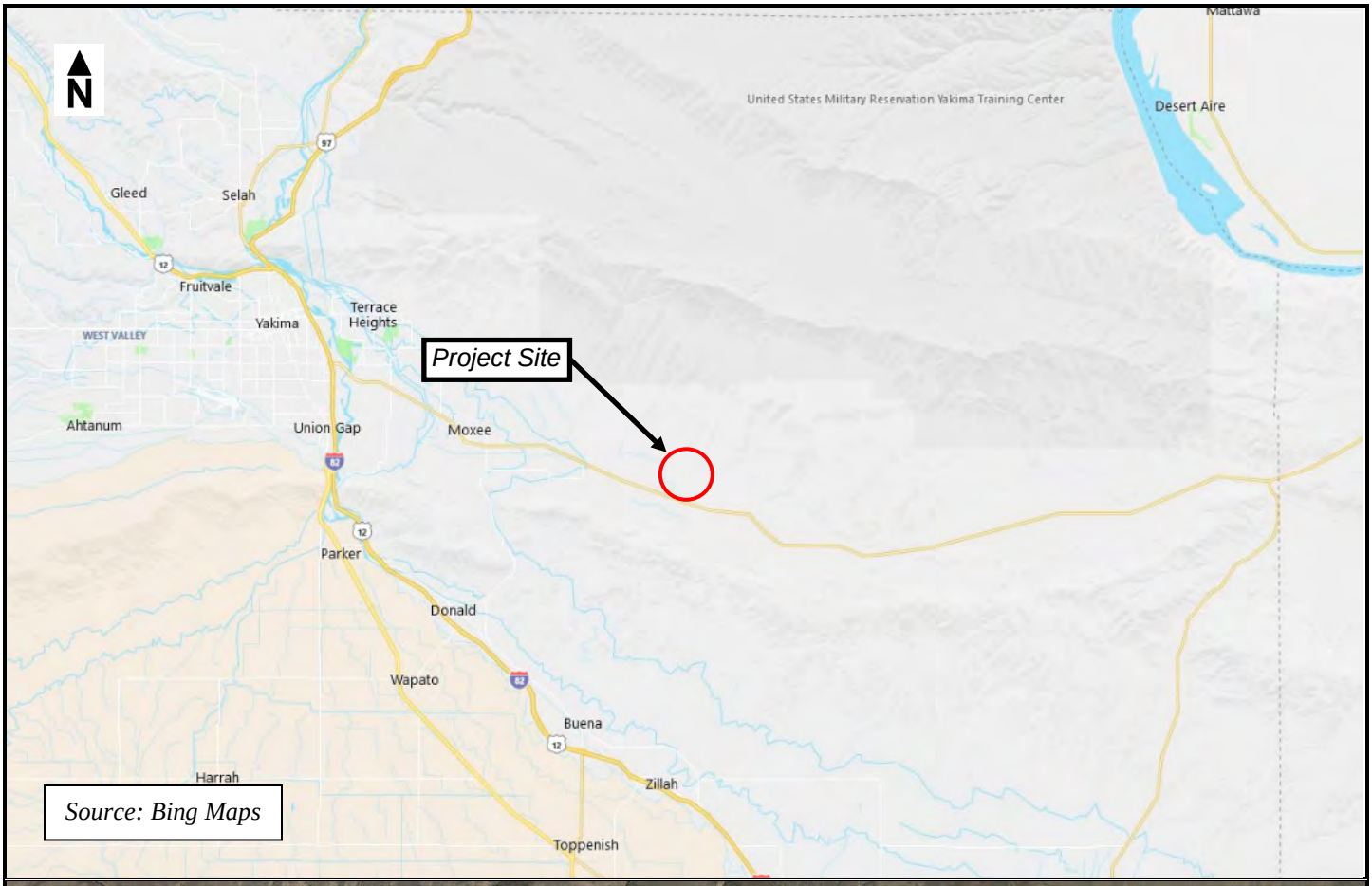
Appendix I

Vicinity Map (Figure 1)

Site Exploration Maps (Figures 2 & 3)

Fault & Geologic Map (Figure 4)

Liquefaction Susceptibility Map (Figure 5)



