Request for Amendment to the Site Certificate for the Perennial Wind Chaser Station

Prepared for

Oregon Energy Facility Siting Council

June 2019

Prepared and Submitted by

Perennial-WindChaser LLC

Contents

Section 1

Introduction

The Perennial Wind Chaser Station (Facility) is a permitted, but not yet constructed natural gas facility in Umatilla County, Oregon with a maximum capacity of 415 megawatts (MW). On September 23, 2015, the Oregon Energy Facility Siting Council (EFSC or the Council) issued a Site Certificate approving the Facility[1]. This Request for Amendment of the Site Certificate is only for extending the construction deadlines. No other requests for amendments have been made. The Facility will consist of up to 4 combustion turbines, as well as related and supported facilities located within the permitted site boundary. No changes to the site boundary or to the design and operation of the Facility are being requested.

"OAR 345-027-0013-Certificate Expiration" notes "If the certificate holder does not begin construction of the facility by the construction beginning date specified in the site certificate or amended site certificate, the site certificate expires on the construction beginning date specified, unless expiration of the site certificate is suspended pending final action by the Council on a request for amendment to a site certificate pursuant to OAR 345-027-0085(2)." Perennial-WindChaser LLC (Perennial) has determined that it will not be able to begin construction by the beginning date specified in its Site Certificate, and thus submits a request to amend the Site Certificate to extend the construction start date an additional two years, and accordingly extend the construction completion deadline from the start date. "OAR 345-027-0085-Request for Amendment to Extend Construction Deadlines" requires the submission of a preliminary request for amendment in accordance with OAR 345-027-0060. This rule also requires: "The preliminary request for amendment must include an explanation of the need for an extension and must be submitted to the Department of Energy before the applicable construction deadline, but no earlier than the date twelve months before the applicable construction deadline."

The reason for this request is that Perennial has been unable to obtain a power purchase agreement and it is unlikely that one will be obtained before the required construction start date. There have been tremendous changes in the energy market and in pending federal regulations covering the energy sector, since the issuance of the Site Certificate. Perennial is optimistic that as soon as future energy planning becomes stable, the need for the Facility will become apparent to the market place. Perennial is also submitting this request within the noted timeline of the rule.

"OAR 345-027-0050(3)-Changes Requiring an Amendment" also requires an Amendment "to extend the construction beginning or completion deadline as described in OAR 345-027-0085."

As allowed under "OAR 345-027-005- Review Processes for Requests for Amendment", Perennial proposes to request a type B review process, if the Department and Council concur, since the request covers just an extension of the construction deadlines listed in the Site Certificate. As support, Perennial believes the proposed change is not complex. The anticipated level of public and agencies interest is expected to be low. The potential impacts

[1] The Council issued a Final Order approving the Site Certificate for The Perennial Wind Chaser Station on September 18, 2015; the Site Certificate was fully executed on September 23, 2015.

are known and presented in the Request for Amendment. There is no significant adverse impact anticipated from this proposed change.

Section 2

Information Required Pursuant to OAR-345-027-0060

2.1 OAR-345-027-0060(1)(a) Name and Mailing Address

(1) To request an amendment of a site certificate required by OAR 345-3027-0050(3) and (4), the certificate holder shall submit a written preliminary request for amendment to the Department of Energy that includes the following:
(a) The name of the facility, the name and mailing address of the certificate holder and the name, mailing address and phone number of the individual responsible for submitting the request.

RESPONSE:

Name of the Facility, the Name and Mailing Address of the Certificate Holder:

Perennial Wind Chaser Station
Perennial-WindChaser, LLC
600 Third Avenue, 30F
New York, NY 10016-2001

Name, Mailing Address, and Phone Number of Individual Responsible for Submitting the Request:

JJ Jamieson, Senior Director, Operations and Development
Perennial Power Holdings, Inc.
24 Waterway Ave, Suite 740 The Woodlands, TX 77380
(281) 719-8825
JJ.Jamieson@perennialpower.net

2.2 OAR-345-027-0060(1)(b) Description of the Proposed Change

(b) A detailed description of the proposed change, including:
(A) a description of how the proposed change affects the facility,
(B) a description of how the proposed change affects those resources or interests protected by applicable laws and Council standards, and
(C) the specific location of the proposed change, and any updated maps and/or geospatial data layers relevant to the proposed change.

RESPONSE: With regard to subpart (A), the proposed change only means that the start of construction will be extended an additional 3 years and the period of construction adjusted accordingly.

With regard to subpart (B), this request does not alter the description of the Facility as set forth in the Site Certificate. The design and operation was reviewed by the original engineering firm that prepared the Application for Site Certificate (ASC), and found no design or operational changes were necessary since the submittal of the ASC. The effect on resources or interests protected by applicable laws and Council standards is detailed in the following sections of this Request for Amendment. In summary, the proposed change of an extended start date of construction will have no significant adverse impact on the Standards.

With regard to subpart (C), the change affects the entire project. A review of the maps was made as part of this request and found that they did not require any updating.

2.3 OAR-345-027-0060(1)(c) Required Division 21 Information

(c) References to any specific Division 21 information that may be required for the Department to make its findings.

RESPONSE: Division 21 lists thirty sections of review which were presented in the ASC. Two sections are not applicable to this Request for Amendment, Exhibit N (Need for the Facility) and Exhibit BB (Other Information). There are seventeen sections related to Council Standards. The general Council Standards which total fourteen are reviewed in section 2.5 of this Request. The three specific Council Standards are reviewed in Section 2.6. Property owners (Exhibit F) adjacent to the Project are reviewed in Section 2.7. With regard to Exhibit A-Applicant Information, Exhibit B-Project Information, and Exhibit C-Location, no changes are noted except for updated applicant contact information which is presented in Section 2.1, and the extension of start and completion of construction date is presented in Section 2.2 of this Request. The remaining Division 21 sections not covered by the standards are addressed in this subsection:

- OAR 345-021-0010(e) Exhibit E-Permits
- OAR 345-021-0010(g) Exhibit G-Material Analysis
- OAR 345-021-0010(j) Exhibit J-Jurisdictional Wetlands
- OAR 345-021-0010(m) Exhibit M-Financial Capability
- OAR 345-021-0010(o) Exhibit O-Water Use
- OAR 345-021-0010(x) Exhibit X-Noise
- OAR 345-021-0010(z) Exhibit Z-Cooling Tower Impacts
- OAR 345-021-0010(cc) Exhibit CC-Additional Statutes, Rules and Ordinances

2.3.1 OAR-345-021-0010(e) Permits

Information about permits needed for construction and operation of the facility, including:
(A) Identification of all federal, state and local government permits related to the siting of the proposed facility, a legal citation of the statute, rule or ordinance governing each permit, and the name, mailing address, email address and telephone number of the agency or office responsible for each permit.
(B) A description of each permit, the reasons the permit is needed for construction or operation of the facility and the applicant's analysis of whether the permit should or should not be included in and governed by the site certificate.
(C) For any state or local government agency permits, licenses or certificates that are proposed to be included in and governed by the site certificate, evidence to support findings by the Council that construction and operation of the proposed facility will comply with the statutes, rules and standards applicable to the permit. The applicant may show this evidence:
(i) In Exhibit J for permits related to wetlands.
(ii) In Exhibit O for permits related to water rights.

(D) For federally-delegated permit applications, evidence that the responsible agency has received a permit application and the estimated date when the responsible agency will complete its review and issue a permit decision.
(E) If the applicant relies on a state or local government permit or approval issued to a third party, identification of any such third-party permit and for each:
(i) Evidence that the applicant has, or has a reasonable likelihood of entering into, a contract or other agreement with the third party for access to the resource or service to be secured by that permit.
(ii) Evidence that the third party has, or has a reasonable likelihood of obtaining, the necessary permit.
(iii) An assessment of the impact of the proposed facility on any permits that a third party has obtained and on which the applicant relies to comply with any applicable Council standard.
(F) If the applicant relies on a federally-delegated permit issued to a third party, identification of any such third-party permit and for each:
(i) Evidence that the applicant has, or has a reasonable likelihood of entering into, a contract or other agreement with the third party for access to the resource or service to be secured by that permit.
(ii) Evidence that the responsible agency has received a permit application.
(iii) The estimated date when the responsible agency will complete its review and issue a permit decision.
(G) The applicant's proposed monitoring program, if any, for compliance with permit conditions.

RESPONSE: The ASC, Exhibit E details permit information required for the construction and operation of the Project. A review of the list of permits in the exhibit and federal, state and local regulations was conducted and no additional permits or approvals were found to be necessary.

Revisions to regulations have affected one permit, the Oregon Department of Energy (DOE) Site Certificate for the Project. This Request for Amendment has been prepared in compliance with the revised regulations.

An update of the active permits is discussed below:
The Air Contaminant Discharge Permit and Prevention of Significant Deterioration Permit (Air Permit) were initially issued on January 26, 2016. An application to extend the construction start date was submitted on April 5, 2017. Oregon Department of Environmental Quality (DEQ) approved the extension on May 17, 2017. The Air Permit now has a required start date of January 26, 2019. The DEQ may grant an additional 18 month extension for good cause. A copy of the Air Permit modification is included in Attachment 1.

On January 7, 2014 a NPDES 1200-C construction stormwater application was submitted to the DEQ-Eastern Region. As noted in DEQ's letter of February 6, 2014, DEQ expects to issue the Construction Stormwater Permit once the Site Certificate and Final Erosion and Sediment Control Plan were submitted. Perennial has been waiting for final project design before submitting these documents. Krista Ratliff at DEQ was contacted on June 28, 2018 and confirmed that the application for the NPDES permit was in the files and on hold. The following information provided in the original application is correct.

Permit: National Pollutant Discharge Elimination System (NPDES) Permit

Agencies: Oregon Department of Environmental Quality - Eastern Region
Water Quality Division
475 NE Bellevue Drive, Suite #110
Bend, Oregon 97701
Ms. Krista Ratliff
Ratliff.krista@deq.state.or.us
(541) 633-2033
Standards: ORS 468 and 468B OAR 340-014, 340-041, 340-045, 340-052, and 345-055
Clean Water Act of 1977 (33 USC § 1251 et seq.) 40 CFR Parts 6, 122 and 124

In addition, Perennial will rely on three third-party permits for the construction and operation of the Facility. The first third-party permit deals with the water supply. The second and third third-party permits deal with the reclaimed water generated by the Station. Perennial proposes to send reclaimed water from the Project to the Hermiston Generating Plant (HGP) as makeup water for the HGP's cooling towers. The HGP operates under a Council Site Certificate. The HGP then discharges its reclaimed water to Lamb Weston. Lamb Weston uses the reclaimed water for wash down or irrigation purposes. Lamb Weston operates under a Water Pollution Control Facilities Permit.

The Port of Umatilla has reissued a letter stating that it expects to able to enter into a contract with Perennial Power Holdings, Inc. to supply up to 2,000 gallons per minute of raw water for the Project. The letter is presented in Section 2.3.5.

Lamb Weston's Water Pollution Control Facilities Permit (Permit No 48780) allows the facility to manage and dispose of the HGP's wastewater, among other wastewaters, by land application for beneficial use on the North Farm and the Madison Farm in accordance with the DEQ-approved Operations, Monitoring, and Management Plan. The permit was issued on 07-20-2015.

Perennial expects that the Station will generate suitable wastewater for re-use as makeup water in the HGP because cooling water at the Station will be used inside the turbine equipment, which requires higher water quality specifications than cooling tower makeup water used at the HGP. Given the anticipated quality of water the HGP would receive from the Station, HGP anticipates no difficulty in continuing to meet the parameters of its contract with Lamb Weston, as well as all environmental standards and applicable Council standards, and that no amendment of the site certificate for the HGP would be required. Therefore, we anticipate that the receipt of wastewater from the Project by HGP will be acceptable to both HGP and Lamb Weston. Once Lamb Weston has indicated that it can accept reclaimed water from the HGP that has come from the Station, HGP will issue a letter to Perennial indicating acceptance of the Station's reclaimed water.

Although Perennial anticipates positive developments for reclaiming the Project's waste water, Perennial will keep the ZLD system as an option.

2.3.2 OAR-345-021-0010(g) Material Analysis

A materials analysis including:
(A) An inventory of substantial quantities of industrial materials flowing into and out of the proposed facility during construction and operation.
(B) The applicant's plans to manage hazardous substances during construction and operation, including measures to prevent and contain spills.

(C) The applicant's plans to manage non-hazardous waste materials during construction and operation.

RESPONSE: We expect no significant changes from the preliminary design conditions. Accordingly, material analysis estimates will remain unchanged from those found in ASC, Exhibit G. Therefore, we anticipate:

(A) The industrial materials flowing into and out of the proposed facility during construction and operation would be the same as those outlined in the initial application. The information is the same as was submitted in ASC, Exhibit G, G-2.

(B) The plans to manage hazardous substances during construction and operation are unchanged from the initial application. The information is the same as was submitted in ASC, Exhibit G, G-2.

(C) The plans to manage non-hazardous waste materials during construction and operation are unchanged from the initial application. The information is the same as was submitted in ASC, Exhibit G, G-2.

2.3.3 OAR-345-021-0010(j) Jurisdictional Wetlands

Information based on literature and field study, as appropriate, about waters of this state, as defined under ORS 196.800, including:
(A) A description of all areas within the site boundary that might be waters of this state and a map showing the location of these features.
(B) An analysis of whether construction or operation of the proposed facility would adversely affect any waters of this state.
(C) A description of the significance of potential adverse impacts to each feature identified in (A), including the nature and amount of material the applicant would remove from or place in the waters analyzed in (B).
(D) If the proposed facility would not need a removal-fill authorization, an explanation of why no such authorization is required for the construction and operation of the proposed facility.
(E) If the proposed facility would need a removal-fill authorization, information to support a determination by the Council that the Oregon Department of State Lands should issue a removal-fill permit, including information in the form required by the Department of State Lands under OAR Chapter 141 Division 85.
(F) A description of proposed actions to mitigate adverse impacts to the features identified in (A) and the applicant's proposed monitoring program, if any, for such impacts.

RESPONSE: In the Final Order for the Perennial Wind Chaser Station, the Council concluded that the proposed facility "would not impact any of the three canals because one waterbody would be crossed by a bridge and the other two would be crossed by an underground bore or horizontal directional drill. Additionally, there would be no removal-fill below the ordinary high water mark (OHWM) and no disturbance would occur above the OHWM or within the associated riparian areas." These three canals were the only Waters of the State identified as occurring in the analysis area. Jurisdictional waters information relevant to the proposed facility was addressed in Exhibit J of the ASC, and those responses were reviewed as part of this Request for Amendment. The analysis area for this exhibit is defined as the location of all Project components where surface-disturbing activities will occur during construction or operation. This area includes the Perennial Wind Chaser Station, the temporary laydown area, the step-up substation and associated underground transmission cable, and the natural gas pipeline right-of-way. As described in the ASC, the analysis area does not include the existing transmission line ROW because the Project will not involve surface disturbing activities during construction or operation of this facility. Rather, the Umatilla Electric Cooperative 115-kilovolt (kV) lines within the existing ROW from the Hermiston Generating Plan to Bonneville Power Administration's McNary Substation will be replaced with the Station's 230-kV lines. Attachment 2 includes a figure that depicts the United States Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) and the United States Geological Survey (USGS) National Hydrography Dataset (NHD) features identified along the transmission line route. Per the figure in Attachment 2, there is a water feature (irrigation runoff impoundment) located near milepost (MP) 4. However, reconductoring activities (including stringing and tensioning) would not impact the water feature since the reconductoring site is located in a field across a road from the impoundment. In addition, the work is not expected to result in any ground disturbance since there will only be mobile equipment placed on the ground and no excavation or earth moving is expected. Equipment will be parked within the work areas but will not be parked within identified NWI or NHD features. Wetland and waterbody features within the stringing work areas will be demarcated on the ground to ensure they are not impacted by reconductoring activities. Regardless, reconductoring work areas were surveyed for wetlands and waterbodies concurrently during the 2019 Washington Ground Squirrel surveys to ensure there were no changes compared to the results of the 2013 surveys. No additional wetland and waterbody features were observed during the 2019 Washington Ground Squirrel surveys as documented in the Biological Resources Report submitted in June 2019.

Appendix J-1 of the ASC contains the revised Wetland Delineation Report submitted to the Oregon Department of State Lands (DSL) on May 14, 2014 (supersedes the original December 19, 2013, submission). The revised report describes the geographic extent, location, and character of the three waterbodies (canals) within the analysis area. On July 17, 2014, the DSL issued a letter of concurrence for the revised Wetland Delineation Report.

For this Request for Amendment, a desktop review was conducted ahead of field surveys to assess current site conditions and confirm that site conditions have not appreciably changed since the ASC. Resources reviewed include:

- USFWS NWI;
- USGS NHD;
- The Natural Resources Conservation Service (NRCS) SSURGO Soil Survey Geographic Database; and
- Aerial Imagery

As determined by on-site reconnaissance conducted by qualified ecologists on June 11 and 12, 2018, and review of the publicly available databases, as noted above, the description of site conditions in the ASC remains applicable and has not changed, and it was confirmed that no hydric soils or springs are mapped within the analysis area; three canals that were previously identified in the ASC were identified by the 2018 desktop analysis. The June 2018 on-site reconnaissance was conducted by two qualified ecologists and included assessment of current conditions of waters, wetlands, habitat, and wildlife. A tablet computer with georeferenced aerial imagery and ArcGIS data layers (including the analysis area boundaries, 2013 survey points, SSURGO, NWI, and NHD data) was used. The tablet computer maintained a wireless connection to a global positioning system unit with sub-meter accuracy and real-time connection to navigate through the analysis area and digitally mark waters, data points, and other features.

This Request for Amendment does not contain any significant changes from the preliminary design, as described in the ASC. Accordingly, the potential impacts to waters of the state and jurisdictional wetlands from construction and operation are unchanged from those described in the ASC, Exhibit J, and remains consistent with the Council conclusions, as further confirmed by the 2018 desktop review and on-site reconnaissance.

In summary, the following information and analysis provided in the ASC remains applicable to this Request for Amendment, and therefore no further information or analysis is necessary:

(A) A description of all areas within the Site Boundary considered to be Waters of the State and a map showing the location of these features are provided in Appendix J-1 of the ASC.

(B) The analysis of whether construction or operation of the proposed facility would adversely affect any Waters of the State was made in Exhibit J of the ASC.

(C) Exhibit J of the ASC includes a description of the significance of potential adverse impacts to each feature identified in (A), including the nature and amount of material the applicant would remove from or place in the waters analyzed in (B).

(D), (E), and (F) Exhibit J of the ASC includes an explanation of why there is no need for a removal-fill authorization for the construction and operation of the proposed facility.

2.3.4 OAR-345-021-0010(m) Financial Capability

Information about the applicant's financial capability, providing evidence to support a finding by the Council as required by OAR 345-022-0050(2). Nothing in this subsection shall require the disclosure of information or records protected from public disclosure by any provision of state or federal law. The applicant shall include:

(A) An opinion or opinions from legal counsel stating that, to counsel's best knowledge, the applicant has the legal authority to construct and operate the facility without violating its bond indenture provisions, articles of incorporation, common stock covenants, or similar agreements.

(B) The type and amount of the applicant's proposed bond or letter of credit to meet the requirements of OAR 345-022-0050.

(C) Evidence that the applicant has a reasonable likelihood of obtaining the proposed bond or letter of credit in the amount proposed in paragraph (B), before beginning construction of the facility.

RESPONSE: The ASC, Exhibit M, details Perennial's financial capability. Section M.1 provides the legal opinion as required in (A). For B and C, Section 2.5.6 (and see Attachment 7) details a revised retirement cost estimate based on Second Quarter, 2018 dollars and contains a letter from MUFG Bank, Ltd indicating its willingness to furnish or arrange a letter of credit for the revised cost estimate.

2.3.5 OAR-345-021-0010(o) Water Use

Information about anticipated water use during construction and operation of the proposed facility. The applicant shall include:
(A) A description of the use of water during construction and operation of the proposed facility.
(B) A description of each source of water and the applicant's estimate of the amount of water the facility will need during construction and during operation from each source under annual average and worst-case conditions.
(C) A description of each avenue of water loss or output from the facility site for the uses described in (A), the applicant's estimate of the amount of water in each avenue under annual average and worst-case conditions and the final disposition of all wastewater.
(D) For thermal power plants, a water balance diagram, including the source of cooling water and the estimated consumptive use of cooling water during operation, based on annual average conditions.
(E) If the proposed facility would not need a groundwater permit, a surface water permit or a water right transfer, an explanation of why no such permit or transfer is required for the construction and operation of the proposed facility.
(F) If the proposed facility would need a groundwater permit, a surface water permit or a water right transfer, information to support a determination by the Council that the Water Resources Department should issue the permit or transfer of a water use, including information in the form required by the Water Resources Department under OAR Chapter 690, Divisions 310 and 380.
(G) A description of proposed actions to mitigate the adverse impacts of water use on affected resources.

RESPONSE: We expect no significant changes from the preliminary design conditions. Accordingly, water usage estimates for construction and operation will remain relatively unchanged from those found in ASC, Exhibit O. Therefore, we anticipate:

(A) The use of water during construction and operation of the proposed facility will remain approximately the same as estimated in ASC, Exhibit O, O.2.

(B) The source of water (Port of Umatilla) and the estimated amount of water the facility will need during construction and during operation, from each source under annual average and worst-case conditions, will remain approximately the same as estimated in ASC, Exhibit O, Table O-1. An updated letter from the Port of Umatilla is included in Attachment 3 indicating that the Port can supply the necessary volume of water to the Project.

(C) Water loss or output from the facility site for the uses described above, under annual average and worst-case conditions, and the final disposition of all wastewater, will remain the same as estimated in ASC, Exhibit O, O.3.

(D) A water balance diagram was provided in ASC, Exhibit O, O.5. The diagram of the source of cooling water and the estimated consumptive use of cooling water during operation, based on annual average conditions, will remain approximately the same.

(E) And (F) The proposed facility does not need a groundwater permit, a surface water permit, or a water right transfer, as previously discussed in ASC, Exhibit O, O.6. The Port of Umatilla will provide the necessary water to the Project (see Attachment 3).

(G) A description of proposed actions to mitigate the adverse impacts of water use on affected resources was provided in ASC, Exhibit O, O.7. No changes are proposed.

2.3.6 OAR-345-021-0010(x) Noise

Information about noise generated by construction and operation of the proposed facility, providing evidence to support a finding by the Council that the proposed facility complies with the Oregon Department of Environmental Quality's noise control standards in OAR 340-035-0035. The applicant shall include:

(A) Predicted noise levels resulting from construction and operation of the proposed facility.

(B) An analysis of the proposed facility's compliance with the applicable noise regulations in OAR 340-035-0035, including a discussion and justification of the methods and assumptions used in the analysis.

(C) Any measures the applicant proposes to reduce noise levels or noise impacts or to address public complaints about noise from the facility.

(D) Any measures the applicant proposes to monitor noise generated by operation of the facility.

(E) A list of the names and addresses of all owners of noise sensitive property, as defined in OAR 340-035-0015, within one mile of the proposed site boundary.

RESPONSE: In the Final Order for the Perennial Wind Chaser Station, the Council concluded that, "the facility complies with the Noise Control Regulations in OAR 340-035-0035(1)(b)(A) and (B)." Noise relevant to the proposed Facility was addressed in Exhibit X of the Application for Site Certificate (ASC), and those responses were reviewed as part of this Request for Amendment (RFA).

As determined by a review of 2018 parcel data as compared to 2013 parcel data, plus an analysis of 2013 aerial photography (Google Earth) to 2018 aerial photography (Google Earth) it was determined that there are 25 new sensitive receptors (homes) in the project noise study area. All are located in the vicinity of the northern end of the transmission line. However, only two sensitive receptors are located adjacent to the transmission right-of-way along Powerline Road; the houses were constructed on vacant lots in the subdivision on the east side of Powerline Road. The transmission ROW is on the west side of Powerline Road. The noise analysis previously conducted indicated there would be no significant noise impacts to these properties. Attachment 4 includes a table listing the new sensitive receptors and figures showing the location of these sensitive receptors.

Accordingly, the potential impacts associated with noise from construction and operation of the proposed facility are unchanged from those described in the ASC, Exhibit X and remain consistent with the Council's conclusions.

Therefore, we anticipate:

(A) The noise from construction and operation of the proposed facility will remain the same as estimated in ASC, Exhibit X.3.1 and Exhibit X.3.2.

(B) The proposed facility will be in compliance with the applicable noise regulations established by the DEQ in OAR 340-035-0035. The Oregon noise regulations have not changed since the original submittal, nor has the design of the proposed facility. The methods and assumptions used in the original application have not changed and are outlined in ASC, Exhibit X.4. Condition PRE-NC-01 of the Site Certificate requires the certificate holder, prior to construction, to re-run the noise model using the noise characteristics of the equipment selected.

(C) The noise control measures established in the original application have not changed.

The noise control measures will be implemented as outlined in ASC, Exhibit X.5 and required by the Site Certificate to reduce noise levels and noise impacts to the surrounding community.

(D) Due, in part, to the Station's distance from the residential receptors, and the proposed noise control measures, the modeling results indicate that Station operation will not result in an increase in noise level greater than 10 dBA above the lowest-measured background hourly L50 for each noise sensitive property. Perennial will conduct noise studies to investigate any complaints of noise related to the operation of the Station as outlined in ASC, Exhibit X.6 and as required by Conditions OPR-NC-01 and OPR-NC-02 of the Site Certificate.

(E) An updated list of the names and addresses of new noise sensitive property within one mile of the four components of the proposed Facility (natural gas pipeline, energy facility, transmission line, and step-up station) is included in the table contained in Attachment 4 of this document. Figures 1 and 2 in Attachment 4 show the locations of these new noise sensitive properties/receptors.

2.3.7 OAR-345-021-0010(z) Cooling Tower Impacts

If the proposed facility has an evaporative cooling tower, information about the cooling tower plume, including:
(A) The predicted size and frequency of occurrence of a visible plume and an assessment of its visual impact.
(B) The predicted locations and frequency of occurrence of ice formation on surfaces and ground level fogging and an assessment of significant potential adverse impacts, including, but not limited to, traffic hazards on public roads.
(C) The predicted locations and rates of deposition of solids released from the cooling tower (cooling tower drift) and an assessment of significant potential adverse impacts to soils, vegetation and other land uses.
(D) Any measures the applicant proposes to reduce adverse impacts from the cooling tower plume or drift.
(E) The assumptions and methods used in the plume analysis
(F) The applicant's proposed monitoring program, if any, for cooling tower plume impacts;

RESPONSE: We expect no significant changes from the preliminary design conditions. Accordingly, cooling tower impacts will remain unchanged from those found in ASC, Exhibit Z. Therefore, we anticipate:

(A) The size of the cooling tower and frequency of occurrence of a visible plume will be unchanged from the initial application. The assessment of the visual impact from the cooling tower plume will not change. The proposed facility's preliminary design included four blocks of power, each with its own cell, which were arranged in a single cooling tower. The cooling tower operation and design is unchanged from the original application. The Seasonal/Annual Cooling Tower Impact (SACTI) model was used with the methodology described under Oregon Administrative Rules (OAR) 345-021-0010(1)(z)(E). The modeling results are the same as those submitted in ASC, Exhibit Z, Z-2.

(B) The SACTI model was also used for predicting ice formation and ground fogging from the cooling tower. The model uses actual meteorological data (five years) to conservatively predict the occurrence of ice formation and other parameters. The SACTI model parameters are unchanged from the original application. The cooling tower parameters and meteorological data from ASC, Exhibit Z are the same as the original application.

(C) The predicted locations and rates of deposition of solids released from the cooling tower are unchanged from the original application. The assessment of potential adverse impacts to soils, vegetation and other land uses are the same as provided in ASC, Exhibit Z, Z-3.

(D)The mist eliminators, outlined in ASC, Exhibit Z, used to limit the amount of drift from the cooling tower exhaust, will be used to reduce adverse impacts from the cooling tower plume.

(E)The SACTI model was used for this analysis. The modeling parameters outlined in ASC, Exhibit Z are unchanged.

(F)Based on the SACTI computer modeling analysis performed, the physical and visual impacts due to the cooling tower plumes at the Site are expected to be minimal, and no potential significant adverse impacts are anticipated. The Project does not include a monitoring program for the cooling tower plume impacts because no potential significant adverse impacts are expected. Nevertheless, Perennial has prepared an overall Revegetation and Noxious Weed Control Plan. As part of that plan, areas within and surrounding the energy facility site will be monitored and remedial action taken if needed. Therefore, if the deposition of salts, metals, or other minerals were to significantly impact vegetation, that plan would provide a means to monitor and mitigate such impacts as outlined in ASC, Exhibit Z, Z-6.

2.3.8 OAR-345-021-0010(cc) Additional Statutes, Rules and Ordinances

Identification, by legal citation, of all state statutes and administrative rules and local government ordinances containing standards or criteria that the proposed facility must meet for the Council to issue a site certificate, other than statutes, rules and ordinances identified in Exhibit E, and identification of the agencies administering those statutes, administrative rules and ordinances. The applicant shall identify all statutes, administrative rules and ordinances that the applicant knows to be applicable to the proposed facility, whether or not identified in the project order. To the extent not addressed by other materials in the application, the applicant shall include a discussion of how the proposed facility meets the requirements of the applicable statutes, administrative rules and ordinances.

RESPONSE: Additional statutes, rules and ordinances were analyzed in Exhibit CC of the ASC and the responses were reviewed as part of this Request for Amendment. No changes to the information presented in Exhibit CC were deemed necessary.

2.4 OAR-345-027-0060(1)(d) Proposed Changes to Site Certificate

(d) The specific language of the site certificate, including conditions, that the certificate holder proposes to change, add or delete by an amendment.

RESPONSE: Perennial proposes to change only the language of General Conditions GEN-GS-02 and GEN-GS-03 concerning the construction start and completion deadlines.

(GEN-GS-02)	*The certificate holder shall begin construction of the facility within two years of September 18, 2018. ~~after the effective date of the site certificate. Under OAR 345-015-0085(9), the site certificate is effective upon execution by the Council chair and the applicant.~~*
(GEN-GS-03)	*The certificate holder shall complete construction of the facility within six years after September 18, 2018. ~~the effective date of the site certificate~~.*

2.5 OAR-345-027-0060(1)(e) Applicable Council Standards

(e) A list of the Council standards and all other laws - including statutes, rules and ordinances - applicable to the proposed change, and an analysis of whether the facility, with the proposed change, would comply with those laws and Council standards. For the purpose of this rule, a law or Council standard is "applicable" if the Council would apply or consider the law or Council standard under OAR 345-027-0075(2).

RESPONSE: The relevant EFSC standards to the proposed change include Division 22 (General Standards for Siting Facilities) and Division 24 (Specific Standards for Siting Facilities). The standards are listed below for Division 22 and in Section 2.6 for Division 24. The Facility is an electric generating facility using natural gas combustion turbine technology, therefore Division 23, which applies to non-generating facilities, does not apply. Similarly, inapplicable provisions of Division 24 (i.e., standards applicable to gas storage, non-generating facilities, etc.) are also not discussed. The following Division 22 standards are addressed in this subsection:

- OAR 345-022-0010 Organizational Expertise
- OAR 345-022-0020 Structural Standard
- OAR 345-022-0022 Soil Protection
- OAR 345-022-0030 Land Use
- OAR 345-022-0040 Protected Areas
- OAR 345-022-0050 Retirement and Financial Assurance
- OAR 345-022-0060 Fish and Wildlife Habitat
- OAR 345-022-0070 Threatened and Endangered Species
- OAR 345-022-0080 Scenic Resources
- OAR 345-022-0090 Historic, Cultural and Archaeological Resources
- OAR 345-022-0100 Recreation
- OAR 345-022-0110 Public Services
- OAR 345-022-0120 Waste Minimization

2.5.1 OAR-345-022-0010 Organizational Expertise

(1) To issue a site certificate, the Council must find that the applicant has the organizational expertise to construct, operate and retire the proposed facility in compliance with Council standards and conditions of the site certificate. To conclude that the applicant has this expertise, the Council must find that the applicant has demonstrated the ability to design, construct and operate the proposed facility in compliance with site certificate conditions and

in a manner that protects public health and safety and has demonstrated the ability to restore the site to a useful, non-hazardous condition. The Council may consider the applicant's experience, the applicant's access to technical expertise and the applicant's past performance in constructing, operating and retiring other facilities, including, but not limited to, the number and severity of regulatory citations issued to the applicant.
(2) The Council may base its findings under section (1) on a rebuttable presumption that an applicant has organizational, managerial and technical expertise, if the applicant has an ISO 9000 or ISO 14000 certified program and proposes to design, construct and operate the facility according to that program.
(3) If the applicant does not itself obtain a state or local government permit or approval for which the Council would ordinarily determine compliance but instead relies on a permit or approval issued to a third party, the Council, to issue a site certificate, must find that the third party has, or has a reasonable likelihood of obtaining, the necessary permit or approval, and that the applicant has, or has a reasonable likelihood of entering into, a contractual or other arrangement with the third party for access to the resource or service secured by that permit or approval.
(4) If the applicant relies on a permit or approval issued to a third party and the third party does not have the necessary permit or approval at the time the Council issues the site certificate, the Council may issue the site certificate subject to the condition that the certificate holder shall not commence construction or operation as appropriate until the third party has obtained the necessary permit or approval and the applicant has a contract or other arrangement for access to the resource or service secured by that permit or approval.
.

RESPONSE: There have been no significant circumstances that should change EFSC's previous finding that "Based on the information provided by the applicant and subject to compliance with the site certificate conditions, the Council finds that the applicant has the organizational expertise to construct, operate and retire the facility." Final Order, page 21.

(1)Two people (David Daley and Russ Tenney) identified in the ASC, Exhibit D. D.3. are no longer part of Perennial's project team. They have been replaced with the following personnel:

JJ Jamieson, Perennial Power Holdings, Inc. (PPH), Senior Director, Operations and Development and Senior Vice President of Hermiston Generating LP. Mr Jamieson has over 18 years of experience in the power and energy industry in a number of different areas. His roles include systems engineering, merchant operations, compliance, Balancing Authority design and implementation, thermal plant management, renewable integration and operation, and was certified as a NERC Reliability Coordinator in 2007. Mr Jamieson has also served on a number of WECC committees including the Operating Committee and was elected Chair of the Market Interface Committee during the implementation of the Energy Imbalance Market. Mr Jamieson was elected to sit on the Member Advisory Committee for Peak RC in 2016 and currently serves that role. Prior to joining PPH in 2016, he was Vice President of Strategic Development for Gridforce Energy Management.

Bradley Knight, Hermiston Generating LP, General Manager. Mr. Knight has over 25 years' experience in the power and energy infrastructure industry. His roles include operating, maintaining, engineering and compliance of nuclear, gas and coal assets. Prior to joining PPH in 2009, he was a Plant Engineer for Cogentrix Energy.

Note that Shigenobu Hamada, PPH, President is still managing the project, thus all PPH documents are still in effect as presented in the ASC, Exhibit A. There has been no regulatory compliance issues associated with the Hermiston Generating Plant since the ASC was submitted.

(2) The Certificate Holder is not relying on an ISO 9000 or ISO 14000 certified program.

(3)(4) Perennial will be relying on three third-party permits, as discussed in ASC, Exhibit E. E.5. There have been no significant changes with the facts related to these permits, other than that DEQ has renewed Lamb Weston's Water Pollution Control Facility permit. Thus the Station will be able to route its recyclable waste water to Hermiston Generating Plant (HGP) for cooling tower make-up and then HGP will be able to send its reclaimed water on to Lamb Weston for wash down or irrigation purposes. Refer to Section 2.3.1 for additional information. In addition, the Port of Umatilla has reissued and updated its letter stating its ability to supply water to the Station. A copy of this letter is included in response to Section 2.3.5 Water Use.

2.5.2 OAR-345-022-0020 Structural Standard

(1) Except for facilities described in sections (2) and (3), to issue a site certificate, the Council must find that:
(a) The applicant, through appropriate site-specific study and based on consultation with the Oregon Department of Geology and Mineral Industries, has adequately characterized the seismic hazard risk of the site;
(b) The applicant can design, engineer, and construct the facility to avoid dangers to human safety and the environment presented by seismic hazards affecting the site as identified in (a);
(c) The applicant, through appropriate site-specific study and based on consultation with the Oregon Department of Geology and Mineral Industries, has adequately characterized the potential geological and soils hazards of the site and its vicinity that could, in the absence of a seismic event, adversely affect, or be aggravated by, the construction and operation of the proposed facility; and
(d) The applicant can design, engineer and construct the facility to avoid dangers to human safety and the environment presented by the hazards identified in subsection (c).
(2) The Council may not impose the Structural Standard in section (1) to approve or deny an application for an energy facility that would produce power from wind, solar or geothermal energy. However, the Council may, to the extent it determines appropriate, apply the requirements of section (1) to impose conditions on a site certificate issued for such a facility.
(3) The Council may not impose the Structural Standard in section (1) to deny an application for a special criteria facility under OAR 345-015-0310. However, the Council may, to the extent it determines appropriate, apply the requirements of section (1) to impose conditions on a site certificate issued for such a facility.

RESPONSE: As provided in Exhibit H of the ASC, the project applicant coordinated with Oregon Department of Geology and Mineral Industries (DOGAMI) to satisfy the regulatory requirements of OAR-345-022-0020. Consultation with Yumei Wang at DOGAMI and Katie Clifford at Oregon Department of Energy (ODOE) occurred on November 14, 2018. Minutes from the consultation were distributed on November 28, 2018. Ms. Clifford sent combined edits of ODOE and DOGAMI via email on December 1, 2018 which were subsequently incorporated into finalized meeting minutes. Exhibit H of the ASC has been revised per the consultation and now includes the recommendations received from DOGAMI and ODOE, as well as a copy of the revised meeting minutes. Refer to Attachment 5. Specifically:

(a) The applicant, through appropriate site-specific study and based on consultation with the Oregon Department of Geology and Mineral Industries, has adequately characterized the seismic hazard risk of the site;

(b) The applicant has appropriately designed, engineered, and will construct the facility to avoid dangers to human safety and the environment presented by seismic hazards affecting the site as identified in (a);

(c) The applicant, through appropriate site-specific study and based on consultation with the Oregon Department of Geology and Mineral Industries, has adequately characterized the potential geological and soils hazards of the site and its vicinity that could, in the absence of a seismic event, adversely affect, or be aggravated by, the construction and operation of the proposed facility; and

(d) The applicant has designed, engineered and will construct the facility to avoid dangers to human safety and the environment presented by the hazards identified in subsection (c).

There have been no design changes to the proposed facility. However, there will be several updated codes to consider during final design of the facility. Those codes will be appropriately followed to ensure human safety and the environment.

2.5.3 OAR-345-022-0022 Soil Protection

To issue a site certificate, the Council must find that the design, construction and operation of the facility, taking into account mitigation, are not likely to result in a significant adverse impact to soils including, but not limited to, erosion and chemical factors such as salt deposition from cooling towers, land application of liquid effluent, and chemical spills.

RESPONSE: The Council previously found that the proposed facility complies with the Council's Siting Standards for Soil Protection. Soil protection relevant to the proposed Facility was addressed in Exhibit I of the ASC, and those responses were reviewed as part of this Request for Amendment (RFA).

As determined by review of publically available databases, the description of site conditions in the ASC remains applicable. The nature and extent of the soils occurring in the analysis area, as described in the ASC, have not changed substantially. The analysis area for this exhibit includes all areas within the Site Boundary where soil disturbance will potentially occur as a result of constructing and operating the Project. It does not include the portions of the existing transmission line to be re-conductored. This RFA does not contain any changes from the preliminary design, as described in the ASC. Accordingly, the potential impacts to soil from construction and operation will remain unchanged from those described in the ASC, Exhibit I.

Therefore, the construction and operation of the facility, taking into account mitigation and subject to the conditions of the Site Certificate, are not likely to result in significant adverse impact to soils including, but not limited to, erosion and chemical factors such as salt deposition from cooling towers, land application of liquid effluent, and chemical spills.

2.5.4 OAR-345-022-0030 Land Use

(1) To issue a site certificate, the Council must find that the proposed facility complies with the statewide planning goals adopted by the Land Conservation and Development Commission.
(2) The Council shall find that a proposed facility complies with section (1) if:
(a) The applicant elects to obtain local land use approvals under ORS 469.504(1)(a) and the Council finds that the facility has received local land use approval under the acknowledged comprehensive plan and land use regulations of the affected local government; or
(b) The applicant elects to obtain a Council determination under ORS 469.504(1)(b) and the Council determines that:
(A) The proposed facility complies with applicable substantive criteria as described in section (3) and the facility complies with any Land Conservation and Development Commission administrative rules and goals and any land use statutes directly applicable to the facility under ORS 197.646(3);
(B) For a proposed facility that does not comply with one or more of the applicable substantive criteria as described in section (3), the facility otherwise complies with the statewide planning goals or an exception to any applicable statewide planning goal is justified under section (4); or
(C) For a proposed facility that the Council decides, under sections (3) or (6), to evaluate against the statewide planning goals, the proposed facility complies with the applicable statewide planning goals or that an exception to any applicable statewide planning goal is justified under section (4).
(3) As used in this rule, the "applicable substantive criteria" are criteria from the affected local government's acknowledged comprehensive plan and land use ordinances that are required by the statewide planning goals and that are in effect on the date the applicant submits the application. If the special advisory group recommends applicable substantive criteria, as described under OAR 345-021-0050, the Council shall apply them. If the special advisory group does not recommend applicable substantive criteria, the Council shall decide either to make its own determination of the applicable substantive criteria and apply them or to evaluate the proposed facility against the statewide planning goals.
(4) The Council may find goal compliance for a proposed facility that does not otherwise comply with one or more statewide planning goals by taking an exception to the applicable goal. Notwithstanding the requirements of ORS 197.732, the statewide planning goal pertaining to the exception process or any rules of the Land Conservation and Development Commission pertaining to the exception process, the Council may take an exception to a goal if the Council finds:
(a) The land subject to the exception is physically developed to the extent that the land is no longer available for uses allowed by the applicable goal;
(b) The land subject to the exception is irrevocably committed as described by the rules of the Land Conservation and Development Commission to uses not allowed by the applicable goal because existing adjacent uses and other relevant factors make uses allowed by the applicable goal impracticable; or
(c) The following standards are met:
(A) Reasons justify why the state policy embodied in the applicable goal should not apply;
(B) The significant environmental, economic, social and energy consequences anticipated as a result of the proposed facility have been identified and adverse impacts will be mitigated in accordance with rules of the Council applicable to the siting of the proposed facility; and
(C) The proposed facility is compatible with other adjacent uses or will be made compatible through measures designed to reduce adverse impacts.

(5) If the Council finds that applicable substantive local criteria and applicable statutes and state administrative rules would impose conflicting requirements, the Council shall resolve the conflict consistent with the public interest. In resolving the conflict, the Council cannot waive any applicable state statute.
(6) If the special advisory group recommends applicable substantive criteria for an energy facility described in ORS 469.300(10)(a)(C) to (E) or for a related or supporting facility that does not pass through more than one local government jurisdiction or more than three zones in any one jurisdiction, the Council shall apply the criteria recommended by the special advisory group. If the special advisory group recommends applicable substantive criteria for an energy facility described in ORS 469.300(10)(a)(C) to (E) or a related or supporting facility that passes through more than one jurisdiction or more than three zones in any one jurisdiction, the Council shall review the recommended criteria and decide whether to evaluate the proposed facility against the applicable substantive criteria recommended by the special advisory group, against the statewide planning goals or against a combination of the applicable substantive criteria and statewide planning goals. In making the decision, the Council shall consult with the special advisory group, and shall consider:
(a) The number of jurisdictions and zones in question;
(b) The degree to which the applicable substantive criteria reflect local government consideration of energy facilities in the planning process; and
(c) The level of consistence of the applicable substantive criteria from the various zones and jurisdictions.

RESPONSE: In the ASC, the certificate holder elected to have the Council make the determination of compliance with the Statewide Planning Goals, as provided in OAR 345-022-0030(2)(b). The Council's findings were set forth in the Final Order. Final Order at 38-116.

The Council found that for purposes of review of the ASC for compliance with the land use standard, the date the application was submitted was April 3, 2014, and the affected local governments are Umatilla County and the City of Umatilla. Final Order at 40.

For purposes of this Request for Amendment, the certificate holder has examined whether there have been changes in zoning or in applicable land use standards since April 3, 2014, or any changes in factual circumstances, that alter any of the Council's findings in the Final Order with respect to compliance with the Council's Land Use Standard, OAR 345-022-0030.

Zoning of Facility

The certificate holder has reviewed the current zoning maps applicable to the facility and has prepared a new zoning map for the Facility, identified as Figure K-1 (see Attachment 6, Zoning Map). The zoning map for Umatilla County zoning is the map designated "West Umatilla County, Oregon," posted at:
http://www.co.umatilla.or.us/planning/GIS%20maps/WestCountyZoning.pdf

The zoning map for the City of Umatilla and for lands outside the City of Umatilla but within the City's Urban Growth Boundary (UGB) is posted at:
http://www.co.umatilla.or.us/planning/city_info/UmatillaCityZoning.pdf The zones outside the city limits but within the UGB are from the County's 1972 Zoning Code.

These maps were compared to the zoning designations shown on Figure K-10 of the ASC.

The relevant zoning within the City of Umatilla and the City of Umatilla UGB has not changed since the ASC was submitted. The certificate holder notes that Umatilla County rezoned the Umatilla Military Depot by Ordinance No. 2014-06, adopted by the Board of Commissioners on July 2, 2014. As shown in Attachment 6, Figure K-1, pages 5-8, the re-conductored transmission line route now follows the eastern edge of areas zoned "Umatilla Depot Refuge" (UDR) and "Depot Industrial – Unrestricted" (DI-U). The Umatilla County Planning Department has confirmed, however, that the land on which the reconductored transmission line is located is still zoned EFU.[2]

Changes in Applicable Land Use Standards

We prepared a chart of the state and local land use standards cited in the Final Order, and evaluated whether any of the standards have been amended since April 3, 2014.

Umatilla County Development Code (UCDC): The current version of the Umatilla County Development Code available online has a revision date of April 13, 2016 : http://www.co.umatilla.or.us/planning/pdf/Umatilla_County_Development_Code.pdf In order to ensure that all relevant changes were captured, the planning ordinances adopted by the Umatilla County Board of Commissioners since the ASC was submitted on April 3, 2014 were reviewed.

Umatilla County Comprehensive Plan: All policies of the Umatilla County Comprehensive Plan addressed in the Final Order were compared to the current Comprehensive Plan available online, which has a revision date of June 7, 2017. The applicable Comprehensive Plan Policies (which were identified as applicable by the Umatilla County Board of Commissioners in its capacity as a Special Advisory Group) are addressed at pages 84-96 of the Final Order. No Comprehensive Plan policy addressed in the Final Order has been amended since the ASC was filed on April 3, 2014 and no new applicable goals or policies have been adopted. One policy – Natural Hazards Policy 4 – is incorrectly quoted at page 92 of the Final Order. The policy should read: "Potentially hazardous major developments (e.g. power plants) must address earthquake hazard possibilities." The Final Order, however, cites the analysis of seismic hazards and non-seismic geological hazards in Exhibit H of the ASC, and therefore is responsive to Natural Hazards Policy 4.

City of Umatilla Zoning Ordinance: Areas within the City of Umatilla are subject to the City's Zoning Ordinance. There has only been one change to applicable standards since April 3, 2014: NC (Neighborhood Commercial) uses are addressed in new Umatilla Zoning Ordinance Article 10-4C. As discussed below, the re-conductored transmission line would now be a conditional use as a "major utility facility" in the NC zone. The conditional use criteria have not changed; therefore, the Council's analysis of the transmission line's compliance with those standards in the Final Order remains applicable.

City of Umatilla Comprehensive Plan: Applicable goals of the City of Umatilla Comprehensive Plan were identified and addressed at pages 113-115 of the Final Order. There have been no changes to those goals, as determined by comparing the goals cited in the Final Order with current version of the Comprehensive Plan on the City's website: https://www.umatilla-city.org/planning/page/comprehensive-plan

The City of Umatilla's planning ordinances are not available online. In order to determine

[2] Email from Robert Waldher, Umatilla County Planning Department, to Katie Clifford, ODOE, Dec. 3, 2018.

whether the City of Umatilla has adopted any new applicable Comprehensive Plan goals or policies, the certificate holder contacted the City of Umatilla Planning Department. According to the City of Umatilla Planning Department, no new Comprehensive Plan goals or policies applicable to the facility have been adopted since April 3, 2014.[3]

1972 Umatilla County Zoning Ordinance: Areas within the Urban Growth Area (UGA) of the City of Umatilla – outside the City limits but within the Urban Growth Boundary – are subject to the 1972 Umatilla County Zoning Ordinance (UCZO). According to Umatilla County, the UCZO was last amended through Ordinance 2013-02, adopted by the County Board of Commissioners on January 29, 2013. Thus, there have been no amendments since the ASC for the facility was filed on April 3, 2014.

The analysis below addresses the following two changes: (1) the application of Umatilla County's "associated transmission line" standards to the 230 kV transmission line and up to three new poles on the portion of the energy facility site zoned EFU; and (2) the change in the City of Umatilla's NC (Neighborhood Commercial) zone, pursuant to which the re-conductored transmission line is now a "Major Utility Facility" rather than a "Community Service Use."

UCDC § 152.617(II)(7)(A) and (7)(B): "Utility facility necessary for public service" and "associated transmission line"

In the ASC and the Final Order, the portions of the natural gas pipeline on EFU land and new transmission poles on EFU land were analyzed under the ORS 215.275(2) standards for "utility facilities necessary for public service." For the "re-conductored" portion of the transmission line on EFU land – i.e., where an existing 115 kV line will be replaced with a 230 kV line on existing poles – the transmission line was determined to be a "minor betterment of existing transmission lines" permitted outright allowed in the EFU zone under UCDC § 152.056. Final Order at 43. That conclusion has not changed.

In the UCDC, the criteria for approval of a "utility facility necessary for public service" are found in UCDC § 152.617(II)(6). UCDC § 152.617(II) was amended by Ordinance 2014-04 (July 2, 2014) to revise standards for "utility facility necessary for public service" (principally, adding provisions regarding workforce housing) and to add standards for a "utility facility necessary for public service" that is an "associated transmission line." It was further amended by Ordinance 2016-02 (March 16, 2016) to make technical corrections to the criteria for "associated transmission lines." The current provisions largely mirror ORS 215.275 (utility facilities necessary for public service) and ORS 215.274 (associated transmission line).

The criteria in UCDC 152.617(II)(6) for a "utility facility necessary for public service" have not changed and parallel ORS 215.275. Therefore, the analysis in the Final Order with respect to the natural gas pipeline on EFU lands has not changed.

Again, the transmission line on EFU land is primarily a re-conductored line permitted outright under UCDC § 152.056. As stated in the ASC, up to six new poles would be required to tie into that existing transmission infrastructure from the energy facility; at most three poles would be constructed on EFU land, all at the energy facility site. ASC, Ex.

[3] Email from Brandon Seitz, City Planner, to Richard Allan, Marten Law, Sept. 25, 2018.

B, B-14; Figure K-6. For the reasons discussed below, those new poles and the 230 kV transmission line they would carry would be an "associated transmission line" under UCDC § 152.617(II)(7)(B).

The UCDC does not appear to define "associated transmission line." UCDC § 152.617(II)(7)(B), however, is based on ORS 215.274, which states that "'associated transmission line' has the meaning given that term in ORS 469.300." ORS 469.300 defines "associated transmission line" as referring to "new transmission lines constructed to connect an energy facility to the first point of junction of such transmission line or lines with either a power distribution system or an interconnected primary transmission system or both or to the Northwest Power Grid." The additional poles and transmission line, located on EFU land on the energy facility site, would be necessary to provide a connection to the re-conductored transmission line, which in turn connects the proposed energy facility to the Northwest Power Grid at the McNary Substation.

UCDC § 152.617(II)(7)(B) sets forth the following requirements with respect to an "associated transmission line":

> *(B) An associated transmission line is necessary for public service and shall be approved by the governing body of a county or its designee if an applicant for approval under ORS 215.283(1)(c) demonstrates to the governing body of the county or its designee that the associated transmission line meets either the requirements of paragraph (1) of this subsection or the requirements of paragraph (2) of this subsection.*

RESPONSE: As discussed below, the new transmission poles and conductor meet the requirements of Paragraph (2) of this subsection.

> *(1) An applicant demonstrates that the entire route of the associated transmission line meets at least one of the following requirements:*
>
> *(a) The associated transmission line is not located on high-value farmland, as defined in ORS 195.300, or on arable land;*
>
> *(b) The associated transmission line is co-located with an existing transmission line;*
>
> *(c) The associated transmission line parallels an existing transmission line corridor with the minimum separation necessary for safety; or*
>
> *(d) The associated transmission line is located within an existing right of way for a linear facility, such as a transmission line, road or railroad that is located above the surface of the ground.*

RESPONSE: The transmission line and new poles on the energy facility site do not satisfy the criteria of Paragraph (1)(a),(b), (c) or (d). With respect to Paragraph (1)(a), the portion of the energy facility site zoned EFU (the area south of the railroad right-of-way) is all "arable land." Neither the statute governing "associated transmission lines" (ORS 215.274) nor the administrative rule (OAR 660-033-0130(16(b) defines "arable land." "Arable land" is defined in OAR 660-033-0130(37)(b), with respect to siting of wind energy facilities, as "lands that are cultivated or suitable for cultivation." Exhibit I of the ASC identified the soils on the entire energy facility site as "Quincy loamy fine sand, gravelly substratum, 0 to 5 percent slopes," which is a Class IV soil if irrigated. Looking to the available definition of "arable land" in OAR 660-033-0130(37)(b), the energy facility site is "suitable for cultivation" and therefore is "arable land."

The applicable definition of "high-value farmland"[4] comes from ORS 195.300(10):

> (f) Land that is in an exclusive farm use zone and that is no more than 3,000 feet above mean sea level, with an aspect between 67.5 and 292.5 degrees and a slope between zero and 15 percent, and that is located within:
>
> (C) The portion of the Columbia Valley viticultural area as described in 27 C.F.R. 9.74 that is within the State of Oregon;

The entire energy facility site is within the Columbia Valley viticultural area and is less than 3,000 feet above mean sea level. Moreover, as mentioned above, the soil classification indicates the entire site has slopes between zero and five percent. Thus, any portion of the energy facility site in the EFU zone (i.e., south of the railroad right-of-way) "with an aspect between 67.5 and 292.5 degrees" is high-value farmland.

> *(2) After an evaluation of reasonable alternatives, an applicant demonstrates that the entire route of the associated transmission line meets, subject to paragraphs (3) and (4) of this subsection, two or more of the following criteria:*
>
> *(a) Technical and engineering feasibility;*
>
> *(b) The associated transmission line is locationally-dependent because the associated transmission line must cross high-value farmland, as defined in ORS 195.300, or arable land to achieve a reasonably direct route or to meet unique geographical needs that cannot be satisfied on other lands;*
>
> *(c) Lack of an available existing right of way for a linear facility, such as a transmission line, road or railroad, that is located above the surface of the ground;*
>
> *(d) Public health and safety; or*
>
> *(e) Other requirements of state or federal agencies.*

RESPONSE: The certificate holder considered the development of new transmission line routes connecting to the grid; all had substantially greater impacts on land zoned for Exclusive Farm Use. In its Amended Notice of Intent, the certificate holder had identified three transmission routes, all connecting to BPA's proposed Longhorn Substation: a northern route that would run north along the eastern side of the Umatilla Army Depot before turning west; and two southern routes that would generally parallel I-84. All three

[4] The definition of "high-value farmland" applicable to an associated transmission line is different than the definition applicable to the energy facility. For the energy facility, which is a "commercial utility facility for the purpose of generating and distributing power for public use by sale" under UCDC § 152.617(I), the applicable definition of "high-value farmland" is found in OAR 660-033-0020. The energy facility site is not "high-value farmland" as defined in OAR 660-033-0020.

routes would require building an entirely new transmission line across extensive areas zoned for Exclusive Farm Use. Moreover, the three routes would not eliminate the need for new transmission poles and a new transmission line on the portion of the Energy Facility Site zoned EFU. The Energy Facility and its switchyard are located on EFU-zoned land. There is no way to transmit electricity from the switchyard to non-EFU land without constructing a line to span from the switchyard to the non-EFU land.

Re-conductoring the existing transmission line from the Hermiston Generating Plant to the BPA McNary Substation eliminates the impacts that would be associated with development of a new transmission facility to connect Wind Chaser to the grid, including impacts to EFU land between the energy facility site and McNary. In order to take advantage of the opportunity to connect to the grid by re-conductoring the existing line, the certificate holder must extend a new transmission line, supported by new poles, from the Wind Chaser switchyard to the existing Hermiston Generating to McNary transmission corridor.

As shown on Figure B-3 of the ASC, from the west side of the onsite switchyard in the southwest corner of the Energy Facility Site (within fence line), it is expected that the installation of four new towers or poles will be necessary to reach the Energy Facility Site boundary at the Site's northwestern corner. Three poles would be located on the portion of the Energy Facility Site located south of the railroad right-of-way; this portion of the Energy Facility Site is zoned EFU. Those three poles, and the transmission line itself, are the only new transmission facilities that will be located on EFU-zoned land.

A fourth pole will be located on the portion of the Energy Facility Site located north of the railroad right-of-way; this portion of the Energy Facility Site is zoned LI (Light Industrial). From the northwest corner of the Energy Facility Site, the transmission line will then cross Westland Road to a fifth new pole on the western side of Westland Road, also on land zoned LI. This pole will connect with the existing structures of the Hermiston Generating Plant to BPA McNary Substation line.

The route selected by the certificate holder avoids crossing a separate EFU-zoned parcel located to the west of the Energy Facility Site, along Westland Road.

Because the portion of the Energy Facility Site south of the railroad right-of-way – which accommodates the generating facility and the switchyard – is zoned EFU and is entirely "arable land," the associated transmission line must cross EFU-zoned "arable land," i.e. the Energy Facility Site itself. That is the only EFU-zoned parcel that will have new poles and the associated transmission line. For those reasons, this short segment of "associated transmission line" is "locationally dependent": it is located on arable land because the Energy Facility Site within the EFU zone is entirely "arable land." Two of the three poles within the EFU zone on the Energy Facility Site are on land that does not meet the definition of "high-value farmland" (see Attachment 6, Figure K-2); the pole located in the northwest corner, near Westland Road and the railroad right-of-way meets the "high-value farmland." Again, however, there is no land on the Energy Facility Site that is not "arable land" or both "arable land" and "high-value farmland." Thus, the associated transmission line is locationally dependent because it "must cross high-value farmland, as defined in ORS 195.300, or arable land."

There is no "existing right-of-way" that can avoid the EFU-zoned land and arable land. The only new segment of the associated transmission line on EFU-zoned land extends from the switchyard to the point where the line can cross an existing railroad right-of-way to reach the northerly portion of the Energy Facility Site, which is zoned LI. No existing right-of-way extends from the switchyard to any location outside the EFU zone.

> *(3) As pertains to paragraph (2), the applicant shall present findings to the governing body of the county or its designee on how the applicant will mitigate and minimize the impacts, if any, of the associated transmission line on surrounding lands devoted to farm use in order to prevent a significant change in accepted farm practices or a significant increase in the cost of farm practices on the surrounding farmland.*

RESPONSE: The certificate holder does not anticipate any impacts of the associated transmission line on surrounding lands devoted to farm use. The energy facility site is surrounded to the north (across the railroad right-of-way), west (across Westland Road) and south by property zoned Light Industrial. As shown on Figure K-6 of the ASC, the new transmission poles will be located on the west side of the energy facility site and will be separated from any cultivated lands by the energy facility itself and by lands zoned Light Industrial. The Final Order concludes that the poles and transmission line on the energy facility site "will not interfere with the ability to irrigate, fertilize or harvest crops on surrounding center-pivot field," "will not affect the costs of the inputs," and "will not impair the ability of the workers to access surrounding farmlands." Final Order at 48.

> *(4) The governing body of a county or its designee may consider costs associated with any of the factors listed in paragraph (B) of this subsection, but consideration of cost may not be the only consideration in determining whether the associated transmission line is necessary for public service.*

RESPONSE: As the Final Order notes, cost was not the only consideration in determining the location of the new transmission line on the EFU-zoned energy facility site. Final Order at 47. To the extent there are cost savings, it is because the location of the Energy Facility provides for a short interconnection to existing transmission infrastructure, which will be upgraded from 115 kV to 230 kV. In other words, locating up to three new poles and the associated 230 kV line on arable land within the EFU zone on the Energy Facility Site makes it possible to avoid the development of an entirely new transmission route to interconnect to the grid.

City of Umatilla NC Zone

The re-conductored transmission line passes through a small area zoned NC (Neighborhood Commercial) by the City of Umatilla, just north of Highway 730. In the Final Order, it was noted that the transmission line was permitted as a "Community Service" use, a conditional use in the NC zone. Final Order at 107. The NC zone is addressed in a new Article 10-4C of the City of Umatilla Zoning Ordinance.

The transmission line would be a "major utility facility," which is a conditional use in the NC zone pursuant to Section 10-4C-5(MM). Section 10-1-6 defines a "major utility facility" as follows:

> UTILITY FACILITY, MAJOR: Any utility facility or structure, as distinguished from local distribution utility facilities, owned or operated by a public, semi-public, private or cooperative electric, fuel, communication, sewage or water company for the generation, transmission, distribution, or processing of its products or for the disposal of cooling water, waste or byproducts and including power transmission lines, major trunk pipelines, power substations, dams, water towers, railroad tracks, sewage lagoons, sanitary landfills, and similar facilities.

Section 10-4C-5 provides, with respect to conditional uses in the NC zone:

> The following conditional uses may be permitted in the NC Zone subject to the property development standards of the NC Zone, the decision criteria and any additional applicable standards in Chapter 12 specific to the use, and the site plan design review requirements and procedures under Subsections 10-4C-7 and 10-4C-8.

With respect to Chapter 12, the general conditional use approval criteria in Section 10-12-1 and the specific standards for utility facilities in Section 10-12-2 were addressed in the Final Order. Final Order at 109-113. Those standards have not changed. Therefore, the Council's findings in the Final Order remain applicable to the transmission line as a conditional use in the NC zone.

Section 10-4C-7 sets forth property development standards. The standards address:

- Basic site development standards (10-4C-7(A)) including Minimum Lot Size and Lot Width; Building Setbacks; Maximum Building Height and Site Coverage.

- Site development impact standards (10-4C-7(B)), including Traffic Impact Analysis; Floodplain, Wetland and Riparian Areas; Stormwater Surface Drainage; Vehicle Access, Driveway and Circulation Standards; Driveway Standards; Utilities (to serve a new building or structure); and Easements (pedestrian, open space, and general public).

● Special site and building design standards (10-4C-7(C)), including Building Orientation and Architectural Features; Off-street Parking, Loading and Unloading; Bicycle and Pedestrian Facilities and Easements; Landscaping, Lighting and Outdoor Storage; Vision Clearance Area and Fences; and Signs.

The re-conductored transmission line, however, will simply replace an existing 115 kV line with a 230 kV line on existing poles. There will be no new structures and no new "on the ground" impacts. Therefore, the property development standards do not apply.

Section 10-4C-8 sets forth requirements for site plan design review, the stated purpose of which is "to provide a process to review proposals to verify that compliance with the property development standards under Section 10-4C-7 of the NC Zone will be met, along with any other applicable provisions of this Code, or the Comprehensive Plan." Section 10-4C-8 does not contain any substantive standards. The Council's process in reviewing the Request for Amendment under the Council's land use standard is sufficient to meet the purpose of the site plan design review requirement.