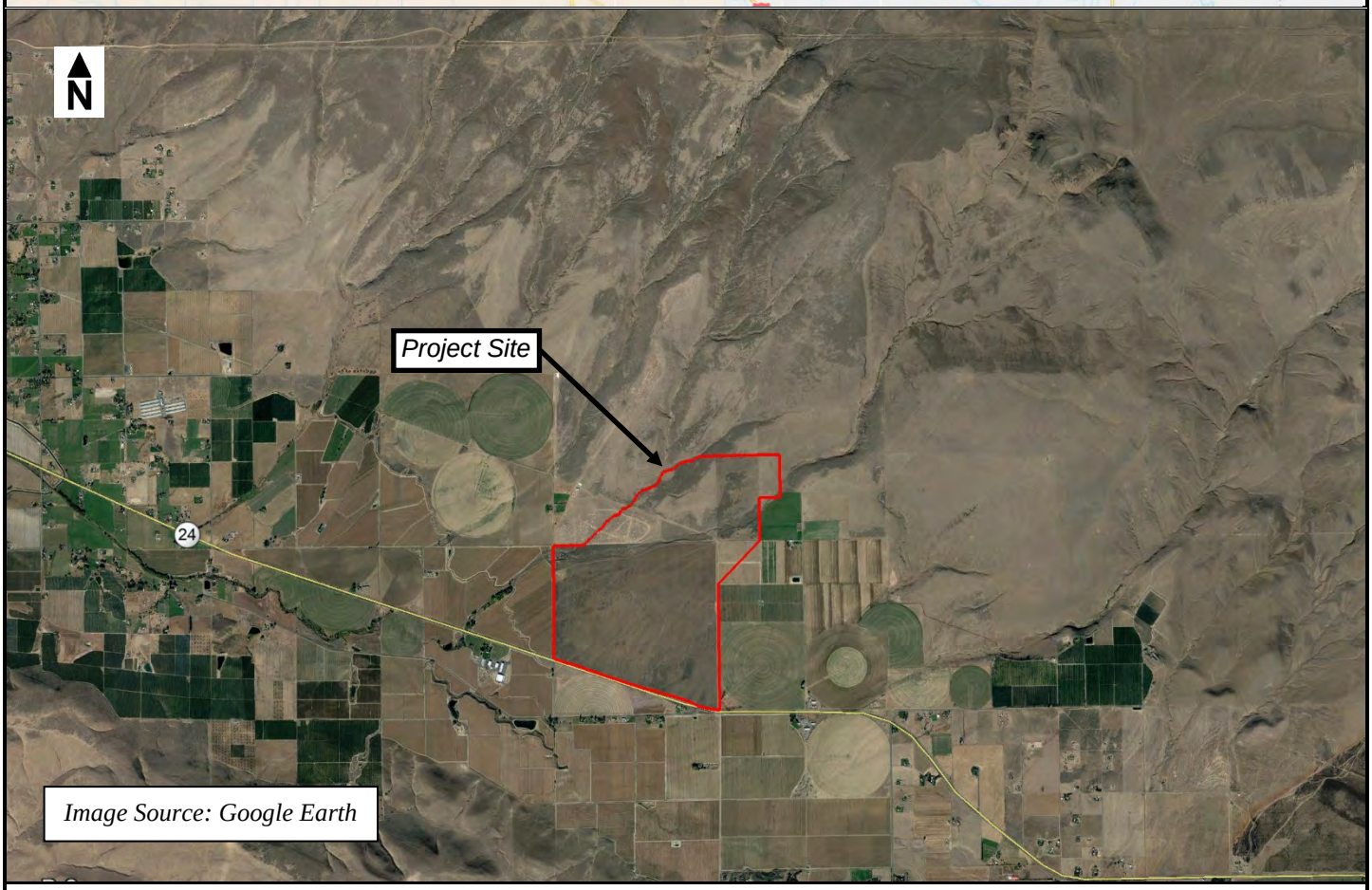


FIGURE 1: VICINITY MAP **PROJECT NO. 220-1274**

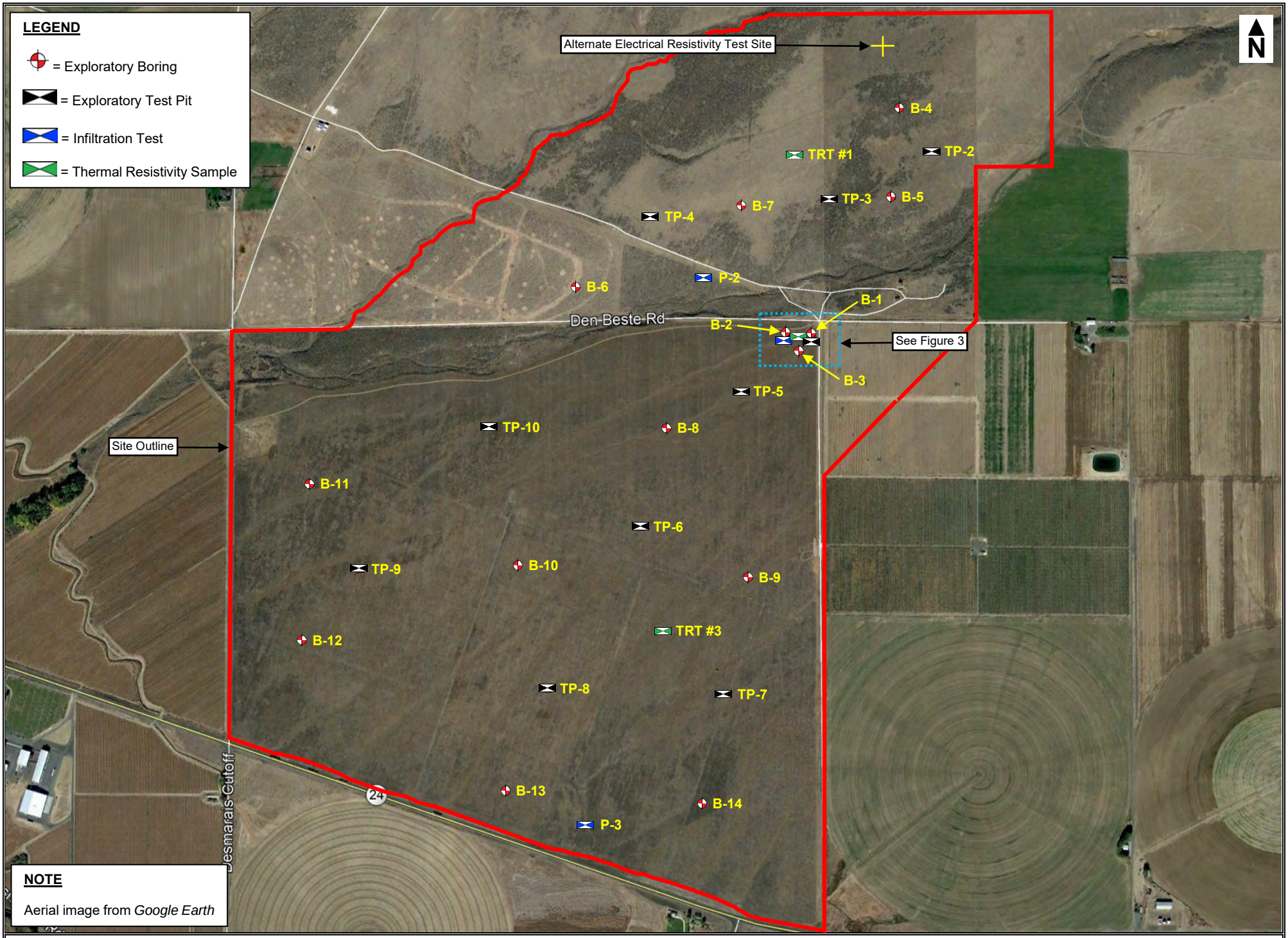


FIGURE 2: SITE EXPLORATION MAP **PROJECT NO. 220-1274**

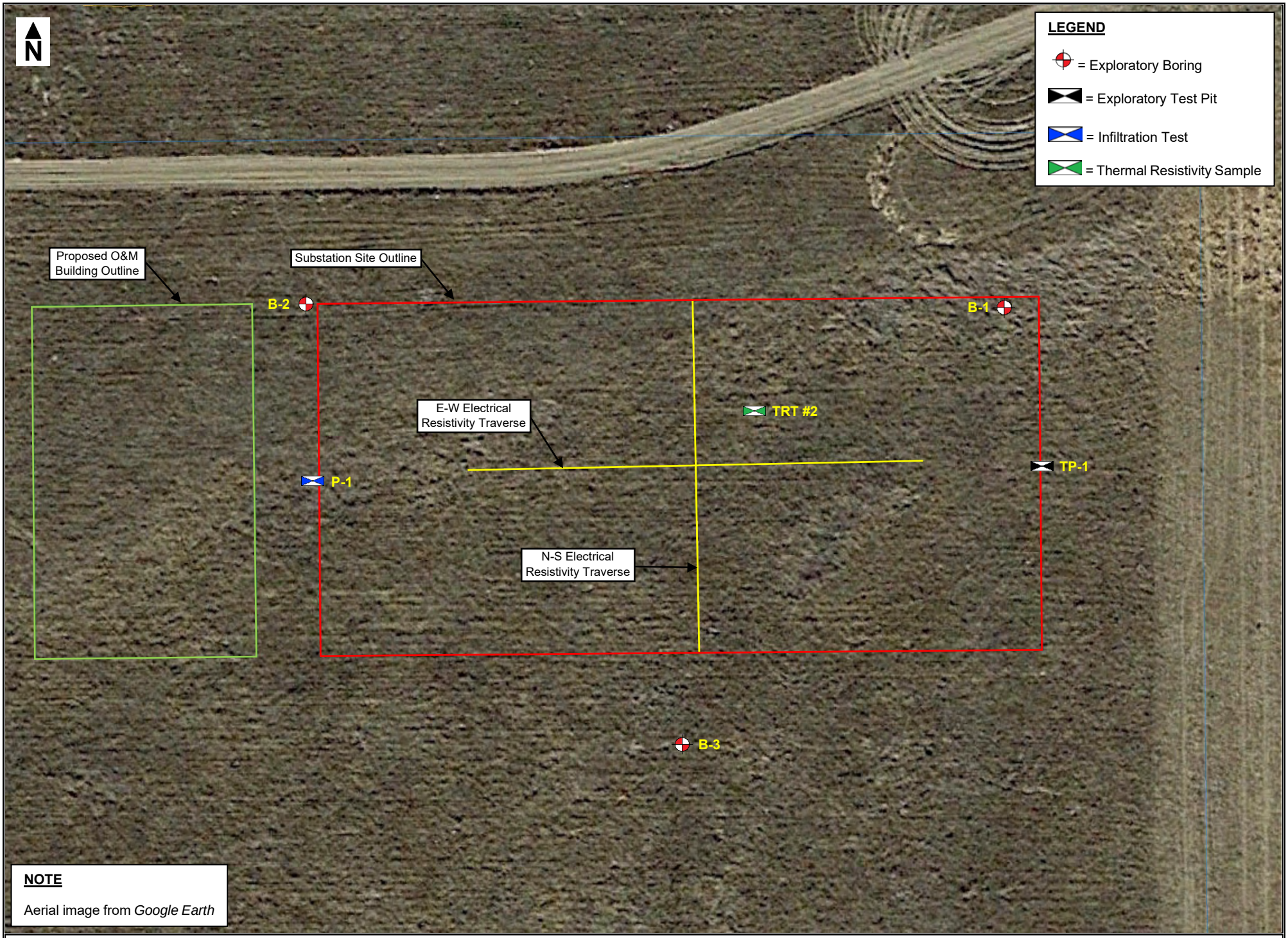


FIGURE 3: SITE EXPLORATION MAP **PROJECT NO. 220-1274**

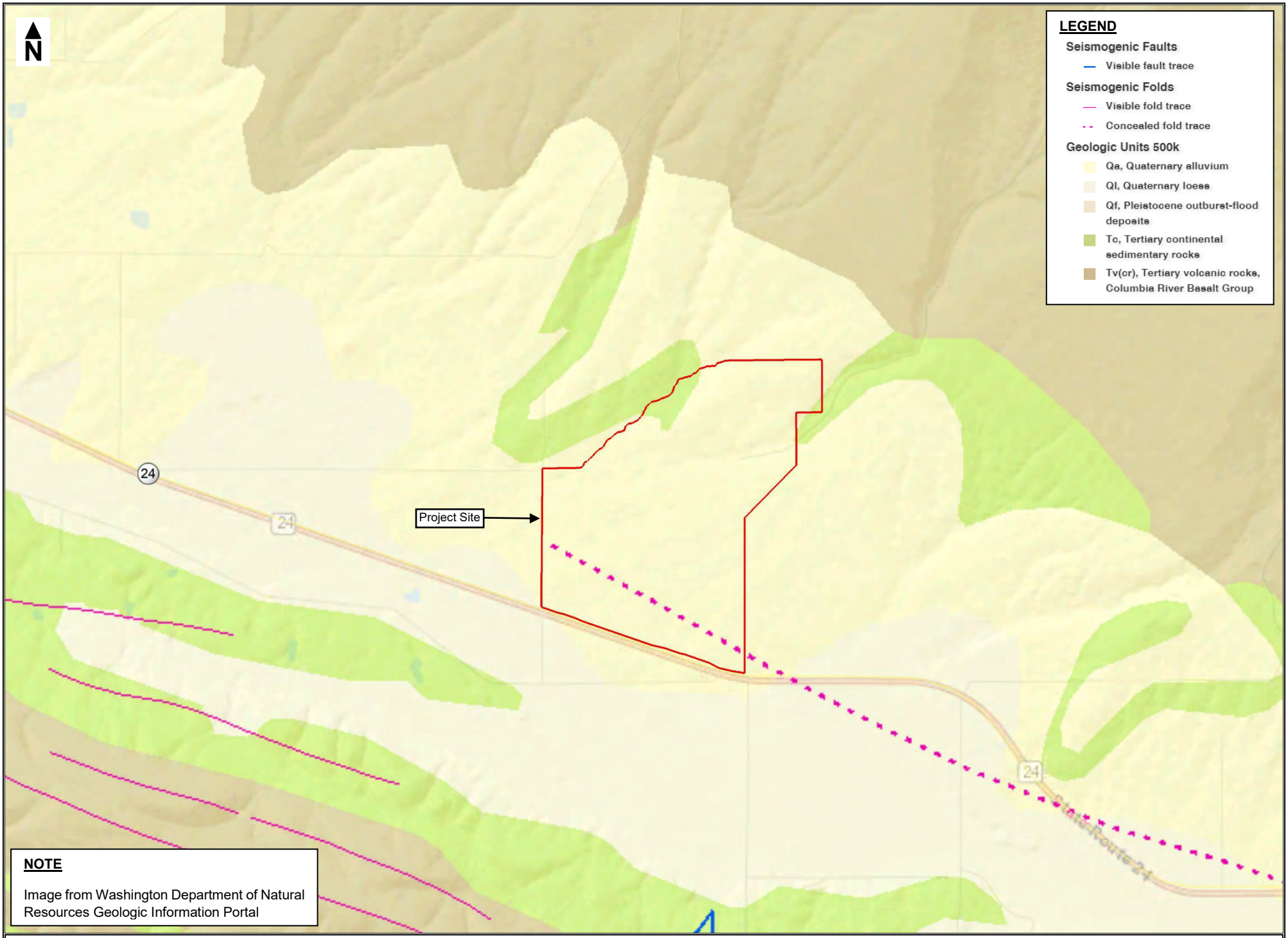


FIGURE 4: FAULT & GEOLOGIC MAP **PROJECT NO. 220-1274**

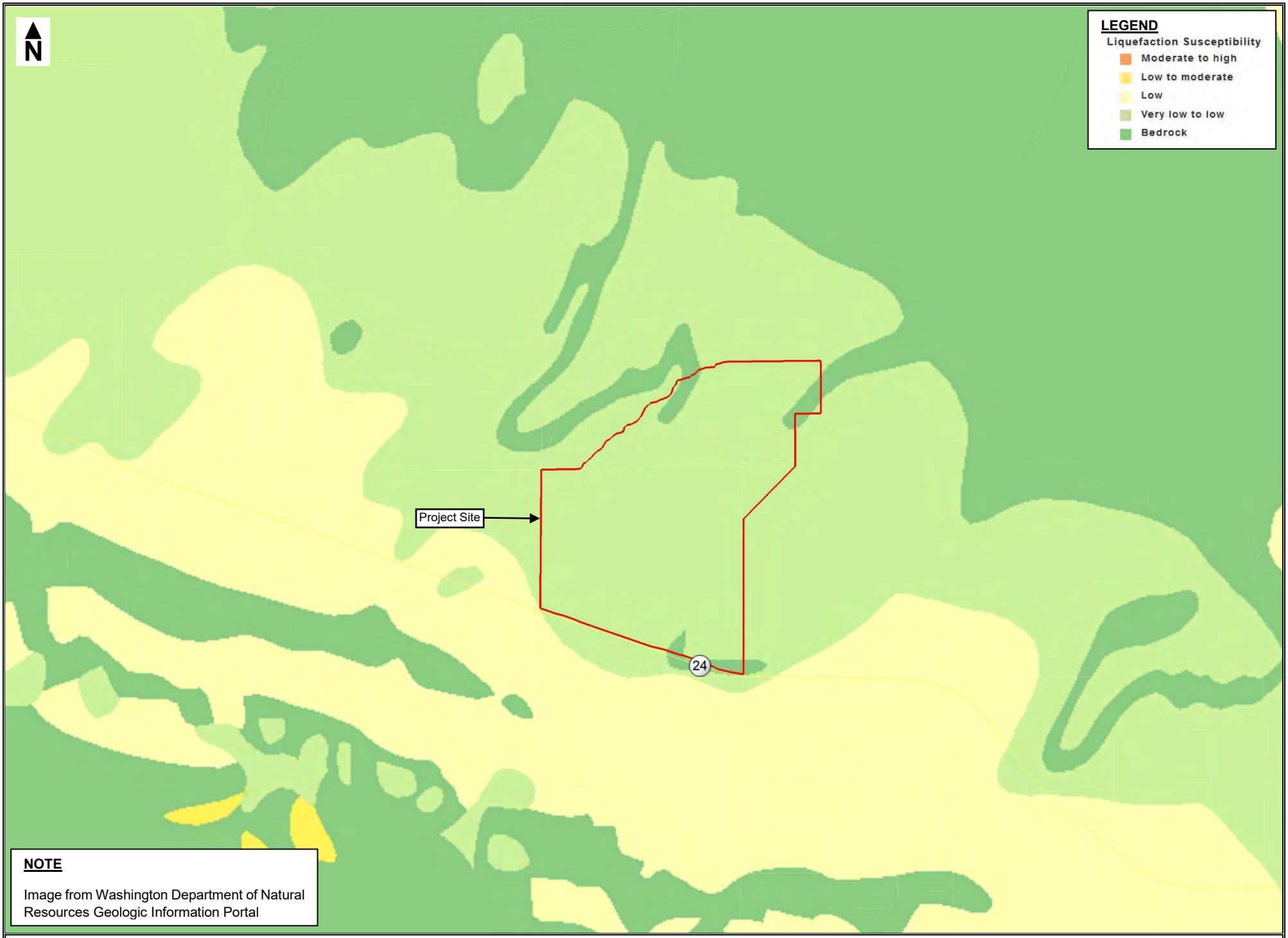
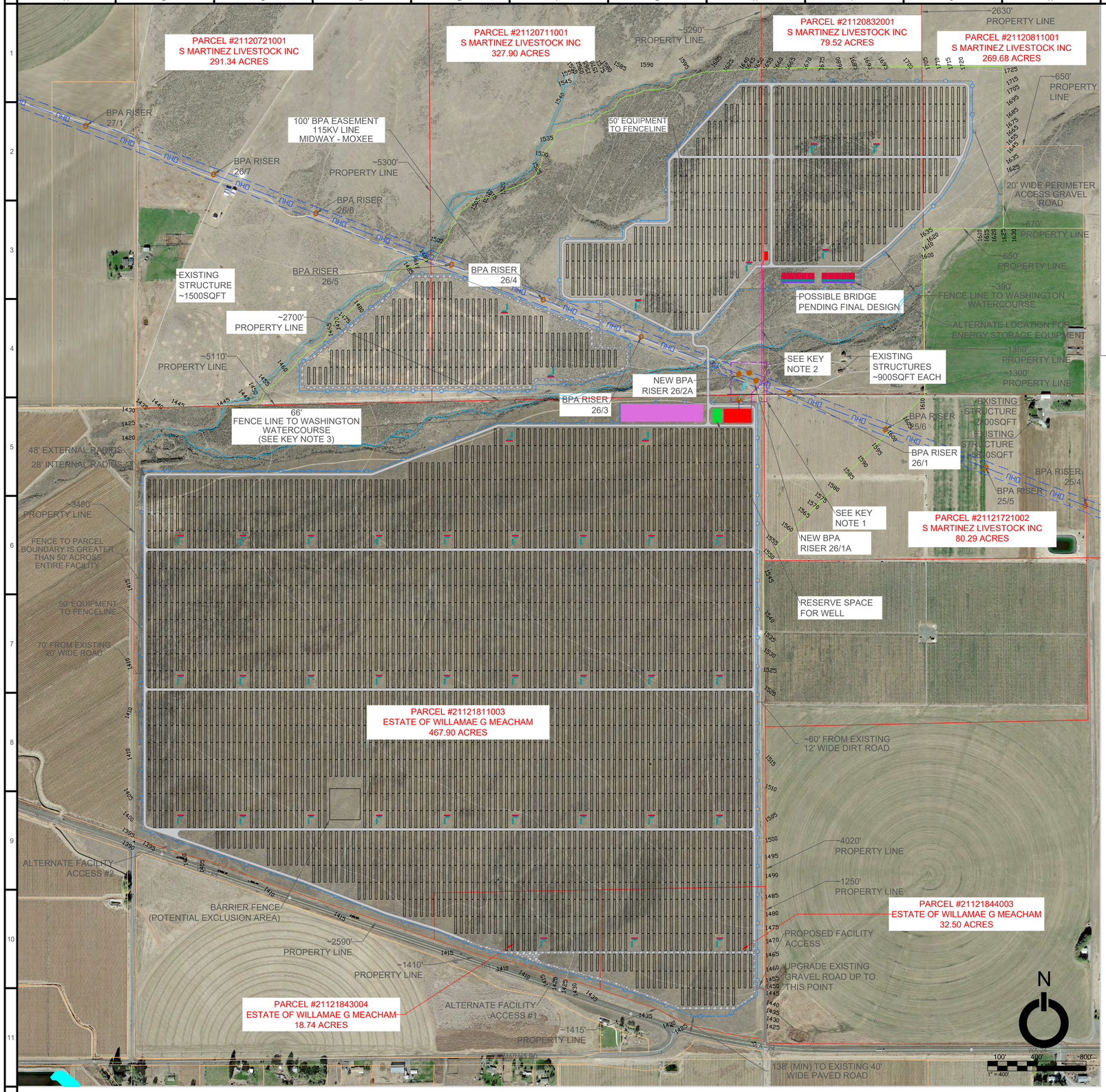
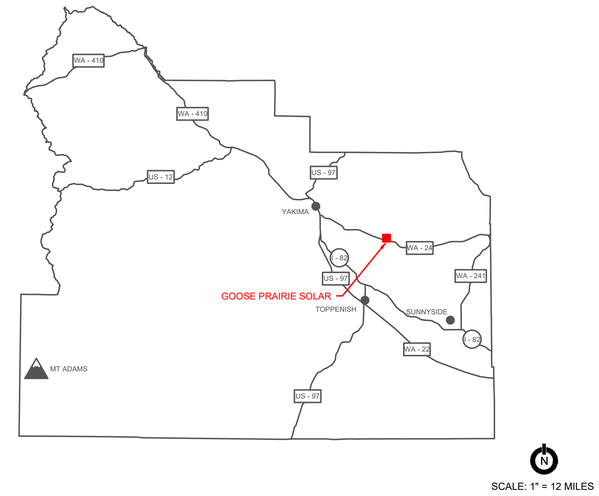


FIGURE 5: LIQUEFACTION SUSCEPTIBILITY MAP **PROJECT NO. 220-1274**



GOOSE PRAIRIE SOLAR + STORAGE 80.00MWAC - CONCEPTUAL LAYOUT

SCALE: 1" = 400'



SCALE: 1" = 12 MILES

YAKIMA COUNTY VICINITY MAP

SITE DETAILS:

SITE LAT:	46.528557°
SITE LONG:	-120.240075°
PARCEL ID:	21121811003
OWNER:	ESTATE OF WILLIMAE G MEACHAM
ACREAGE:	467.90
EXISTING ZONING:	AG
EXISTING USE:	83 CURRENT USE AGRICULTURE
PARCEL ID:	21121843004
OWNER:	ESTATE OF WILLIMAE G MEACHAM
ACREAGE:	18.74
EXISTING ZONING:	AG
EXISTING USE:	83 CURRENT USE AGRICULTURE
PARCEL ID:	21121844003
OWNER:	ESTATE OF WILLIMAE G MEACHAM
ACREAGE:	32.50
EXISTING ZONING:	AG
EXISTING USE:	83 CURRENT USE AGRICULTURE
PARCEL ID:	21120721001
OWNER:	S MARTINEZ LIVESTOCK INC
ACREAGE:	291.34
EXISTING ZONING:	AG
EXISTING USE:	83 CURRENT USE AGRICULTURE
PARCEL ID:	21120711001
OWNER:	S MARTINEZ LIVESTOCK INC
ACREAGE:	327.9
EXISTING ZONING:	AG
EXISTING USE:	83 CURRENT USE AGRICULTURE
PARCEL ID:	21120832001
OWNER:	S MARTINEZ LIVESTOCK INC
ACREAGE:	79.52
EXISTING ZONING:	AG
EXISTING USE:	81 AGRICULTURE NOT CURRENT USE
PARCEL ID:	21120811001
OWNER:	S MARTINEZ LIVESTOCK INC
ACREAGE:	269.68
EXISTING ZONING:	AG
EXISTING USE:	83 CURRENT USE AGRICULTURE
PARCEL ID:	21121721002
OWNER:	S MARTINEZ LIVESTOCK INC
ACREAGE:	80.29
EXISTING ZONING:	AG
EXISTING USE:	83 CURRENT USE AGRICULTURE

DESIGN SUMMARY:

MODULE POWER:	445W
MODULE COUNT:	260,550
ARRAY DC VOLTAGE:	1500V
SOLAR INVERTER SIZE:	2.105MW/2.500MVA @50C
SOLAR INVERTER QTY:	38 +/-
DC CAPACITY:	115.944MWdc @ STC (Front)
AC CAPACITY:	80.000MWac
DC/AC RATIO:	1.45
GROUND COVERGE RATIO:	33.25%
GROUND SNOW LOAD:	15 PSF
ASCE 7-10 WINDSPEED:	110 MPH

LAND USE SUMMARY:

TOTAL PARCEL AREA:	1567.87 ACRES
FACILITY AREA EXTENT:	791.39 ACRES
TOTAL FENCED AREA:	590.00 ACRES
TOTAL ACCESS ROAD:	23.09 ACRES
FACILITY STAGING AREA:	2.12 ACRES
O&M FACILITY AREA:	0.171 ACRES
FACILITY SUBSTATION:	0.556 ACRES

KEY NOTES:

1. PRELIMINARY LOCATION OF LINE TAP. FINAL LOCATION IS SUBJECT TO CHANGE BASED ON BPA INTERCONNECTION ENGINEERING STUDY RESULTS.
2. MEDIUM VOLTAGE LINE TO CONNECT NORTHERN PROJECT AREA TO FACILITY SUBSTATION. EXACT LOCATION TO BE DETERMINED.
3. FACILITY SHALL MAINTAIN A MINIMUM 60' SETBACK FROM ALL WATERWAYS.