2.5.5 OAR-345-022-0040 Protected Areas

(1) Except as provided in sections (2) and (3), the Council shall not issue a site certificate for a proposed facility located in the areas listed below. To issue a site certificate for a proposed facility located outside the areas listed below, the Council must find that, taking into account mitigation, the design, construction and operation of the facility are not likely to result in significant adverse impact to the areas listed below. References in this rule to protected areas designated under federal or state statutes or regulations are to the designations in effect as of May 11, 2007:

(a) National parks, including but not limited to Crater Lake National Park and Fort Clatsop National Memorial;

(b) National monuments, including but not limited to John Day Fossil Bed National Monument, Newberry National Volcanic Monument and Oregon Caves National Monument;

(c) Wilderness areas established pursuant to The Wilderness Act, 16 U.S.C. 1131 et seq. and areas recommended for designation as wilderness areas pursuant to 43 U.S.C. 1782;

(d) National and state wildlife refuges, including but not limited to Ankeny, Bandon Marsh, Baskett Slough, Bear Valley, Cape Meares, Cold Springs, Deer Flat, Hart Mountain, Julia Butler Hansen, Klamath Forest, Lewis and Clark, Lower Klamath, Malheur, McKay Creek, Oregon Islands, Sheldon, Three Arch Rocks, Umatilla, Upper Klamath, and William L. Finley;

(e) National coordination areas, including but not limited to Government Island, Ochoco and Summer Lake;

(f) National and state fish hatcheries, including but not limited to Eagle Creek and Warm Springs;

(g) National recreation and scenic areas, including but not limited to Oregon Dunes National Recreation Area, Hell's Canyon National Recreation Area, and the Oregon

Cascades Recreation Area, and Columbia River Gorge National Scenic Area;
(h) State parks and waysides as listed by the Oregon Department of Parks and Recreation and the Willamette River Greenway;
(i) State natural heritage areas listed in the Oregon Register of Natural Heritage Areas pursuant to ORS 273.581;
(j) State estuarine sanctuaries, including but not limited to South Slough Estuarine Sanctuary, OAR chapter 142;
(k) Scenic waterways designated pursuant to ORS 390.826, wild or scenic rivers designated pursuant to 16 U.S.C. 1271 et seq., and those waterways and rivers listed as potentials for designation;
(l) Experimental areas established by the Rangeland Resources Program, College of Agriculture, Oregon State University: the Prineville site, the Burns (Squaw Butte) site, the Starkey site and the Union site;
(m) Agricultural experimental stations established by the College of Agriculture, Oregon State University…
(n) Research forests established by the College of Forestry, Oregon State University, including but not limited to McDonald Forest, Paul M. Dunn Forest, the Blodgett Tract in Columbia County, the Spaulding Tract in the Mary's Peak area and the Marchel Tract;
(o) Bureau of Land Management areas of critical environmental concern, outstanding natural areas and research natural areas;
(p) State wildlife areas and management areas identified in OAR chapter 635, division 8.

RESPONSE: In the Final Order for the Perennial Wind Chaser Station the Council concluded that, "the design, construction and operation of the facility are not likely to result in significant adverse impacts to any protected areas, in compliance with the Protected Area Standard."

The geographic extent and location of protected areas identified in the ASC has not changed. In addition, this request to amend does not contain any significant changes from the preliminary design as described in the original ASC that would affect protected areas. Accordingly, the potential impacts to protected areas from construction and operation are unchanged from those described in the ASC, Exhibit L and remains consistent with the Council conclusions.

Therefore, we conclude the following:

(A) The list of the protected areas within the analysis area showing the distance and direction from the proposed Facility and the basis for protection remains the same as described in the original ASC.

(B) The map showing the location of the proposed Facility relative to the protected areas within the analysis area remains the same as presented in the ASC, Exhibit L, Figure L-1.

(C) The description of significant potential impacts remains the same as described in the ASC, Exhibit L and the Final Order, which determined that the proposed Facility would generate no significant potential impacts to the protected areas from sources identified in subparagraphs (i) through (vi).

2.5.6 OAR-345-022-0050 Retirement and Financial Assurance

To issue a site certificate, the Council must find that:
(1) The site, taking into account mitigation, can be restored adequately to a useful, non-

hazardous condition following permanent cessation of construction or operation of the facility.
(2) The applicant has a reasonable likelihood of obtaining a bond or letter of credit in a form and amount satisfactory to the Council to restore the site to a useful, non-hazardous condition.

RESPONSE: The Council previously found that the Project complies with the Council's Retirement and Financial Assurance Standard. The Retirement and Financial Assurance Standard was reviewed in Exhibits M (Financial Capability) and W (Facility Retirement), and those responses were reviewed as part of this Request for Amendment.

With regard to Subsection (1), Exhibit W (Facility Retirement), cost estimates have been updated to Second Quarter 2018 dollars. The updated Exhibit W is included in Attachment 7 of this document.

With regard to Subsection (2), an updated Financial Capability letter is also included in Attachment 7 of this document, reflecting the higher cost estimate.

2.5.7 OAR-345-022-0060 Fish and Wildlife Habitat

To issue a site certificate, the Council must find that the design, construction and operation of the facility, taking into account mitigation, are consistent with:
(1)The general fish and wildlife habitat mitigation goals and standards of OAR 635-415-0025 (1) through (6) in effect as of February 24, 2017.
(2) For energy facilities that impact sage-grouse habitat, the sage-grouse specific habitat mitigation requirements of the Greater Sage-Grouse Conservation Strategy for Oregon at OAR 635-415-0025(7) and OAR 635-140-0000 through -0025 in effect as of February 24, 2017.

RESPONSE: The Council previously found that the proposed Facility complies with the Council's Fish and Wildlife Habitat Standard. Fish and wildlife habitat was reviewed in Exhibit P of the ASC, and those responses in Exhibit P were reviewed as part of this Request for Amendment.

To confirm that fish and wildlife habitat has not appreciably changed, a desktop review was conducted ahead of on-site reconnaissance conducted in June 2018 to assess current site conditions and compared to site conditions in the ASC. Resources reviewed include:

- The USFWS NWI data;
- USGS NHD data;
- NRCS SSURGO Soil Survey Geographic Database; and
- Aerial Imagery

Based on the desktop analysis, the description of the site conditions in the ASC, including habitat descriptions for fish and wildlife, remains applicable and has not changed.

To confirm the results of the desktop analysis, two qualified ecologists conducted an on-site reconnaissance on June 11 and 12, 2018, to assess current conditions of fish and wildlife habitat, including waters and wetlands. To conduct the on-site reconnaissance, a tablet computer with georeferenced aerial imagery and ArcGIS data layers (including the analysis area boundaries, 2013 survey points, SSURGO, NWI, and NHD data) was used. The tablet computer maintained a wireless connection to a global positioning system unit with sub-meter accuracy and real-time connection to navigate through the analysis area and digitally mark waters, data points, and other features.

In response to a Request for Additional Information two qualified ecologists conducted additional on-site surveys on April 22 and 23, and May 10, 2019, for Washington ground squirrels and wetlands and water features. These surveys verified that Washington ground squirrels are not present in the project features and no wetlands or waterbodies would be impacted by the construction or operation of the project. In addition, signs of Washington ground squirrels (e.g., burrows, scat, alarm calls) were not observed. The Biological Resources Survey Report was submitted to the Oregon Department of Energy in June 2019 and is included in Attachment 8.

Based on the 2018 on-site reconnaissance survey and review of the databases listed above, the location and geographic extent of waters, habitats, and other natural resources identified in the ASC have not changed. It should also be noted that the study area is not a highly populated area, and little change in terms of development has occurred to the area in the past 5 years based on aerial imagery and on-site reconnaissance.

In addition, this Request for Amendment does not contain any significant changes from the preliminary design, as described in the ASC. Accordingly, the potential impacts to fish and wildlife species and habitat from construction and operation will remain relatively unchanged from those described in the ASC, Exhibit P. Therefore, with regard to section (1) of the standard, the design, construction, and operation of the proposed Facility is consistent with the general fish and wildlife habitat mitigation goals and standards of OAR 635-415-0025(1) through (6) in effect as of February 24, 2017, subject to the conditions of the Site Certificate.

With regard to section (2) of the standard, no mitigation specific to sage-grouse was proposed in the original ASC, and none is proposed in this Request for Amendment since neither sage-grouse nor sage-grouse habitat are known to occur within the Site Boundary or the vicinity.

2.5.8 OAR-345-022-0070 Threatened and Endangered Species

To issue a site certificate, the Council, after consultation with appropriate state agencies, must find that:
(1) For plant species that the Oregon Department of Agriculture has listed as threatened or endangered under ORS 564.105(2), the design, construction and operation of the proposed facility, taking into account mitigation:
(a) Are consistent with the protection and conservation program, if any, that the Oregon Department of Agriculture has adopted under ORS 564.105(3); or
(b) If the Oregon Department of Agriculture has not adopted a protection and conservation program, are not likely to cause a significant reduction in the likelihood of survival or recovery of the species; and
(2) For wildlife species that the Oregon Fish and Wildlife Commission has listed as threatened or endangered under ORS 496.172(2), the design, construction and operation of the proposed facility, taking into account mitigation, are not likely to cause a significant reduction in the likelihood of survival or recovery of the species.

RESPONSE: In the Final Order for the Perennial Wind Chaser Station, the Council concluded that, "the facility complies with the Council's Threatened and Endangered Species Standard." Threatened and endangered species information relevant to the proposed Facility was addressed in Exhibit Q of the ASC, and those responses were reviewed as part of this Request for Amendment.

As determined by on-site reconnaissance conducted by qualified ecologists on June 11 and 12, 2018, and review of publically available databases, the description of site conditions in the ASC remains applicable. This Request for Amendment does not contain any significant changes from the preliminary design, as described in the ASC. In addition, the lack of threatened and endangered species or habitat suitable for such species identified in the ASC has not changed.

Ecology and Environment, Inc., reviewed the current threatened and endangered species lists managed by the Oregon Department of Fish and Wildlife[5] and the Oregon Department of Agriculture[6] to determine if any applicable species have been listed since the ASC was completed. OAR 345-021-0010(q)(A) no longer requires the consideration of federal threatened and endangered species, as it did at the time the ASC was prepared.

An updated Oregon Biodiversity Information Center (ORBIC) search conducted in September 2018 indicates there are three changes to special status species records compared to the ORBIC data used in the ASC (i.e., from 2012). Included are changes to one state endangered species and two state sensitive species.

The state endangered Washington ground squirrel (*Urocitellus washingtoni*) areas increased in size since the 2012 ORBIC search. The data on which these Washington ground squirrel areas are based on are at least 30 years old, which corresponds to the 2012 ORBIC data, suggesting that the data may now be buffered more conservatively rather than new observations of the species being confirmed since 2012. As indicated in the ASC, habitat conditions for the Washington ground squirrel within the Project area are poor and no sign of Washington ground squirrel activity was documented. Regardless, pre-construction Washington ground squirrel surveys were conducted on April 22 and 23, 2019, and on May 10, 2019, which is within the designated survey window (February 15 through May 30). No Washington ground squirrel activity or sign (e.g., burrows, scat, alarm calls) was documented during the surveys within suitable habitat in the study area. The Biological Resources Survey Report from the April and May 2019 surveys was submitted to the Oregon Department of Energy in June 2019. Refer to Attachment 8.

The state sensitive Pacific lamprey (*Entosphenus tridentatus*) areas also have increased since the 2012 ORBIC search, presumably based on 2011 sampling data from the Umatilla River. Pacific Lampreys are a state sensitive species. The Project would not involve any in-water work; therefore, no impacts would occur on this species.

Lastly, the 2018 ORBIC data indicate that a pair of western burrowing owls (*Athene cunicularia hypugaea*) have been documented approximately 2.5 miles east of the Project's

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[5] Oregon Department of Fish and Wildlife. 2018. Threatened, Endangered, and Candidate Fish and Wildlife Species. https://www.dfw.state.or.us/wildlife/diversity/species/threatened_endangered_candidate_list.asp Accessed July 10, 2018.

[6] Oregon Department of Agriculture. 2018. Oregon Listed Plants by County. https://www.oregon.gov/ODA/programs/PlantConservation/Pages/ListedPlants.aspx Accessed July 10, 2018.

northern terminus. Given the distance from the Project, and the age of the records (1976 to 2006), the Project is not likely to impact western burrowing owls. In addition, if any active burrowing owl nests are discovered during pre-construction surveys, construction activities would be avoided in proximity of the nest until it was no longer active.

One additional state-listed endangered plant species, northern wormwood (*Artemisia campestris* var. *wormskioldii*), occurs in Umatilla County. This species is restricted to basalt, compacted cobble, and sand on the banks of the Columbia River.[7] While suitable habitat occurs within the analysis area, there is no suitable habitat for this species within the Site Boundary. Accordingly, the potential impacts to threatened and endangered species from construction and operation will remain unchanged from those described in the ASC, Exhibit Q.

Therefore, with regard to section (1) of OAR-345-022-0070, the design, construction, and operation of the proposed Facility is (a) consistent with the Oregon Department of Agriculture's Native Plant Conservation Program adopted under ORS 564.105(3) and (b) not likely to cause a significant reduction in the likelihood of survival or recovery of any state- or federally listed species.

With regard to section (2) of OAR-345-022-0070, the design, construction, and operation of the proposed Facility, taking into account mitigation, are not likely to cause a significant reduction in the likelihood of survival or recovery of any state- or federally listed species.

2.5.9 OAR-345-022-0080 Scenic Resources

(1) Except for facilities described in section (2), to issue a site certificate, the Council must find that the design, construction and operation of the facility, taking into account mitigation, are not likely to result in significant adverse impact to scenic resources and values identified as significant or important in local land use plans, tribal land management plans and federal land management plans for any lands located within the analysis area described in the project order.
(2) The Council may issue a site certificate for a special criteria facility under OAR 345-015-0310 without making the findings described in section (1). However, the Council may apply the requirements of section (1) to impose conditions on a site certificate issued for such a facility.

RESPONSE: In the Final Order for the Perennial Wind Chaser Station the Council concluded that, "Based on the foregoing findings and the evidence in the record, and subject to compliance with the site certificate conditions, the Council finds that the facility complies with the Council's Scenic Resources Standard."

The Application for Site Certification (ASC) indicated that neither the City of Umatilla Comprehensive Plan nor the Morrow County Comprehensive Plan include any goals, policies, or inventories identifying or protecting specific scenic areas. In contrast, the Umatilla County Comprehensive Plan identifies a number of outstanding scenic views and establishes a policy addressing scenic resources.

[7] Oregon Department of Agriculture. No date. Northern wormwood (*Artemisia campestris var.wormskioldii*). https://www.oregon.gov/oda/shared/Documents/Publications/PlantConservation/ArtemisiaCampestrisWormskioldiiProfile.pdf Accessed July 10, 2018.

The City of Umatilla Comprehensive Plan[8] has not changed since the ASC was submitted to EFSC in October 2014 and the site certificate issued in September 2015. The City of Umatilla Comprehensive Plan Section 5.2 Scenic Areas is "Reserved for Expansion", and has no further information.

Although portions of the Morrow County Comprehensive Plan have been amended since the ASC was submitted, the Natural Resources Element of the Plan is dated October 1, 2013. It has not been amended. That Natural Resources Element of the Morrow County Comprehensive Plan does not identify any inventoried scenic resources and does not include any policies specific to Scenic Resources. That is consistent with the statement in the Exhibit R of the ASC (See ASC at R-8).

With respect to the Umatilla County Comprehensive Plan, we have reviewed the discussion of the Plan's scenic resources provisions in Exhibit R of the ASC (ASC at R-6 to R-7). Exhibit R quotes Policy 20 of Chapter 8 ("Open Space, Scenic and Historic Areas, and Natural Resources") of the Comprehensive Plan. The quoted language has not been amended, and it does not appear that Umatilla County has adopted new policies regarding Scenic Resources. Exhibit R also discusses scenic values addressed in the Umatilla County Comprehensive Plan Technical Report. The Technical Report appears to have been last amended in 1984.

The Umatilla County Comprehensive Plan states in Chapter 8 that open space "contributes to the aesthetic quality of the landscape" (Umatilla County 2010, p. 8-1). The plan asserts that Umatilla County has a number of outstanding scenic views and establishes a policy addressing scenic resources. The plan identifies McNary Dam, Lake Wallula, and the Umatilla River downstream from State Highway 207 as important sites with aesthetic qualities and views in the county. The visual analysis in the ASC indicated the Project, including the new step-up substation south of the dam and lake, the transmission line, and the Station, will not be easily visible or noticeable due to their distances from publicly accessible areas and intervening structures, terrain, and vegetation. The Project features have not changed in any manner that would make them more visible from these locations.

There are no tribal land management plans or federal land management plans located within the analysis area.

Therefore, we assert the following:

(1) The description of significant potential impacts remains the same as described in the ASC, Exhibit R and the Final Order, which determined that the proposed Facility would generate no significant potential impacts to scenic resources.

(2) The design, construction and operation of the Facility, taking into account mitigation, are not likely to result in significant adverse impact to scenic resources and values identified as significant or important in local land use plans, tribal land management plans and federal land management plans for any lands located within the analysis area described in the project order.

2.5.10 OAR-345-022-0090 Historic, Cultural and Archaeological Resources

(1) Except for facilities described in sections (2) and (3), to issue a site certificate, the

[8] https://www.umatilla-city.org/sites/default/files/fileattachments/planning/page/701/goal_5_-_natural_resources.pdf; Accessed July 6, 2018

Council must find that the construction and operation of the facility, taking into account mitigation, are not likely to result in significant adverse impacts to:
(a) Historic, cultural or archaeological resources that have been listed on, or would likely be listed on the National Register of Historic Places;
(b) For a facility on private land, archaeological objects, as defined in ORS 358.905(1)(a), or archaeological sites, as defined in 358.905(1)(c); and
(c) For a facility on public land, archaeological sites, as defined in ORS 358.905(1)(c)

RESPONSE: In the Final Order for the Perennial Wind Chaser Station, the Council concluded that, "the design, construction and operation of the facility are not likely to result in significant adverse impacts to any historic, cultural and archaeological resources, in compliance with the Protected Area Standard."

The geographic extent and location of historic, cultural, and archaeological resources identified in the analysis area for Exhibit S of the ASC have not changed. The analysis area for Exhibit S is defined as the area within the Site Boundary. In addition, this Request for Amendment does not contain any significant changes from the preliminary design as described in the original ASC that would affect historic, cultural, and archaeological resources. Accordingly, the potential impacts to historic, cultural, and archaeological resources from construction and operation of the proposed Facility are unchanged from those described in the ASC, Exhibit S and remain consistent with the Council's conclusions.

Therefore, we assert the following:

(A) The historic, cultural, and archaeological resources within the analysis area remain the same as described in the ASC, Exhibit S. No additional cultural resource inventories have been conducted within the analysis area, and no new historic, cultural, or archaeological resources have been recorded.

(B) Per the original ASC and as required by the Site Certificate, Perennial-WindChaser LLC will take reasonable measures to avoid physical damage to the alignment, construction materials, and design of the five historic-period resources eligible for listing with the National Register of Historic Places. These five resources are Westland Irrigation District Canals, West Extension Irrigation Canal, Union Pacific Railroad Messner-Hinkle Segment, Bonneville Power Administration (BPA) McNary-Boardman No. 1 Line, and BPA McNary-Coyote Springs No. 1 Line. Construction of the proposed Facility will avoid impacts to the Westland Irrigation Canals and the Extension Irrigation Canal by horizontal directional drilling or, if that is not possible, trenching followed by restoration of the original alignment, construction materials, and design. Construction of the proposed Facility will avoid impacts to the Union Pacific Railroad Messner-Hinkle Segment by crossing underneath this resource via trenching. Construction of the proposed Facility will avoid impacts to the BPA McNary-Boardman No. 1 Line and the BPA McNary-Coyote Springs No. 1 Line, which are both transmission lines, by passing underneath or around them.

2.5.11 OAR-345-022-0100 Recreation

(1) Except for facilities described in section (2), to issue a site certificate, the Council must find that the design, construction and operation of a facility, taking into account mitigation, are not likely to result in a significant adverse impact to important recreational opportunities in the analysis area as described in the project order. The Council shall consider the following

factors in judging the importance of a recreational opportunity:
(a) Any special designation or management of the location;
(b) The degree of demand;
(c) Outstanding or unusual qualities;
(d) Availability or rareness;
(e) Irreplaceability or irretrievability of the opportunity.
(2) The Council may issue a site certificate for a special criteria facility under OAR 345-015-0310 without making the findings described in section (1). However, the Council may apply the requirements of section (1) to impose conditions on a site certificate issued for such a facility.

RESPONSE: In the Final Order for the Perennial Wind Chaser Station the Council concluded that, "None of the recreational opportunities . . . would be directly impacted by construction and operation of the facility. Therefore, as explained in the ASC, any potential impacts to important recreational opportunities would result from indirect impacts of the construction and operation of the proposed facility."

The geographic extent and location of recreational opportunities identified in the ASC has not changed. The analysis area for recreational opportunities, as defined in the Final Order, is the area within the Site Boundary, including the proposed rights-of-way for the natural gas pipeline and transmission line, and 5 miles from the Site Boundary. In addition, this Request for Amendment does not contain any significant changes from the preliminary design as described in the ASC that would affect recreation. Accordingly, the potential impacts to recreation from construction and operation are unchanged from those described in the ASC, Exhibit T and remain consistent with the Council's conclusions.

2.5.12 OAR-345-022-0110 Public Services

To issue a site certificate, the Council must find that the construction and operation of the facility, taking into account mitigation, are not likely to result in significant adverse impact to the ability of public and private providers within the analysis area described in the project order to provide: sewers and sewage treatment, water, storm water drainage, solid waste management, housing, traffic safety, police and fire protection, health care and schools.

RESPONSE: The Council previously found that the proposed Facility complies with the Council's Public Services Standard. Public services relevant to the proposed Facility were addressed in Exhibit U of the Application for Site Certificate (ASC), and those responses were reviewed as part of this Request for Amendment.

Some facets of public services identified in the ASC have changed to some extent since submittal of the ASC in October 2014, but the overall volume and quality of public services provided in the analysis area has remained approximately the same. The analysis area for public services, as defined in the Final Order, is the Site Boundary, including the proposed rights-of-way for the natural gas pipeline and transmission line, plus an area 10 miles around the Site Boundary. However no changes to the number of operational and construction workers at the site are anticipated.

No changes have occurred in the following public services: sewage collection and treatment, water supply and disposal, stormwater, solid waste, housing, or roads and traffic. Regarding police and fire services, the Hermiston Police Department Communications Center closed in 2014 and services were contracted with the Umatilla

County Public Safety Answering Point. The Hermiston Fire and Emergency Services District merged with the Stanfield Fire District and became Umatilla Fire District 1, for a combined total of four fire stations, and continues to operate the station located approximately 2 miles from the proposed Facility. On September 13, 2018, a Perennial representative called the Umatilla Fire District 1 and spoke with the Fire Marshal, Scott Goff. The Perennial representative explained the reason for the call, specifically to confirm that the Umatilla Fire District 1 has the capacity to serve the facility during construction and operation. The Perennial representative indicated that this consultation was necessary due to the merging of the Hermiston Fire and Emergency Services District and the Stanfield Fire District into the Umatilla Fire District 1 since the ASC. An email with information on the Project, as requested by the Fire Marshal, was sent on September 13, 2018, in order for Mr. Goff to complete his review. A follow-up email was sent to Mr. Goff on October 1, 2018, and a follow-up call was placed to the Umatilla Fire District 1 on October 2, 2018. Mr. Goff responded on October 15, 2018, and indicated that there is no change in the ability for the Umatilla Fire District 1 to provide services for the Project. The email from Mr. Goff included information on how the Fire District has changed and indicated that the nearest fire station, Station 23, is located approximately 2 miles from the Project site. Attachment 9 includes the email consultation with the Fire Marshal, Mr. Goff.

Regarding health services, the Umatilla County Fire District 1 operates six medical units to provide emergency medical transportation, whereas in 2014 it had operated five medical units. Regarding school services, although enrollment growth in recent years in the Hermiston School District has neared capacity, Interim Superintendent of Schools Tricia Mooney indicated on July 16, 2018, that she does not anticipate any adverse impact from an increase in student population associated with construction of the proposed Facility. The demand for public services in the project vicinity has not changed since 2014, when the ASC was submitted, due to a relatively slow rise in population; the U.S. Census Bureau estimated that the Umatilla County population was 76,985 in 2017, an increase of only 1.44 percent above the 2010 population.[9]

This Request for Amendment does not contain any significant changes from the preliminary design, as described in the ASC. In combination with the minimal changes discussed above, the potential impacts to public services from construction and operation of the proposed Facility will remain essentially unchanged from those described in the ASC, Exhibit U.

2.5.13 OAR-345-022-0120 Waste Minimization

(1) Except for facilities described in sections (2) and (3), to issue a site certificate, the Council must find that, to the extent reasonably practicable:
(a) The applicant's solid waste and wastewater plans are likely to minimize generation of solid waste and wastewater in the construction and operation of the facility, and when solid waste or wastewater is generated, to result in recycling and reuse of such wastes;
(b) The applicant's plans to manage the accumulation, storage, disposal and transportation of waste generated by the construction and operation of the facility are likely to result in minimal adverse impact on surrounding and adjacent areas.
(2) The Council may issue a site certificate for a facility that would produce power from

[9] United States Census Bureau. 7/1/2017. American Fact Finder. https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml Accessed July 16, 2018.

wind, solar or geothermal energy without making the findings described in section (1). However, the Council may apply the requirements of section (1) to impose conditions on a site certificate issued for such a facility.
(3) The Council may issue a site certificate for a special criteria facility under OAR 345-015-0310 without making the findings described in section (1). However, the Council may apply the requirements of section (1) to impose conditions on a site certificate issued for such a facility.

RESPONSE: We expect no significant changes from the preliminary design conditions. Accordingly, the plans to minimize the generation -- and maximize recycling or reuse -- of solid waste and wastewater will remain unchanged from those found in ASC, Exhibit V. Therefore, we anticipate:

(1)(a) The description of major types of solid waste and wastewater that construction, operation and retirement of the facility are likely to generate will remain unchanged from those described in ASC, Exhibit V.

(1)(b) The description of structures, systems and equipment for management and disposal of solid waste, wastewater and storm water will remain unchanged from those described in ASC, Exhibit V.

2.6 OAR-345-024 Applicable Specific Division 24 Standards

The following Division 24 standards are addressed in this subsection:

- OAR 345-024-0090 Transmission Lines
- OAR 345-024-0590 Standard for Non-Base Load Power Plants
- OAR 345-024-0600 Means of Compliance for Non-Base Load Power Plants
- OAR 345-024-0610 Modification of the Standard for Non-Base Load Power Plants
- OAR 345-024-0710 Monetary Path Payment Requirement
- OAR 345-024-0720 Qualified Organization

2.6.1 OAR-345-024-0090 Transmission Lines

To issue a site certificate for a facility that includes any transmission line under Council jurisdiction, the Council must find that the applicant:
(1) Can design, construct and operate the proposed transmission line so that alternating current electric fields do not exceed 9 kV per meter at one meter above the ground surface in areas accessible to the public;
(2) Can design, construct and operate the proposed transmission line so that induced currents resulting from the transmission line and related or supporting facilities will be as low as reasonably achievable.

RESPONSE: Electric and magnetic fields (EMF) were analyzed in Exhibit AA of the ASC and the responses were reviewed as part of this Request for Amendment. We expect no significant changes from the preliminary design conditions. There is one new residence within 200 feet of the proposed transmission line. Other residences are located closer to the proposed transmission line than this residence and were analyzed for EMF. Therefore, the new residence would be less impacted than the closer residences and would not need to be further analyzed for this update. Accordingly, we expect the previously estimated EMF impacts to remain unchanged from those found in ASC, Exhibit AA. Accordingly, the plans to minimize electromagnetic fields will remain unchanged from those found in ASC, Exhibit AA. Therefore, we anticipate:

(A) The design and operation of the proposed transmission lines will remain unchanged from those described in ASC, Exhibit AA, so that alternating current electric fields do not exceed 9 kV per meter at one meter above the ground surface in areas accessible to the public.

(B) The design and operation of the proposed transmission lines will remain unchanged from those described in ASC, Exhibit AA, so that induced currents resulting from the transmission line and related or supporting facilities will be as low as reasonably achievable.

Figures C-1.A through C-1.H show the stringing sites (see Attachment 10).

2.6.2 OAR-345-024-0590 Standard for Non-Base Load Power Plants

To issue a site certificate for a non-base load power plant, the Council must find that the net carbon dioxide emissions rate of the proposed facility does not exceed 0.614 pounds of carbon dioxide per kilowatt-hour of net electric power output, with carbon dioxide emissions and net electric power output measured on a new and clean basis. For a base load gas plant designed with power augmentation technology as defined in OAR 345-001-0010, the Council shall apply this standard to the incremental carbon dioxide emissions from the designed operation of the power augmentation technology. The Council shall determine whether the carbon dioxide emissions standard is met as follows:

(1) The Council shall determine the gross carbon dioxide emissions that are reasonably likely to result from the operation of the proposed energy facility. The Council shall base such determination on the proposed design of the energy facility, the limitation on the hours of generation for each fuel type and the average temperature, barometric pressure and relative humidity at the site during the times of the year when the facility is intended to operate. For a base load gas plant designed with power augmentation technology, the Council shall base its determination of the incremental carbon dioxide emissions on the proposed design of the facility, the proposed limitation on the hours of generation using the power augmentation technology and the average temperature, barometric pressure and relative humidity at the site during the times of the year when the facility is intended to operate with power augmentation technology. The Council shall adopt site certificate conditions to ensure that the predicted carbon dioxide emissions are not exceeded on a new and clean basis; however, the Council may modify the parameters of the new and clean basis to accommodate average conditions at the times when the facility is intended to operate and technical limitations, including operational considerations, of a non-base load power plant or power augmentation technology or for other cause.

(2) For any remaining emissions reduction necessary to meet the applicable standard, the applicant may elect to use any of the means described in OAR 345-024-0600 or any combination thereof. The Council shall determine the amount of carbon dioxide or other greenhouse gas emissions reduction that is reasonably likely to result from the applicant's offsets and whether the resulting net carbon dioxide emissions meet the applicable carbon dioxide emissions standard. The amount of greenhouse gas emissions means the pounds of carbon dioxide and the carbon dioxide equivalent of other greenhouse gases. For methane, one pound of methane is equivalent to 25 pounds of carbon dioxide. For nitrous oxide, one pound of nitrous oxide is equivalent to 298 pounds of carbon dioxide.

(3) If the applicant elects to comply with the standard using the means described in OAR 345 024-0600(2), the Council shall determine the amount of greenhouse gas emissions reduction that is reasonably likely to result from each of the proposed offsets. In making this determination, the Council shall not allow credit for offsets that have already been allocated or awarded credit for greenhouse gas emissions reduction in another regulatory setting. The fact that an applicant or other parties involved with an offset may derive benefits from the offset other than the reduction of greenhouse gas emissions is not, by itself, a basis for withholding credit for an offset. The Council shall base its determination of the amount of greenhouse gas emission reduction on the following criteria and as provided in OAR 345-024-0680:

(a) The degree of certainty that the predicted quantity of greenhouse gas emissions reduction will be achieved by the offset.

(b) The ability of the Council to determine the actual quantity of greenhouse gas emissions reduction resulting from the offset, taking into consideration any proposed measurement, monitoring and evaluation of mitigation measure performance.

(c) The extent to which the reduction of greenhouse gas emissions would occur in the absence of the offsets.

(4) Before beginning construction, the certificate holder shall notify the Department of Energy in writing of its final selection of an equipment vendor and shall submit a written design information report to the Department sufficient to verify the facility's designed new and clean heat rate and its nominal electric generating capacity at average annual site conditions for each fuel type. For a base load gas plant designed with power augmentation technology, the certificate holder shall include in the report information sufficient to verify the facility's designed new and clean heat rate, tested under parameters the Council orders pursuant to section (1), and the nominal electric generating capacity at average site conditions during the intended use for each fuel type from the operation of the proposed facility using the power augmentation technology. The certificate holder shall include the proposed limit on the annual average number of hours for each fuel used, if applicable. The certificate holder shall include the proposed total number of hours of operation for all fuels, subject to the limitation that the total annual average number of hours of operation per year is not more than 6,600 hours. In the site certificate, the Council may specify other information to be included in the report. The Department shall use the information the certificate holder provides in the report as the basis for calculating, according to the site certificate, the gross carbon dioxide emissions from the facility and the amount of greenhouse gas emissions reductions the certificate holder must provide under OAR 345-024-0600.

(5)(a) Every Five years after commencing commercial operation, the certificate holder shall report to the Council the facility's actual gross carbon dioxide emissions. The certificate holder shall calculate actual gross carbon dioxide emissions using the new and clean heat rate and the actual hours of operation on each fuel during the five-year period or shall report to the Council the actual measured or calculated carbon dioxide emissions as reported to either the Oregon Department of Environmental Quality or the U.S. Environmental Protection Agency pursuant to a mandatory carbon dioxide emissions reporting requirement.