GENERAL NOTES:

1. PARCEL BOUNDARIES PROVIDED BY YAKIMA COUNTY, WA OPEN DATA PORTAL.
2. NO FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) FLOOD HAZARD ZONES ARE FOUND ON THE PARCEL ON WHICH THE FACILITY IS PROPOSED.
3. NATIONAL WETLAND INVENTORY (NWI) WETLANDS SHOWN. ALL ELECTRICAL EQUIPMENT MINIMUM OF 50' FROM HIGH WATER LINE. NWI WETLANDS WILL BE GROUND-TRUTHED VIA A PROFESSIONAL WETLAND SURVEY AND DELINEATION SITE LAYOUT WILL ADJUST ACCORDING TO RESULTS.
4. LOCATION OF WASHINGTON WATERCOURSES PROVIDED BY WASHINGTON GEOSPATIAL OPEN DATA PORTAL.
5. FACILITY FALLS WITHIN A MILITARY TRAINING ROUTE BUFFER. CONSULTATION WITH DEPARTMENT OF DEFENSE HAS BEGUN. NO CONCERNS FLAGGED BY DEPARTMENT OF DEFENSE.
6. FACILITY LAYOUT INCLUDES AN OPTIONAL BATTERY STORAGE SYSTEM CAPABLE OF SERVING AS 80MW OF LOAD OR GENERATION. APPLICANT SEEKS FLEXIBILITY BETWEEN AN AC-COUPLED OR DC-COUPLED SYSTEM. BOTH ARE SHOWN FOR ILLUSTRATIVE PURPOSES.
7. PROPOSED FACILITY ACCESS POINT TO BE COORDINATED WITH WASHINGTON DEPARTMENT OF TRANSPORTATION AND YAKIMA COUNTY TRANSPORTATION SERVICES DIVISION.
8. THE FACILITY WILL COMPLY WITH ALL ZONING AND COUNTY REQUIREMENTS.
9. LOCATION OF ALL PROPOSED EQUIPMENT ARE SUBJECT TO CHANGE. CHANGES TO SITE PLAN ARE TO STAY WITHIN THE FACILITY AREA EXTENT AS SHOWN.
10. COLLECTION LINE LOCATIONS ARE PENDING BASED ON FURTHER ENGINEERING ANALYSIS.
11. PROJECT IS IN YAKIMA COUNTY FIRE DISTRICT #4 AND WILL COMPLY WITH ALL REQUIREMENTS OF THE FIRE OFFICIAL. ACCESS ROADS AND GATES WILL COMPLY WITH THE APPLICABLE VERSION OF THE INTERNATIONAL FIRE CODE AS ADOPTED BY THE STATE OF WASHINGTON. GATES 20' IN WIDTH WITH ACCESSIBLE HARDWARE PER FIRE DEPARTMENT REQUIREMENTS SHALL BE INSTALLED. FIRE ACCESS ROADS SHALL BE 20' IN WIDTH, WITH INNER TURNING RADIUS OF 30' AND OUTER TURNING RADIUS OF 45'.
12. THE AMENDED 2018 INTERNATIONAL FIRE CODE WILL REPLACE THE 2015 CODE EFFECTIVE JULY 1, 2020.
13. THIS SITE CONSISTS OF TWO NRCS SOIL TYPES; WILLIS SILT LOAM AND MOXEE SILT LOAM.
14. REFER TO STUDY RESULTS PERFORMED BY WEST INC. FOR DETAILED INFORMATION REGARDING THREATENED, ENDANGERED AND SENSITIVE SPECIES FOUND ON SITE.

PROJECT

GOOSE PRAIRIE

ADDRESS

11900-12898 WA -24
MOXEE, WA 98936

DRAWING

TITLE:
CONCEPT LAYOUT
SHEET NUMBER:
A-001
SCALE:
1" = 400'
DRAWN BY:
CG
CHECKED BY:

DATE:
10/28/2020
REVISIONS:

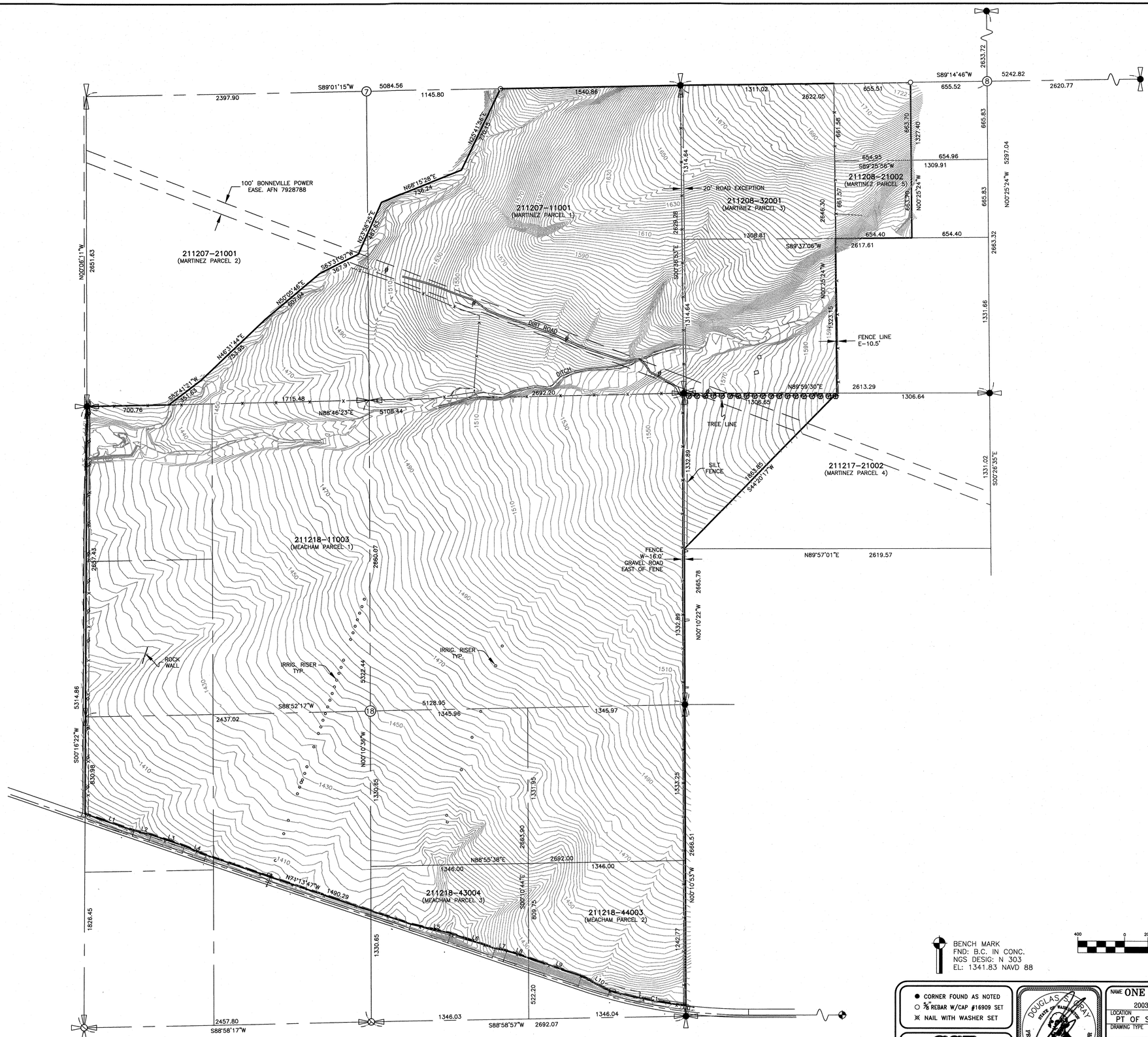
DESCRIPTION

THIS FACILITY CONSISTS OF THE DESIGN AND INSTALLATION OF AN 80.00MWac SOLAR PHOTOVOLTAIC + BATTERY SYSTEM. MODULES ARE TO BE MOUNTED IN SINGLE AXIS TRACKERS, WHICH FOLLOW THE SUN FROM EAST TO WEST THROUGHOUT THE DAY. INTERCONNECTION TO BE COORDINATED WITH THE LOCAL UTILITY.

LEGEND

- GRAVEL ACCESS ROAD
- FACILITY STAGING / PARKING AREA
- FACILITY O&M BUILDING
- FACILITY SUBSTATION
- PARCEL BOUNDARY
- PARCEL ZONING OFFSET
- NEIGHBOR PARCEL BOUNDARY
- FACILITY AREA EXTENT
- FACILITY SECURITY FENCE
- EXISTING UTILITY LINE
- GENERATION TIE LINE
- EXISTING UTILITY RISER
- PROPOSED NEW RISER

OneEnergy RENEWABLES



GRAPHIC SCALE

400 0 200 400 800 1600

(IN FEET)
1 inch = 400 ft.

BENCH MARK
FND: B.C. IN CONC.
NGS DESIG: N 303
EL: 1341.83 NAVD 88

● CORNER FOUND AS NOTED
○ 5/8" REBAR W/CAP #16909 SET
⊠ NAIL WITH WASHER SET

GSE
Gray Surveying & Engineering, Inc.
Land Surveying • Civil Engineering • Project Management
P.O. Box 510 • 2706 River Road
Yakima, Wa. 98902 • (509) 575-6434

DOUGLAS S. GRAY
STATE OF WASHINGTON
16909
REGISTERED
PROFESSIONAL LAND SURVEYOR
4-1-20

NAME ONE ENERGY-GOOSE PRAIRIE SOLAR
2003 WESTERN AVENUE SUITE 225 SEATTLE, WA. 98121
LOCATION PT OF SEC. 7, 8, 17 & 18, T. 12N., R. 21E., W.M.
DRAWING TYPE ALTA/NSPS
DRAWN BY: MM
CHECKED BY: D.S.G.
PROJECT NO. 20-075
PARCEL NO. AS SHOWN ON MAP
SCALE: 1" = 400'
DATE: 3/17/2020
SHEET 2 OF 3

Appendix II

Exploratory Boring & Test Pit Logs

Key Chart (for Soil Classification)

GN Northern, Inc.
722 N. 16th Avenue Suite 31
Yakima, Washington 98902
Telephone: (509) 248-9798
Fax: (509) 248-4220

BORING NUMBER B-1

CLIENT OER WA Solar 1, LLC
PROJECT NAME Goose Prairie Photovoltaic (PV) Solar Array Project
PROJECT NUMBER 220-1274
PROJECT LOCATION Near Moxee, Yakima County Washington
DATE STARTED 9/15/20 **COMPLETED** 9/15/20
GROUND ELEVATION 1552 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Western States Soil Conservation, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 55 Track-Mounted Rig
AT TIME OF DRILLING ---
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46°32'4.27"N, 120°13'49.68"W
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0						
	SPT	30-50/5"	GM		SILTY GRAVEL WITH SAND, (GM) tan to pink, dry, very dense, some cobbles	
					4.0	1548.0
5	SPT	7-15-23 (38)	SM		SILTY SAND, (SM) brown, fine grained, moist, dense - ash lense	
	SPT	50/4"			- becomes damp, very dense, trace gravel	
10	SPT	38-50/2"			- with lenses of silt, some gravel	
					- no gravel	
15	SPT	7-19-43 (62)			- becomes moist	
					19.0	1533.0
20	SPT	50/4"	GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) brown gray, damp, very dense	
					22.0	1530.0
25	SPT	50-50/2"	SM		SILTY SAND, (SM) brown, fine to medium grained, damp to moist, very dense, some basalt gravel (sandstone) [Ellensburg Formation]	
					29.0	1523.0
30	SPT	18-25-48 (73)	GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) gray brown, damp, very dense	
					31.0	1521.0
			SM		SILTY SAND, (SM) brown, fine grained, moist, dense to very dense, trace caliche (sandstone)	
					34.0	1518.0
35	SPT	50/3"	GM		SILTY GRAVEL WITH SAND, (GM) brown, damp, very dense	
					37.5	1514.5
40	SPT	50/5"	SM		SILTY SAND, (SM) brown, fine to medium grained, damp to moist, very dense, some gravel (sandstone)	
					40.4	1511.6

- Groundwater not encountered at time of drilling
- Referenced elevations are approximate and based on Google Earth topography

Bottom of borehole at 40.4 feet.

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Yakima, Washington 98902
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Fax: (509) 248-4220

BORING NUMBER B-2

CLIENT OER WA Solar 1, LLC
PROJECT NAME Goose Prairie Photovoltaic (PV) Solar Array Project
PROJECT NUMBER 220-1274
PROJECT LOCATION Near Moxee, Yakima County Washington
DATE STARTED 9/16/20 **COMPLETED** 9/16/20
GROUND ELEVATION 1546 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Western States Soil Conservation, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 55 Track-Mounted Rig
AT TIME OF DRILLING ---
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46°32'4.30"N, 120°13'52.78"W
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0							
	SPT	50/5"		GM		SILTY GRAVEL WITH SAND, (GM) tan to pink, dry, dense, ashy, with cobbles	
5	SPT	50					
	SPT	50/3"					
						8.5	1537.5
10	SPT	50/3"		SM		SILTY SAND, (SM) brown, fine to coarse grained, damp, very dense, trace gravel	
15	SPT	17-36-50/3"	MC = 6% Fines = 77%			- becomes damp to moist, fine grained, with Silt with Sand (ML)	
						19.0	1527.0
20	SPT	7-14-50/6"		ML		SILT WITH SAND (ML) / SANDY SILT, (ML) brown, moist, very dense, (siltstone) [Ellensburg Formation]	
						24.0	1522.0
25	SPT	30-42-50/2"		SM		SILTY SAND, (SM) fine grained, moist, very dense, (sandstone)	
30	SPT	17-30-47 (77)				- some gravel - some Sandy Silt (ML)	
35	SPT	18-34-50/4"				- trace gravel	
40	SPT	17-34-50/3"				- with gravel	
						41.3	1504.8

- Groundwater not encountered at time of drilling
- Referenced elevations are approximate and based on Google Earth topography

Bottom of borehole at 41.3 feet.

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BORING NUMBER B-3

CLIENT OER WA Solar 1, LLC
PROJECT NAME Goose Prairie Photovoltaic (PV) Solar Array Project
PROJECT NUMBER 220-1274
PROJECT LOCATION Near Moxee, Yakima County Washington
DATE STARTED 9/16/20 **COMPLETED** 9/16/20
GROUND ELEVATION 1550 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Western States Soil Conservation, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 55 Track-Mounted Rig
AT TIME OF DRILLING ---
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46°32'2.95"N, 120°13'51.13"W
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0					SILTY GRAVEL WITH SAND, (GM) tan, dry, dense, ashy	
5	SPT	12-50/2"	GM			
	SPT	50/5"				
					7.0	1543.0
10	SPT	13-44-50/3"	ML		SANDY SILT, (ML) brown, damp, very dense, (siltstone) [Ellensburg Formation]	
	SPT	12-29-39 (68)				
					14.0	1536.0
15	SPT	40-38-30 (68)	SM		SILTY SAND, (SM) gray brown, fine to medium grained, dry to damp, very dense, trace coarse grained sand (sandstone)	
20	SPT	16-36-50/5"			- becomes damp to moist, fine grained	
25	SPT	27-50/4"			- trace gravel	
30	SPT	27-50/5"				
35	SPT	11-26-42 (68)			- becomes moist	
40	SPT	23-50/6"			- becomes damp to moist, trace coarse grained sand	
					41.0	1509.0

- Groundwater not encountered at time of drilling
- Referenced elevations are approximate and based on Google Earth topography

Bottom of borehole at 41.0 feet.