(b) The certificate holder shall specify its election of method used to measure or calculate carbon dioxide emissions in the notification report described at section (4) of this rule. That election, once made, shall apply for each five year period unless the site certificate is amended to allow a different election. If the certificate holder calculates actual carbon dioxide emissions using the new and clean heat rate and the actual hours of operation, the certificate holder shall also report to the Council the facility's actual annual hours of operation by fuel type. If the actual gross carbon dioxide emissions exceed the projected gross carbon dioxide

emissions for the five-year period calculated under section (4), the certificate holder shall offset any excess emissions for that period and shall offset estimated future excess carbon dioxide emissions using the monetary path as described in OAR 345-024-0600(3) and (4) or as approved by the Council.
(6) For a base load gas plant designed with power augmentation technology, every five years after commencing commercial operation, the certificate holder shall report to the Council the facility's actual hours of operation using the power augmentations technology for each fuel type. If the actual gross carbon dioxide emissions, calculated using the new and clean heat rate, tested under parameters the Council orders pursuant to section (1), and the actual hours of operation using the power augmentation technology on each fuel during the five-year period exceed the projected gross carbon dioxide emissions for the five-year period calculated under section (4), the certificate holder shall offset any excess emissions for that period and shall offset estimated future excess carbon dioxide emissions using the monetary path as described in OAR 345-024-0600(3) and (4) or as approved by the Council.

RESPONSE: We expect no significant changes from the design, operating conditions, or planned operational profile of the Facility. However the Council standard has changed from 0.675 to 0.614 pounds of carbon dioxide per kilowatt-hour of net electric power output. Accordingly, Exhibit Y has been updated with the new standard and is presented in Attachment 11.

(1) The gross carbon dioxide emissions will remain unchanged as a result of the operation of the proposed energy Facility as the predicted CO2 emissions of the Project measured on a new and clean basis as estimated in Exhibit Table Y-2. No power augmentation will be proposed for the project.
(2) Means of emissions reductions to meet applicable standards will remain unchanged and are outlined in ASC, Exhibit Y.
(3) Means of emissions reductions to meet applicable standards will remain unchanged and are outlined in ASC, Exhibit Y.
(4) Before beginning construction, the certificate holder will notify the ODOE in writing of the final selection of equipment vendor and will submit a written design information report to the Department verifying the Facility's designed new and clean performance.
(5) Every five years after commencing operation, the certificate holder will comply with the Council's emissions reporting requirements as specified by OAR-345-024-0590.

2.6.3 OAR-345-024-0600 Means of Compliance for Non-Base Load Power Plants

The applicant may elect to use any of the following means, or any combination thereof, to comply with the carbon dioxide emissions standard for non-base load power plants or for the incremental carbon dioxide emissions from the operation of a base load gas plant with power augmentation technology:
(1) Designing and operating the facility to produce electrical and thermal energy sequentially from the same fuel source and using the thermal energy to displace another source of carbon dioxide emissions from fossil fuels that would have otherwise continued to occur. The Council shall adopt site certificate conditions ensuring that the carbon dioxide emissions reduction will be achieved.
(2) Implementing offset projects directly or through a third party, pursuant to OAR 345-024-0680. The Council may adopt site certificate conditions ensuring that the proposed

offset projects are implemented by the date specified in the site certificate, but shall not require that predicted levels of avoidance, displacement or sequestration of greenhouse gas emissions be achieved.
(3) Providing offset funds, directly or through a third party, in an amount deemed sufficient to produce the reduction in greenhouse gas emissions necessary to meet the applicable carbon dioxide emissions standard. The applicant or third party shall use the funds as specified in OAR 345-024-0710. The Council shall deem the payment of the monetary offset rate, pursuant to OAR 345-024-0580, to result in a reduction of one ton of carbon dioxide emissions. The Council shall determine the offset funds using the monetary offset rate and the level of emissions reduction required to meet the applicable standard. If the Council issues a site certificate based on this section, the Council may not adjust the amount of the offset funds based on the actual performance of offsets.
(4) Notwithstanding sections (1), (2) or (3), if the certificate holder exceeds the projected gross carbon dioxide emissions calculated under OAR 345-024-0590(4) during any five-year reporting period described in 345-024-0590(5) and (6), the certificate holder shall offset excess emissions for the specific reporting period according to subsection (a) and shall offset the estimated future excess emissions according to subsection (b). The certificate holder shall offset excess emissions using the monetary path as described in subsection (c) and OAR 345-024-0710 or as approved by the Council.
(a) In determining the excess carbon dioxide emissions that the certificate holder must offset for a five-year period, the Council shall credit the certificate holder with offsets equal to the difference between the carbon dioxide emissions allowed by the site certificate in previous periods and actual emissions, if actual emissions were lower than allowed. Once a certificate holder has used a credit, the certificate holder shall not use it again.
(b) The Council shall specify in the site certificate a methodology for estimating future excess carbon dioxide emissions. The Department of Energy shall calculate estimated future excess emissions. To estimate excess emissions for the remaining period of the deemed life of the facility, the Department shall use the annual average number of hours of operation during the five-year period in which the certificate holder exceeded the estimated gross carbon dioxide emissions described in OAR 345-024-0590(5) and the new and clean heat rate and capacity for the facility, adjusted for the average temperature, barometric pressure and relative humidity at the site during the times of the year when the facility is intended to operate. If the annual average hours exceed 6,600, the Department shall estimate emissions at 100 percent capacity for the remaining period of a deemed 30-year life of the facility. At the request of the certificate holder, the Council may, by amendment of the site certificate, use an alternative methodology to estimate future excess carbon dioxide emissions.
(c) The certificate holder shall pay for the net excess carbon dioxide emissions calculated pursuant to subsections (a) and (b) at the monetary path offset rate in real dollars for the quarter and year in which the Council issued the final order that applied the carbon dioxide standard. The Council shall specify in the site certificate the methodology for calculating the real dollar value of the monetary offset rate. The Department shall calculate the net excess carbon dioxide emissions and notify the certificate holder of the amount of the monetary path payment required to offset them. The certificate holder shall pay fully the required amount to the qualified organization within 60 days of notification by the Department of the amount. The certificate holder shall not be eligible for a refund of any monetary path payments due to the calculations in this rule.
(5) Any other means that the Council adopts by rule for demonstrating compliance with the carbon dioxide emissions standard.
(6) If the Council or a court on judicial review concludes that the applicant has not demonstrated compliance with the applicable carbon dioxide emissions standard under

sections (1), (2) or (5) of this rule, or any combination thereof, and the applicant agrees to meet the requirements of sections (3) and (4) for any deficiency, the Council or a court shall find compliance based on such agreement.

RESPONSE: We expect no significant changes from the design, operating conditions, or planned operational profile of the Facility. Accordingly, emissions estimates will remain relatively unchanged from those found in ASC, Exhibit Y and the applicant maintains the selection of OAR 345-024-0600(3) to comply with the carbon dioxide emissions standard for non-base load power plants.

2.6.4 OAR-345-024-0610 Modification of the Standard for Non-Base Load Power Plants

The Council may by rule modify the carbon dioxide emissions standard for non-base load power plants in OAR 345-024-0590 so that the standard remains equivalent to the standard for the net carbon dioxide emissions rate of a base load gas plant, subject to the principles described in OAR 345-024-0510.

RESPONSE: As the Council has modified the carbon dioxide standard for non-base load power plants since the issuance of the Site Certificate, Exhibit Y has been updated and included in Attachment 11.

2.6.5 OAR-345-024-0710 Monetary Path Payment Requirement

(1) If the applicant elects to meet the applicable carbon dioxide emissions standard in whole or in part under OAR 345- 024-0560(3), 345-024-0600(3) or 345-024-0630(2), (4) and (5), the applicant shall provide a bond or letter of credit in a form reasonably acceptable to the Council to ensure the payment of the offset funds and the additional funds required under section (4) of this rule. The applicant shall provide such security by the date specified in the site certificate. In the site certificate, the Council shall specify a date no later than the commencement of construction of the facility for base load gas plants and non-base load power plants. For nongenerating facilities, the Council shall specify a date no later than the commencement of construction of the facility for providing the initial bond or letter of credit, and the Council shall specify conditions for providing subsequent incremental payments to meeting the monetary path payment requirement. The certificate holder for a nongenerating facility must meet its incremental monetary path payment requirements before exhausting its offset credit account, as described in OAR 345-024-0630(4). In no case shall the applicant diminish the bond or letter of credit or receive a refund from a qualified organization based on the calculations of the facility's emissions on a new and clean basis for a fossil-fueled power plant or any other measure for a nongenerating energy facility. A qualified organization shall not refund any offset funds to a certificate holder based on the operation or performance of a non-base load power plant during any five-year period reported under OAR 345-024- 0590(5) or, for a nongenerating facility, on any offset credits the certificate holder provided under 345-024-0620(5).

(2) In the site certificate, the Council shall require the certificate holder to disburse the offset funds and other funds required as specified in sections (3) and (4), unless the Council finds that no qualified organization exists, in which case the Council shall require the certificate holder to disburse the offset funds as specified in 345-024-0720(2).

(3) When the certificate holder receives written notice from the qualified organization certifying that the qualified organization is contractually obligated to pay any funds to implement offsets using the offset funds, the certificate holder shall make the requested amount available to the qualified organization unless the total of the amount requested and

any amounts previously requested exceeds the offset funds, in which case the certificate holder shall make available only the remaining amount of the offset funds. The qualified organization shall use at least 80 percent of the offset funds for contracts to implement offsets. The qualified organization shall assess offsets for their potential to qualify in, generate credits in or reduce obligations in other regulatory settings. The qualified organization may use up to 20 percent of the offset funds for monitoring, evaluation, administration and enforcement of contracts to implement offsets.

(4) At the request of the qualified organization and in addition to the offset funds, the certificate holder shall pay the qualified organization an amount equal to 10 percent of the first $500,000 of the offset funds and 4.286 percent of any offset funds in excess of $500,000. The certificate holder for a base load gas plant shall pay not less than $50,000, unless the Council specifies a lesser amount in the site certificate. In the site certificate, the Council may specify a minimum amount that other fossil-fueled power plants or nongenerating energy facilities must pay. This payment compensates the qualified organization for its costs of selecting offsets and contracting for the implementation of offsets.

(5) Notwithstanding any provision to the contrary, a certificate holder subject to this rule has no obligation with regard to offsets, the offset funds or the funds required by section (4) other than to make available to the qualified organization the total amount required under OAR 345-024-0560(3), 345-024-0600(3) and (4), 345-024-0630(2), (4) and (5), and section (4) of this rule. The Council shall not base a revocation of the site certificate or any other enforcement action with respect to the certificate holder on any nonperformance, negligence or misconduct by the qualified organization.

(6) For monetary path payments a certificate holder must make before beginning construction, the certificate holder shall make all offset fund payments and all payments required by section (4) to the qualifying organization in real dollars of the year in which the Council issues a final order applying the carbon dioxide emissions standard to the energy facility. In the site certificate, the Council shall specify an appropriate inflation index for calculating real dollars. For a non-base load power plant, if a certificate holder must make a payment as described in OAR 345-024-0600(4), the certificate holder shall make a payment that has the same present value per ton of carbon dioxide as the monetary path offset rate of the year in which the Council issued the final order applying the carbon dioxide standard. In the site certificate, the Council shall specify the methodology for calculating present value. If the certificate holder of a nongenerating facility must make payments as described in OAR 345-024-0630(4) and (5), the Council shall specify in the site certificate the method for calculating the rate for the dollar value per ton of carbon dioxide required according to subsection (a) or (b) below:

(a) Unless the applicant and the Council agree to the methodology in subsection (b), the certificate holder shall make payments that have the same present value per ton of carbon dioxide as the monetary path offset rate of the year in which the Council issued the final order applying the carbon dioxide standard. The Council shall set an appropriate discount rate for calculating the present value, using the cost of capital most recently approved by a state utility regulatory commission for that utility or a similar utility as a guide; or

(b) If the applicant requests and the Council agrees, the certificate holder shall make payments at the monetary path offset rate in effect on the date the certificate holder makes the payment.

RESPONSE: We expect no significant changes from the design, operating conditions, or planned operational profile of the Facility. Accordingly, emissions estimates will remain relatively unchanged from those found in ASC, Exhibit Y. The applicant will comply with the revised CO2 standard of OAR 345-024-0590 for the Project solely by providing offset funds to The Climate Trust, as allowed by OAR 345-024-0600(3) and in compliance with the monetary path payment requirement of OAR 345-024-0710. The applicant has modified Exhibit Y to adjust the present value per ton of carbon dioxide from $1.27/TCO2 to $1.90/TCO2 as the current year monetary path offset rate. The revised Exhibit Y is included in Attachment 11.

2.6.6 OAR-345-024-0720 Qualified Organization

(1) If the applicant elects to meet the applicable carbon dioxide emissions standard in whole or in part under OAR 345- 024-0560(3), 345-024-0600(3) and (4), or 345-024-0630(2), (4) and (5), the applicant shall identify the qualified organization. The applicant may identify an organization that has applied for, but has not received, an exemption from federal income taxation, but the Council may not find that the organization is a qualified organization unless the organization is exempt from federal taxation under section 501(c)(3) of the Internal Revenue Code as amended and in effect on September 18, 2015.

(2) If the Council finds there is no qualified organization, the certificate holder shall disburse the offset funds according to one or more contracts for implementation of offsets as determined by the following process:

(a) The Council shall establish criteria for selection of offsets, based on the reduction of net carbon dioxide emissions and the criteria set forth in OAR 345-024-0550(3) for base load plants, 345-024-0590(3) for non-base load power plants and 345-024-0620(3) for nongenerating facilities. The Council may consider the costs of particular types of offsets in relation to the expected benefits of such offsets. In establishing criteria, the Council shall not require the certificate holder to select particular offsets and shall allow the certificate holder a reasonable range of choices in selecting offsets.

(b) Based on the criteria established by the Council, the certificate holder shall select one or more offsets. The certificate holder shall give written notice of its selections to the Council and to any person requesting notice. For the purposes of this rule, the date of notice is the date the certificate holder places the notice in the United States mail, with first-class postage prepaid.

(c) On petition by the Department of Energy or by any person adversely affected or aggrieved by the certificate holder's selection of offsets, or on the Council's own motion, the Council may review the selection. The petition must be received by the Council within 30 days of the date of notice.

(d) The Council shall approve the certificate holder's selection unless it finds that the selection is not consistent with criteria established under subsection (a).

(e) The certificate holder shall execute one or more contracts to implement the selected offsets within 18 months after commencing construction of the facility unless the Council allows additional time based on a showing of good cause by the certificate holder. If a certificate holder would have made a payment to a qualified organization as described in OAR 345-024-0600(4) or 345-024-0630(4) or (5), the certificate holder shall instead execute one or more contracts to implement the selected offsets, by a method acceptable to the Council, within 18 months after reporting to the Council as described in 345-024-0590(5) or within 18 months after the Department notifies the certificate holder that the certificate holder must replenish the offset credit account as described in 345-024-0630(4). The certificate holder shall, under such contracts, obligate the expenditure of at least 85 percent of the offset funds for the implementation of offsets. The certificate holder may spend no more than 15 percent of the offset funds on monitoring, evaluation and enforcement of such contracts.

(f) The certificate holder's financial liability for implementation, monitoring, evaluation and enforcement of offsets under this subsection (2) is limited to the amount of any offset funds

not already contractually obligated. The Council shall not base a revocation of the site certificate or any other enforcement action with respect to the certificate holder on any nonperformance, negligence or misconduct by the entity or entities implementing, monitoring or evaluating the selected offsets.
(3) Every qualified organization that has received funds under this rule shall, at five-year intervals beginning on the date of receipt of such funds, provide the Council with the information the Council requests about the qualified organization's performance. The Council shall evaluate the information requested and, based on such information, shall make recommendations to the Legislative Assembly that the Council deems appropriate.

RESPONSE: We have elected to use the monetary path per OAR-345-024-0710 as designated in our response in ASC, Exhibit Y. The applicant will provide the amount of offset funds to a qualified organization that meets OAR-345-024-0720 requirements. As required by the Site Certificate, the certificate holder will provide a bond or letter of credit for the amount equal to the present value of the calculated offset funds as determined by the Council prior to beginning construction of the Facility.

2.7 OAR-345-027-0060(1)(f) Other Applicable Requirements

(f) An updated list of the owners of property located within or adjacent to the site of the facility, as described in OAR 345-021-0010(1)(f).

RESPONSE: The updated landowners list (Exhibit F - Property Owners) is included in Attachment 12.

2.8 OAR-345-027-0060(3) Analysis Area

(3) For any Council standard that requires evaluation of impacts within an analysis area, the analysis area shall be the larger of either the study area(s) as defined in OAR 345-001-0000(59) or the analysis area(s) described in the project order for the application for site certificate, unless otherwise approved in writing by the Department following a pre-amendment conference.

RESPONSE: The analysis area described in the Project Order was used in the evaluation of impacts.

2.9 OAR-345-027-0060(4) Other Information

(4) The certificate holder may incorporate, by specific reference, evidence previously submitted to the Department in the application for site certificate or previous request for amendment, or evidence that is otherwise included in the Department's record on the facility.

RESPONSE: All exhibits of the ASC are hereby incorporated by reference.

ATTACHMENT 1

Standard Air Contaminant Discharge Permit

State of Oregon
Department of
Environmental
Quality

STANDARD
AIR CONTAMINANT DISCHARGE PERMIT

Department of Environmental Quality
Eastern Region
475 NE Bellevue Dr., Suite 110
Bend, OR 97701
541-388-6146

This permit is being issued in accordance with the provisions of ORS 468A.040 and based on the land use compatibility findings included in the permit record.

ISSUED TO:

Perennial-WindChaser LLC
600 Madison Avenue, 30F
New York, NY 10022-1615

INFORMATION RELIED UPON:

Application No.: 29036
Date Received: 04/05/2017

PLANT SITE LOCATION:

Perennial WindChaser Station
78145 Westland Road
Hermiston, OR 97838

LAND USE COMPATIBILITY FINDING:

Pursuant to ORS 469, Oregon Department of Energy's Energy Facility Siting Council will determine that the proposed land use complies with state-wide planning goals prior to granting a Site Certificate.

ISSUED BY THE DEPARTMENT OF ENVIRONMENTAL QUALITY

Mark W. Bailey, Eastern Region Air Quality Manager

MAY 17 2017
Dated

Addendum No. 1
Simple Technical Permit Modification

In accordance with OAR 340-216-0020 and 340-224-0030(5), Condition 1.2.a and 1.2.b now read as follows: (Changes are highlighted)

1.2 Procedural Requirements

a. Construction must commence within 36 months of initial permit issuance. Approval terminates and is invalid if construction is not commenced within 36 months of initial permit issuance, if construction is discontinued for a period of 18 months or more, or if construction is not completed within 18 months of the scheduled time. [OAR 340-222-0030(4)]

b. DEQ may grant one additional 18-month construction approval extension for good cause as allowed in OAR 340-224-0030(5).

ATTACHMENT 2

Figure - NWI and NHD Transmission Line

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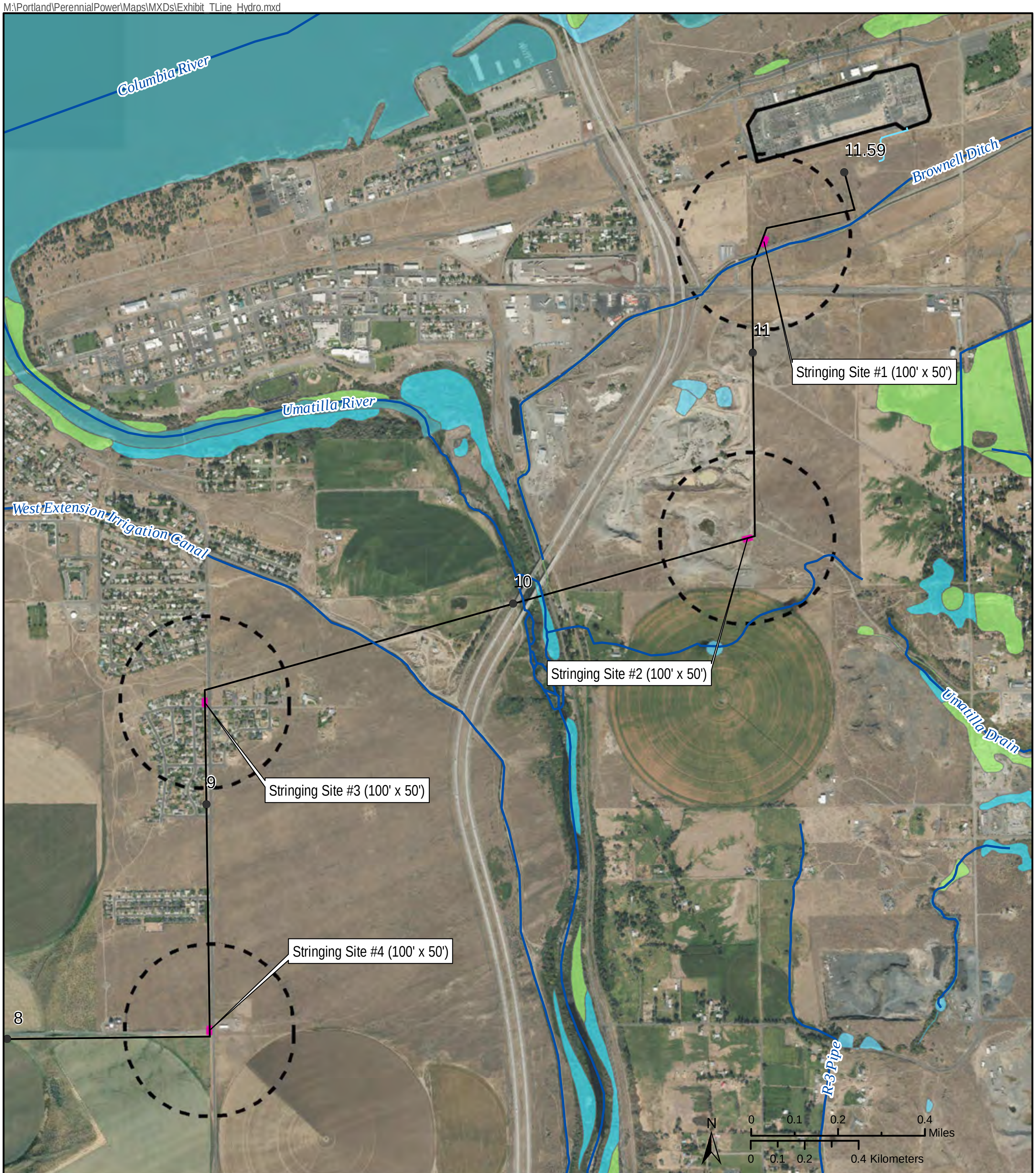

- Mileposts
- Natural Gas Pipeline
- Existing Transmission Line
- Underground Transmission Line
- Stringing Areas
- Stringing Areas 1,000-foot Buffer
- McNary Substation

- NHD Flowline

NWI Wetlands

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake

Source: NWI 2018; NHD 2018

Figure 1

NWI and NHD Transmission Line

Perennial Wind Chaser Station

January 2019

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- Mileposts
- Natural Gas Pipeline
- Existing Transmission Line
- Stringing Areas
- Stringing Areas 1,000-foot Buffer
- NHD Flowline

Source: NWI 2018; NHD 2018

Figure 2

NWI and NHD Transmission Line

Perennial Wind Chaser Station

January 2019

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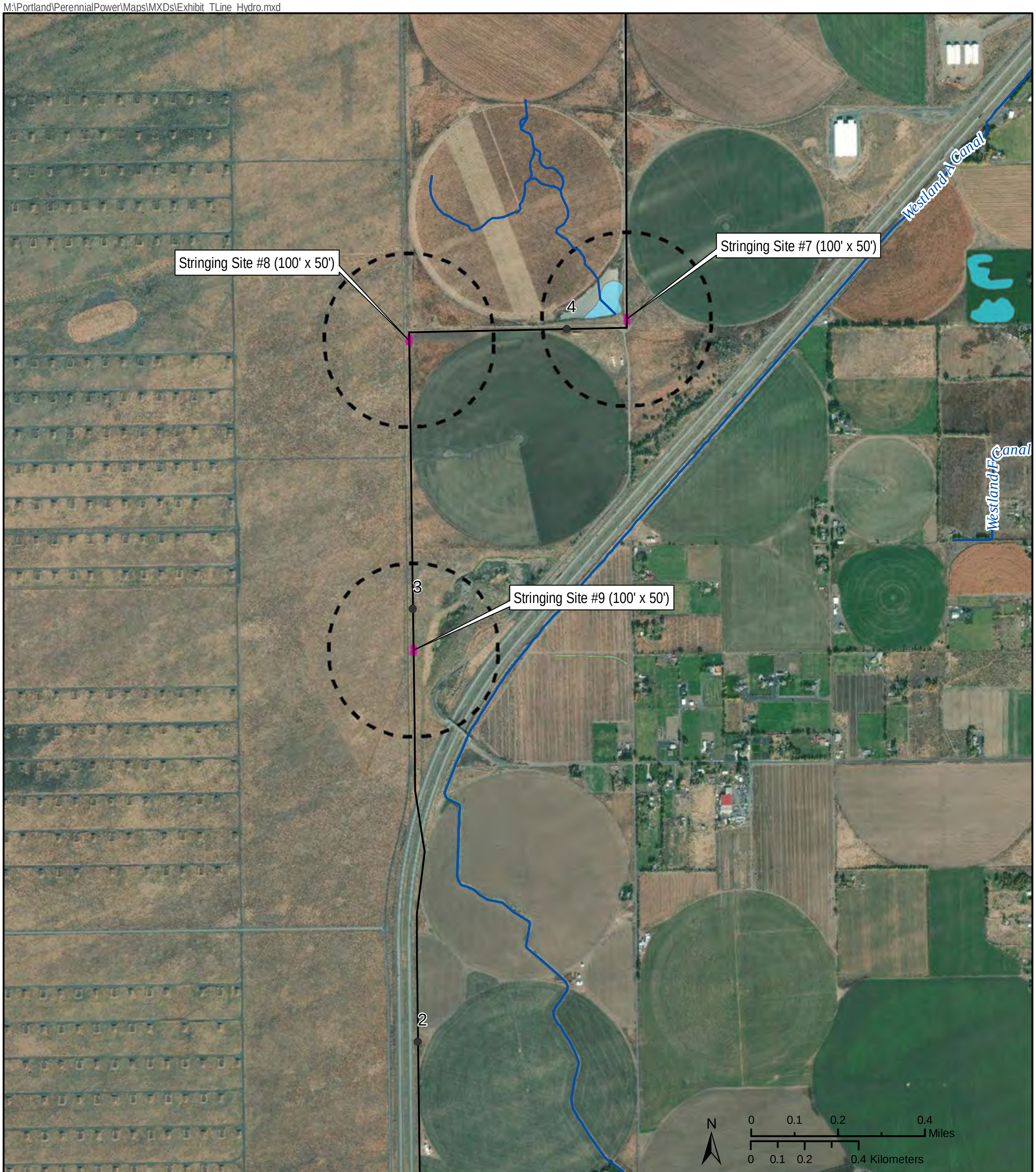

- Mileposts
- Natural Gas Pipeline
- Existing Transmission Line
- Stringing Areas
- Stringing Areas 1,000-foot Buffer
- NHD Flowline

NWI Wetlands
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

Figure 3

NWI and NHD Transmission Line

Perennial Wind Chaser Station

Source: NWI 2018; NHD 2018

January 2019

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- Mileposts
- Natural Gas Pipeline
- Existing Transmission Line
- Stringing Areas
- Stringing Areas 1,000-foot Buffer
- Energy Facility Site
- NHD Flowline

NWI Wetlands

- Freshwater Emergent Wetland
- Freshwater Pond

Figure 4

NWI and NHD Transmission Line

Perennial Wind Chaser Station

Source: NWI 2018; NHD 2018

January 2019

ATTACHMENT 3

Port of Umatilla Letter

PORT OF UMATILLA

May 30, 2018

Mr. JJ Jamieson
Senior Director, Operations and Development
Perennial Power Holdings, Inc.
24 Waterway Ave, Suite 740
The Woodlands, TX 77380

RE: PERENNIAL WIND CHASER STATION

Dear Mr. Jamieson,

The Port of Umatilla holds water rights under Permit Number 49497, Municipal Use, with an allowed rate of diversion of 155 cfs. Under this permit the Port of Umatilla has the capacity to supply process water to Perennial's Wind Chaser Station for both construction and operation.

The Port of Umatilla expects to be able to enter into a contract with Perennial Power Holdings, Inc. to supply raw water (up to 2000 gpm) to the Wind Chaser Project.

It is understood that this letter will be used as an attachment to the Perennial Wind Chaser Station's Site Certificate Renewal.

Sincerely,

Kim B. Puzey
General Manager
Port of Umatilla

ATTACHMENT 4

List and Figures of New Noise Sensitive Receptors

Tax Lot Identification	Owner	Mailing Address	City	State	Zip	Miles from feature
5N2815AA00300	GUTIERREZ MARICELA & MUNOZ OCTAVIO G	194 RIO SENDA DR	UMATILLA	OR	97882-201	0.85
5N2815AA00500	MYERS KURTIS A	190 RIO SENDA ST	UMATILLA	OR	97882-964	0.83
5N2815BA01700	CORTES YVONNE SANCHEZ	902 CHENOWITH AVE	UMATILLA	OR	97882-200	0.54
5N2815BA05100	GUZMAN GUZMAN MARIO	41 RIO SENDA ST	UMATILLA	OR	97882-960	0.48
5N2815BA07300	TOBIN THOMAS R & MARLENE	20 RIO SENDA ST	UMATILLA	OR	97882	0.42
5N2815BA07500	ARMSTRONG JENNIFER	PO BOX 1290	UMATILLA	OR	97882-129	0.44
5N2817CA03400	MKG ENTERPRISES LLC	PO BOX 368	UMATILLA	OR	97882-036	0.41
5N2818DD02700	MORGAN KEITH C & EDIE JANE	85 TRUMAN AVE	UMATILLA	OR	97882-623	0.49
5N2818DD03700	SHURTS KENDALL & KATELYN	1630 REAGAN ST	UMATILLA	OR	97882-923	0.49
5N2818DD03800	MUNIZ EUGENE	1660 REAGAN ST	UMATILLA	OR	97882-623	0.47
5N2820BB01500	ROSALES JESUS MIGUEL	PO BOX 422	HERMISTON	OR	97838-042	0.18
5N2820BB02300	MEEKS LARRY D & MEEKS LEANNA K	PO BOX 907	UMATILLA	OR	97882-090	0.13
5N2820BC08500	NEUBIG RYAN C	2644 PHEASANT RIDGE ST	UMATILLA	OR	97882-620	0.10
5N2820BC08600	HOPHAN TIMOTHY A & KAREN F	PO BOX 2096	LAKE OSWEGO	OR	97035-063	0.10
5N2820BD00100	LEON JORGE & MARIA B	288 PINE TREE AVE	UMATILLA	OR	97882-617	0.02
5N2820BD00200	NAIDENOV NICKON	300 PINE TREE AVE	UMATILLA	OR	97882-619	0.03
5N2820BD00700	YEPEZ ELSA MORALES	392 PINE TREE AVE	UMATILLA	OR	97882-619	0.07
5N2820BD00800	BERRY NOAH R	400 PINE TREE AVE	UMATILLA	OR	97882-618	0.08
5N2820BD01400	GUZMAN-GUZMAN A & YEPEZ MARISELA M	399 BOBWHITE AVE	UMATILLA	OR	97882-932	0.09
5N2820BD01800	CROCKER MICHAEL L	301 HAWK CIR	UMATILLA	OR	97882-609	0.04
5N2820BD02100	KARAN SALESH SHALENDRA & TABITHA	2444 CURLEW ST	UMATILLA	OR	97882-619	0.02
5N2820BD02500	ESQUIVEL RAMON A	PO BOX 93	UMATILLA	OR	97882-009	0.05
5N2820BD03200	ARMENTA-MADRIGAL PEDRO & ARMENTA AMALIA	400 BOBWHITE AVE	UMATILLA	OR	97882-932	0.12
5N2820BD03300	HODGE SARAH	422 BOBWHITE AVE	UMATILLA	OR	97882-932	0.13

- Mileposts
- Transmission Line
- 1-mile Study Area
- New Parcels with Sensitive Receptors

Figure 1

Sensitive Receptors

Perennial Wind Chaser Station

Source: ESRI 2018, Umatilla County Taxlots 2018

September 2018

- Mileposts
- Transmission Line
- 1-mile Study Area
- Station
- New Parcels with Sensitive Receptors

Figure 2

Sensitive Receptors

Perennial Wind Chaser Station

Source: ESRI 2018, Umatilla County Taxlots 2018

September 2018

ATTACHMENT 5

Exhibit H - Geology

EXHIBIT H

GEOLOGY

OAR 345-021-0010(1)(h)

TABLE OF CONTENTS

APPENDICES

H.1 INTRODUCTION

OAR 345-021-0010(1)(h) *Information from reasonably available sources regarding the geological and soil stability within the analysis area, providing evidence to support findings by the Council as required by OAR 345-022-0020:*

Response: This exhibit presents the results of a preliminary geologic and geotechnical assessment for the Perennial Wind Chaser Station (Station) and step-up substation. The other components of the Perennial Wind Chaser Station project (Project) will be assessed in an additional geotechnical investigation, as described in Section H.4. This exhibit was prepared using information from previously published geologic and seismic studies and preliminary site-specific geotechnical explorations. Detailed geotechnical design recommendations will be prepared in a separate report after additional subsurface explorations are completed.