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BORING NUMBER B-4

CLIENT OER WA Solar 1, LLC
PROJECT NAME Goose Prairie Photovoltaic (PV) Solar Array Project
PROJECT NUMBER 220-1274
PROJECT LOCATION Near Moxee, Yakima County Washington
DATE STARTED 9/17/20 **COMPLETED** 9/17/20
GROUND ELEVATION 1655 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Western States Soil Conservation, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 55 Track-Mounted Rig
AT TIME OF DRILLING ---
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46°32'23.50"N, 120°13'38.83"W
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0						SILT, (ML) tan, dry to damp, medium dense
	SPT	5-5-7 (12)				
5	SPT	3-5-8 (13)		ML		
	SPT	8-12-18 (30)	MC = 4% Fines = 83%			- becomes medium dense to dense
10	SPT	6-39-49 (88)				10.5 1644.5 SILTY SAND, (SM) tan, fine grained, dry, very dense, trace ash lense in upper ~6" (sandstone) [Ellensburg Formation]
						- trace gravel
15	SPT	22-50/4"				- becomes dry to damp, very dense, slightly cemented, trace medium grained sand, with Silt with Sand (ML)
				SM		- trace gravel
20	SPT	50/3"				- some gravel
						23.0 1632.0 - Groundwater not encountered at time of drilling - Referenced elevations are approximate and based on Google Earth topography Bottom of borehole at 23.0 feet.

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Yakima, Washington 98902
Telephone: (509) 248-9798
Fax: (509) 248-4220

BORING NUMBER B-5

CLIENT OER WA Solar 1, LLC
PROJECT NAME Goose Prairie Photovoltaic (PV) Solar Array Project
PROJECT NUMBER 220-1274
PROJECT LOCATION Near Moxee, Yakima County Washington
DATE STARTED 9/17/20 **COMPLETED** 9/17/20
GROUND ELEVATION 1616 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Western States Soil Conservation, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 55 Track-Mounted Rig
AT TIME OF DRILLING ---
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46°32'15.94"N, 120°13'39.72"W
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0					SILTY GRAVEL WITH SAND, (GM) brown, dry, very dense	
	SPT	50				
5	SPT	50/3"	GM			
	SPT	50/3"				
10	SPT	50/4"				
					12.0	1604.0
			ML		SILT WITH SAND (ML) / SANDY SILT, (ML) brown, fine grained, dry, very dense, (siltstone) [Ellensburg Formation]	
					14.5	1601.5
15	SPT	50/3"	GM		SILTY GRAVEL WITH SAND, (GM) brown, dry, very dense	
					19.0	1597.0
			SM		SILTY SAND, (SM) brown, dry, very dense, (sandstone)	
20	SPT	50/1"			20.1	1595.9

- Groundwater not encountered at time of drilling
- Referenced elevations are approximate and based on Google Earth topography

Bottom of borehole at 20.1 feet.

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BORING NUMBER B-6

CLIENT OER WA Solar 1, LLC
PROJECT NAME Goose Prairie Photovoltaic (PV) Solar Array Project
PROJECT NUMBER 220-1274
PROJECT LOCATION Near Moxee, Yakima County Washington
DATE STARTED 9/17/20 **COMPLETED** 9/17/20
GROUND ELEVATION 1501 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Western States Soil Conservation, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 55 Track-Mounted Rig
AT TIME OF DRILLING ---
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46°32'8.31"N, 120°14'18.63"W
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0			ML		SILT, (ML) tan, dry, loose	
	SPT	4-18-11 (29)				
3.0						1498.0
			GM		SILTY GRAVEL WITH SAND, (GM) brown, dry, medium dense	
5	SPT	50/6"			- becomes very dense	
	SPT	50/5"				
10	SPT	50/1"				
12.0						1489.0
			ML		SILTY SAND, (ML) light olive tan, damp, very dense, (sandstone) [Ellensburg Formation]	
15	SPT	12-23-44 (67)				
20	SPT	12-20-25 (45)			- becomes Silt with Sand (ML) / Sandy Silt (ML), brown	
25	SPT	16-33-49 (82)				
26.5						1474.5

- Groundwater not encountered at time of drilling
- Referenced elevations are approximate and based on Google Earth topography

Bottom of borehole at 26.5 feet.

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BORING NUMBER B-7

CLIENT OER WA Solar 1, LLC
PROJECT NAME Goose Prairie Photovoltaic (PV) Solar Array Project
PROJECT NUMBER 220-1274
PROJECT LOCATION Near Moxee, Yakima County Washington
DATE STARTED 9/17/20 **COMPLETED** 9/17/20
GROUND ELEVATION 1580 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Western States Soil Conservation, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 55 Track-Mounted Rig
AT TIME OF DRILLING ---
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46°32'15.21"N, 120°13'58.26"W
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0				ML		SILT, (ML) tan, dry, loose to medium dense	
						2.0	1578.0
	SPT	48-50				SILTY GRAVEL, (GM) brown, dry, very dense	
5	SPT	50/3"					
	SPT	50/3"					
10	SPT	50/3"		GM			
15	SPT	39-50/4"	MC = 3% Fines = 13%			- becomes Poorly Graded Gravel with Silt and Sand (GP-GM)	
						19.0	1561.0
20	SPT	50/3"		SM		SILTY SAND, (SM) brown, fine grained, dry to damp, very dense, trace gravel (sandstone) [Ellensburg Formation]	
						22.0	1558.0
				GM		SILTY GRAVEL WITH SAND, (GM) brown, dry to damp, very dense, with Silty Sand with Gravel (SM)	
25	SPT	50/3"				25.3	1554.8

- Groundwater not encountered at time of drilling
- Referenced elevations are approximate and based on Google Earth topography

Bottom of borehole at 25.3 feet.

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BORING NUMBER B-8

CLIENT OER WA Solar 1, LLC
PROJECT NAME Goose Prairie Photovoltaic (PV) Solar Array Project
PROJECT NUMBER 220-1274
PROJECT LOCATION Near Moxee, Yakima County Washington
DATE STARTED 9/18/20 **COMPLETED** 9/18/20
GROUND ELEVATION 1510 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Western States Soil Conservation, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 55 Track-Mounted Rig
AT TIME OF DRILLING ---
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46°31'56.31"N, 120°14'7.56"W
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0				ML		SILT, (ML) tan, dry, loose
						2.0 — 1508.0
	SPT	50/2"		GM		SILTY GRAVEL WITH SAND, (GM) light brown, dry, very dense
5	SPT	50/4"				
						8.5 — 1501.5
				ML		SILT WITH SAND, (ML) brown, moist, very dense, some Sandy Silt (ML) (siltstone) [Ellensburg Formation]
10	SPT	11-16-44 (60)				
						14.5 — 1495.5
15	SPT	17-23-26 (49)		SM		SILTY SAND, (SM) brown, fine grained, damp to moist, dense to very dense, (sandstone)
20	SPT	43-46-50 (96)	MC = 5% Fines = 15%			- becomes fine to medium grained, trace coarse grained sand
25	SPT	12-17-22 (39)				
						26.5 — 1483.5

- Groundwater not encountered at time of drilling
- Referenced elevations are approximate and based on Google Earth topography

Bottom of borehole at 26.5 feet.

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BORING NUMBER B-9

CLIENT OER WA Solar 1, LLC
PROJECT NAME Goose Prairie Photovoltaic (PV) Solar Array Project
PROJECT NUMBER 220-1274
PROJECT LOCATION Near Moxee, Yakima County Washington
DATE STARTED 9/21/20 **COMPLETED** 9/21/20
GROUND ELEVATION 1502 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Western States Soil Conservation, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 55 Track-Mounted Rig
AT TIME OF DRILLING ---
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46°31'43.70"N, 120°13'57.42"W
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			ML		SILT, (ML) tan, dry, loose to medium dense
					2.0 — 1500.0
	SPT	50/6"	GM		SILTY GRAVEL WITH SAND, (GM) tan, dry, very dense
5	SPT	50/5"			- becomes dry to damp
	SPT	50/4"			- becomes brown, damp
10	SPT	50/3"			
					13.5 — 1488.5
15	SPT	50/5"	SM		SILTY SAND WITH GRAVEL, (SM) brown, damp, very dense, (sandstone) [Ellensburg Formation]
					18.5 — 1483.5
20	SPT	7-8-8 (16)	ML		SANDY SILT, (ML) brown, moist, medium dense, some Silty Sand (SM) and Silt with Sand (ML) (siltstone)
25	SPT	27-35-50/4"			- becomes very dense
					26.2 — 1475.8

- Groundwater not encountered at time of drilling
- Referenced elevations are approximate and based on Google Earth topography

Bottom of borehole at 26.2 feet.

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BORING NUMBER B-10

CLIENT OER WA Solar 1, LLC
PROJECT NAME Goose Prairie Photovoltaic (PV) Solar Array Project
PROJECT NUMBER 220-1274
PROJECT LOCATION Near Moxee, Yakima County Washington
DATE STARTED 9/21/20 **COMPLETED** 9/21/20
GROUND ELEVATION 1461 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Western States Soil Conservation, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 55 Track-Mounted Rig
AT TIME OF DRILLING ---
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46°31'44.71"N, 120°14'25.90"W
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			ML		SILT, (ML) tan, dry, loose
					2.0 — 1459.0
	SPT	31-50/4"	GM		SILTY GRAVEL WITH SAND, (GM) tan, dry, very dense
5	SPT	50/4"			
					9.5 — 1451.5
10	SPT	50/5"	SM		SILTY SAND, (SM) brown, fine grained, damp, very dense, (sandstone) [Ellensburg Formation]
15	SPT	20-45-50/5"			- becomes moist, with Sandy Silt (ML)
20	SPT	35-50/3"			- becomes damp to moist
25	SPT	18-33-45 (78)			- becomes moist
					26.5 — 1434.5

- Groundwater not encountered at time of drilling
- Referenced elevations are approximate and based on Google Earth topography

Bottom of borehole at 26.5 feet.

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BORING NUMBER B-11

CLIENT OER WA Solar 1, LLC
PROJECT NAME Goose Prairie Photovoltaic (PV) Solar Array Project
PROJECT NUMBER 220-1274
PROJECT LOCATION Near Moxee, Yakima County Washington
DATE STARTED 9/21/20 **COMPLETED** 9/21/20
GROUND ELEVATION 1426 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Western States Soil Conservation, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 55 Track-Mounted Rig
AT TIME OF DRILLING ---
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46°31'51.57"N, 120°14'51.61"W
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0					SILT, (ML) tan, dry, loose	
	SPT	5-10-34 (44)	ML			
3.5						1422.5
					SILTY GRAVEL WITH SAND, (GM) tan, dry, very dense	
5	SPT	50/4"	GM			
7.0						1419.0
	SPT	18-28-33 (61)			POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) brown, dry to damp, very dense	
10	SPT	50/4"				
			GP-GM			
15	SPT	50/3"			- becomes Silty Gravel (GM)	
20						
20.0						1406.0
	SPT	16-15-16 (31)			SILT, (ML) olive tan, damp to moist, dense, (siltstone) [Ellensburg Formation]	
			ML			
25						
	SPT	19-25-23 (48)			- becomes moist	
26.5						1399.5

- Groundwater not encountered at time of drilling
- Referenced elevations are approximate and based on Google Earth topography

Bottom of borehole at 26.5 feet.

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BORING NUMBER B-12

CLIENT OER WA Solar 1, LLC
PROJECT NAME Goose Prairie Photovoltaic (PV) Solar Array Project
PROJECT NUMBER 220-1274
PROJECT LOCATION Near Moxee, Yakima County Washington
DATE STARTED 9/21/20 **COMPLETED** 9/21/20
GROUND ELEVATION 1418 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Western States Soil Conservation, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 55 Track-Mounted Rig
AT TIME OF DRILLING ---
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46°31'38.34"N, 120°14'52.47"W
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0			ML		SILT, (ML) tan, dry, loose	
	SPT	25-50/3"				
2.8						1415.3
					SILTY GRAVEL WITH SAND, (GM) tan, dry, very dense	
5	SPT	50/4"				
	SPT	50/6"	GM			
10	SPT	30-18-15 (33)				
11.0						1407.0
					SILT WITH CLAY, (ML) olive brown, moist, dense	
15	SPT	4-8-14 (22)			- becomes medium dense	
			ML			
20	SPT	5-9-14 (23)				
25	SPT	8-13-13 (26)				
26.5						1391.5

- Groundwater not encountered at time of drilling
- Referenced elevations are approximate and based on Google Earth topography

Bottom of borehole at 26.5 feet.

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BORING NUMBER B-13

CLIENT OER WA Solar 1, LLC
PROJECT NAME Goose Prairie Photovoltaic (PV) Solar Array Project
PROJECT NUMBER 220-1274
PROJECT LOCATION Near Moxee, Yakima County Washington
DATE STARTED 9/21/20 **COMPLETED** 9/21/20
GROUND ELEVATION 1417 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Western States Soil Conservation, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 55 Track-Mounted Rig
AT TIME OF DRILLING ---
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46°31'25.60"N, 120°14'27.30"W
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0			ML		SILT, (ML) tan, dry, loose	
					2.0	1415.0
	SPT	26-50/6"	GM		SILTY GRAVEL WITH SAND, (GM) tan, dry, very dense	
5	SPT	50/1"				
					6.5	1410.5
	SPT	50/5"	GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) brown, dry to damp, very dense	
					9.0	1408.0
10	SPT	23-50/5"	GM		SILTY GRAVEL WITH SAND, (GM) brown, damp to moist, very dense - becomes dry to damp	
					13.5	1403.5
15	SPT	34-45-50 (95)	SM		SILTY SAND, (SM) brown, damp to moist, very dense, (sandstone) [Ellensburg Formation]	
					19.5	1397.5
20	SPT	6-14-31 (45)	ML		SANDY SILT, (ML) brown, moist, medium dense, some Silty Sand (SM) and Silt with Sand (ML) (siltstone)	
25	SPT	17-38-50 (88)				
					26.5	1390.5

- Groundwater not encountered at time of drilling
- Referenced elevations are approximate and based on Google Earth topography

Bottom of borehole at 26.5 feet.

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BORING NUMBER B-14

CLIENT OER WA Solar 1, LLC
PROJECT NAME Goose Prairie Photovoltaic (PV) Solar Array Project
PROJECT NUMBER 220-1274
PROJECT LOCATION Near Moxee, Yakima County Washington
DATE STARTED 9/21/20 **COMPLETED** 9/21/20
GROUND ELEVATION 1442 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Western States Soil Conservation, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 55 Track-Mounted Rig
AT TIME OF DRILLING ---
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46°31'24.49"N, 120°14'3.15"W
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			ML		SILT, (ML) tan, dry, loose
	SPT	3-2-3 (5)			
5	SPT	1-4-3 (7)			
7.0					1435.0
	SPT	32-49-50 (99)	SM		SILTY SAND, (SM) tan, fine grained, dry, very dense, some Sandy Silt (ML), with ash lenses (sandstone) [Ellensburg Formation]
10	SPT	31-32-34 (66)			
15	SPT	50/5"			- becomes slightly cemented, trace caliche, trace gravel
20	SPT	9-26-24 (50)			- becomes dense to very dense
25	SPT	29-30-33 (63)			- becomes dry, very dense
26.5					1415.5

- Groundwater not encountered at time of drilling
- Referenced elevations are approximate and based on Google Earth topography

Bottom of borehole at 26.5 feet.

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TEST PIT NUMBER TP-1

CLIENT OER WA Solar 1, LLC
PROJECT NAME Goose Prairie Photovoltaic (PV) Solar Array Project
PROJECT NUMBER 220-1274
PROJECT LOCATION Near Moxee, Yakima County Washington
DATE STARTED 8/26/20 **COMPLETED** 8/26/20
GROUND ELEVATION 1552 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR Valley Septic & Excavating
GROUND WATER LEVELS:
EXCAVATION METHOD Case 580 Super N Backhoe
AT TIME OF EXCAVATION ---
LOGGED BY MBB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46°32'3.77"N, 120°13'49.52"W
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		GM		SILTY GRAVEL WITH SAND, (GM) brown, angular, dry, appears dense to very dense, with cobbles, trace boulders
2.5				- becomes cemented, appears very dense
5.0				- becomes reddish brown, moist
6.0				1546.0
7.5		SM		SILTY SAND WITH GRAVEL, (SM) dark reddish brown, fine to medium grained, moist, appears very dense, (sandstone) [Ellensburg Formation]
10.0			10.0	1542.0

- Test pit terminated at ~10' BGS due to excavator refusal
- Groundwater not encountered at time of excavation
- Referenced elevations are approximate and based on Google Earth topography

Bottom of test pit at 10.0 feet.