Based on the evidence presented in this Exhibit, including the review of reasonably available geological and soil resources and Preliminary Geotechnical Engineering Reports provided for both site facilities, the facilities have a low risk of geo-seismic and geologic hazards. The facilities can be designed and constructed to standards that adequately protect the facilities and the public from seismic, geologic, and soil hazards.

The following sections present information required under Oregon Administrative Rule (OAR) 345-021-0010(1)(h).

H.2 GEOLOGIC REPORT

OAR 345-021-0010(1)(h)(A) *A geologic report meeting the Oregon State Board of Geologist Examiners geologic report guidelines. Current guidelines shall be determined based on consultation with the Oregon Department of Geology and Mineral Industries, as described in paragraph (B) of this subsection."*

Response: The Oregon Department of Geology and Mineral Industries (DOGAMI) open file report 00-04 "Guidelines for Engineering Geologic Reports and Site-Specific Seismic Hazard Reports" was reviewed, and Preliminary Geotechnical Engineering Reports have been provided for both sites following the requirements outlined by the DOGAMI report is presented in Appendix H-1. This report was prepared by Perennial-WindChaser LLC's (Perennial's) geotechnical consultant, Shannon & Wilson, Inc. (S&W), of Lake Oswego, Oregon. The report summarizes S&W's preliminary geotechnical investigation of the Station and step-up substation site, which was performed in January 2019. The following attachments are provided in this appendix:

- *Attachment H1, Preliminary Geotechnical Engineering Report, Perennial Wind Chaser Station, Hermiston, Oregon*; *Step-up Substation, Umatilla, Oregon*;

H.3 EVIDENCE OF CONSULTATION WITH THE OREGON DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES

OAR 345-021-0010(1)(h)(B) *A summary of consultation with the Oregon Department of Geology and Mineral Industries regarding the appropriate methodology and scope of the seismic hazards and geology and soil-related hazards assessments, and the appropriate site-specific geotechnical work that must be performed before submitting the application for the Department to determine that the application is complete.*

Response: Shannon & Wilson consulted with the Oregon Department of Geology and Mineral Industries (DOGAMI) both in 2013, for the initial preparation of Exhibit H, and in 2018, for the current revision of Exhibit H. During preparation of the geotechnical reports, S&W consulted with the DOGAMI to explain preliminary site-specific geologic explorations and evaluations performed at the Station and substation site as well as discuss available documentation reviewed. Consultation occurred by telephone on September 5, 2013, between an S&W engineering geologist, David Higgins, CEG and Bill Burns with DOGAMI. A follow-up email was sent to Mr. Burns on September 6, 2013, requesting any additional references that should be reviewed. He responded to the email on September 11, 2013. A copy of the email correspondence is provided in Appendix H-1, Appendix D.

The recent consultation for the current revisions to Exhibit H occurred by telephone on November 14, 2018. The call was attended by Adrian Holmes, CEG, and Stephen McLandrich, PE, GE, from Shannon & Wilson, and Yumei Wang, PE, from DOGAMI. Representatives from Burns & McDonnell, the Oregon Department of Energy (ODOE), RTP Environmental, and Perennial Power also attended the call. A complete list of attendees and meeting notes are included in Appendix H-1, Appendix D, along with a subsequent email documenting DOGAMI's and ODOE's comments to those meeting notes.

H.4 SITE-SPECIFIC GEOLOGIC AND GEOTECHNICAL WORK

OAR 345-021-0010(1)(h)(C) *A description and schedule of site-specific geotechnical work that will be performed before construction for inclusion in the site certificate as conditions.*

Response: Preliminary geotechnical reports, which include site-specific geotechnical explorations and engineering evaluations, are provided in Appendix H-1, Appendix A and Appendix B. The reports include an interpretation of subsurface conditions from site explorations, which were intended to provide a general understanding of site conditions. Preliminary recommendations are provided based on general site conditions and are intended for use during preliminary design to estimate facility costs and provide sufficient information for site permitting. Additional site-specific geologic and geotechnical work will be performed in the final design phase, as outlined below.

During the final design phase, it is recommended that additional geotechnical explorations and engineering evaluations be performed for the proposed Power-Generating Facility and Step-Up Substation based upon their final design layout. The additional geotechnical explorations will include field explorations, laboratory testing, and engineering studies and recommendations. The field explorations will include additional borings for the final locations of the turbine/generators, access bridge, step-up substation transmission towers, and buried transmission cable.

In situ shear wave velocity will be directly measured to a depth of 100 feet using the suspension logging method, in at least one boring at the proposed Power-Generating Facility site and Step-Up Substation site. Additional engineering evaluations will be performed based on the refined subsurface conditions. The additional engineering evaluations are:

- Refine or upgrade the seismic hazard evaluations and develop code-based ground motion design parameters for the Step-Up Substation.
- Perform site-specific ground motion study following the guidance in ASCE 7-16, Chapter 21 for the Power-Generating Facility. This study will capture long-period amplification of large and distant subduction zone events.
- Estimate soil bearing capacity and settlement for the transformer foundation, transmission tower foundation, and other geotechnical evaluations based upon the final design layout and design loads.
- Develop geotechnical recommendations for trench excavation, shoring, and backfill of the buried transmission cable, as well as trenchless excavation techniques if required. Perennial has assumed that the embedment of the buried transmission cable is relatively shallow and that open trench excavation is the preferred construction method; however, trenchless excavation may be required to pass below existing railroad tracks.
- A final geotechnical design report will be completed for the final design and construction.

H.5 TRANSMISSION LINES AND PIPELINES

OAR 345-021-0010(1)(h)(D) *For all transmission lines, and for all pipelines that would carry explosive, flammable or hazardous materials, a description of locations along the proposed route where applicant proposes to perform site-specific geotechnical work, including, but not limited to, railroad crossings, major road crossings, river crossings, dead ends (for transmission lines), corners (for transmission lines), and portions of the proposed route where geological reconnaissance and other site-specific studies provide evidence of existing landslides, marginally* *stable slopes or potentially liquefiable soils that could be made unstable by the planned construction or experience impacts during the facility's operation.*

Response*:*

Transmission Lines: The transmission lines for the Perennial Wind Chaser Station project utilize existing infrastructure between the proposed Power-Generating Facility and Step-Up Substation. Several new transmission structures are anticipated, connecting the generating facility east of Westland Road with existing infrastructure directly across the street on the west side of Westland Road. A proposed underground transmission line, at a few-hundred feet long, is anticipated to connect the proposed Step-Up Substation with the existing McNary Substation.

The locations of new transmission structures for transmission lines exiting the proposed Power-Generating Facility have not yet been determined. The proposed location of the underground transmission line between the Step-Up Substation and McNary Substation is shown in Appendix H-1, Attachment H2, Figure 2.

As discussed in Section H.3, additional geotechnical explorations and engineering evaluations may be needed prior to the construction of new transmission structures and the underground transmission line. The need for site-specific geotechnical explorations and the type of explorations will be determined based on geologic reconnaissance, once final locations for the transmission structures and the underground transmission line alignment

Pipelines: A proposed natural gas pipeline will approach the Power-Generating Facility from the south and enter the facility on the east side. The proposed natural gas pipeline will run parallel to an existing natural gas pipeline within existing right-of-way until it enters the generating facility boundary.

Geotechnical explorations are not routinely required for shallow, small-diameter gas pipelines in trenched excavations. We do not anticipate that site-specific geotechnical work will be needed to evaluate the pipeline alignment, unless the pipeline is large or requires a deep excavation. We assume that the new gas line will be installed at a similar depth and using similar construction techniques to the existing parallel gas line.

We reviewed maps showing the location of the pipeline, and the topography is flat-lying agricultural landscape with no mapped landslides. Based on our review of area mapping and surface observations near the pipeline, there are no known slope hazards.

If trenchless excavation techniques are used to construct the gas line below Westland A Canal and Highline Canal, we recommend geotechnical borings be performed on each side of the canals during final design. The purpose of the borings will be to determine the minimum depth of the pipeline below the canal. In our opinion, trenchless excavation techniques are feasible and do not pose an elevated hazard.

H.6 SEISMIC HAZARD ASSESSMENT

OAR 345-021-0010(1)(h)(E) *An assessment of seismic hazards, in accordance with standard-of-practice methods and best practices, that addresses all issues relating to the consultation with the Oregon Department of Geology and Mineral Industries described in paragraph (B) of this subsection, and an explanation of how the applicant will design, engineer, construct, and operate the facility to avoid dangers to human safety and the environment from these seismic hazards. Furthermore, an explanation of how the applicant will design, engineer, construct and operate the facility to integrate disaster resilience design to ensure recovery of operations after major disasters. The applicant shall include proposed design and engineering features, applicable construction codes, and any monitoring and emergency measures for seismic hazards, including tsunami safety measures if the site is located in the DOGAMI-defined tsunami evacuation zone.:*

<u>Response</u>:

Review of Seismic Sources: Earthquakes in the Pacific Northwest occur largely as a result of the collision between the Juan de Fuca plate and the North American plate. These two tectonic plates meet along a mega thrust fault called the Cascadia Subduction Zone (CSZ). The CSZ runs approximately parallel to the coastline from northern California to southern British Columbia. The compressional forces that exist between these two colliding plates cause the denser oceanic plate to descend, or subduct, beneath the continental plate. This process leads to contortion and faulting of both plates and volcanism along the Cascade Range.

Within the present understanding of the regional tectonic framework and historical seismicity, three broad earthquake sources have been identified. These three types of earthquakes and their maximum plausible earthquakes, as determined by the 2014 Oregon Structural Specialty Code, are as follows:

- Subduction Zone Interface (also referred to as Interplate) Earthquakes originate along the CSZ, which is located 25 miles (40 kilometers [km]) beneath the coastline. Paleoseismic evidence and historic tsunami studies indicate that the most recent subduction zone thrust fault event occurred in the year 1700, probably ruptured the full length of the CSZ, and may have reached a Magnitude of 9.
- Deep-focus, Intraplate (also referred to as Intraslab) Earthquakes originate from within the subducting Juan de Fuca oceanic plate as a result of the downward bending and contortion of the plate. These earthquakes typically occur 28 to 38 miles (45 to 61 km) beneath the surface. Such events could be as large as Moment Magnitude 7.5. Examples

of this type of earthquake include the 1949 Magnitude 7.1 Olympia earthquake, the 1965 Magnitude 6.5 earthquake between Tacoma and Seattle, and the 2001 Nisqually earthquake at Magnitude 6.8, slightly north of Olympia. Intraslab events have occurred frequently in Puget Sound, but historically are rare in Oregon.

- Shallow-focus Crustal Earthquakes are typically located within the upper 12 miles (19 km) of the continental crust and could be generated by contortion of the overriding North American plate beneath the project area. The largest known crustal earthquake in the Pacific Northwest is the 1872 North Cascades quake at Magnitude 7.4. Other examples include the 1993 Magnitude 5.6 Scotts Mill earthquake and Magnitude 6 Klamath Falls earthquake.

Shallow crustal faults and folds throughout Oregon and Washington have been located and characterized by the United States Geological Survey (USGS). The USGS provides approximate fault locations and a detailed summary of the available fault information in the USGS Quaternary Fault and Fold Database. The database defines four categories of faults, Classes A through D, based on evidence of tectonic movement known or presumed to be associated with large earthquakes during Quaternary time (within the last 1.6 million years).

For Class A faults, geologic evidence demonstrates that a tectonic fault exists and that it has likely been active within the Quaternary period. For Class B faults, there is equivocal geologic evidence of Quaternary tectonic deformation, or the fault may not extend deep enough to be considered a source of significant earthquakes. Class C and D faults lack convincing geologic evidence of Quaternary tectonic deformation, or have been studied carefully enough to determine that they are not likely to generate significant earthquakes.

According to the USGS Oregon Fault and Fold database, there are Class A fault systems (a system has multiple fault segments) and Class B fault systems within approximately 80 kilometers (50 miles) of the project sites. The locations of Quaternary faults mapped by the USGS within a 50-mile radius of each facility site are shown on Figure 5 of Appendix H-1, along with active faults mapped by the Washington Department of Natural Resources, and DOGAMI-mapped faults.

Available lidar data around each site was reviewed, shown in Figure 3 of Appendix H-1, to look for evidence of additional potentially active faults. In Perennial's opinion, review of the available lidar data did not disclose any faults that are not already shown on Figure 5 of Appendix H-1.

Code-Based Ground Motion Parameters: The current building code that applies to the seismic performance of structures at this site is the 2014 Oregon Structural Specialty Code. This code incorporates and, in some cases, modifies the 2012 International Building Code (IBC). IBC 2012 refers to ASCE 7-10. The IBC has been recently revised and the current version is dated 2018.

ASCE 7 has also been more recently revised and the current version is dated 2016 and is referred to as ASCE 7-16.

It is anticipated that the Oregon Building Code Division will be adopting IBC 2018 with modifications that are currently under review for incorporation. The new 2019 Oregon Structural Specialty Code is anticipated to be adopted sometime at the end of 2019. We anticipate that the permitting for this project will be required to meet the newer code. For completeness, code-based design ground motion parameters are developed for both the current building code and IBC 2018.

Code-based design ground motion parameters are generated using the appropriate seismic hazard maps. The 2014 Oregon Structural Specialty Code uses the 2008 seismic hazard maps while IBC 2018 uses the 2014 seismic hazard maps. The ground motion parameters obtained from the both 2008 and 2014 seismic hazard maps are based on a site that is on the boundary of Site Class Band Site Class C. These mapped values need to be modified to account for subsurface conditions at the site by applying site class coefficients. The subsurface explorations at both facility sites correspond to Site Class C (very dense soil and soft rock) according to both the current and the anticipated future code. This site class was determined using Standard Penetration Test (SPT) blow counts. During geotechnical exploration for final design, direct measurement of the shear wave velocity at the power generation site can be used to confirm this.

We generated the mapped values of Ss, S1, and PGAM using the online web application available through USGS (USGS, 2018a). Exhibit 6-1 of Appendix H-1 presents the ground motion design parameters at each site and for each code.

Geo-Seismic Hazards: An assessment of seismic hazards expected to result from reasonably probable seismic events is included in the Preliminary Geotechnical Engineering Reports in Appendices A and B of Appendix H-1. Seismic hazards considered for the design seismic event include strong ground shaking, liquefaction, liquefaction-induced lateral spreading, liquefaction-induced settlement seismically-induced landslide, fault rupture/displacement, and tsunami inundation. A summary of these assessments is provided in Appendix H-1.

Seismic Resiliency: The engineering and design of the Step-Up Substation and the Power Generation Facility will meet the seismic performance requirements of Risk Category III structures as defined by the 2014 Oregon Structural Specialty Code or, if a new code is adopted prior to the final permitting process, the future 2019 Oregon Structural Specialty Code. Based on site-specific geotechnical explorations and preliminary geotechnical evaluations, the site has little to negligible risk for geo-seismic hazards besides strong shaking from an earthquake. Furthermore, we understand that operators of the facilities will have an emergency response plan for disasters (similar to the one currently in place at the existing Hermiston facility) to ensure that the facilities will return to normal operation as quickly as practical after a disaster.

H.7 NON-SEISMIC GEOLOGIC HAZARDS

OAR 345-021-0010(1)(h)(F) *An assessment of geology and soil-related hazards which could, in the absence of a seismic event, adversely affect or be aggravated by the construction or operation of the facility, in accordance with standard-of-practice methods and best practices, that address all issues relating to the consultation with the Oregon Department of Geology and Mineral Industries described in paragraph (B) of this subsection. An explanation of how the applicant will design, engineer, construct and operate the facility to adequately avoid dangers to human safety and the environment presented by these hazards, as well as:*

(i) An explanation of how the applicant will design, engineer, construct and operate the facility to integrate disaster resilience design to ensure recovery of operations after major disasters.

(ii) An assessment of future climate conditions for the expected life span of the proposed facility and the potential impacts of those conditions on the proposed facility.

Response:

Non-Seismic Geologic Hazards: Non-seismic geologic hazards considered for the site facilities include landslides, flooding, soil erosion, collapsing soils, and high winds.

Neither the Power Generating Facility or Step-Up Substation are within mapped landslide areas, according to the Statewide Landslide Information Database for Oregon (DOGAMI, 2017). Both sites are also relatively flat, and, based on the materials encountered in the preliminary borings, we do not anticipate landslide risks at either site.

According to Federal Emergency Management Agency (FEMA) National Flood Insurance Program (NFIP) mapping, the Power-Generating Facility is in Zone X, which is outside the 0.2 percent annual chance (500-year) floodplain (FEMA, 2018). According to the same mapping, the Step-Up Substation is in Zone D, which includes areas in which flood hazards are "undetermined, but possible." However, the Step-Up Substation is at a similar elevation as downtown Umatilla, which is mapped as Zone X (outside the 500-year floodplain). Based on the FEMA mapping, the risk of flooding appears to be low at both sites.

Both the generating and substation facility site soils are classified as moderately erodible on United States Soil Conservation Service mapping. However, soil erosion is a low risk because site facilities will generally be founded on gravel and bedrock, and most surfaces will be paved or covered by gravel. Erodible soils will be mitigated with site pavements and cover. Exposed soils should be vegetated to resist erosion and drainage facilities should be installed to capture runoff. Area drainage can be conveyed to near-surface gravel deposits with high infiltration potential.

As discussed in our Preliminary Geotechnical Engineering Reports in Appendix A and Appendix B, collapsible soils are a potential hazard at both facility sites. Recommendations for mitigation of collapsible soils are included in the Preliminary Geotechnical Engineering Reports.

High winds are prevalent in the vicinity of the proposed facilities, but site facilities will be designed to resist high wind loads in accordance with applicable construction codes.

<u>Response:</u> (Disaster Resilience - OAR 345-021-0010(1)(h)(F)(i))

Section 6.2.4 discusses how the two facilities will be designed to handle seismic hazards. The risk of other natural disasters is low, as discussed in Section 7.2.1, above.

<u>Response:</u> (Future Climate Conditions - OAR 345-021-0010(1)(h)(F)(ii))

Most climate scientists believe that Earth's climate will continue to change throughout the design life of these two projects. The Oregon Global Warming Commission published a "Biennial Report to the Legislature" in November of 2018, indicating that anticipated effects of climate change in the State of Oregon will include increased temperatures, droughts, wildfires, flooding, and sea level rise. However, these anticipated impacts of climate change will not likely affect the proposed new structures.

Increased temperatures and droughts would not have significant adverse impacts on the Step-Up Substation or the Power-Generating Facility. Increased ambient temperatures would only mildly affect the performance of the combustion turbines at the Power Generating Facility. Dryer conditions would not inherently affect turbine operation at all, though particulate matter in the air from significant wildfires (brought on with increased frequency by drought) could have mild impacts to combustion turbine performance. These mild impacts to combustion turbine performance would not cause the Power-Generating Facility to fail catastrophically or to stop operating.

There may be an increase in the frequency of extreme weather events such as windstorms or snow/ice storms. However, the loading imposed on the structures from such storms would be captured in the current and anticipated building codes.

According to a USGS study of future climate effects on the Columbia and Willamette River levees (USGS, 2018b), the Pacific Northwest is projected to experience a decline in spring snowpack, earlier snowmelt, and earlier peaking streams, with some basins experiencing higher peak flows. This could impact the Columbia and Umatilla Rivers and cause elevated flood levels. However, flooding and sea level rise are not expected to have any adverse impacts on the Step-Up Substation or the Power-Generating Facility because of the elevation of the sites. Both the Power-Generating Facility and Step-Up Substation sites appear to be outside the currently mapped 500-year. floodplain, making the risk of climate change-related flooding relatively low.

Even a substantial rise in sea levels is not expected to impact the sites over the project's life span. Even if significant rainfall or snowmelt events increase due to climate change, it is not anticipated that flooding would increase to the point of causing significant damage to either site.

H.8 REFERENCES

DOGAMI, 2017, Statewide Landslide Information Database for Oregon (SUDO), Version 3.4, released December 14, 2017, accessed December 26, 2018, Available: https://gis.dogami.oregon.gov/maps/slido/.

FEMA, 2018, FEMA Flood Map Service Center, accessed December 26, 2018, Available: https://msc.fema.gov /portal/home.

Lidke, D.J., compiler, 2003, Fault number 569, unnamed fault north of Service Anticline, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, https://earthquakes.usgs.gov/hazards/qfaults, accessed 12/27/2018 09:25 PM.

Oregon Global Warming Commission, 2018, Biennial Report to the Legislature for the 2019 Legislative Session: Oregon Global Warming Commission, Salem, Oregon, 85 p.

U.S. Geologic Survey, 2018a, Seismic Design Web Service Documentation, accessed December 26, 2018, Available: https://earthquake.usgs.gov/ws/designmaps/

U.S. Geologic Survey, 2018b, Oregon Water Science Center Web Service Documentation, accessed December 26, 2018, Available: https://www.usgs.gov/centers/or-water/ science/future-climate-effects-columbia-and-willamette-river-levees?qt-science center_objects= 1 #qt-science_center_objects.

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APPENDIX H-1 – Perennial Wind Chaser Station, Exhibit H Geology and Seismicity, OAR 345-021-0010(1)(H), Power Generating Facility, Hermiston, Oregon, Step-up Substation Umatilla, Oregon

SUBMITTED TO:
Burns & McDonnell
9400 Ward Parkway
Kansas City, Missouri 64114

BY:
Shannon & Wilson, Inc.
3990 Collins Way, Suite 100
Lake Oswego, OR 97035

503-210-4750
www.shannonwilson.com

EXHIBIT H: GEOLOGY AND SEISMICITY

Perennial Wind Chaser Station

POWER-GENERATING FACILITY - HERMISTON, OREGON
STEP-UP SUBSTATION - UMATILLA, OREGON

February 13, 2019

Shannon & Wilson No: 102032-002

SHANNON & WILSON

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Submitted To: Burns & McDonnell
9400 Ward Parkway
Kansas City, Missouri 64114
Attn: Jim Hawkins

Subject: EXHIBIT H: GEOLOGY AND SEISMICITY, PERENNIAL WIND CHASER STATION, POWER-GENERATING FACILITY - HERMISTON, OREGON STEP-UP SUBSTATION - UMATILLA, OREGON

Shannon & Wilson participated in this project as a subconsultant to Burns & McDonnell. Our scope of services was specified in our Work Authorization Number SW009G, dated December 3, 2018.

In 2013, under a previous scope of services, Shannon & Wilson performed field explorations and prepared Preliminary Geotechnical Reports for both a proposed Power-Generating Facility and a proposed substation associated with the project. As part of those services, we also prepared Exhibit H of the original Application for Site Certificate.

Our current scope of services entails updating the Exhibit H document so that it is consistent with current Oregon Administrative Rules (OARs). The findings and recommendations in this revised Exhibit H report, dated February 13, 2019, supersede those provided in all previous versions of this document. This report was reissued as final to include requested edits to the proposed geotechnical investigation work.

Sincerely,

SHANNON & WILSON, INC.

CERTIFIED
OREGON
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ENGINEERING GEOLOGIST
renews 1/1/2020

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ACRONYMS

Acronyms

ASC	Application for Site Certificate
CEG	Certified Engineering Geologist
CSZ	Cascadia Subduction Zone
DOGAMI	Oregon Department of Geology and Mineral Industries
FEMA	Federal Emergency Management Agency
GE	Geotechnical Engineer
IBC	International Building Code
ka	Thousand years
km	Kilometer
Ma	Million years
MCE	Maximum Credible Earthquake
MconE	Maximum Considered Earthquake
mm	Millimeter
MPE	Maximum Probable Earthquake
NFIP	National Flood Insurance Program
OAR	Oregon Administrative Rule
PE	Professional Engineer
USGS	United States Geological Survey
yr	Year

1 INTRODUCTION

1.1 OAR 345-021-0010(1)(h)

"Information from reasonably available sources regarding the geological and soil stability within the analysis area, providing evidence to support findings by the Council as required by OAR 345-022-0020, including:"

1.2 OAR 345-021-0010(1)(h) Response

Perennial-Wind Chaser, LLC (Perennial), is planning to construct a new 4x100-megawatt GE LMS100 Power-Generating Facility in Hermiston, Oregon, as part of the Wind Chaser Station Project. The location of the proposed Power-Generating Facility is in an agricultural field located on the east side of Westland Road, approximately one-half mile north of I-84. In support of the Power-Generating Facility, a Step-Up Substation will be located in an agricultural field immediately south of the Bonneville Power Administration (BPA) McNary Substation in Umatilla, Oregon. The locations of both the Power-Generating Facility and Step-Up Substation are shown on the Vicinity Map, Figure 1.

OAR 345-021-0010(1)(h) requires that the Application for Site Certificate (ASC) for the proposed facilities must provide information from reasonably available sources addressing geological and soil stability and provide evidence to support findings. The information provided within this Exhibit is intended to address the requirements of OAR 345-021-0010(1)(h)(A, B, C, D, E, and F).

Based on the evidence presented in this Exhibit, including the review of reasonably available geological and soil resources and Preliminary Geotechnical Engineering Reports provided for both site facilities, the facilities have a low risk of geo-seismic and geologic hazards. The facilities can be designed and constructed to standards that adequately protect the facilities and the public from seismic, geologic, and soil hazards.

2 GEOLOGIC REPORT

2.1 OAR 345-021-0010(1)(h)(A)

"A geologic report meeting the Oregon State Board of Geologist Examiners geologic report guidelines. Current guidelines shall be determined based on consultation with the Oregon

Department of Geology and Mineral Industries, as described in paragraph (B) of this subsection."

2.2 OAR 345-021-0010(1)(h)(A) Response

The Oregon Department of Geology and Mineral Industries (DOGAMI) open file report 00-04 "Guidelines for Engineering Geologic Reports and Site-Specific Seismic Hazard Reports" was reviewed, and Preliminary Geotechnical Engineering Reports have been provided for both sites following the requirements outlined by the DOGAMI report. The Preliminary Geotechnical Engineering Reports, including geologic reporting, for the Power-Generating Facility and Step-Up Substation are included in Appendix A and Appendix B, respectively. Geologic maps of sites are shown in Figure 2; lidar maps of the sites are shown in Figure 3, and soils maps of sites are shown in Figure 4.

DOGAMI open file report 00-04 requires a "Disclosure statement of geologist's financial interest, if any, in the project or client's organization." Shannon & Wilson, Inc. (Shannon & Wilson), was retained by Burns & McDonnell to assist with development of the Exhibit H report for the Perennial Wind Chaser Station project for the Perennial-Wind Chaser, LLC, organization. Neither Shannon & Wilson nor the authors of this report have a financial interest in the project or organization.

DOGAMI open file report 00-04 requires discussion of "Other significant engineering geologic characteristics or concerns, such as fluctuating water table and the effects of proposed modification of future hydrologic processes." A discussion of current groundwater conditions is included in preliminary geotechnical engineering reports for both the Power-Generating Facility and Step-Up Substation. In our opinion, the only potential significant impact on the hydrologic processes at either facility would be from a water supply well, if constructed. Geotechnical explorations encountered shallow groundwater within a gravel alluvium aquifer at the Power-Generating Facility and did not encounter groundwater at the Step-Up Substation.

We understand that a groundwater pumping well with a proposed pumping rate of up to 5,000 gallons per day may be installed at the Power-Generating Facility and that there will not be a pumping well at the Step-Up Substation. Groundwater was encountered 27 feet below the ground surface at the Power-Generating Facility site, and the gravel aquifer extends to the base of the borings, to a minimum depth of 90 feet.

Shannon & Wilson performed an evaluation of potential impacts from groundwater pumping at the proposed Power-Generating Facility. The evaluation is summarized in a letter, dated July 25, 2014, which is included in Appendix C. Based on the evaluation, the gravel aquifer is likely sufficient to supply 5,000 gallons of water a day with no significant impacts on area wells screened in the same aquifer. Many area agricultural wells tap the deep regional basalt aquifer that is not directly connected to the shallow gravel aquifer at the Power-Generating Facility site. Actual impacts from pumping would be determined during a drawdown test after the production well is installed.

3 DOGAMI CONSULTATION

3.1 OAR 345-021-0010(1)(h)(B)

"A summary of consultation with the Oregon Department of Geology and Mineral Industries regarding the appropriate methodology and scope of the seismic hazards and geology and soil-related hazards assessments, and the appropriate site-specific geotechnical work that must be performed before submitting the application for the Department to determine that the application is complete."

3.2 OAR 345-021-0010(1)(h)(B) Response

Shannon & Wilson consulted with the Oregon Department of Geology and Mineral Industries (DOGAMI) both in 2013, for the initial preparation of Exhibit H, and in 2018, for the current revision of Exhibit H.

The initial consultation regarding Exhibit H occurred by telephone on September 5, 2013, between a Shannon & Wilson engineering geologist, David Higgins, CEG, and DOGAMI engineering geologist, Bill Burns, CEG. They discussed preliminary site-specific geologic explorations and evaluations performed at the facility sites, as well as available documentation reviewed. A follow-up email was sent to Bill Burns on September 6, 2013, which he responded to on September 11, 2013. A copy of that email correspondence is provided in Appendix D.

The recent consultation for the current revisions to Exhibit H occurred by telephone on November 14, 2018. The call was attended by Adrian Holmes, CEG, and Stephen McLandrich, PE, GE, from Shannon & Wilson, and Yumei Wang, PE, from DOGAMI. Representatives from Burns & McDonnell, the Oregon Department of Energy (ODOE), RTP Environmental, and Perennial Power also attended the call. A complete list of attendees and meeting notes are included in Appendix D, along with a subsequent email documenting DOGAMI's and ODOE's comments to those meeting notes.

4 ADDITIONAL GEOTECHNICAL WORK

4.1 OAR 345-021-0010(1)(h)(C)

"A description and schedule of site-specific geotechnical work that will be performed before construction for inclusion in the site certificate as conditions."

4.2 OAR 345-021-0010(1)(h)(C) Response

Preliminary geotechnical reports, which include site-specific geotechnical explorations and engineering evaluations, are provided in Appendix A and Appendix B. The reports include an interpretation of subsurface conditions from site explorations, which were intended to provide a general understanding of site conditions. Preliminary recommendations are provided based on general site conditions and are intended for use during preliminary design to estimate facility costs and provide sufficient information for site permitting.

During the final design phase, we recommend that additional geotechnical explorations and engineering evaluations be performed for the proposed Power-Generating Facility and Step-Up Substation based upon their final design layout. The additional geotechnical explorations will include field explorations, laboratory testing, and engineering studies and recommendations. The field explorations will include additional borings for the final locations of turbine/generators, access bridge, substation transmission towers, and the buried transmission cable.

In situ shear wave velocity will be directly measured to a depth of 100 feet, using the suspension logging method, in at least one boring at the proposed Power-Generating Facility site and Step-Up Substation site. Additional engineering evaluations will be performed based upon the refined subsurface conditions. The additional engineering evaluations will include the following:

- Refine or upgrade the seismic hazard evaluations and develop code-based ground motion design parameters for the Step-Up Substation.
- Perform site-specific ground motion study following the guidance in ASCE 7-16, Chapter 21 for the Power-Generating Facility. This study will capture long-period amplification of large and distant subduction zone events.
- Estimate the soil bearing capacity and settlement for the transformer foundation, transmission tower foundation, and other geotechnical evaluations based upon the final design layout and design loads.
- Develop geotechnical recommendations for trench excavation, shoring, and backfill of the buried transmission cable, as well as trenchless excavation techniques, if required. We have assumed that the embedment of the buried transmission cable is relatively

shallow, and open-trench excavation is the preferred construction method. However, trenchless excavation may be required to pass below exiting railroad tracks.

- A final geotechnical design report will be completed for the final design and construction.

5 TRANSMISSION LINES AND PIPELINES

5.1 OAR 345-021-0010(1)(h)(D)

" For all transmission lines, and for all pipelines that would carry explosive, flammable or hazardous materials, a description of locations along the proposed route where the applicant proposes to perform site specific geotechnical work, including but not limited to railroad crossings, major road crossings, river crossings, dead ends (for transmission lines), corners (for transmission lines), and portions of the proposed route where geologic reconnaissance and other site specific studies provide evidence of existing landslides, marginally stable slopes or potentially liquefiable soils that could be made unstable by the planned construction or experience impacts during the facility's operation."