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TEST PIT NUMBER TP-2

CLIENT OER WA Solar 1, LLC
PROJECT NAME Goose Prairie Photovoltaic (PV) Solar Array Project
PROJECT NUMBER 220-1274
PROJECT LOCATION Near Moxee, Yakima County Washington
DATE STARTED 8/26/20 **COMPLETED** 8/26/20
GROUND ELEVATION 1639 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR Valley Septic & Excavating
GROUND WATER LEVELS:
EXCAVATION METHOD Case 580 Super N Backhoe
AT TIME OF EXCAVATION ---
LOGGED BY MBB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46°32'19.81"N, 120°13'34.61"W
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0					
		ML		SILT WITH GRAVEL, (ML) brown, dry, appears loose	
2.5				2.5	1636.5
		SM		SILTY SAND WITH GRAVEL, (SM) light pinkish tan, dry, appears very dense, (caliche)	
				4.0	1635.0
5.0		GM		SILTY GRAVEL WITH SAND, (GM) light pinkish tan, dry, appears very dense, highly cemented	
				- becomes moist	
7.5				8.0	1631.0

- Test pit terminated at ~8' BGS due to excavator refusal
- Groundwater not encountered at time of excavation
- Referenced elevations are approximate and based on Google Earth topography

Bottom of test pit at 8.0 feet.

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TEST PIT NUMBER TP-3

CLIENT OER WA Solar 1, LLC
PROJECT NAME Goose Prairie Photovoltaic (PV) Solar Array Project
PROJECT NUMBER 220-1274
PROJECT LOCATION Near Moxee, Yakima County Washington
DATE STARTED 8/26/20 **COMPLETED** 8/26/20
GROUND ELEVATION 1589 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR Valley Septic & Excavating
GROUND WATER LEVELS:
EXCAVATION METHOD Case 580 Super N Backhoe
AT TIME OF EXCAVATION ---
LOGGED BY MBB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46°32'15.77"N, 120°13'47.13"W
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		ML		SILT WITH SAND, (ML) brown, dry, appears medium dense
2.5				
5.0				
7.5				- becomes cemented, trace cobbles
10.0				- becomes moderately cemented, with cobbles
11.0				1578.0

- Groundwater not encountered at time of excavation
- Referenced elevations are approximate and based on Google Earth topography

Bottom of test pit at 11.0 feet.

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TEST PIT NUMBER TP-4

CLIENT OER WA Solar 1, LLC
PROJECT NAME Goose Prairie Photovoltaic (PV) Solar Array Project
PROJECT NUMBER 220-1274
PROJECT LOCATION Near Moxee, Yakima County Washington
DATE STARTED 8/26/20 **COMPLETED** 8/26/20
GROUND ELEVATION 1559 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR Valley Septic & Excavating
GROUND WATER LEVELS:
EXCAVATION METHOD Case 580 Super N Backhoe
AT TIME OF EXCAVATION ---
LOGGED BY MBB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46°32'14.29"N, 120°14'9.38"W
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0					
		ML		SILT WITH SAND, (ML) brown, dry, appears medium dense, trace gravel	
2.5			2.5		1556.5
		GM		SILTY GRAVEL WITH SAND, (GM) light brown, subangular, dry to damp, appears very dense, moderately to highly cemented	
5.0				- becomes highly cemented	
			6.0		1553.0

- Test pit terminated at ~6' BGS due to excavator refusal
- Groundwater not encountered at time of excavation
- Referenced elevations are approximate and based on Google Earth topography

Bottom of test pit at 6.0 feet.

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TEST PIT NUMBER TP-5

CLIENT OER WA Solar 1, LLC
PROJECT NAME Goose Prairie Photovoltaic (PV) Solar Array Project
PROJECT NUMBER 220-1274
PROJECT LOCATION Near Moxee, Yakima County Washington
DATE STARTED 8/26/20 **COMPLETED** 8/26/20
GROUND ELEVATION 1531 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR Valley Septic & Excavating
GROUND WATER LEVELS:
EXCAVATION METHOD Case 580 Super N Backhoe
AT TIME OF EXCAVATION ---
LOGGED BY MBB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46°31'59.45"N, 120°13'58.16"W
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		ML		SILT WITH GRAVEL, (ML) brown, dry, appears medium dense
1.5				1529.5
		GM		SILTY GRAVEL WITH SAND, (GM) light brown to white, subrounded to subangular, dry, appears very dense, with cobbles, highly cemented
2.5				- trace boulder
5.0				- becomes Poorly Graded Gravel with Silt and Sand (GP-GM)
6.0				1525.0

- Test pit terminated at ~6' BGS due to excavator refusal
- Groundwater not encountered at time of excavation
- Referenced elevations are approximate and based on Google Earth topography

Bottom of test pit at 6.0 feet.

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TEST PIT NUMBER TP-6

CLIENT OER WA Solar 1, LLC
PROJECT NAME Goose Prairie Photovoltaic (PV) Solar Array Project
PROJECT NUMBER 220-1274
PROJECT LOCATION Near Moxee, Yakima County Washington
DATE STARTED 8/26/20 **COMPLETED** 8/26/20
GROUND ELEVATION 1492 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR Valley Septic & Excavating
GROUND WATER LEVELS:
EXCAVATION METHOD Case 580 Super N Backhoe
AT TIME OF EXCAVATION ---
LOGGED BY MBB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46°31'47.98"N, 120°14'10.63"W
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		ML		SILT WITH GRAVEL, (ML) brown, dry, appears medium dense
3.5				1488.5
		GM		SILTY GRAVEL WITH SAND, (GM) light brown to white, subrounded to subangular, dry, appears very dense, with cobbles, highly cemented, with caliche
6.0				1486.0

- Test pit terminated at ~6' BGS due to excavator refusal
- Groundwater not encountered at time of excavation
- Referenced elevations are approximate and based on Google Earth topography

Bottom of test pit at 6.0 feet.

GN Northern, Inc.
722 N. 16th Avenue Suite 31
Yakima, Washington 98902
Telephone: (509) 248-9798
Fax: (509) 248-4220

TEST PIT NUMBER TP-7

CLIENT OER WA Solar 1, LLC
PROJECT NAME Goose Prairie Photovoltaic (PV) Solar Array Project
PROJECT NUMBER 220-1274
PROJECT LOCATION Near Moxee, Yakima County Washington
DATE STARTED 8/26/20 **COMPLETED** 8/26/20
GROUND ELEVATION 1475 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR Valley Septic & Excavating
GROUND WATER LEVELS:
EXCAVATION METHOD Case 580 Super N Backhoe
AT TIME OF EXCAVATION ---
LOGGED BY MBB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46°31'33.81"N, 120°14'0.30"W
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		ML		SILT WITH GRAVEL, (ML) brown, dry, appears medium dense
2.5		GM		SILTY GRAVEL WITH SAND, (GM) light brown to white, subrounded to subangular, dry, appears very dense, with cobbles, highly cemented, with caliche
5.0				
7.0				

1472.5

1468.0

- Test pit terminated at ~7' BGS due to excavator refusal
- Groundwater not encountered at time of excavation
- Referenced elevations are approximate and based on Google Earth topography

Bottom of test pit at 7.0 feet.

GN Northern, Inc.
722 N. 16th Avenue Suite 31
Yakima, Washington 98902
Telephone: (509) 248-9798
Fax: (509) 248-4220

TEST PIT NUMBER TP-8

CLIENT OER WA Solar 1, LLC
PROJECT NAME Goose Prairie Photovoltaic (PV) Solar Array Project
PROJECT NUMBER 220-1274
PROJECT LOCATION Near Moxee, Yakima County Washington
DATE STARTED 8/26/20 **COMPLETED** 8/26/20
GROUND ELEVATION 1443 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR Valley Septic & Excavating
GROUND WATER LEVELS:
EXCAVATION METHOD Case 580 Super N Backhoe
AT TIME OF EXCAVATION ---
LOGGED BY MBB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46°31'34.25"N, 120°14'22.07"W
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0					
		ML		SILT WITH GRAVEL, (ML) brown, dry, appears medium dense	
2.5			2.5		1440.5
		GM		SILTY GRAVEL WITH SAND, (GM) light brown to white, subrounded to subangular, dry, appears very dense, with cobbles, highly cemented, with caliche	
5.0					
			6.0		1437.0

- Test pit terminated at ~6' BGS due to excavator refusal
- Groundwater not encountered at time of excavation
- Referenced elevations are approximate and based on Google Earth topography

Bottom of test pit at 6.0 feet.

GN Northern, Inc.
722 N. 16th Avenue Suite 31
Yakima, Washington 98902
Telephone: (509) 248-9798
Fax: (509) 248-4220

TEST PIT NUMBER TP-9

CLIENT OER WA Solar 1, LLC
PROJECT NAME Goose Prairie Photovoltaic (PV) Solar Array Project
PROJECT NUMBER 220-1274
PROJECT LOCATION Near Moxee, Yakima County Washington
DATE STARTED 8/26/20 **COMPLETED** 8/26/20
GROUND ELEVATION 1429 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR Valley Septic & Excavating
GROUND WATER LEVELS:
EXCAVATION METHOD Case 580 Super N Backhoe
AT TIME OF EXCAVATION ---
LOGGED BY MBB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46°31'44.39"N, 120°14'45.19"W
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0		ML		SILT WITH GRAVEL, (ML) brown, dry, appears medium dense	
2.5					
3.5					1425.5
		GM		SILTY GRAVEL WITH SAND, (GM) light brown to white, subrounded to subangular, dry, appears very dense, with cobbles, highly cemented, with caliche	
5.0					
6.0					1423.0

- Test pit terminated at ~6' BGS due to excavator refusal
- Groundwater not encountered at time of excavation
- Referenced elevations are approximate and based on Google Earth topography

Bottom of test pit at 6.0 feet.

GN Northern, Inc.
722 N. 16th Avenue Suite 31
Yakima, Washington 98902
Telephone: (509) 248-9798
Fax: (509) 248-4220

TEST PIT NUMBER TP-10

CLIENT OER WA Solar 1, LLC
PROJECT NAME Goose Prairie Photovoltaic (PV) Solar Array Project
PROJECT NUMBER 220-1274
PROJECT LOCATION Near Moxee, Yakima County Washington
DATE STARTED 8/26/20 **COMPLETED** 8/26/20
GROUND ELEVATION 1471 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR Valley Septic & Excavating
GROUND WATER LEVELS:
EXCAVATION METHOD Case 580 Super N Backhoe
AT TIME OF EXCAVATION ---
LOGGED BY MBB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46°31'56.46"N, 120°14'29.35"W
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0					
		ML		SILT WITH GRAVEL, (ML) brown, dry, appears medium dense	
2.5			2.5		1468.5
		GM		SILTY GRAVEL WITH SAND, (GM) light brown to white, subrounded to subangular, dry, appears very dense, with cobbles, highly cemented, with caliche	
5.0					
			6.5		1464.5

- Test pit terminated at ~6.5' BGS due to excavator refusal
- Groundwater not encountered at time of excavation
- Referenced elevations are approximate and based on Google Earth topography

Bottom of test pit at 6.5 feet.

Northern, Inc.
Kennewick, Yakima, Spokane, Hermiston (OR)

KEY CHART

RELATIVE DENSITY OR CONSISTENCY VERSUS SPT N-VALUE

COARSE-GRAINED SOILS			FINE-GRAINED SOILS		
DENSITY	**N (BLOWS/FT)**	**FIELD TEST**	**CONSISTENCY**	**N (BLOWS/FT)**	**FIELD TEST**
Very Loose	0 – 4	Easily penetrated with ½-inch reinforcing rod pushed by hand	Very Soft	0 – 2	Easily penetrated several inches by thumb
Loose	4 – 10	Difficult to penetrate with ½-inch reinforcing rod pushed by hand	Soft	2 – 4	Easily penetrated one inch by thumb
Medium -Dense	10 – 30	Easily penetrated with ½-inch rod driven with a 5-lb hammer	Medium-Stiff	4 – 8	Penetrated over ½-inch by thumb with moderate effort
Dense	30 – 50	Difficult to penetrate with ½-inch rod driven with a 5-lb hammer	Stiff	8 – 15	Indented about ½-inch by thumb but penetrated with great effort
Very Dense	> 50	penetrated only a few inches with ½-inch rod driven with a 5-lb hammer	Very Stiff	15 – 30	Readily indented by thumb
			Hard	> 30	Indented with difficulty by thumbnail

USCS SOIL CLASSIFICATION

MAJOR DIVISIONS				GROUP DESCRIPTION
Coarse-Grained Soils <50% passes #200 sieve	**Gravel** and **Gravelly Soils** <50% coarse fraction passes #4 sieve	**Gravel** (with little or no fines)	GW	Well-graded **Gravel**
			GP	Poorly Graded **Gravel**
		Gravel (with >12% fines)	GM	Silty **Gravel**
			GC	Clayey **Gravel**
	Sand and **Sandy Soils** >50% coarse fraction passes #4 sieve	**Sand** (with little or no fines)	SW	Well-graded **Sand**
			SP	Poorly graded **Sand**
		Sand (with >12% fines)	SM	Silty **Sand**
			SC	Clayey **Sand**
Fine-Grained Soils >50% passes #200 sieve	**Silt** and **Clay** Liquid Limit < 50		ML	**Silt**
			CL	Lean **Clay**
			OL	Organic **Silt** and C**lay** (low plasticity)
	Silt and **Clay** Liquid Limit > 50		MH	Inorganic **Silt**
			CH	Inorganic **Clay**
			OH	Organic **Clay** and **Silt** (med. to high plasticity)
Highly Organic Soils			PT	**Peat**

Top Soil

LOG SYMBOLS

	2S	2" OD Split Spoon (SPT)
	3S	3" OD Split Spoon
	NS	Non-Standard Split Spoon
	ST	Shelby Tube
	CR	Core Run
	BG	Bag Sample
	TV	Torvane Reading
	PP	Penetrometer Reading
	NR	No Recovery
	GW	Groundwater Table

MODIFIERS

DESCRIPTION	RANGE
Trace	<5%
Little	5% – 12%
Some	>12%

MOISTURE CONTENT

DESCRIPTION	FIELD OBSERVATION
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but not visible water
Wet	Visible free water

SOIL CLASSIFICATION INCLUDES

1. Group Name
2. Group Symbol
3. Color
4. Moisture content
5. Density / consistency
6. Cementation
7. Particle size (if applicable)
8. Odor (if present)
9. Comments

MAJOR DIVISIONS WITH GRAIN SIZE

SIEVE SIZE						
12"	3"	3/4"	4	10	40	200
GRAIN SIZE (INCHES)						
12	3	0.75	0.19	0.079	0.0171	0.0029

Boulders	Cobbles	Gravel		Sand			Silt and Clay
		Coarse	Fine	Coarse	Medium	Fine	

Conditions shown on boring and testpit logs represent our observations at the time and location of the fieldwork, modifications based on lab test, analysis, and geological and engineering judgment. These conditions may not exist at other times and locations, even in close proximity thereof. This information was gathered as part of our investigation, and we are not responsible for any use or interpretation of the information by others.