5.2 OAR 345-021-0010(1)(h)(D) Response

5.2.1 Transmission Lines

The transmission lines for the Perennial Wind Chaser Station project utilize existing infrastructure between the proposed Power-Generating Facility and Step-Up Substation. Several new transmission structures are anticipated, connecting the generating facility east of Westland Road with existing infrastructure directly across the street on the west side of Westland Road. A proposed underground transmission line, at a few-hundred feet long, is anticipated to connect the proposed Step-Up Substation with the existing McNary Substation.

The locations of new transmission structures for transmission lines exiting the proposed Power-Generating Facility have not yet been determined. The proposed location of the underground transmission line between the Step-Up Substation and McNary Substation is shown in Attachment H2, Figure 2.

As discussed in Section 3.1, additional geotechnical explorations and engineering evaluations may be needed prior to the construction of new transmission structures and the underground transmission line. The need for site-specific geotechnical explorations and the type of explorations will be determined based on geologic reconnaissance, once final locations for the transmission structures and the underground transmission line alignment are determined. Currently, we anticipate geotechnical explorations and additional engineering evaluations will be needed where the proposed underground transmission line crosses below the existing railroad tracks between the Step-Up and McNary Substations.

5.2.2 Pipelines

A proposed natural gas pipeline will approach the Power-Generating Facility from the south and enter the facility on the east side. The proposed natural gas pipeline will run parallel to an existing natural gas pipeline within existing right-of-way until it enters the generating facility boundary.

Geotechnical explorations are not routinely required for shallow, small-diameter gas pipelines in trenched excavations. We do not anticipate that site-specific geotechnical work will be needed to evaluate the pipeline alignment, unless the pipeline is large or requires a deep excavation. We assume that the new gas line will be installed at a similar depth and using similar construction techniques to the existing parallel gas line.

We reviewed maps showing the location of the pipeline, and the topography is flat-lying agricultural landscape with no mapped landslides. Based on our review of area mapping and surface observations near the pipeline, there are no known slope hazards.

If trenchless excavation techniques are used to construct the gas line below Westland A Canal and Highline Canal, we recommend geotechnical borings be performed on each side of the canals during final design. The purpose of the borings will be to determine the minimum depth of the pipeline below the canal. In our opinion, trenchless excavation techniques are feasible and do not pose an elevated hazard.

6 SEISMIC HAZARD ASSESSMENT

6.1 OAR 345-021-0010(1)(h)(E)

" An assessment of seismic hazards, in accordance with standard-of-practice methods and best practices, that addresses all issues relating to the consultation with the Oregon Department of Geology and Mineral Industries described in paragraph (B) of this subsection, and an explanation of how the applicant will design, engineer, construct, and operate the facility to avoid dangers to human safety and the environment from these seismic hazards. Furthermore, an explanation of how the applicant will design, engineer, construct and operate the facility to integrate disaster resilience design to ensure recovery of operations after major disasters. The applicant shall include proposed design and engineering features, applicable construction codes, and any monitoring and emergency measures for seismic hazards, including tsunami safety measures if the site is located in the DOGAMI-defined tsunami evacuation zone."

6.2 OAR 345-021-0010(1)(h)(E) Response

6.2.1 Review of Seismic Sources

Earthquakes in the Pacific Northwest occur largely as a result of the collision between the Juan de Fuca plate and the North American plate. These two tectonic plates meet along a mega thrust fault called the Cascadia Subduction Zone (CSZ). The CSZ runs approximately parallel to the coastline from northern California to southern British Columbia. The compressional forces that exist between these two colliding plates cause the denser oceanic plate to descend, or subduct, beneath the continental plate. This process leads to contortion and faulting of both plates and volcanism along the Cascade Range.

Within the present understanding of the regional tectonic framework and historical seismicity, three broad earthquake sources have been identified. The three types of earthquakes and the characteristic moment magnitudes, considered by the 2014 Oregon Structural Specialty Code, are as follows:

- Subduction Zone Interface (also referred to as Interplate) Earthquakes originate along the CSZ, which is located 25 miles beneath the coastline. Paleoseismic evidence and historic tsunami studies indicate that the most recent subduction zone thrust fault event occurred in the year 1700, probably ruptured the full length of the CSZ, and may have reached a Magnitude 9.
- Deep-focus, Intraplate (also referred to as Intraslab) Earthquakes originate from within the subducting Juan de Fuca oceanic plate as a result of the downward bending and contortion of the plate. These earthquakes typically occur 28 to 38 miles beneath the surface. Such events could be as large as Moment Magnitude 7.5. Examples of this type of earthquake include the 1949 Magnitude 7.1 Olympia earthquake, the 1965 Magnitude 6.5 earthquake between Tacoma and Seattle, and the 2001 Nisqually (slightly north of Olympia) earthquake at Magnitude 6.8. Intraslab events have occurred frequently in Puget Sound but historically are rare in Oregon.
- Shallow-focus Crustal Earthquakes are typically located within the upper 12 miles of the continental crust and could be generated by contortion of the overriding North American plate beneath the project area. The largest known crustal earthquake in the Pacific Northwest is the 1872 North Cascades quake at Magnitude 7.4. Other examples include the 1993 Magnitude 5.6 Scotts Mill earthquake and 1993 Magnitude 6 Klamath Falls earthquake.

Shallow crustal faults and folds throughout Oregon and Washington have been located and characterized by the United States Geological Survey (USGS). The USGS provides approximate fault locations and a detailed summary of the available fault information in the USGS Quaternary Fault and Fold Database. The database defines four categories of faults, Class A through D, based on evidence of tectonic movement known or presumed to be associated with large earthquakes during Quaternary time (within the last 1.6 million years).

For Class A faults, geologic evidence demonstrates that a tectonic fault exists and that it has likely been active within the Quaternary period. For Class B faults, there is equivocal geologic evidence of Quaternary tectonic deformation, or the fault may not extend deep enough to be considered a source of significant earthquakes. Class C and D faults lack convincing geologic evidence of Quaternary tectonic deformation, or have been studied carefully enough to determine that they are not likely to generate significant earthquakes.

According to the USGS Oregon Fault and Fold database, there are Class A fault systems (a system has multiple fault segments) and Class B fault systems within approximately 80 kilometers (50 miles) of the project sites. The locations of Quaternary faults mapped by the USGS within a 50-mile radius of each facility site are shown on Figure 5, along with active faults mapped by the Washington Department of Natural Resources, and DOGAMI-mapped faults.

We reviewed available lidar data around each site, shown in Figure 3, to look for evidence of additional potentially active faults. In our opinion, review of the available lidar data did not disclose any faults that are not already shown on Figure 5.

6.2.2 Code-Based Ground Motion Parameters

The current building code that applies to the seismic performance of structures at this site is the 2014 Oregon Structural Specialty Code. This code incorporates and, in some cases, modifies the 2012 International Building Code (IBC). IBC 2012 refers to ASCE 7-10. The IBC has been recently revised and the current version is dated 2018. ASCE 7 has also been more recently revised and the current version is dated 2016 and is referred to as ASCE 7-16.

It is anticipated that the Oregon Building Code Division will be adopting IBC 2018 with modifications that are currently under review for incorporation. The new 2019 Oregon Structural Specialty Code is anticipated to be adopted sometime at the end of 2019. We anticipate that the permitting for this project will be required to meet the newer code. For completeness, code-based design ground motion parameters are developed for both the current building code and IBC 2018.

Code-based design ground motion parameters are generated using the appropriate seismic hazard maps. The 2014 Oregon Structural Specialty Code uses the 2008 seismic hazard maps while IBC 2018 uses the 2014 seismic hazard maps. The ground motion parameters obtained from the both 2008 and 2014 seismic hazard maps are based on a site that is on the boundary of Site Class B and Site Class C. These mapped values need to be modified to account for subsurface conditions at the site by applying site class coefficients. The subsurface explorations at both facility sites correspond to Site Class C (very dense soil and soft rock) according to both the current and the anticipated future code. This site class was determined using Standard Penetration Test (SPT) blow counts. During geotechnical exploration for final design, direct measurement of the shear wave velocity at the power generation site can be used to confirm this.

We generated the mapped values of S_S, S_1, and PGA_M using the online web application available through USGS (USGS, 2018a). Exhibit 6-1 presents the ground motion design parameters at each site and for each code.

Exhibit 6-1: Code-Based Seismic Design Parameters

Seismic Parameter	2014 Oregon Structural Specialty Code		2018 IBC/ ASCE 7-16	
	Step-Up Substation	Power Generating Facility	Step-Up Substation	Power Generating Facility
Site Class	C	C	C	C
Mapped MCE Peak Ground Acceleration	0.170 g	0.165 g	0.179 g	0.173 g
PGA Site coefficient, F_{pga}	1.200	1.200	1.221	1.227
Peak Ground Acceleration Corrected for Site Effects, PGA_M	0.204 g	0.198 g	0.218 g	0.213 g
Mapped Short Period Spectral Acceleration, S_S	0.398 g	0.389 g	0.398 g	0.387 g
Mapped 1-Second Period Spectral Acceleration, S_1	0.153 g	0.150 g	0.152 g	0.150 g
Short Period Site Coefficient, F_a	1.200	1.200	1.300	1.300
1-Second Period Site Coefficient, F_v	1.647	1.650	1.500	1.500
Short Period Design Spectral Acceleration, S_{DS}	0.319 g	0.311 g	0.345 g	0.335 g
1-Second Period Design Spectral Acceleration, S_{D1}	0.168 g	0.165 g	0.152 g	0.150 g
Seismic Design Category	C	C	C	C

6.2.3 Geo-Seismic Hazards

An assessment of seismic hazards expected to result from reasonably probable seismic events is included in the Preliminary Geotechnical Engineering Reports in Appendices A and B. Seismic hazards considered for the design seismic event include strong ground shaking, liquefaction, liquefaction-induced lateral spreading, liquefaction-induced settlement, seismically-induced landslide, fault rupture/displacement, and tsunami inundation. A summary of these assessments is provided below.

6.2.3.1 Strong Ground Shaking

Code-based ground motion parameters are presented above. In addition to a code-based study, a site specific seismic analysis will be performed for the power generating site in accordance with Chapter 21 of ASCE 7-16 using in situ shear wave velocity measurements. Depending on the final design requirements, site-specific ground motion modelling, such as 1D Shake Analysis, may be performed to evaluate site-specific ground motions. Structural and non-structural components will be designed to meet the performance criteria as required in IBC 2018 and ASCE 7-16 for a Risk Category III structure. In general, Risk Category III structures are designed to be more seismically resilient through the use of a seismic importance factor of 1.25 and through other codified means.

6.2.3.2 Liquefaction

At the Step-Up Substation, groundwater was not found in a borehole which was left open for a day. It is anticipated that there will not be saturated soils at this site; therefore, the risk of liquefaction, liquefaction-induced settlement, and liquefaction-induced lateral spreading is negligible.

At the Power Generating Facility site, groundwater was found at a depth of 27 feet below the ground surface. At this site, there are tens of feet of saturated sands, silts, and gravels. The blow counts of the sand and gravel deposits indicate that they are dense to very dense. The blow counts of the silt deposits indicate that they are very stiff to hard. Due to the high blow counts found throughout the saturated soils at the site, the risk of liquefaction, liquefaction-induced settlement, and liquefaction-induced lateral spreading is very low.

6.2.3.3 Seismically-Induced Landslide

Due to the relatively flat ground at each site, the risk of seismically-induced landslide is negligible.

6.2.3.4 Fault Rupture/Displacement

To the north of the Step-Up Substation, the unnamed fault north of Service Anticline (a Class B fault) is mapped in southern Washington (Lidke, 2003). While this fault is not mapped at the Step-Up Substation site, it is near the site and oriented in a direction such that, if it were to continue, it would be at the site. We reviewed lidar images of the site and its surroundings and conclude that there is no surficial evidence to indicate that this fault extends to our site. If there is a fault at this site, it would not have had any activity since the last of the Missoula Floods, approximately 15,000 years ago. Since there are no mapped faults at this site, and since there is no surface evidence of faulting, fault rupture at this site is considered negligible.

There are no faults mapped at or near the Power Generation Site; therefore, the risk of fault rupture is considered negligible.

6.2.3.5 Tsunami Inundation

Both sites lie outside of any mapped tsunami zones; therefore, we consider that the risk to tsunami inundation to be negligible.

6.2.4 Seismic Resiliency

The engineering and design of the Step-Up Substation and the Power Generation Facility will meet the seismic performance requirements of Risk Category III structures as defined by the 2014 Oregon Structural Specialty Code or, if a new code is adopted prior to the final permitting process, the future 2019 Oregon Structural Specialty Code. Based on site-specific geotechnical explorations and preliminary geotechnical evaluations, the site has little to negligible risk for geo-seismic hazards besides strong shaking from an earthquake. Furthermore, we understand that operators of the facilities will have an emergency response plan for disasters (similar to the one currently in place at the existing Hermiston facility) to ensure that the facilities will return to normal operation as quickly as practical after a disaster.

7 NON-SEISMIC GEOLOGIC HAZARDS

7.1 OAR 345-021-0010(1)(h)(F)

"An assessment of geology and soil-related hazards which could, in the absence of a seismic event, adversely affect or be aggravated by the construction or operation of the facility, in accordance with standard-of-practice methods and best practices, that address all issues relating to the consultation with the Oregon Department of Geology and Mineral Industries described in paragraph (B) of this subsection. An explanation of how the applicant will design, engineer, construct and operate the facility to adequately avoid dangers to human safety and the environment presented by these hazards, as well as:

(i) An explanation of how the applicant will design, engineer, construct and operate the facility to integrate disaster resilience design to ensure recovery of operations after major disasters.

(ii) An assessment of future climate conditions for the expected life span of the proposed facility and the potential impacts of those conditions on the proposed facility."

7.2 OAR 345-021-0010(1)(h)(F) Response

7.2.1 Non-Seismic Geologic Hazards

Nonseismic geologic hazards considered for the site facilities include landslides, flooding, soil erosion, collapsing soils, and high winds.

Neither the Power Generating Facility or Step-Up Substation are within mapped landslide areas, according to the Statewide Landslide Information Database for Oregon (DOGAMI, 2017). Both sites are also relatively flat, and, based on the materials encountered in the preliminary borings, we do not anticipate landslide risks at either site.

According to Federal Emergency Management Agency (FEMA) National Flood Insurance Program (NFIP) mapping, the Power-Generating Facility is in Zone X, which is outside the 0.2 percent annual chance (500-year) floodplain (FEMA, 2018). According to the same mapping, the Step-Up Substation is in Zone D, which includes areas in which flood hazards are "undetermined, but possible." However, the Step-Up Substation is at a similar elevation as downtown Umatilla, which is mapped as Zone X (outside the 500-year floodplain). Based on the FEMA mapping, the risk of flooding appears to be low at both sites.

Both the generating and substation facility site soils are classified as moderately erodible on United States Soil Conservation Service mapping. However, soil erosion is a low risk because site facilities will generally be founded on gravel and bedrock, and most surfaces will be paved or covered by gravel. Erodible soils will be mitigated with site pavements and cover. Exposed soils should be vegetated to resist erosion and drainage facilities should be installed to capture runoff. Area drainage can be conveyed to near-surface gravel deposits with high infiltration potential.

As discussed in our Preliminary Geotechnical Engineering Reports in Appendix A and Appendix B, collapsible soils are a potential hazard at both facility sites. Recommendations for mitigation of collapsible soils are included in the Preliminary Geotechnical Engineering Reports.

High winds are prevalent in the vicinity of the proposed facilities, but site facilities will be designed to resist high wind loads in accordance with applicable construction codes.

7.2.2 Disaster Resilience - OAR 345-021-0010(1)(h)(F)(i) Response

Section 6.2.4 discusses how the two facilities will be designed to handle seismic hazards. The risk of other natural disasters is low, as discussed in Section 7.2.1, above.

7.2.3 Future Climate Conditions - OAR 345-021-0010(1)(h)(F)(ii) Response

Most climate scientists believe that Earth's climate will continue to change throughout the design life of these two projects. The Oregon Global Warming Commission published a "Biennial Report to the Legislature" in November of 2018, indicating that anticipated effects of climate change in the State of Oregon will include increased temperatures, droughts, wildfires, flooding, and sea level rise. However, these anticipated impacts of climate change will not likely affect the proposed new structures.

Increased temperatures and droughts would not have significant adverse impacts on the Step-Up Substation or the Power-Generating Facility. Increased ambient temperatures would only mildly affect the performance of the combustion turbines at the Power-Generating Facility. Dryer conditions would not inherently affect turbine operation at all, though particulate matter in the air from significant wildfires (brought on with increased frequency by drought) could have mild impacts to combustion turbine performance. These mild impacts to combustion turbine performance would not cause the Power-Generating Facility to fail catastrophically or to stop operating.

There may be an increase in the frequency of extreme weather events such as windstorms or snow/ice storms. However, the loading imposed on the structures from such storms would be captured in the current and anticipated building codes.

According to a USGS study of future climate effects on the Columbia and Willamette River levees (USGS, 2018b), the Pacific Northwest is projected to experience a decline in spring snowpack, earlier snowmelt, and earlier peaking streams, with some basins experiencing higher peak flows. This could impact the Columbia and Umatilla Rivers and cause elevated flood levels. However, flooding and sea level rise are not expected to have any adverse impacts on the Step-Up Substation or the Power-Generating Facility because of the elevation of the sites. Both the Power-Generating Facility and Step-Up Substation sites appear to be outside the currently mapped 500-year floodplain, making the risk of climate change-related flooding relatively low. Even a substantial rise in sea levels is not expected to impact the sites over the project's life span. Even if significant rainfall or snowmelt events increase due to climate change, it is not anticipated that flooding would increase to the point of causing significant damage to either site.

8 REFERENCES

DOGAMI, 2017, Statewide Landslide Information Database for Oregon (SLIDO), Version 3.4, released December 14, 2017, accessed December 26, 2018, Available: https://gis.dogami.oregon.gov/maps/slido/.

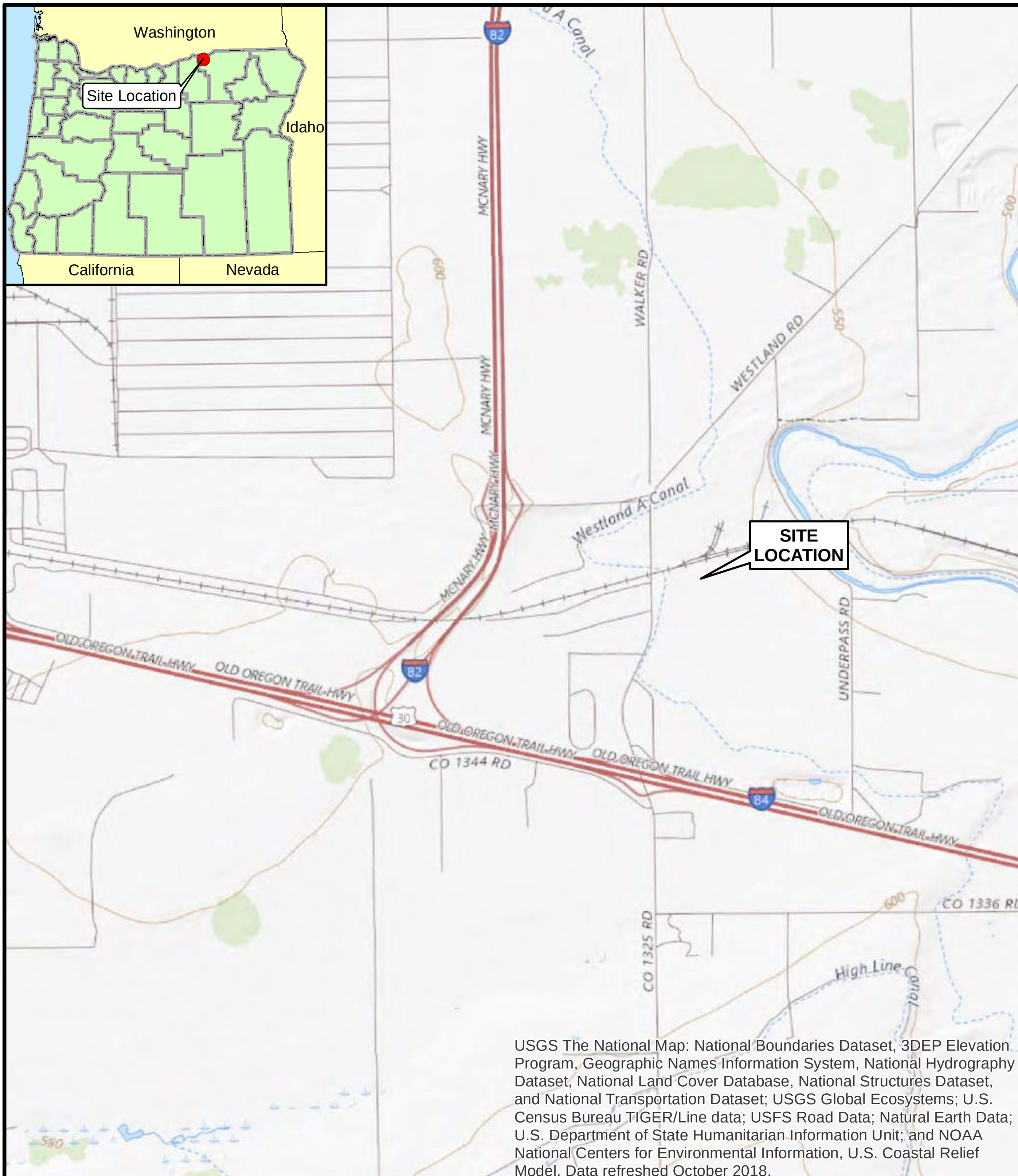
FEMA, 2018, FEMA Flood Map Service Center, accessed December 26, 2018, Available: https://msc.fema.gov/portal/home.

Lidke, D.J., compiler, 2003, Fault number 569, unnamed fault north of Service Anticline, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, https://earthquakes.usgs.gov/hazards/qfaults, accessed 12/27/2018 09:25 PM.

Oregon Global Warming Commission, 2018, Biennial Report to the Legislature for the 2019 Legislative Session: Oregon Global Warming Commission, Salem, Oregon, 85 p.

U.S. Geologic Survey, 2018a, Seismic Design Web Service Documentation, accessed December 26, 2018, Available: https://earthquake.usgs.gov/ws/designmaps/

U.S. Geologic Survey, 2018b, Oregon Water Science Center Web Service Documentation, accessed December 26, 2018, Available: https://www.usgs.gov/centers/or-water/science/future-climate-effects-columbia-and-willamette-river-levees?qt-science_center_objects=1#qt-science_center_objects.



USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed October 2018.

0 0.25 0.5 1

Scale in Miles

N

Perennial Wind Chaser Station Exhibit H
Power-Generating Facility
Hermiston, Oregon

VICINITY MAP

February 2019 102032-002

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 1
Sheet 1 of 2

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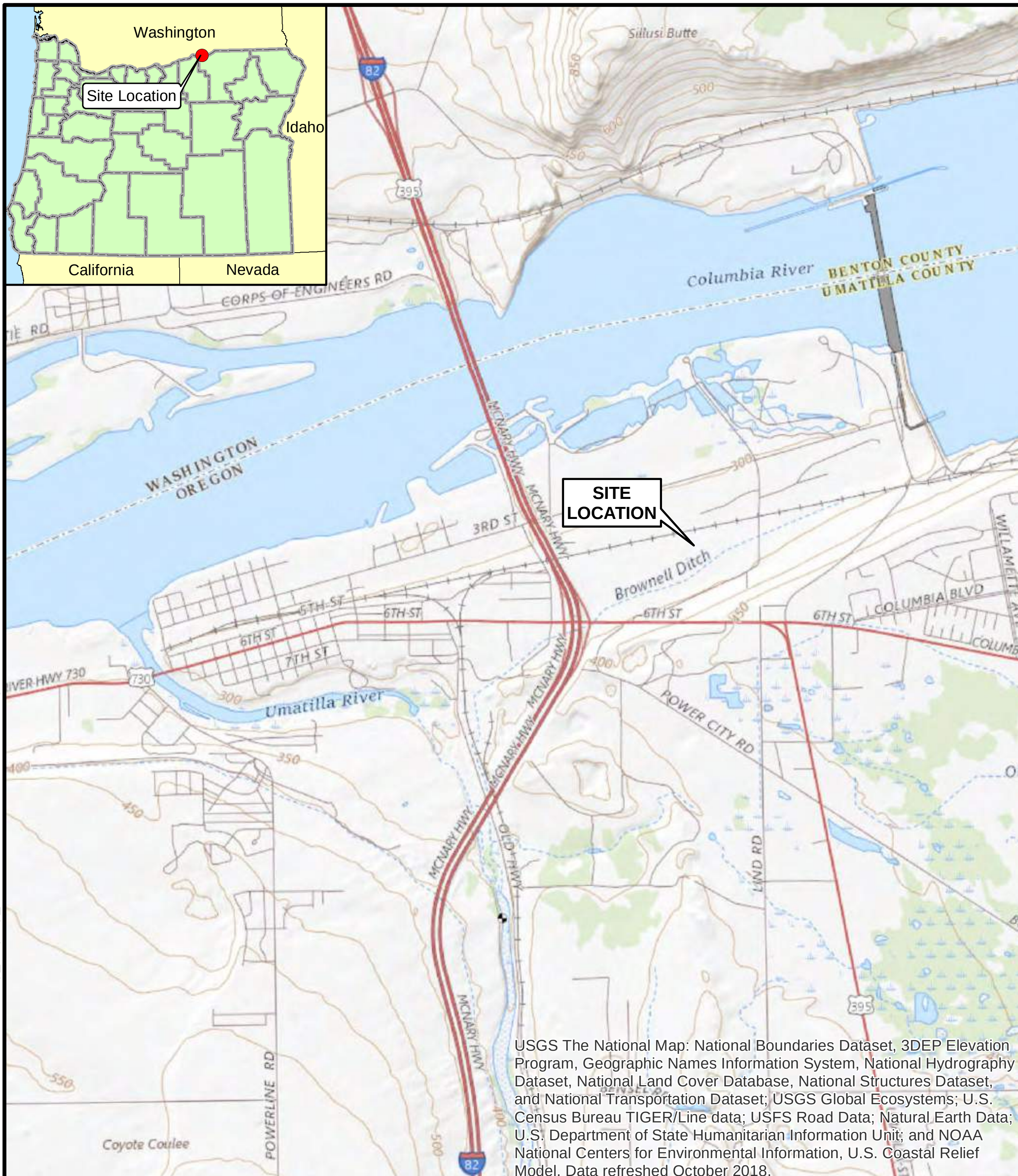

0 0.25 0.5 1

Scale in Miles

N

Perennial Wind Chaser Station Exhibit H
Step-Up Substation
Umatilla, Oregon

VICINITY MAP

February 2019 102032-002

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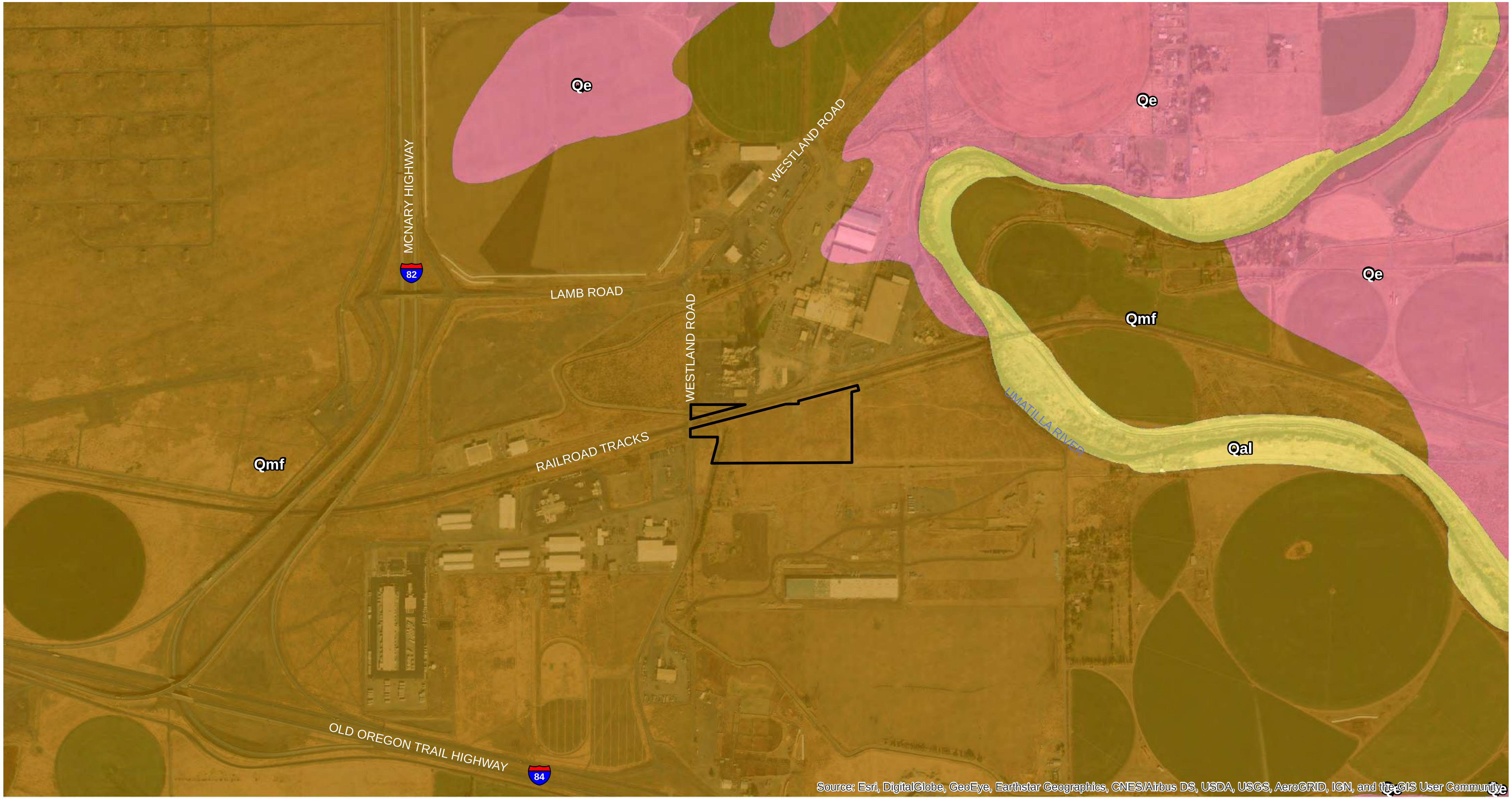
FIG. 1
Sheet 2 of 2

Filename: T:\Projects\PDX\102000s\102032 Perennial Power\Avmxd\Vicinity_Step-Up_10.3.mxd Date: 12/20/2018 Login: AEH



LEGEND

- Project Site
- Qal - Alluvium
- Qe - Eolian Sand and Ash
- Qmf - Missoula Flood Deposits

0 500 1000 2000

Scale in Feet

NOTES

1. Geologic mapping obtained from DOGAMI publication OGDC-6.
2. No faults are mapped within the area shown by DOGAMI or USGS.