Appendix III
Laboratory Testing Results

GN Northern, Inc.
722 N. 16th Avenue Suite 31
Yakima, Washington 98902
Telephone: (509) 248-9798
Fax: (509) 248-4220

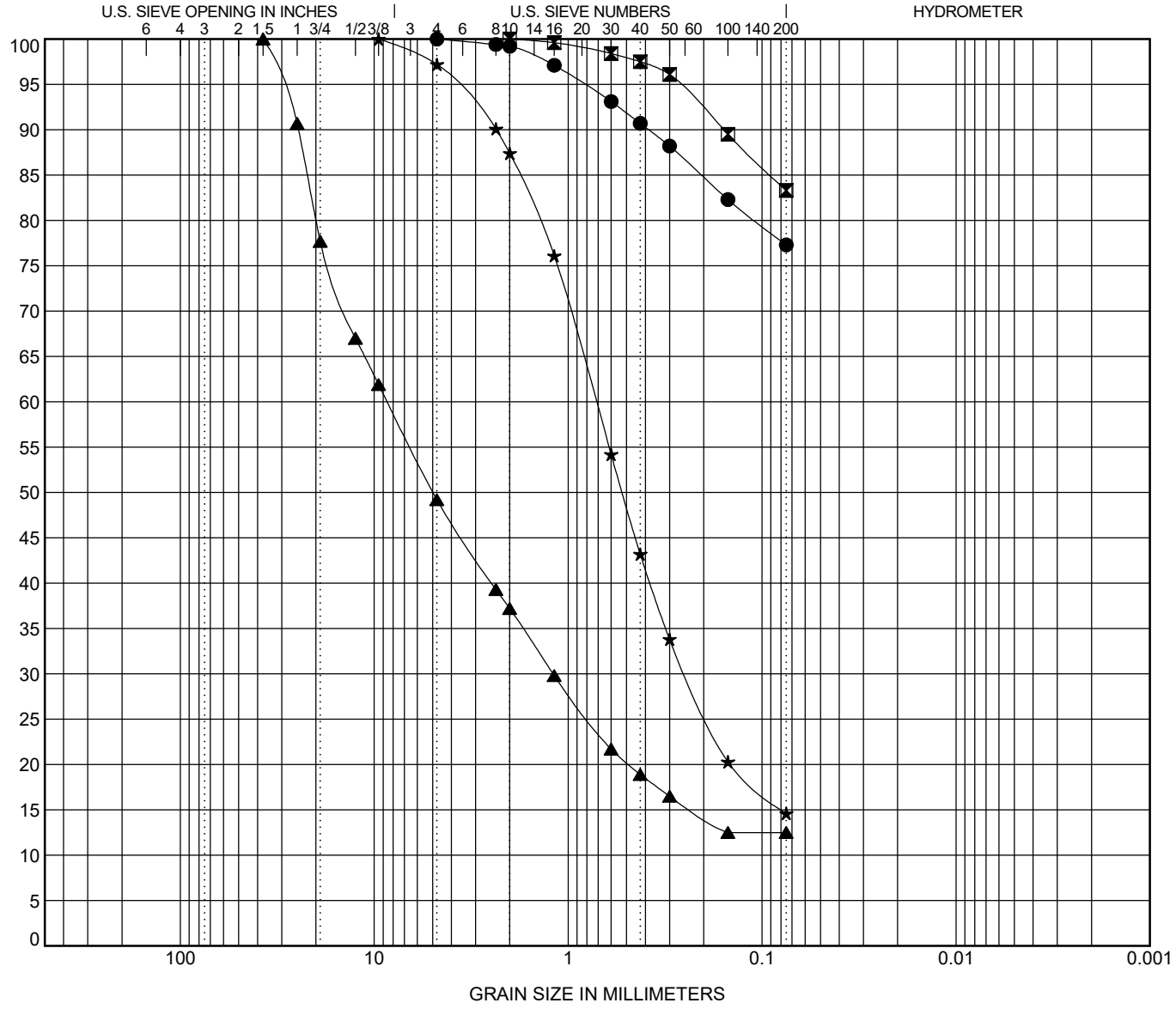
GRAIN SIZE DISTRIBUTION

CLIENT OER WA Solar 1, LLC

PROJECT NAME Goose Prairie Photovoltaic (PV) Solar Array Project

PROJECT NUMBER 220-1274

PROJECT LOCATION Near Moxee, Yakima County Washington



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	B-2	15.0	SILT WITH SAND (ML)					
⊠	B-4	7.5	SILT WITH SAND (ML)					
▲	B-7	15.0	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM)					
★	B-8	20.0	SILTY SAND (SM)					

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-2	15.0	4.75				0.0	22.7	77.3	
⊠	B-4	7.5	2				0.0	16.7	83.3	
▲	B-7	15.0	37.5	8.564	1.197		50.8	36.7	12.5	
★	B-8	20.0	9.5	0.718	0.247		2.8	82.6	14.6	

Appendix IV
Soil Corrosivity Testing Results

Am Test Inc.
13600 NE 126TH PL
Suite C
Kirkland, WA 98034
(425) 885-1664
www.amtestlab.com

Professional Analytical Services

ANALYSIS REPORT

GN NORTHERN, INC.
11115 E MONTGOMERY AVE
SPOKANE VALLEY, WA 99206
Attention: KARL HARMON
Project Name: GOOSE PRAIRIE SOLAR ARRAY
Project #: 220-1274
PO Number: 220-1274
All results reported on an as received basis.

Date Received: 09/03/20
Date Reported: 9/23/20

AMTEST Identification Number **20-A013972**
Client Identification **TP1 @ 4'**
Sampling Date **08/26/20**

Conventionals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
pH	8.16	Unit			ASTM G51	KF	09/08/20
Resistivity	3300	ohms cm		100	ASTM G-187	KF	09/08/20
Redox Potential	359.	unit		200	ASTM D1498-76	KF	09/08/20

Minerals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Chloride	30.	ug/g		10	ASTM D4327	AY	09/16/20
Sulfate	< 10	ug/g		10	ASTM D4327	AY	09/16/20

Miscellaneous

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANLST	DATE
Sulfide	NEGATIVE				Acetate Paper Acetate	KF	09/08/20

GN NORTHERN, INC.
Project Name: GOOSE PRAIRIE SOLAR ARRAY
AmTest ID: 20-A013973

AMTEST Identification Number **20-A013973**
Client Identification **TP3 @ 4'**
Sampling Date **08/26/20**

Conventionals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
pH	8.35	Unit			ASTM G51	KF	09/08/20
Resistivity	2400	ohms cm		100	ASTM G-187	KF	09/08/20
Redox Potential	379.	unit		200	ASTM D1498-76	KF	09/08/20

Minerals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Chloride	64.	ug/g		10	ASTM D4327	AY	09/16/20
Sulfate	< 10	ug/g		10	ASTM D4327	AY	09/16/20

Miscellaneous

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANLST	DATE
Sulfide	NEGATIVE				Acetate Paper Acetate	KF	09/08/20

GN NORTHERN, INC.
Project Name: GOOSE PRAIRIE SOLAR ARRAY
AmTest ID: 20-A013974

AMTEST Identification Number **20-A013974**
Client Identification **TP8 @ 1.5'**
Sampling Date **08/26/20**

Conventionals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
pH	7.33	Unit			ASTM G51	KF	09/08/20
Resistivity	8200	ohms cm		100	ASTM G-187	KF	09/08/20
Redox Potential	414.	unit		200	ASTM D1498-76	KF	09/08/20

Minerals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Chloride	< 10	ug/g		10	ASTM D4327	AY	09/16/20
Sulfate	17.	ug/g		10	ASTM D4327	AY	09/16/20

Miscellaneous

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANLST	DATE
Sulfide	NAGATIVE				Acetate Paper Acetate	KF	09/08/20

Kathy Fugiel
President

Appendix V
Results of Electrical Resistivity Testing

Global Geophysics
P.O. Box 2229
Redmond, WA 98073-2229
Tel: 425-890-4321
Fax: 206-582-0838

September 8, 2020 Our ref: 110-0901.000

GN Northern Inc.
722 North 16th Avenue, Suite 31
Yakima, WA 98902

Attention: Mr. Imran Magsi

RE: REPORT FOR ELECTRICAL RESISTIVITY SURVEY IN MOXEE, WA

This letter report presents the results of the geophysical surveys performed by Global Geophysics. The survey was carried out on September 2, 2020 in Moxee, WA. The objective of the survey was to measure the soil resistivity for grounding design.

GEOPHYSICAL METHODS AND FIELD PROCEDURES

Electrical Resistivity

The electrical resistivity sounding technique measures the differences in the electrical properties of geologic materials. These differences can result from variations in lithology, water content, and pore-water chemistry. The method involves transmitting an electric current into the ground between two electrodes and measuring the voltage between two other electrodes. The direct measurement is the apparent resistivity of the area beneath the electrodes. The measurements include deeper layers as the electrode spacing is increased.

The data were acquired with an AGI SuperSting resistivity meter, along E-W and N-S directions.

RESULTS

The line layout is shown below

Location: Moxee WA

Supplier: Conducted by Global Geophysics, P.O. Box 2229, Redmond, WA, 98073. Tel. 425-890-4321; email: Jliu@GlobalGeophysics.com;

Date of Test: September 2, 2020

Test Type: In situ

Manufacturer and model: AGI SuperSting

Date of last meter calibration: April, 2020

Ambient temperature: 85-95 F

Weather condition: Sunny

Recent precipitation: None

Soil composition: Sand

Difficulty of inserting the electrodes: Easy

Terrain condition: Flat open area with minimal vegetation

Lead cable size: 16 gauge copper wires

Electrode: 3/4 inch in diameter, 30 inch long stainless steel

Sounding Name: Moxee 1- EW

Electrode Spacing "a" (ft)	Source Voltage (V)	I Injected (mA)	Apparent Resistance (ohm)	Apparent Resistivity (ohm-m)
1	400	8.00	34.900	66.85
2	400	13.00	9.1000	34.86
3	400	8.00	7.5000	43.10
5	400	14.00	5.2000	49.80
7	400	14.00	4.3000	57.66
10	400	17.00	2.9000	55.55
30	400	18.00	0.7000	40.23
50	400	24.00	0.3500	33.52

Test Type: In situ

Supplier: Conducted by Global Geophysics, P.O. Box 2229, Redmond, WA, 98073. Tel. 425-890-4321; email: Jliu@GlobalGeophysics.com;

Manufacturer and model: AGI SuperSting

Date of last meter calibration: April, 2020

Ambient temperature: 85-95 F

Weather condition: Sunny

Recent precipitation: None

Soil composition: Sand

Difficulty of inserting the electrodes: Easy

Terrain condition: Flat open area with minimal vegetation

Lead cable size: 16 gauge copper wires

Electrode: 3/4 inch in diameter, 30 inch long stainless steel

Sounding Name: Moxee 1 -NS

Electrode Spacing "a" (ft)	Source Voltage (V)	I Injected (mA)	Apparent Resistance (ohm)	Apparent Resistivity (ohm-m)
1	400	8.00	34.865	66.79
2	400	13.00	8.9993	34.48
3	400	8.00	7.0532	40.53
5	400	14.00	5.0870	48.72
7	400	14.00	4.2257	56.66
10	400	17.00	2.9217	55.97
30	400	18.00	0.6761	38.85
50	400	24.00	0.3192	30.57

Location: Moxee WA

Supplier: Conducted by Global Geophysics, P.O. Box 2229, Redmond, WA, 98073. Tel. 425-890-4321; email: Jliu@GlobalGeophysics.com;

Date of Test: September 2, 2020

Test Type: In situ

Manufacturer and model: AGI SuperSting

Date of last meter calibration: April, 2020

Ambient temperature: 85-95 F

Weather condition: Sunny

Recent precipitation: None

Soil composition: Sand

Difficulty of inserting the electrodes: Easy

Terrain condition: Flat open area with minimal vegetation

Lead cable size: 16 gauge copper wires

Electrode: 3/4 inch in diameter, 30 inch long stainless steel

Sounding Name: Moxee 2- EW

Electrode Spacing "a" (ft)	Source Voltage (V)	I Injected (mA)	Apparent Resistance (ohm)	Apparent Resistivity (ohm-m)
1	400	7.00	17.4300	33.39
2	400	12.00	9.6800	37.09
3	400	11.00	7.0810	40.69
5	400	11.00	5.1580	49.40
7	400	10.00	4.4420	59.56
10	400	21.00	2.7530	52.74
30	400	96.00	0.5246	30.15
50	400	35.00	0.1645	15.76

Test Type: In situ

Supplier: Conducted by Global Geophysics, P.O. Box 2229, Redmond, WA, 98073. Tel. 425-890-4321; email: Jliu@GlobalGeophysics.com;

Manufacturer and model: AGI SuperSting

Date of last meter calibration: April, 2020

Ambient temperature: 85-95 F

Weather condition: Sunny

Recent precipitation: None

Soil composition: Sand

Difficulty of inserting the electrodes: Easy

Terrain condition: Flat open area with minimal vegetation

Lead cable size: 16 gauge copper wires

Electrode: 3/4 inch in diameter, 30 inch long stainless steel

Sounding Name: Moxee 2 -NS

Electrode Spacing "a" (ft)	Source Voltage (V)	I Injected (mA)	Apparent Resistance (ohm)	Apparent Resistivity (ohm-m)
1	400	7.00	17.5600	33.64
2	400	12.00	9.7000	37.16
3	400	11.00	7.1000	40.80
5	400	11.00	5.2000	49.80
7	400	10.00	4.4000	59.00
10	400	21.00	2.8000	53.64
30	400	96.00	0.5300	30.46
50	400	35.00	0.1800	17.24

CLOSURE

Global Geophysics services will be conducted in a manner consistent with the level of care and skill ordinarily exercised by other members of the geophysical community currently practicing under similar conditions subject to the time limits and financial and physical constraints applicable to the services.

We appreciate the opportunity to work with you on this project, and we hope that you find the results of the geophysical survey useful to your investigation. If you have any questions regarding this report, please call the undersigned at 425-890-4321. We look forward to providing you with additional geophysical services in the future.

Sincerely,

Global Geophysics.

John Liu, Ph.D., R.G.
Principal Geophysicist

Appendix VI
Results of Thermal Resistivity Testing


TRT Sampling Map
TRT Sample
TRT Sample
TRT Sample
SITE ACCESS
Google Earth
N
4000 ft

21239 FM529 Rd., Bldg F
Cypress, Texas 77433
Tel: 281-985-9344
Fax: 832-427-1752
www.geothermusa.com
info@geothermusa.com

September 25, 2020

GN Northern
722 No. 16th Ave, Ste. 31
Yakima, WA 98902
Attn: Max Barnett, GIT

Re: Thermal Analysis of Native Samples
Goose Prairie Solar Array - Moxee, WA (PO No. 220-1274)

The following is the report of thermal dryout characterization tests conducted on three (3) soil samples sent to our laboratory.