Perennial Wind Chaser Station Exhibit H
Power-Generating Facility
Hermiston, Oregon

GEOLOGY MAP

February 2019 102032-002

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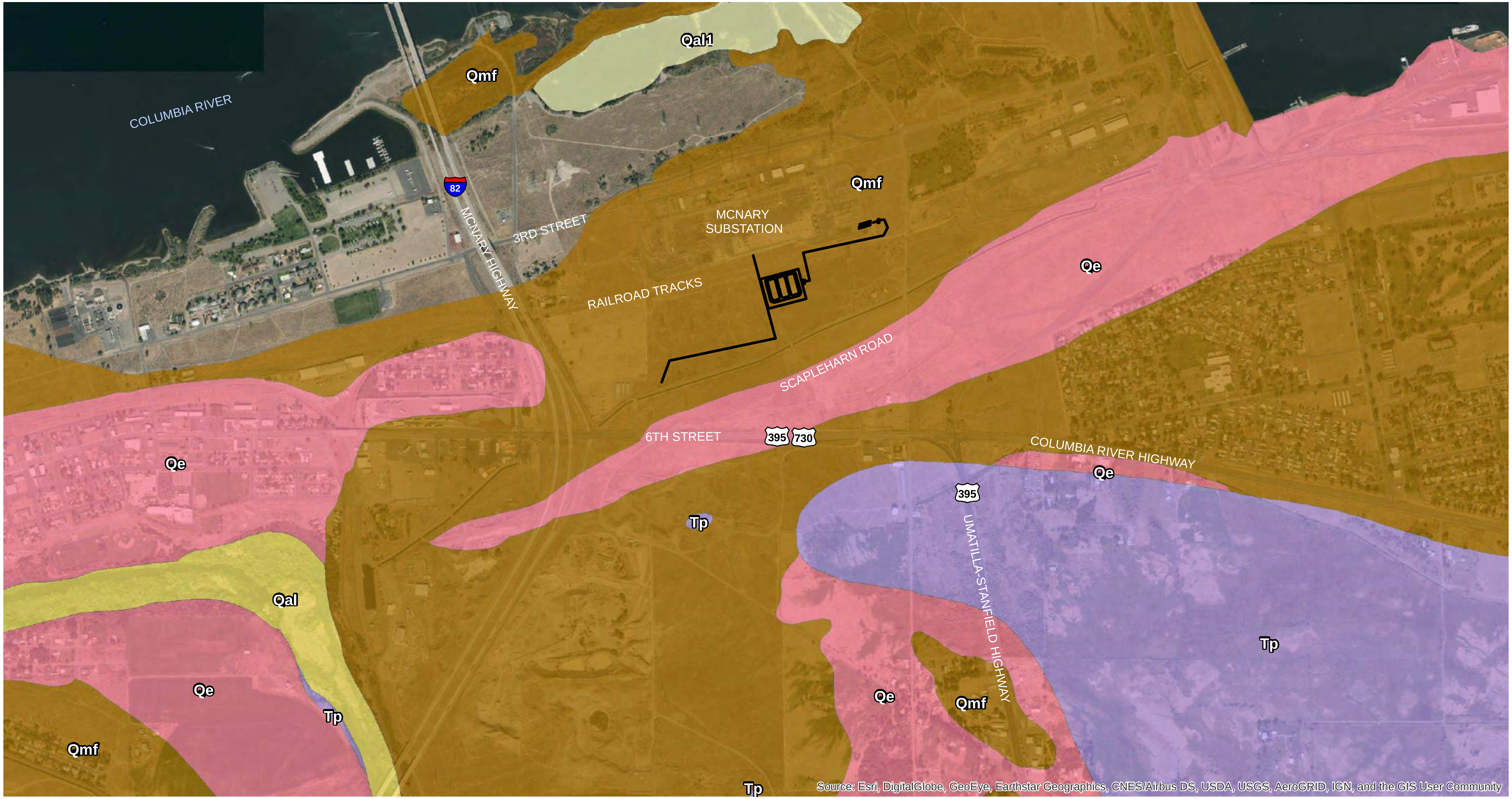
FIG. 2
Sheet 1 of 2

Filename: T:\Projects\PDX\102000s\102032 Perennial Power\Avmxd\Geology_Power-Gen_10.3.mxd Date: 12/20/2018 Login: AEH



LEGEND

- Project Site and Associated Features
- Qal - Alluvium
- Qal1 - Alluvium
- Qe - Eolian Sand and Ash
- Qmf - Missoula Flood Deposits
- Tp - Columbia River Basalt Group Pomona Member

0 500 1000 2000

Scale in Feet

NOTES

1. Geologic mapping obtained from DOGAMI publication OGDC-6.
2. No faults are mapped within the area shown by DOGAMI or USGS.

Perennial Wind Chaser Station Exhibit H
Step-Up Substation
Umatilla, Oregon

GEOLOGY MAP

February 2019 102032-002

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FIG. 2
Sheet 2 of 2

Filename: T:\Projects\PDX\102000s\102032 Perennial Power\Avmxd\Geology_Step-Up_10.6.mxd Date: 12/20/2018 Login: AEH

LEGEND

Project Site

0 0.25 0.5 1

Scale in Miles

NOTES

1. 2016 LiDAR data obtained from DOGAMI.

Perennial Wind Chaser Station Exhibit H
Power-Generating Facility
Hermiston, Oregon

LIDAR MAP

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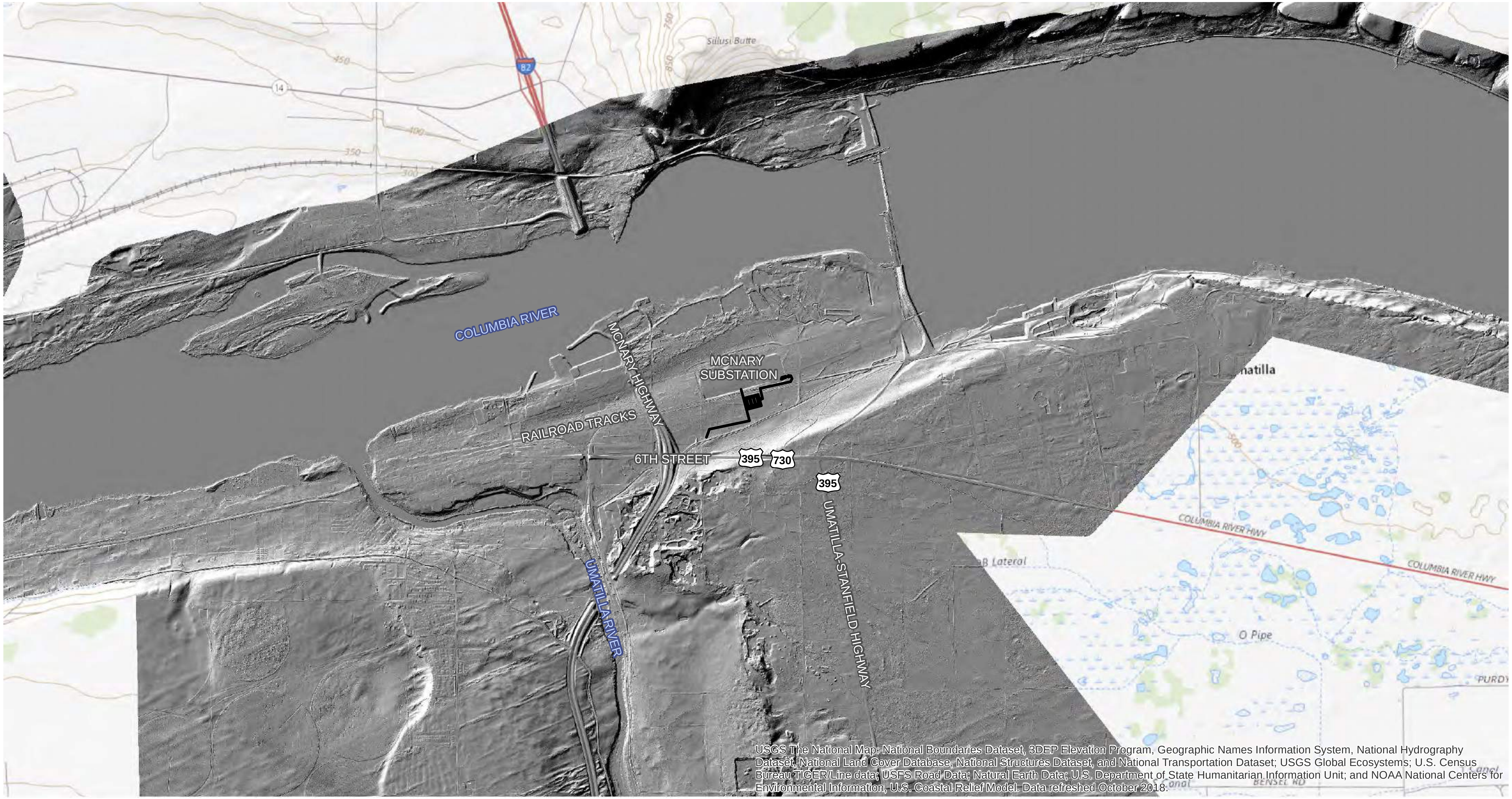
FIG. 3
Sheet 1 of 2

Filename: T:\Projects\PDX\102000s\102032 Perennial Power\Avmxd\LiDAR_Power-Gen_10.3.mxd Date: 12/21/2018 Login: AEH



LEGEND

Project Site and Associated Features

0 0.25 0.5 1

Scale in Miles

NOTES

1. 2010 and 2016 LiDAR data obtained from DOGAMI and WA DNR.

Perennial Wind Chaser Station Exhibit H
Step-Up Substation
Umatilla, Oregon

LIDAR MAP

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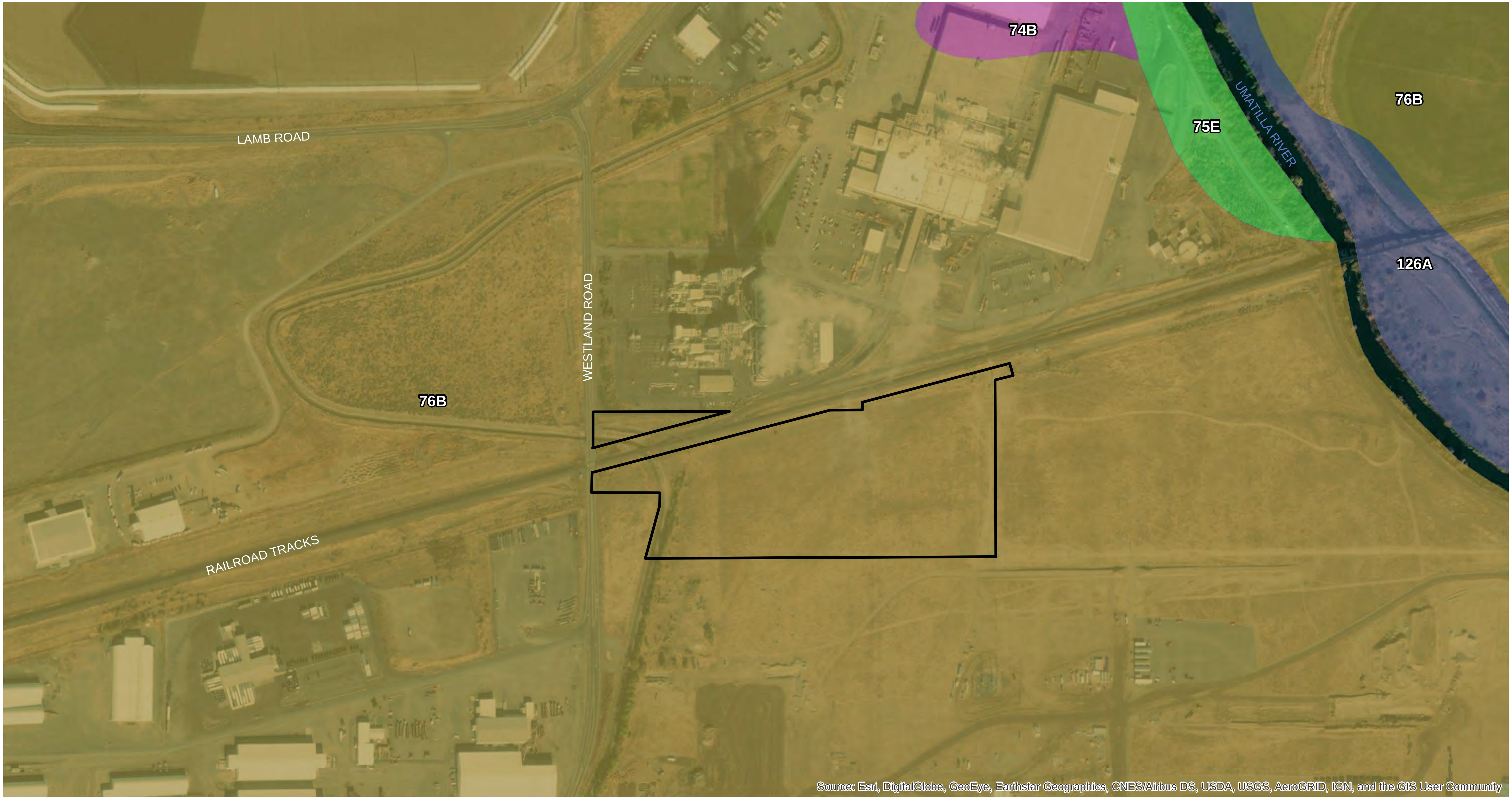
FIG. 3
Sheet 2 of 2

Filename: T:\Projects\PDX\102000s\102032 Perennial Power\Avmxd\LiDAR_Step-Up_10.3.mxd Date: 12/21/2018 Login: AEH



LEGEND

Project Site

126A - Xerofluvents, 0 to 3 Percent Slopes, Slight Erodability

74B - Quincy Fine Sand, 0 to 5 Percent Slopes, Slight Erodability

75E - Quincy Loamy Fine Sand, 5 to 25 Percent Slopes, Moderate Erodability

76B - Quincy Loamy Fine Sand, Gravelly Substratum, 0 to 5 Percent Slopes, Slight Erodability

0 200 400 800

Scale in Feet

NOTES

1. Soils mapping downloaded from USDA Web Soil Survey on December 26, 2018, last updated by USDA on September 18, 2018.

Perennial Wind Chaser Station Exhibit H
Power-Generating Facility
Hermiston, Oregon

SOILS MAP

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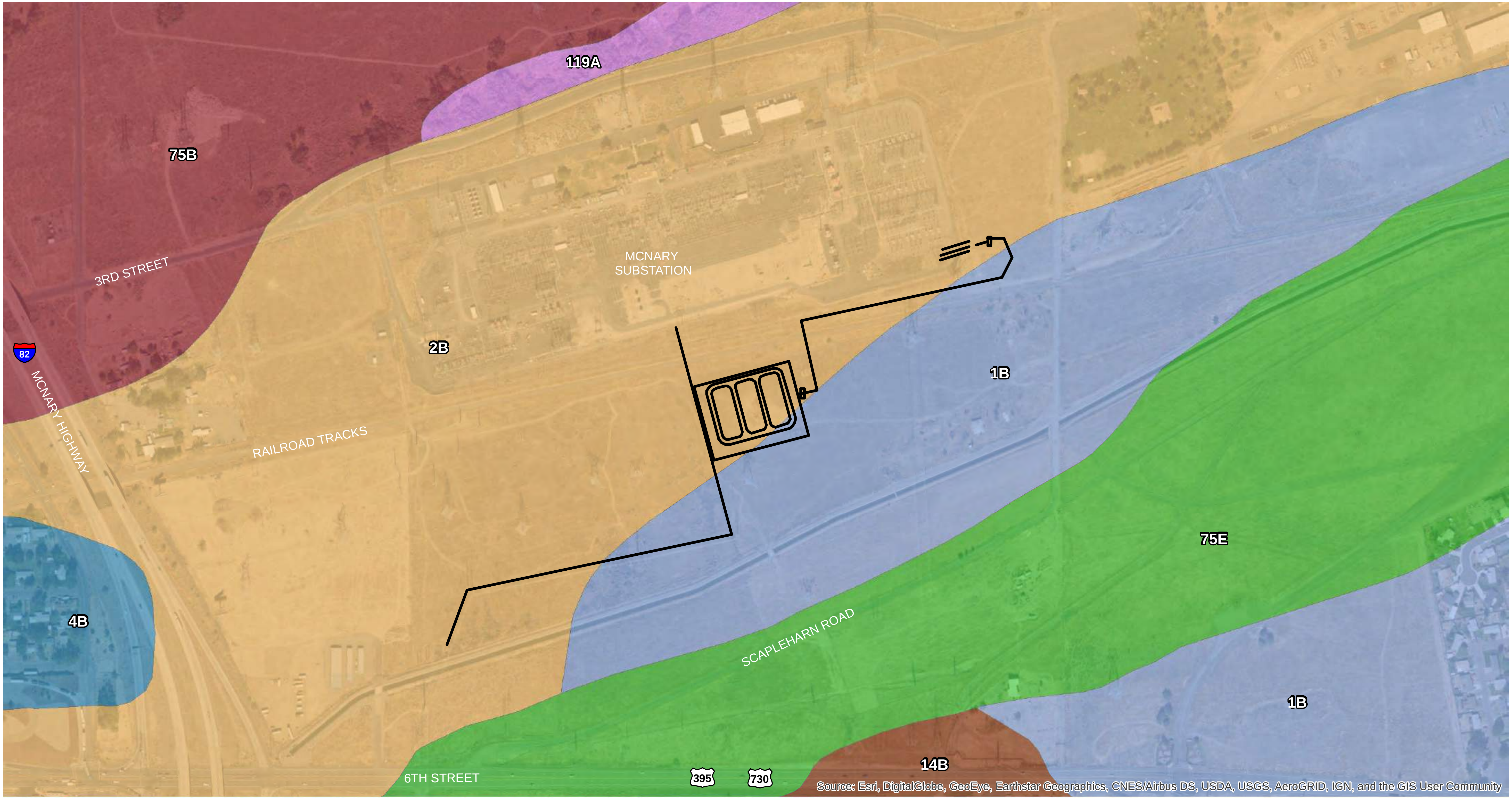
FIG. 4
Sheet 1 of 2

Filename: T:\Projects\PDX\102000s\102032 Perennial Power\Avmxd\Soils_Power-Gen_10.3.mxd Date: 12/26/2018 Login: AEH



LEGEND

- Project Site and Associated Features
- 119A - Wanser Loamy Fine Sand, 0 to 3 Percent Slopes, Slight Erodability
- 14B - Burbank Loamy Fine Sand, 0 to 5 Percent Slopes, Slight Erodability
- 1B - Adkins Fine Sandy Loam, 0 to 5 Percent Slopes, Slight Erodability
- 2B - Adkins Fine Sandy Loam, Gravelly Substratum, 0 to 5 Percent Slopes
- 4B - Adkins-Urban Land Complex, 0 to 5 Percent Slopes, Slight Erodability
- 75B - Quincy Loamy Fine Sand, 0 to 5 Percent Slopes, Slight Erodability
- 75E - Quincy Loamy Fine Sand, 5 to 25 Percent Slopes, Moderate Erodability

0 200 400 800

Scale in Feet

NOTES

1. Soils mapping downloaded from USDA Web Soil Survey on December 26, 2018, last updated by USDA on September 18, 2018.

Perennial Wind Chaser Station Exhibit H
Step-Up Substation
Umatilla, Oregon

SOILS MAP

February 2019 102032-002

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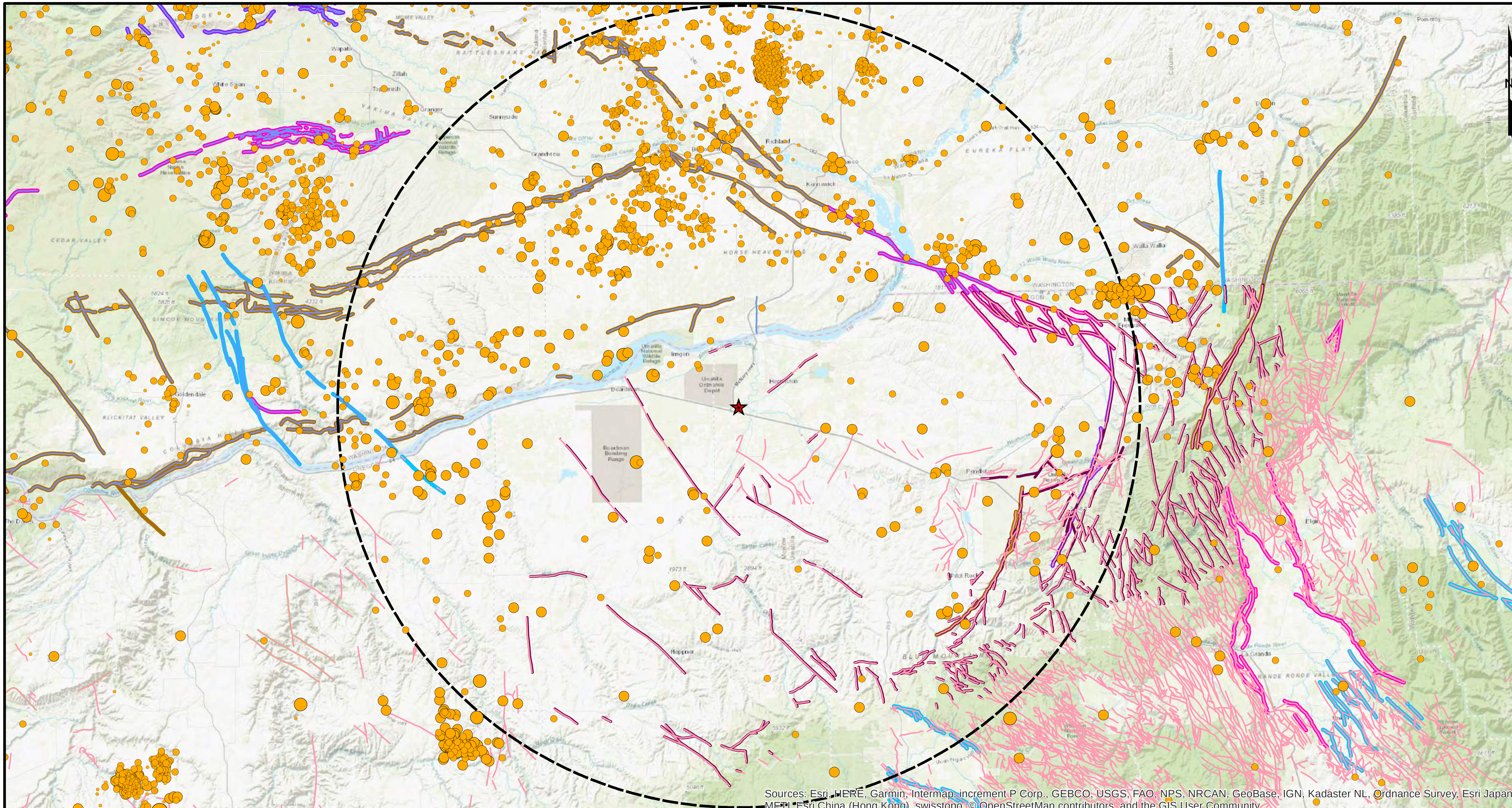
FIG. 4
Sheet 2 of 2

Filename: T:\Projects\PDX\102000s\102032 Perennial Power\Avmxd\Soils_Step-Up_10.3.mxd Date: 12/26/2018 Login: AEH



LEGEND

Earthquake Magnitude
- 0.1 - 1.0
- 1.0 - 2.0
- 2.0 - 3.0
- 3.0 - 4.0
- 4.0 - 5.0

- Project Site
- 50-mile Radius
- Faults (DOGAMI, OGDC-6)
- Faults (DOGAMI, O-07-15)
- Buried Faults (DOGAMI, O-07-15)
- Active Faults (WA DNR)

Quaternary Faults (USGS)
Age (Years since most recent deformation)
- <15,000 - Class A
- <130,000 - Class A
- <750,000 - Class A
- <1,600,000 - Class A
- Various Ages - Class B

0 6 12 24
Scale in Miles

NOTES

1. Historical earthquakes downloaded from https://earthquake.usgs.gov/earthquakes/search/ on December 21, 2018. Dataset begins in 1969 and includes magnitudes as ML and Md.
2. WA DNR active faults from GIS data downloaded from https://www.dnr.wa.gov/programs-and-services/geology/publications-and-data/gis-data-and-databases on December 21, 2018.
3. USGS faults from the USGS Quaternary Fault and Fold Database of the United States. GIS data downloaded on December 27, 2018, last updated by USGS on December 11, 2017.

Perennial Wind Chaser Station Exhibit H
Power-Generating Facility
Hermiston, Oregon

HISTORICAL EARTHQUAKES AND FAULTS

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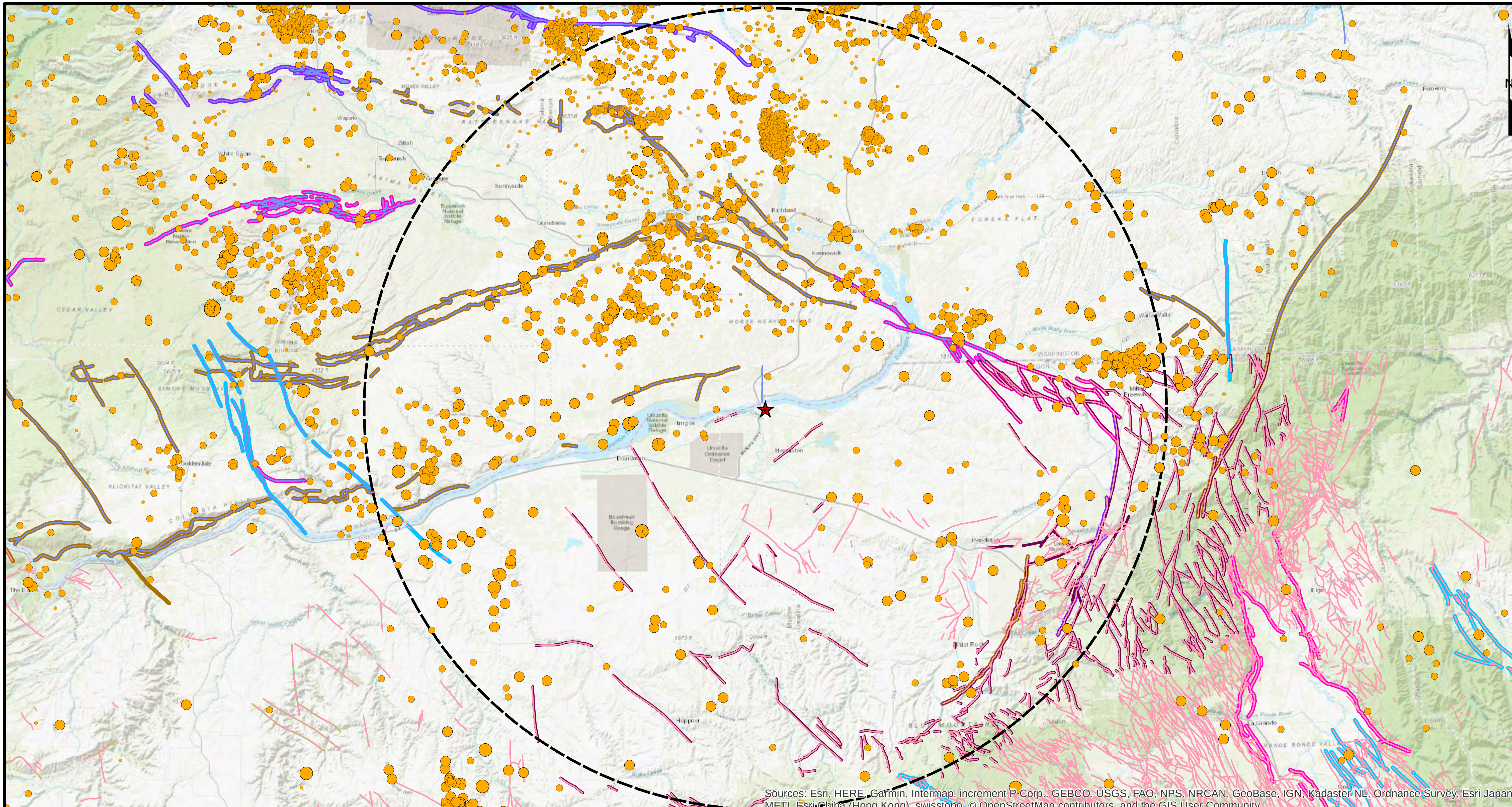
FIG. 5
Sheet 1 of 2

Filename: T:\Projects\PDX\102000s\102032 Perennial Power\Avmxd\FaultsEQs_Power-Gen_10.3.mxd Date: 12/27/2018 Login: AEH



LEGEND

Earthquake Magnitude
- 0.1 - 1.0
- 1.0 - 2.0
- 2.0 - 3.0
- 3.0 - 4.0
- 4.0 - 5.0

- Project Site
- 50-mile Radius
- Faults (DOGAMI, OGDC-6)
- Faults (DOGAMI, O-07-15)
- Buried Faults (DOGAMI, O-07-15)
- Active Faults (WA DNR)

Quaternary Faults (USGS)
Age (Years since most recent deformation)
- <15,000 - Class A
- <130,000 - Class A
- <750,000 - Class A
- <1,600,000 - Class A
- Various Ages - Class B

0 6 12 24
Scale in Miles

NOTES

1. Historical earthquakes downloaded from https://earthquake.usgs.gov/earthquakes/search/ on December 21, 2018. Dataset begins in 1969 and includes magnitudes as ML and Md.
2. WA DNR active faults from GIS data downloaded from https://www.dnr.wa.gov/programs-and-services/geology/publications-and-data/gis-data-and-databases on December 21, 2018.
3. USGS faults from the USGS Quaternary Fault and Fold Database of the United States. GIS data downloaded on December 27, 2018, last updated by USGS on December 11, 2017.

Perennial Wind Chaser Station Exhibit H
Step-Up Substation
Umatilla, Oregon

HISTORICAL EARTHQUAKES AND FAULTS

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FIG. 5
Sheet 2 of 2

Filename: T:\Projects\PDX\102000s\102032 Perennial Power\Avmxd\FaultsEQs_Step-Up_10.3.mxd Date: 12/27/2018 Login: AEH

Appendix A

Preliminary Geotechnical Engineering Report for Generating Facility

APPENDIX A: PRELIMINARY REPORT FOR GENERATING FACILITY

Preliminary Geotechnical Engineering Report
Perennial Wind Chaser Station
Hermiston, Oregon

November 19, 2013

SHANNON & WILSON, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Preliminary Geotechnical Engineering Report
Perennial Wind Chaser Station
Hermiston, Oregon

November 19, 2013

SHANNON & WILSON, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Excellence. Innovation. Service. Value
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24-1-03794-001

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PRELIMINARY GEOTECHNICAL ENGINEERING REPORT
PERENNIAL WIND CHASER STATION
HERMISTON, OREGON

1.0 INTRODUCTION

Perennial-Wind Chaser LLC is planning to construct a new 415-megawatt power-generating facility in Hermiston, Oregon, as part of the Perennial Wind Chaser Station project. The proposed generating facility will include gas turbine generators, stacks, transformers, pipe racks, cooling tower, water treatment facilities, compressors, tanks, a 230-kilovolt switchyard, a stormwater pond, a control and administration building, and, potentially, an onsite septic facility. The location of the proposed generating facility is in an agricultural field located on the east side of Westland Road approximately a half mile north of I-84, as shown on Vicinity Map, Figure 1.

Shannon & Wilson, Inc., is providing preliminary geotechnical engineering services for the project under subcontract to Burns & McDonnell Engineering Company, Inc. This Draft Preliminary Geotechnical Engineering Report presents our field exploration and laboratory test data, as well as the results of our preliminary geotechnical engineering evaluations for the design of the proposed generating facility. This report was prepared in general accordance with the Oregon State Board of Geologist Examiners Guidelines for Engineering Geologic Reports and Site-Specific Seismic Hazard Reports.

2.0 PROJECT UNDERSTANDING

2.1 Site Description

The proposed generation facility site is immediately south of the existing Hermiston Generating Station, which operates independently of the proposed facility. The proposed site is separated from the existing station to the north by Union Pacific Railroad tracks. The west side of the site is bordered by the Westland A Canal. Additional agricultural fields lay to the south and east. Site topography is relatively flat, sloping down very gently to the east, dropping approximately 0.7 feet every 100 feet. The site is currently vegetated by tall grass with a line of trees parallel to and on the east side of the canal. There are a few small piles of basalt boulders up to about three feet in diameter scattered throughout the site. These boulders were likely derived from near-surface gravel deposits.

2.2 Plant Components

The Site Plan, Figure 2, shows the proposed location and configuration of the various facility components, as provided to us by Burns & McDonnell Engineering Company, Inc. We understand that the site will be accessed from Westland Road with a small bridge spanning the canal. We also understand the final layout of the proposed facility and final site grades have not yet been determined and that foundation loads are currently unknown. As shown on Figure 2, the 400-megawatt power-generating facility will contain the following major components:

- Four Combustion Turbines and Generators
- Four Exhaust Stacks
- Two Turbine Control Centers
- Two Transformers
- Two Secondary Transformers
- Two Auxiliary Transformers
- Cooling Tower
- Gas Compressors
- Four Water Tanks
- 230 kV Switchyard
- Control and Administration Building including Water Treatment Facility
- Pipe Racks
- Stormwater Detention Pond
- Septic Tank and Drain Field
- Entrance Road Bridge
- Roadways

3.0 GEOLOGY AND SEISMICITY

3.1 Regional Geology

The project site is located within the Umatilla Basin, a broad lowland that is part of the Deschutes-Columbia Plateau geomorphic province. Evolution of the Columbia Plateau is described by Reidel and others (1989). The Deschutes-Columbia Plateau is floored at depth by basalt bedrock of the Columbia River Basalt Group (CRBG). The CRBG were erupted in the middle Miocene epoch, between about 17 and 6 million years ago, from fissure vents near the Idaho border. The CRBG consists of six formations, 14 members, and more than 150 individual flow units. Total thickness of the basalt section is greater than 15,000 feet in the Tri-Cities area to the north, and the section thins to a tapered edge against the flanks of the Blue Mountains to the southeast. The CRBG section is estimated at about 5,000 feet thick in the Umatilla Basin, although no borings are known to have penetrated to that depth.