Thermal Dryout Tests: The samples were tested at the optimum moisture content and 90% of the maximum dry density provided by **GN Northern**. The tests were conducted in accordance with the IEEE standard 442-2017. The results are tabulated below, and the thermal dryout curves are presented in **Figures 1 to 3.**

Sample ID, Description, Thermal Resistivity, Moisture Content and Density

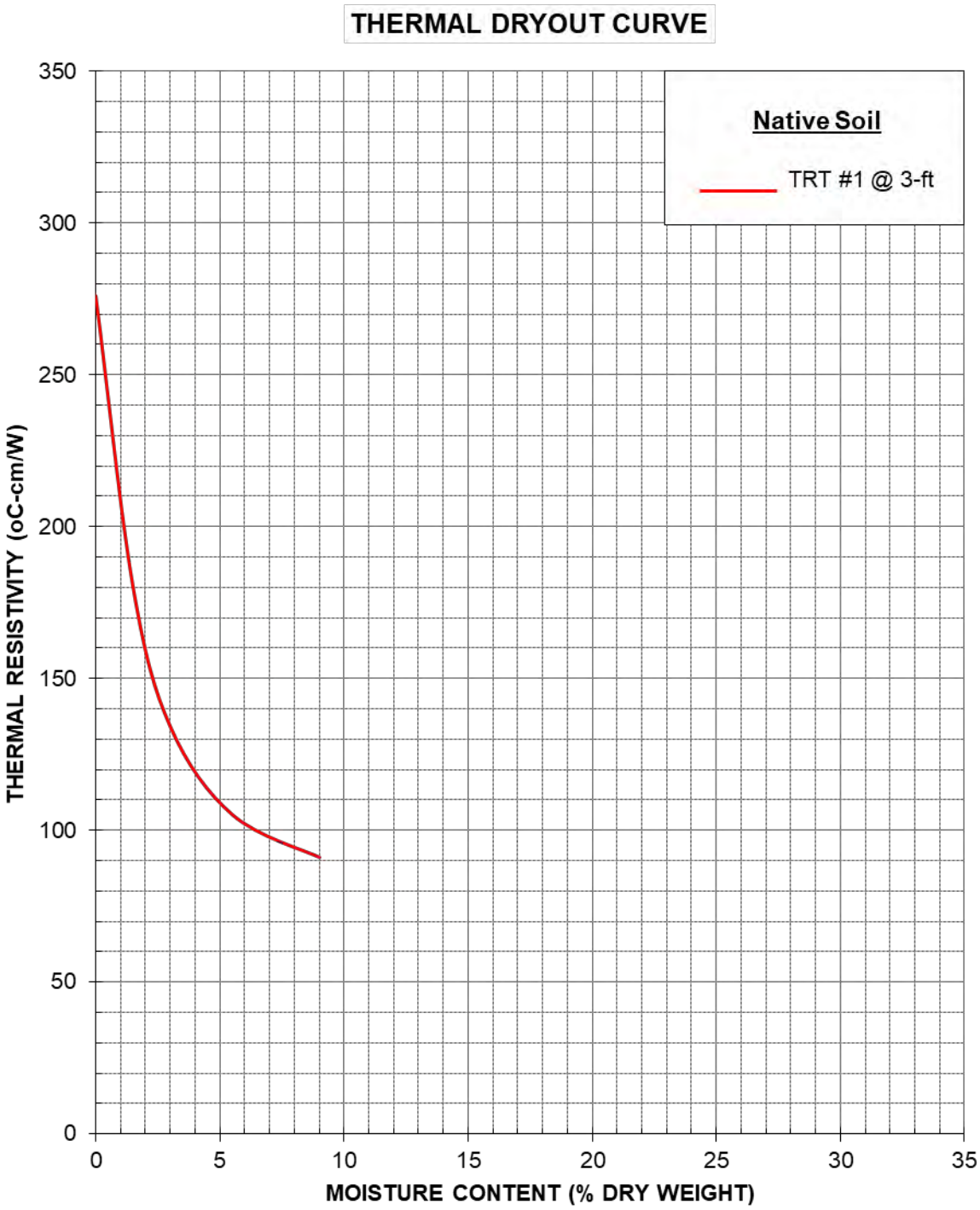
Sample ID	Description (GN Northern)	Thermal Resistivity (°C-cm/W)		Moisture Content (%)	Dry Density (lb/ft^3)
		Wet	Dry		
TRT #1 @ 3-ft	Silty gravel with sand	91	276	9	110
TRT #2 @ 3-ft	Silty gravel with sand	98	290	9	106
TRT #3 @ 3-ft	Silty gravel with sand	110	309	11	98

Comments: The thermal characteristic depicted in the dryout curves apply for the soils at their respective test dry density.

Please contact us if you have any questions or if we can be of further assistance.

Geotherm USA

Nimesh Patel

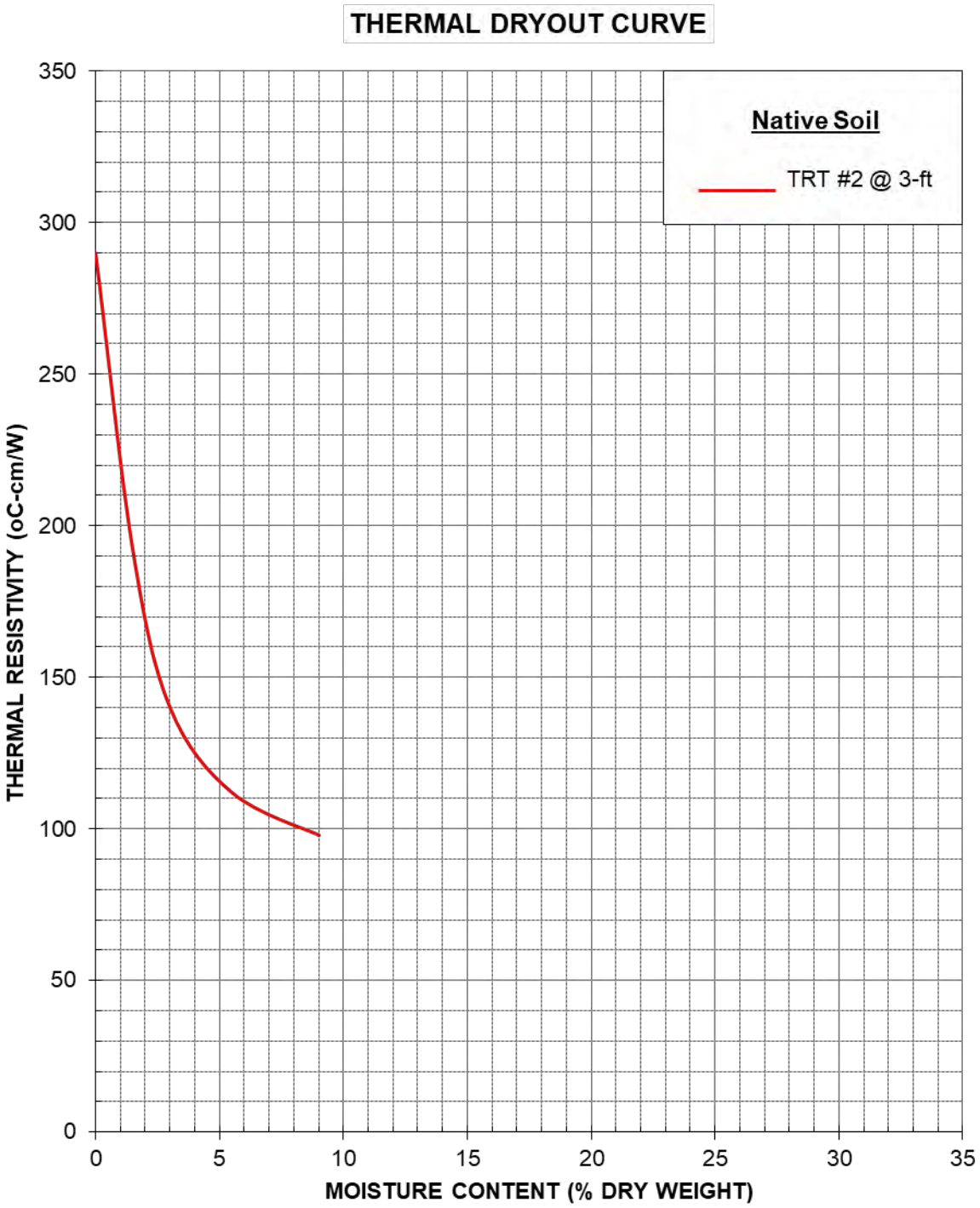


GN Northern (PO No. 220-1274)

Thermal Analysis of Native Soil

Goose Prairie Solar Array, Moxee, WA

September 2020 **Figure 1**

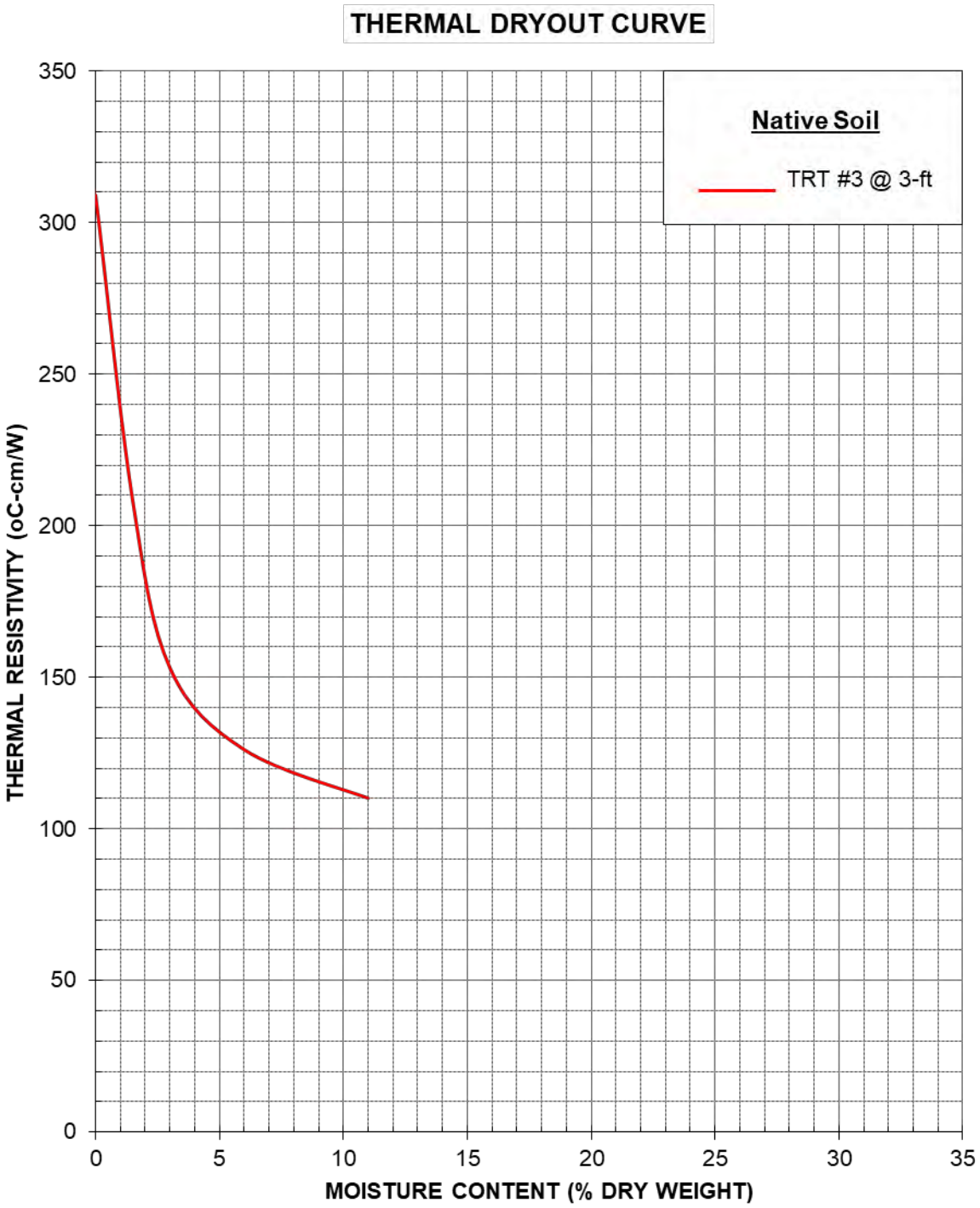


GN Northern (PO No. 220-1274)

Thermal Analysis of Native Soil

Goose Prairie Solar Array, Moxee, WA

September 2020 **Figure 2**



GN Northern (PO No. 220-1274)

Thermal Analysis of Native Soil

Goose Prairie Solar Array, Moxee, WA

September 2020 **Figure 3**

Appendix VII
Site & Exploration Photographs

View of site conditions looking south from near Den Beste Rd

View of site conditions looking NE from near test pit TP-1

Exposed subsurface soil profile within test pit TP-1

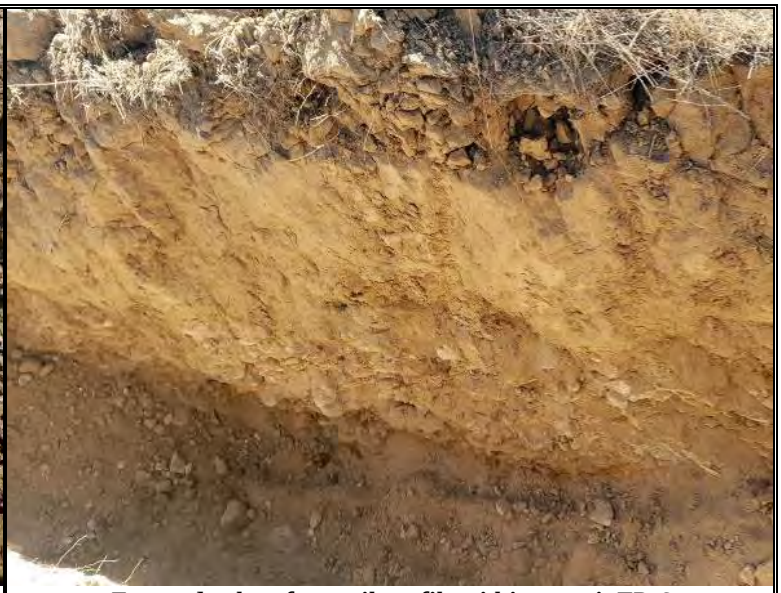
Exposed subsurface soil profile within test pit TP-2

Exposed subsurface soil profile within test pit TP-3

Exposed subsurface soil profile within test pit TP-4

PLATE 1: SITE & EXPLORATION PHOTOS – 8/26/2020 **PROJECT NO. 220-1274**

Exposed subsurface soil profile within test pit TP-5



Exposed subsurface soil profile within test pit TP-6

Excavation and spoils at test pit TP-7

Exposed subsurface soil profile within test pit TP-7

Exposed subsurface soil profile within test pit TP-8

Exposed subsurface soil profile within test pit TP-9

PLATE 2: SITE & EXPLORATION PHOTOS – 8/26/2020 **PROJECT NO. 220-1274**

Exposed subsurface soil profile within test pit TP-10

Infiltration test setup at P-1

Infiltration test setup at P-3

Drilling at boring B-1, looking northeast

Split-spoon sample obtained from boring B-1 at 15' BGS

Drilling at boring B-4, looking south

PLATE 3: SITE & EXPLORATION PHOTOS – 8/26 & 9/15/2020 **PROJECT NO. 220-1274**

View of conditions in northeastern portion of site, looking east

View of conditions in northeastern portion of site, looking northeast

View of conditions in northeastern portion of site, looking northeast

View of conditions in northeastern portion of site, looking south

View of conditions in northeastern portion of site

View of conditions in northeastern portion of site, looking south

PLATE 4: SITE RECONNAISSANCE PHOTOS – 11/20/2020 **PROJECT NO. 220-1274**

View of conditions in northeastern portion of site, looking east

View of conditions in northeastern portion of site, looking northeast

View of conditions in northeastern portion of site, looking northeast

View of conditions in northeastern portion of site

View of conditions in northeastern portion of site, looking southeast

View of conditions in northeastern portion of site, looking south

PLATE 5: SITE RECONNAISSANCE PHOTOS – 11/20/2020 **PROJECT NO. 220-1274**

Appendix VIII
NRCS Soil Survey

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

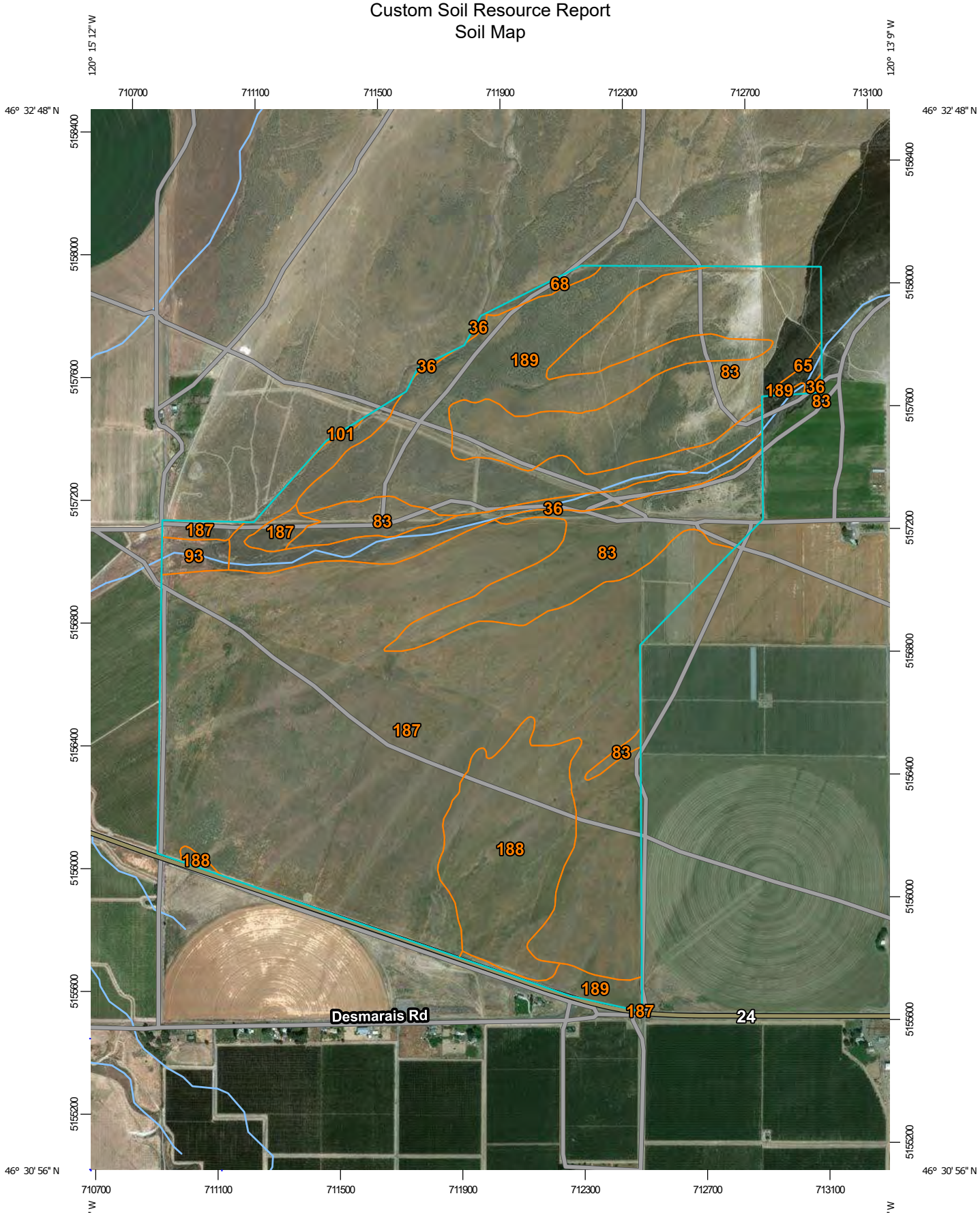
A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Yakima County Area, Washington

Goose Prairie Solar Array, near Moxee, WA

October 8, 2020

Custom Soil Resource Report
Soil Map



Map Scale: 1:16,800 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 200 400 800 1200

Feet: 0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

Yakima County Area, Washington

36—Finley cobbly fine sandy loam, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 29sx
Elevation: 300 to 1,500 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 135 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Finley, cobbly, and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Finley, Cobbly

Setting

Landform: Terraces, alluvial fans
Parent material: Alluvium

Typical profile

H1 - 0 to 4 inches: cobbly fine sandy loam
H2 - 4 to 14 inches: fine sandy loam
H3 - 14 to 30 inches: very gravelly loam
H4 - 30 to 60 inches: extremely gravelly loamy sand

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: 20 to 40 inches to strongly contrasting textural stratification
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 20 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 3.2 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Ecological site: R007XY501WA - SANDY 6-10 PZ
Hydric soil rating: No

65—Kiona stony silt loam, 15 to 45 percent slopes

Map Unit Setting

National map unit symbol: 29ty
Elevation: 400 to 2,500 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 48 to 54 degrees F
Frost-free period: 140 to 210 days
Farmland classification: Not prime farmland

Map Unit Composition

Kiona and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kiona

Setting

Landform: Hillslopes
Parent material: Loess and colluvium derived from basalt

Typical profile

H1 - 0 to 5 inches: stony silt loam
H2 - 5 to 14 inches: very cobbly loam
H3 - 14 to 60 inches: very cobbly silt loam

Properties and qualities

Slope: 15 to 45 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 35 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 4.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R007XY102WA - LOAMY 6-10 PZ
Hydric soil rating: No

68—Lickskillet very stony silt loam, 5 to 45 percent slopes

Map Unit Setting

National map unit symbol: 29v1
Elevation: 200 to 3,600 feet
Mean annual precipitation: 10 to 16 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 100 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Lickskillet and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lickskillet

Setting

Landform: Hillslopes, ridges
Parent material: Residuum and colluvium weathered from basalt, and loess

Typical profile

H1 - 0 to 3 inches: silt loam
H2 - 3 to 20 inches: very gravelly loam, very cobbly loam
H2 - 3 to 20 inches: unweathered bedrock
H3 - 20 to 24 inches:

Properties and qualities

Slope: 5 to 45 percent
Depth to restrictive feature: 12 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: R008XY201WA - DRY STONY 10-16 PZ
Hydric soil rating: No

83—Moxee silt loam, 2 to 15 percent slopes

Map Unit Setting

National map unit symbol: 29vl
Elevation: 900 to 2,000 feet
Mean annual precipitation: 8 to 12 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 125 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Moxee and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Moxee

Setting

Parent material: Loess

Typical profile

H1 - 0 to 7 inches: silt loam
H2 - 7 to 11 inches: silt loam
H3 - 11 to 18 inches: gravelly silt loam
H4 - 18 to 22 inches: cemented material

Properties and qualities

Slope: 2 to 15 percent
Depth to restrictive feature: 10 to 20 inches to duripan
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): 6s
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: R008XY201WA - DRY STONY 10-16 PZ
Hydric soil rating: No

Minor Components

Riverwash

Percent of map unit: 5 percent
Landform: Alluvial cones
Hydric soil rating: Yes

93—Pits

Map Unit Composition

Pits: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pits

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

101—Ritzville silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 29p1
Elevation: 800 to 3,000 feet
Mean annual precipitation: 9 to 12 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 100 to 180 days
Farmland classification: Farmland of unique importance

Map Unit Composition

Ritzville and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ritzville

Setting

Landform: Hillslopes
Parent material: Loess

Typical profile

H1 - 0 to 7 inches: silt loam
H2 - 7 to 37 inches: silt loam
H3 - 37 to 60 inches: silt loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: High (about 12.0 inches)

Interpretive groups
Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: R008XY102WA
Hydric soil rating: No

187—Willis silt loam, 2 to 5 percent slopes

Map Unit Setting
National map unit symbol: 29s2
Elevation: 1,000 to 3,000 feet
Mean annual precipitation: 9 to 12 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 125 to 180 days
Farmland classification: Farmland of statewide importance

Map Unit Composition
Willis and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Willis

Setting
Parent material: Loess

Typical profile
H1 - 0 to 6 inches: silt loam
H2 - 6 to 22 inches: silt loam
H3 - 22 to 34 inches: silt loam
H4 - 34 to 38 inches: cemented material

Properties and qualities
Slope: 2 to 5 percent
Depth to restrictive feature: 20 to 40 inches to duripan
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Moderate (about 6.7 inches)

Interpretive groups
Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C

Ecological site: R008XY102WA
Hydric soil rating: No

188—Willis silt loam, 5 to 8 percent slopes

Map Unit Setting

National map unit symbol: 29s3
Elevation: 1,000 to 3,000 feet
Mean annual precipitation: 9 to 12 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 125 to 180 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Willis and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Willis

Setting

Parent material: Loess

Typical profile

H1 - 0 to 6 inches: silt loam
H2 - 6 to 22 inches: silt loam
H3 - 22 to 34 inches: silt loam
H4 - 34 to 38 inches: cemented material

Properties and qualities

Slope: 5 to 8 percent
Depth to restrictive feature: 20 to 40 inches to duripan
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Moderate (about 6.7 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R008XY102WA
Hydric soil rating: No

189—Willis silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 29s4
Elevation: 1,000 to 3,000 feet
Mean annual precipitation: 9 to 12 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 125 to 180 days
Farmland classification: Farmland of unique importance

Map Unit Composition

Willis and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Willis

Setting

Parent material: Loess

Typical profile

H1 - 0 to 6 inches: silt loam
H2 - 6 to 22 inches: silt loam
H3 - 22 to 34 inches: silt loam
H4 - 34 to 38 inches: cemented material

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 20 to 40 inches to duripan
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Moderate (about 6.7 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R008XY102WA
Hydric soil rating: No

Appendix IX
Washington Department of Ecology Well Logs

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No. G5-G4-250
Permit No. G425018

(1) OWNER: Name Gordon Meacham Address Hanford Highway Rt. 1 Box 209 Moxee

(2) LOCATION OF WELL: County Yakima NW ¼ SW ¼ Sec. 18 T. 12 N., R. 21 W.M.
Bearing and distance from section or subdivision corner M

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other Stock ☒

(4) TYPE OF WORK: Owner's number of well (if more than one) ....
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☒ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 142 ft. Depth of completed well 142 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6" Diam. from 71 ft. to 74 ft.
Threaded ☐ ." Diam. from ft. to ft.
Welded ☒ ." Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☒
Manufacturer's Name
Type Model No
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 22 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name Sta Rite
Type: Submersible H.P. 3/4

(8) WATER LEVELS: Land-surface elevation above mean sea level .... ft.
Static level 100 ft. below top of well Date ~~9-29-77~~ 10-4-77
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ~~9-29-77~~ 10-4-77
Bailer test 12 gal./min. with 30 ft. drawdown after 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG:
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
soil	0	2
hardpan cobbles + gravel	3	18
tan clay (sandy)	19	95
dark brown clay (little sand+gravel)	96	139
coarse sand+gravel (little clay)	140	142
water		
Picked up about 4-5 gpm at 51		

RECEIVED
OCT 25 1977
DEPARTMENT OF ECOLOGY
CENTRAL REGIONAL OFFICE

Work started 9-29, 19 77 Completed 10-4, 19 77

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Henry Bach Well Drilling
(Person, firm, or corporation) (Type or print)
Address PO Box 1651 Yakima Wn. 98907
[Signed] Henry Bach
(Well Driller)
License No. 0053 Date 10-8, 19 77

(USE ADDITIONAL SHEETS IF NECESSARY) OR

ECY 050-1-20

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

56386

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. W085226
UNIQUE WELL I.D. # ACE159
Water Right Permit No.

(1) OWNER: Name Benito Uribe Address 4209 Thorp Rd Moxee WA 98936

(2) LOCATION OF WELL: County Yakima - SE 1/4 SE 1/4 Sec 18 T. 12 N. R 21 W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) PARCEL # 211218-44004 R

(3) PROPOSED USE: [X] Domestic [ ] Industrial [ ] Municipal [ ] Irrigation [ ] Test Well [ ] Other [ ] DeWater

(4) TYPE OF WORK: Owner's number of well (If more than one)
Abandoned [ ] New well [X] Method: Dug [ ] Bored [ ] Deepened [ ] Cable [ ] Driven [ ] Reconditioned [ ] Rotary [X] Jetted [ ]

(5) DIMENSIONS: Diameter of well 6 inches. Drilled 220 feet. Depth of completed well 220 ft.

(6) CONSTRUCTION DETAILS:
Casing Installed: 6 " Diam. from 3 ft. to 157 ft.
Welded [X] Liner installed [ ] Threaded [ ] " Diam. from ft. to ft.
" Diam. from ft. to ft.

Perforations: Yes [ ] No [X]
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes [ ] No [X]
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes [ ] No [X] Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes [X] No [ ] To what depth? 20 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes [ ] No [X]
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 148 ft. below top of well Date 8-12-96
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes [ ] No [X] If yes, by whom?
Yield: 35 gal./min. with ft. drawdown after hrs.
" ESTIMATED AIRLIFT "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airlift gal./min. with stem set at ft. for hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes [ ] No [X]

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Topsoil BROWN Soft	0	3
Sandstone BROWN Med	3	45
Clay Tan+BROWN Soft	45	92
Cemented Gravel/BROWN MED	92	95
Sandstone tan med	95	148
Cemented gravel brown hard	148	189
Sandstone BROWN MED	189	220
6" Dewe Shoe Utilized		

RECEIVED
SEP 13 1996
DEPT OF ECOLOGY
Water Resources Program

Work Started July 17 19 96 Completed August 12 19 96

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME WILLYS WELLS INC (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address 6520 Postma Rd Yakima WA 98901
(Signed) Chris Hayes (WELL DRILLER) License No. 1908
(Chris Hayes)
Contractor's Registration No. WILLYW1088MW Date September 12, 1996

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (206) 407-6600. The TDD number is (206) 407-6006.

ECY 050-1-20 (9/93)

File Original with Department of Ecology 89643
Second Copy - Owner's Copy
Third Copy - Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Notice of Intent W122778

UNIQUE WELL I D # AFH 085

Water Right Permit No

(1) OWNER: Name Thomas Saucedo Address 7253 Desmarias Rd, Moxee

(2) LOCATION OF WELL County Yakima SE 1/4 SE 1/4 Sec 18 T 12 N R 21 WM

(2a) STREET ADDRESS OF WELL (or nearest address) 7253 Desmarias Rd, Moxee

TAX PARCEL NO

(3) PROPOSED USE: [X] Domestic [ ] Industrial [ ] Municipal [ ] Irrigation [ ] Test Well [ ] Other [ ] DeWater

(4) TYPE OF WORK: Owner's number of well (if more than one)
[X] New Well Method
[ ] Deepened [ ] Dug [ ] Bored
[ ] Reconditioned [ ] Cable [ ] Driven
[ ] Decommission [X] Rotary [ ] Jetted

(5) DIMENSIONS: Diameter of well 6 inches
Drilled 240 feet Depth of completed well 240 ft

(6) CONSTRUCTION DETAILS
Casing Installed
[X] Welded 6 " Diam from +1½ ft to 233½ ft
[ ] Liner installed " Diam from ft to ft
[ ] Threaded " Diam from ft to ft

Perforations [ ] Yes [X] No
Type of perforator used
SIZE of perforations in by in
perforations from ft to ft

Screens [ ] Yes [X] No [ ] K-Pac Location
Manufacturer's Name
Type Model No
Diam Slot Size from ft to ft
Diam Slot Size from ft to ft

Gravel/Filter packed [ ] Yes [X] No [ ] Size of gravel/sand
Material placed from ft to ft

Surface seal [X] Yes [ ] No To what depth? 18 ft
Material used in seal bentonite
Did any strata contain unusable water? [ ] Yes [ ] No
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP Manufacturer's Name
Type H P

(8) WATER LEVELS Land-surface elevation above mean sea level ft
Static level 130 ft below top of well Date 8-16-00
Artesian pressure lbs per square inch Date
Artesian water is controlled by
(Cap, valve, etc)

(9) WELL TESTS Drawdown is amount water level is lowered below static level
Was a pump test made? [ ] Yes [ ] No If yes, by whom?
Yield gal /min with ft drawdown after hrs
Yield gal /min with ft drawdown after hrs
Yield gal /min with ft drawdown after hrs
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal /min with ft drawdown after hrs
Airtest 50 gal./min with ft drawdown after hrs
Artesian flow g p m Date
Temperature of water Was a chemical analysis made? [ ] Yes [X] No

(10) WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION
Formation Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information Indicate all water encountered

MATERIAL	FROM	TO
Clay	0	8
conglomerate	8	18
sandstone	18	20
clay, conglomerate	20	28
lt brn clay	28	121
brn sandstone	121	181
clay sandstone	181	220
sandstone, water	220	240

RECEIVED
AUG 22 2000
DEPARTMENT OF ECOLOGY

Work Started 809-00 Completed 8-16-00

WELL CONSTRUCTION CERTIFICATION

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards Materials used and the information reported above are true to my best knowledge and belief

Type or Print Name Charles White License No 2328
(Licensed Driller/Engineer)

Trainee Name License No
Drilling Company Water Wells Drilling
(Signed) License No 2328
(Licensed Driller/Engineer)
Address 5503 Ahtanum Rd, Yakima 98903

Contractor's Registration No WATERWD*112QB Date 8-17-00

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer For special accommodation needs contact the Water Resources Program at (360) 407-6600 The TDD number is (360) 407-6006

ECY 050-1-20 (11/98)