As the basalt flows were being erupted, tectonic stress began building in the earth's crust, eventually producing many broad folds and faults across the newly forming basalt plateau. The down-warps, or basins, that formed on the basalt surface were filled by sediments eroded from the adjacent uplands and deposited by in-flowing streams along with an influx of air-fall volcanic ash. In the Umatilla Basin, these late Miocene to early Pliocene age (about 6 to 4 million year-old) sedimentary deposits were largely derived from the Blue Mountains to the south, although during this period the ancestral Umatilla River watershed may have included a large area south of the Blue Mountains axis (Smith and others, 1989). These Pliocene sediments were deposited as alluvial fans and north-flowing stream channel deposits and defined by Farooqui and others (1981) as the Alkali Canyon Formation. The Alkali Canyon Formation is exposed lying above the CRBG at higher elevations to the south (Walker, 1973; Madin and Geitgey, 2007) where they rise above the level of the Pleistocene flood deposits (described below). The Alkali Canyon Formation probably thins toward the north, but it is likely present locally in the Hermiston area where it hasn't been eroded away by the Umatilla River and Pleistocene catastrophic flood episodes.

During the high ice periods of the Pleistocene epoch, catastrophic flooding of glacial Lake Missoula deposited sand and gravel over the older deposits in the Umatilla Basin. Glacial Lake Missoula was impounded behind an ice dam which blocked the mouth of the Clark Fork in western Montana. At least 40, and by some counts (Waitt, 1980) up to about 90, times the lake level was able to overcome the ice and the lake emptied catastrophically, flooding the Columbia River system and back-flooding up tributary stream canyons along its path. The floodwater pooled temporarily in the wide Umatilla Basin forming a lake that for a short period of time was up to 400 feet deep. The high-velocity flood waters initially scoured their way into the basin, then as the flood waters deepened, a tremendous bed load of coarse gravel migrated into the basin filling the flood channels at lower elevations, while in succession, finer gravel and then sand mantled progressively higher topography. As the flood flow waned, silt was deposited out of suspension in the slack water. Then, slowly over a period of several days, the flood waters quietly receded. The process probably recurred at intervals of at least several decades between about 18,000 and 15,000 years ago (Allen and others, 2009).

Since the last flood event, the surface of the Umatilla Basin has been modified by strong easterly winds which have reworked the sand and silt deposited by the Missoula floods along with an influx of wind-blown silt ("loess") eroded from the Palouse of southeastern Washington. Other modifications have included erosion and re-deposition of the older sediments along the channel of the Umatilla River and its tributaries.

3.2 Seismic Setting

Earthquakes in the Pacific Northwest occur largely as a result of the collision between the Juan de Fuca plate and the North American plate. These two tectonic plates meet along a mega thrust fault called the Cascadia Subduction Zone (CSZ). The CSZ runs approximately parallel to the coastline from northern California to southern British Columbia. The compressional forces that exist between these two colliding plates cause the denser oceanic plate to descend, or subduct, beneath the continental plate. This process leads to contortion and faulting of both plates and volcanism along the Cascade Range.

Shallow crustal faults and folds throughout Oregon and Washington have been located and characterized by the United States Geological Survey (USGS). The USGS provides approximate fault locations and a detailed summary of the available fault information in the USGS Quaternary Fault and Fold Database (USGS, 2013). The database defines four categories of faults, Classes A through D, based on evidence of tectonic movement known or presumed to be associated with large earthquakes during Quaternary time (less than 1.8 million years ago). For Fault Class A and B faults, geologic evidence has been published that demonstrates the existence of Quaternary deformation and, therefore, the faults are correlated to a higher potential for earthquake generation. Class A faults are known or presumed to be associated with relatively large magnitude earthquakes (moment magnitude [Mw] of 6 to 7). Faults defined as Class B exhibit equivocal geologic evidence of Quaternary deformation, or may not extend deep enough to be considered a source of significant earthquakes.

According to the USGS' Oregon Fault and Fold database, there are two Class A fault systems (a system has multiple fault segments) and two Class B fault systems within approximately 75 kilometers (47 miles) of the project site. Their names, general locations relative to the site, slip rates, and the times since their most recent deformation are summarized in Table 1.

TABLE 1: QUATERNARY FAULTS WITHIN A 75-KM RADIUS OF THE PERENNIAL POWER SITE

Name	Fault Class	Distance and Direction from Site	Most Recent Deformation*	Slip Rate
Hite System – Agency Section	A	58 km East southeast	<1.6 Ma	<0.2 mm/yr
Hite System – Thorn Hollow Section	A	70 km East	<130 Ka	<0.2 mm/yr
Wallula Fault System	A	44 km East northeast	<15 Ka	<0.2 mm/yr
Columbia Hill Structures	B	20 km North	<1.6 Ma	<0.2 mm/yr
Horse Heaven Hills Structures	B	35 km North northwest	<1.6 Ma	<0.2 mm/yr

* Ka = "kiloannum" or thousand years; Ma = "megaannum" or million years.

4.0 FIELD EXPLORATIONS

Shannon & Wilson, Inc., explored the subsurface conditions at the site with ten (10) geotechnical borings, five (5) dynamic cone penetrometer (DCP) tests, and two (2) infiltration tests. The borings, designated B-1 through B-10, were drilled between June 5 and June 14, 2013, by

Hardcore Drilling, Inc., of Dundee, Oregon. A Shannon & Wilson geologist located the borings, collected soil samples, and logged the materials encountered during drilling. The DCP tests, designated DCP-1 through DCP-5, were conducted to estimate parameters for pavement design. The infiltration tests, designated INT-1 and INT-2, were conducted to estimate infiltration capacity for potential stormwater management design and onsite septic facilities. The DCPs and infiltration tests were performed by a Shannon & Wilson geologist on July 9, 2013. The locations of the borings, DCPs, and infiltration tests were measured in the field using a handheld GPS unit. Approximate exploration locations are shown on the Exploration Plan, Figure 3. Details of the exploration program, including boring logs, descriptions of the techniques used to advance and sample the borings, and DCP and infiltration test procedures and results are presented in Appendix A.

5.0 LABORATORY TESTING

Laboratory tests were performed on selected samples from the borings to determine basic index and engineering properties of the soils encountered. The laboratory testing program included moisture content analyses, particle-size analyses, Atterberg Limits tests, and corrosivity testing. Laboratory testing was performed in general accordance with applicable ASTM International (ASTM), American Association of State Highway and Transportation Officials (AASHTO), and United States Environmental Protection Agency (EPA) standard test procedures. Results of the laboratory tests and a brief description of the testing procedures are presented in Appendix B.

6.0 PHOTOGRAPHS OF THE SITE

Site conditions were documented in photographs taken at each field exploration location. A Photograph Log is presented in Appendix C.

7.0 SUBSURFACE CONDITIONS

We grouped the materials encountered in our field explorations into four (4) geotechnical units, as described below. Our interpretation of the subsurface conditions is based on the borings and regional geologic information from published sources. The geotechnical units are as follows:

- *Loess*: Medium dense to dense Silty SAND to SAND, trace silt (SM, SP-SM, and SP).
- *Catastrophic Flood Deposits – Gravel Facies*: Dense to very dense Sandy GRAVEL, trace silt with cobbles and boulders (GP).
- *Catastrophic Flood Deposits – Fine-grained Facies*: Very stiff to hard SILT to Sandy SILT and Clayey SILT with sand to trace sand (ML and MH).
- *Catastrophic Flood Deposits – Sand Facies*: Dense to very dense Silty SAND to SAND, trace silt (SM, SP-SM, and SP)

These generalized geotechnical units have been defined by their geologic and engineering properties and their distribution in the subsurface. The units and their inter-relationships are shown on the Geologic Profile A-A', Figure 4. The location of the profile is shown on the Exploration Plan, Figure 3. The profile is interpretive, and variations in subsurface conditions may exist between the locations of the borings. Contacts between the units may be more gradational than shown in the profiles and in the boring logs in Appendix A.

7.1 Loess

Loess is wind-blown sediment. The unit was encountered in all borings from the ground surface to depths ranging from about 2 to 5 feet. The Loess generally consists of medium dense to dense gray and brown Silty SAND to SAND, trace silt (SM, SP-SM, and SP). It is typically dry and micaceous with nonplastic fines, fine to medium sand, and occasional organics. The wind-blown silty fine sand may be considered a collapsible soil, based on our local experience. Collapsible soil usually has a relative high porosity and a correspondingly low unit weight. Soil collapse can occur by wetting under a moderate normal stress, through vibration, or by subjecting the soil to higher normal stresses without wetting it. Standard Penetration Test (SPT) N-values in the unit ranged from 11 to 39 blows per foot (bpf) and averaged 22 bpf. Natural moisture content analyses ranged from 3 to 18 percent, and averaged 10 percent. Fines contents determined by sieve analyses ranged from 19 to 25 percent and averaged 23 percent by dry weight. A single Atterberg Limits test found one specimen to be nonplastic.

7.2 Catastrophic Flood Deposits

The Catastrophic Flood Deposits are gravel, sand, and fine-grained sediment deposited by the Missoula Floods. We grouped them into three facies based on their grain sizes: Gravel Facies, Fine-grained Facies, and Sand Facies. The different depositional facies reflect changing energy levels in the dynamic flood environment and are described in greater detail below.

7.2.1 Gravel Facies

Gravel Facies deposits were encountered directly below the Loess in all borings. The unit was fully penetrated in borings B-1 through B-6, with encountered thicknesses ranging from about 14 to 41 feet. Additional five- to seven-foot thick layers were observed, interbedded with other units below. Borings B-7 through B-10 were terminated in the Gravel Facies, with a maximum penetration of about 58 feet. The Gravel Facies unit generally thickens to the east across the site. In general, the unit consists of dense to very dense Sandy GRAVEL, trace silt, with cobbles and boulders (GP). Five- to ten-foot thick layers of Silty GRAVEL with sand and Gravelly SAND (GM and SP) were also encountered within the unit. Fines are typically nonplastic, sand is typically fine to coarse, and gravel is typically fine to coarse and rounded to subangular. Difficult drilling conditions, including mud loss and borehole instability, were observed in the Gravel Facies in several borings. Drill action consistent with the presence of cobbles and boulders was observed. The largest boulder encountered during drilling was estimated to be at least 2.5 feet in diameter. About 40 percent of the SPTs attempted in the unit met refusal, where more than 50 blows were required to drive the sampler through a six-inch interval. The non-refusal SPT N-values ranged from 7 to 87 bpf and averaged 54 bpf. A single natural moisture content analysis indicated 14 percent moisture.

7.2.2 Fine-Grained Facies

Fine-grained Facies deposits were encountered below the Gravel Facies in borings B-1 through B-6 and ranged in thickness from about 13 to 32 feet. In B-1 and B-2, five-foot thick interbeds of Sand Facies Deposits were observed within the Fine-grained Facies. In B-1, an additional bed of Fine-grained Facies deposits was observed at a depth of 80 feet. The Fine-grained Facies generally consists of very stiff to hard gray to brown SILT to Sandy SILT and Clayey SILT with sand to trace sand (ML and MH). The unit is typically moist and micaceous with low to medium plasticity fines and fine sand. SPT N-values in the unit ranged from 21 to 65 bpf and averaged 43 bpf. Natural moisture content analyses ranged from 36 to 56 percent, and averaged 47 percent. Fines contents determined by sieve analyses ranged from 53 to 90 percent and averaged 80 percent by dry weight. Atterberg Limits tests indicated plasticity indices ranging from 0 to 12 percent, averaging 5 percent.

7.2.3 Sand Facies

Sand Facies deposits were encountered in boring B-1 through B-6, interbedded with and below the Fine-grained and Gravel Facies deposits. In general, the Sand Facies consists of dense to very dense gray and brown Silty SAND to SAND, trace silt (SM, SP-SM, and SP). The unit is typically moist and micaceous, with nonplastic to low plasticity fines and fine to medium sand. One out of 17 SPTs attempted in the unit met refusal, where more than 50 blows were required to drive the sampler through a six-inch interval. The non-refusal SPT N-values ranged from 36 to 85 bpf and averaged 64 bpf. Natural moisture content analyses ranged from 29 to 45 percent, and averaged 36 percent.

7.3 Groundwater

To estimate the depth to groundwater, boring B-1 was flushed with clean water and left open with a tremie pipe inserted to the bottom after drilling. The hole was open from June 5 through June 14, 2013. The water level in the hole was measured every day from June 10 through June 14, when it was backfilled. The measured water level in the open hole remained at 27.6 feet below ground surface from June 10 through June 14. In our opinion, this value likely represents the general depth to groundwater at the site at the time the explorations were performed. Groundwater levels should be expected to fluctuate seasonally and with changes in precipitation, land use, and other factors. In general, we expect groundwater levels in this area to be at a seasonal high during the winter and late spring and at a seasonal low during the late summer and early fall.

8.0 SITE-SPECIFIC SEISMIC HAZARD EVALUATION

In accordance with the site classification criteria in the International Build Code (IBC, 2012), we recommend using a Site Class C for designing structures at this site. The following paragraphs describe required seismically-related hazard evaluations on site.

Strong Ground Motions: The maximum considered earthquake (MCE) ground motions at the bedrock level were obtained from the United States Geological Survey's (USGS) Earthquake Hazards Program – 2008 interactive deaggregation website. The ground motions are based on a probabilistic hazard analysis performed by the USGS and the seismic site classification of the project site. Table 2 provides recommendation seismic design parameters.

TABLE 2: RECOMMENDED SEISMIC DESIGN PARAMETERS

Seismic Parameter	Recommended Value
Site Class	C
Short Period Spectral Acceleration, S_s	0.43g
1-Second Period Spectral Acceleration, S_1	0.13g
Site Factor, F_v	1.67
Site Factor, F_a	1.20
Short Period Damped Acceleration, S_{DS}	0.34g
1-Second Period Damped Acceleration, S_{D1}	0.15g
Seismic Design Category	D

Note: g = gravity acceleration

Fault Rupture: The project site lies more than 12 miles from the nearest mapped fault. It is our opinion that the risk of fault rupture at the site is low.

Other Hazards: Due to the location and geography of the site, it is our opinion that the risk for liquefaction, lateral spread, landsliding, tsunami, or seiche at the site is very low.

9.0 CONCLUSIONS AND RECOMMENDATIONS

9.1 General Conclusions

The borings drilled at the site indicate that the project site is mantled by a relatively thin layer of Loess overlying dense to very dense Catastrophic Flood Deposits - Gravel Facies, and the stiff to hard Fine-grained Facies. The following general conclusions are presented based on the results of our engineering analyses and evaluations.

- The upper 2 to 5 feet of wind-blown silty sand (Loess) is potentially collapsible or subject to strength loss based on our local project experience. Collapse or loss of strength of the soil can occur either by wetting, vibrating, or subjecting the soil to higher normal stresses.
- Most project structures can be supported by shallow foundations; such as mat foundations, ring foundations, and spread footings. Based on our evaluations, it is more economical to use shallow foundations than to use deep foundations, such as driven steel H-piles or pipe piles.
- Turbines and generators, including the Combustion Turbines and Generators, and the Condenser, are the heavy, settlement-sensitive structures. The foundations for these critical structures should transfer load to the dense to very dense Catastrophic Flood Deposits encountered at a depth ranging from 2 to 5 feet. Therefore, all wind-blown silty sand should be completely removed and the excavation backfilled with structural fill. Structural fill, such as the compacted crushed rock or native soil mixed with fly ash/cement, can be used beneath a mat foundation.
- Other structure foundations, for typically lighter, less sensitive structures, such as Main Power Transformers, Cooling Tower, Water Storage Tanks, and Metal Buildings, may be founded within the lower portions of the wind-blown deposit (Loess), where present. The upper 3 feet of Loess from the existing ground surface should be removed and replaced with structural fill. Also, the remaining wind-blown deposit should be pre-wetted and compacted. Detailed design recommendations are provided in the following sections.

9.2 Foundation Subgrade Preparation and Earthwork

9.2.1 Foundation Subgrade Preparation

Excavation and subgrade preparation recommendations are provided in the following paragraphs for the various structures. We understand that the design subgrade elevations may vary for the proposed structures. Therefore, we present herein two different subgrade preparation approaches for the two groups of the structures. The first group includes turbines and generators (heavy, settlement-sensitive structures). The second group includes other structures that are typically lighter weight, less sensitive structures, such as Main Power Transformers, Cooling Tower, Water Storage Tanks, and Metal Buildings. Excavation and subgrade preparation requirements for the above two groups of structures are described in the following paragraphs.

Turbines/Generators Subgrade Preparation – Foundation excavations should extend to the top of the dense to very dense Catastrophic Flood Deposits at the depths ranging 2 to 5 feet below the existing ground surface, and graded to provide a smooth soil surface. Prior to placement of structural fill, the underlying subgrade should be compacted by several coverages of a large smooth drum roller with a minimum static weight of 10,000 pounds, initially operating in the vibratory mode. Following compaction, proof-rolling should be accomplished while operating the drum roller in the static mode. Any loose of soft materials encountered should be removed and replaced with compacted structural fill.

Other Structures Subgrade Preparation – Foundation excavations should extend to a minimum design grade of three (3) feet below existing grade, or to the top of the dense to very dense Catastrophic Flood Deposits, and graded to provide a smooth soil surface. Subgrade preparation and conditioning steps for locations where the Catastrophic Flood Deposits are not encountered are: (1) saturate (pre-wet) the remaining wind-blown silty sand layer with a soaking system operating for an estimated 4 to 6 hours; (2) within one hour of stopping sprinkling, grade to a level surface and compact with at least three coverages of a large smooth drum roller with a minimum static weight of 10,000 pounds and a dynamic force of at least 38,000 foot-pounds operating in the vibratory mode; and (3) proof-roll the compacted surface with a final coverage of the roller operating in the static mode and observe subgrade to detect unsuitable performance during observations by a Shannon & Wilson representative. Any loose or soft materials encountered should be removed and replaced with compacted structural fill. If Catastrophic Flood Deposits are encountered within upper three feet, the subgrade should be prepared as recommended for the Turbines/Generators, above.

9.2.2 Cut and Fill Slopes

We recommend that permanent cut and fill slopes on the site should be no steeper than 2 Horizontal:1 Vertical (2H:1V). Temporary cut slopes will be required for the proposed turbines/generator foundations and buried pipelines or utilities. We recommend that the temporary cut slope inclination be 1.5H:1V or flatter.

The contractor and subcontractor should be aware of and familiar with applicable local, state, and federal safety regulations, including the current OSHA Excavation and Trench Safety Standards, and OSHA Health and Safety Standards for Excavations, 29 CFR Part 1926, or successor regulations. Construction site safety should be the sole responsibility of the contractor, who also is solely responsible for the means, methods, and sequencing of construction operations. We are providing the following information solely as a service to our client. Under no circumstances should the information provided herein be interpreted to mean that Shannon & Wilson is assuming responsibility for construction site safety or the contractor's activities; such responsibility is not being implied and should not be inferred.

9.2.3 Structural Fill

After the partial or complete removal of the wind-blown silty sand layer, compacted structural fill should be used to establish foundation bearing grades. Prior to beginning structural fill placement, the foundation excavation subgrades should be prepared as recommended above. Crushed rock should consist of ¾-inch minus angular rock base aggregate, in accordance with Oregon Department of Transportation (ODOT) Standard Specifications for Construction (2008), Section 02630. In addition to the ODOT requirements, material passing the No. 200 sieve shall not exceed 5 percent by weight using a washed sieve analysis, ASTM D1140. We recommend that the backfill material placed to establish foundation bearing grades be compacted to at least 92 percent of its modified Proctor maximum dry density, determined in accordance with ASTM D1557.

An alternative structural fill is fly ash/cement/soil mix. We understand that the material and placement requirements for fly ash/cement/soil mix will be specified by the project civil engineers, if this option is pursued. We believe that the native silty sand is suitable for use with a fly ash or cement admixture.

The native excavated soil may also be used as structural fill underneath certain spread footings and mat foundations, but the native excavated soil should not be used as structural fill under the mat foundations of the heavy, settlement-sensitive turbines/generators.

Free-draining crushed rock should be used within the ring foundations under the water storage tanks. The preferred material for the free-draining rock is crushed rock coarse aggregate, ¾- to ¼-inch, in accordance with Oregon Department of Transportation (ODOT) Standard

Specifications for Construction (2008), Section 00430.11. Alternatively, concrete sand satisfying ASTM C33 would be acceptable.

9.3 Foundation Design Recommendations

9.3.1 General

The subsurface conditions revealed by the borings indicate that the ground surface across the site is underlain by 2 to 5 feet of wind-blown silty sand which, in turn, is underlain by the Catastrophic Flood Deposits. The allowable settlements for the proposed structures are not known at this time. In the preliminary design, based upon our similar project and local geologic experiences, we recommend excavation depths for the wind-blown silty sand and foundation subgrade preparation for two types of structures: one is for the settlement-sensitive heavy structures, the other is for relatively lightweight structures. In all cases, the width of any foundation element should not be less than 24 inches. Based on discussion with the City of Hermiston Public Works Department, a frost depth of 2 feet is used in the Hermiston area for foundation design. Therefore, foundations should be embedded a minimum depth of 24 inches, measured from the top of the floor slab or lowest adjacent finished grade to the base of the foundation. The following paragraphs present geotechnical design recommendations for two types of structures and include soil allowable bearing capacity, estimated settlement, and foundation excavation and backfill requirements.

9.3.2 Settlement-Sensitive Heavy Structures

For Combustion Turbines and Generators and other settlement-sensitive heavy structures, we recommend complete removal of the wind-blown silty sand layer to an estimated depth of 2 to 5 feet and replacement with a well-graded, clean, crushed rock structural fill, or a fly ash/cement soil mix structural fill. Subgrade preparation should include compaction and proof-rolling as previously described in Section 9.2.1. Due to the sensitivity of foundations to long-term settlement and the possible migration of the crushed rock fill into the native soil, a non-woven geotextile is recommended between the structural fill and the native soil subgrade as a separation layer.

We recommend that an allowable bearing pressure of 5,000 psf be used to proportion the mat foundations for the Turbines/Generators with a factor of safety (FS) of 3. For earthquake loading, this bearing capacity can be increased by one-third (33 percent). The estimated total elastic settlement is less than 0.5 inch. This settlement will occur immediately upon equipment loading. The total long-term settlement, defined as after beginning of operation, is estimated to be in the range of 0.1 to 0.2 inches. The differential settlement is dependent on the variability of the underlying dense to very deposit and the rigidity of the mat foundation and cannot be quantified. We recommend using a subgrade modulus of 300 pci for foundation design regardless of foundation dimensions. In addition to our model, we are assuming in all cases that the minimum crushed rock thickness under the mat foundations is 12 inches.

9.3.3 Light Weight Structures

To limit settlement to an acceptable level, we recommend excavating the upper wind-blown silty sand to a depth of 3 feet below the existing ground surface or to the top of the Catastrophic Flood Deposit later and backfilling to the foundation grade with structural fill. Subgrade preparation should be performed as described in Section 9.2.1. To limit total settlement to less than 1 inch, an allowable static bearing pressure of 3,500 psf can be used for foundation design with a FS of 3. For earthquake loading, this bearing capacity can be increased by one-third (33 percent). A subgrade modulus of 150 pci is recommended for foundation design regardless of foundation dimensions if a 6-inch-thick leveling course is used.

9.4 Lateral Earth Pressure on Embedded Walls

9.4.1 General

Lateral earth pressures on retaining walls depend on the type of wall (i.e., yielding or non-yielding), the type and method of placement of backfill against the wall, the magnitude of surcharge weight on the ground surface adjacent to the wall, the slope of the backfill, and the design criteria (static or seismic condition). Our opinion is that the embedded walls for the typical underground structures should be designed as non-yielding walls and for seismic loading conditions. Lateral earth pressures for the embedded walls have been analyzed assuming backfill material is an imported, free-draining crushed rock.

Groundwater at the project site is much lower than the existing ground surface and we recommend that the walls be backfilled with free-draining rock. Therefore, we assume that no hydrostatic pressure is against embedded walls. Although permanent surcharge loading above grade has not been identified at this time, we have included surcharge lateral pressures in case such loads are identified in the future. Also, we have assumed lateral pressures that may be induced during compaction of backfill materials.

9.4.2 Backfill Material and Compaction

We recommend that the backfill material placed against the wall be compacted at least to 90 percent of its modified Proctor maximum dry density, determined in accordance with ASTM D1557. Heavy compaction equipment should not be allowed closer than 5 feet to the embedded wall to limit inducing high lateral earth pressures.

9.4.3 Lateral Earth Pressure

The static lateral earth pressure on the embedded walls consists of two components: the static earth pressure, and static surcharge pressure. We recommend the at-rest lateral static earth pressure equal to 50H pounds per square foot (psf) be used for design. We assume that surcharge loads, q, acting on the ground surface adjacent to the embedded walls can produce 0.4q psf uniform rectangular distribution lateral pressure on the wall.

For the seismic loading condition, based on the heights of the walls and the backfill materials, we recommend using the Mononobe-Okabe equation. For the seismic loading, we recommend an additional lateral earth pressure of 14 psf with an inverted triangular distribution be applied to the wall.

The distributions and resultants of these lateral pressures are shown on Figure 5. The recommendations presented above are independent of other structural considerations including wall stiffness, load factoring, and crack control.

9.4.4 Lateral Resistance

The lateral loads on the proposed structures, including lateral earth pressures, earthquakes, and wind can be resisted by sliding resistance of the foundation and partial soil passive pressure, which is assumed to be about 50 percent of full soil passive pressure. We recommend that an allowable coefficient of sliding resistance, f, equal to 0.45, and an allowable partial soil passive pressure, 180d psf (where d is depth of the embedment of the bottom of foundation), be used for design of sliding and overturning resistance.

9.5 Trench Backfilling

The engineering conclusions and recommendations for the buried underground pipeline trench backfilling are presented below. Our recommendations for trench backfilling consist of two different approaches. One is for trenches in non-structural areas, the other is for trenches in settlement-sensitive areas, such as the embedded pipe below the foundations. Also, in each trench backfill approach, the trench materials consist of three zones, designated: pipe bedding, pipe zone, and trench backfill. The definitions of these three zones are shown in Figure 6.

9.5.1 Trench Materials for Typical Non-Structural Areas

As shown in Figure 6, the pipe zone is defined from the bottom of the pipe to a distance of 12 inches above the top of the pipe. The trench backfill is defined as the backfill between the ground surface and the pipe zone. For the typical yard piping in non-structural locations, the native sandy soil is acceptable for bedding material. The selected native excavation soil also can be used for both the pipe zone and the trench backfill zone. All pieces of gravel and particles larger than 1 inch in diameter should be removed from the pipe zone. Loose lifts should not exceed 8 inches and should be compacted to at least 85 percent of ASTM D1557 (modified Proctor). The lifts should be placed the full width of the trench and be brought up equally on each side of pipe to maintain balanced loading on the pipe wall. Particular care should be taken in placing the initial lift on the underside of the pipe to provide a solid backing and prevent lateral movement during backfilling and compaction.

9.5.2 Trench Materials for Settlement-Sensitive Areas

Where the trench is within the loading influence zone of a settlement-sensitive foundation, the native sandy soil is acceptable for bedding material. However, for the pipe zone and the trench backfill zone, we recommend that native materials not be used. Instead, for the pipe zone we recommend the use of either well-graded clean crushed rock or controlled density fill (CDF). CDF is composed of sand or fine gravel not exceeding ½-inch maximum size with portland cement, fly ash, admixtures and water as binding materials to create a flowable backfill material. Admixtures should be used as necessary to produce flowability without segregation. The unconfined compressive strength of the material should be between 50 and 250 psi at 28 days, per ASTM D4832. In placing CDF, care needs to be exercised to not float the pipe. If crushed rock is used, the material should be placed in loose lifts not exceeding 8 inches and compacted to 90 percent of ASTM D1557 (modified Proctor). The lifts should be placed the full width of the trench and be brought up equally on each side of pipe to maintain balanced loading on the pipe wall. Particular care should be taken in placing the initial lift on the underside of the pipe to provide a solid backing and prevent lateral movement during backfill and compaction.

For the trench backfill above the pipe zone, we recommend using crushed rock. CDF is not recommended in this zone because a "hard spot" could be created, resulting in an uneven subgrade modulus condition.

9.5.3 Floor Slab

For floor slab subgrade preparation, we recommend excavating the upper wind-blown silty sand to a depth of 3 feet below the existing ground surface or to the top of the Catastrophic Flood Deposit and backfilling with structural fill. The structural fill may consist of clean, well-graded crushed rock or native sandy/silty soil. If native soil is used as structural fill in the floor slab areas, we recommend a minimum 8 inches of clean crushed rock with less than 2 percent passing Sieve No. 200 be placed beneath the floor slab as a capillary break between subgrade and slab. The structural backfill should be compacted at least to 90 percent of its modified Proctor maximum dry density, determined in accordance with ASTM D1557. We recommend a subgrade modulus of 150 pci be used for floor slab design.

9.6 Pavement Design

9.6.1 General

We assume that the new pavement for the access road and parking lot will consist primarily of asphalt concrete (AC) pavement. It is our understanding Portland cement concrete (PCC) pavement may be used in some areas as an alternative. The 2011 ODOT Pavement Design Guide (OPDG) recommends a minimum 20-year design life for AC pavement. The pavement is designed using the 2011 OPDG and the 1993 AASHTO Guide for Design of Pavement Structures procedures. Subgrade preparation, pavement and base rock materials, and installation should be in accordance with the 2008 ODOT Oregon Standard Specifications for Construction (OSSC).

9.6.2 Traffic Analysis for AC Pavement

Traffic data was not provided for our pavement design; however we understand the pavement design is intended to be preliminary and for permitting purposes only. An Average Daily Traffic (ADT) of 500 vehicles, with 5 percent trucks, was assumed. In addition, a yearly growth rate of 2 percent was assumed.

ODOT truck conversion factors for two-way AC pavement were used to determine design equivalent single axle load (ESALs). The design ESALs over the design life was calculated to be approximately 503,000 ESALs.

9.6.3 Dynamic Cone Penetration Test Results

We performed five Dynamic Cone Penetration (DCP) tests for the project. The DCP is a device widely used to estimate in-situ strength properties of subgrade soils. We used the DCP standard test method (ASTM D6951-03) to estimate subgrade resilient modulus (M_r) per the OPDG. Based on the DCP blows, we established a DCP index value. We correlated the DCP index value to subgrade resilient modulus using the correlation between DCP index and M_r provided in the OPDG and the AASHTO Guide for Design of Pavement Structures. DCP logs showing correlated M_r profiles for each test are attached in Appendix A. We used selected DCP test results as input for pavement design.

9.6.4 Subgrade

The anticipated subgrade soil for on-grade pavement consists primarily of medium dense silty sand. The subgrade preparation should be completed in accordance with ODOT specifications. Based on the ODOT OSSC, the subgrade should be compacted to a minimum density of 95 percent of the maximum dry density (AASHTO T-99) for the upper 12 inches of subgrade soil. After site clearing/grubbing and/or grading (cut), and prior to placement of fill or pavement material, we recommend that the subgrade be inspected to identify any soft or weak spots. The subgrade inspection should consist of proof-rolling the subgrade with a fully loaded dump truck and testing selected locations with a nuclear density gauge. Soft or weak spots should be overexcavated and replaced with compacted granular material. We recommend that a non-woven geotextile be used between soil subgrade and base aggregate to separate and minimize subgrade fines pumping into the base rock.

For subgrade prepared and improved in accordance with the recommendations provided in this report, a M_r value of 6,000 psi can be used for AC pavement design. Alternatively, the AC pavement may be designed using a California Bearing Ratio (CBR) value of 4.

9.6.5 AC Pavement Design Parameters

The following additional assumptions should be reviewed by the design team to evaluate their suitability for this project. Changes in the assumptions will affect the corresponding pavement section recommendations.

- Subgrade Resilient Modulus (psi) = 6,000
- Design Life: 20 years for new AC pavement
- Standard Deviation = 0.49
- Loss of Serviceability = 1.7 (initial = 4.2, terminal = 2.5)
- Reliability: 75 Percent
- Drainage Coefficient = 1.0 (good)

9.6.6 AC Pavement Section Recommendations

Based on pavement design parameters listed above, the recommended AC pavement section for the access road and parking lot is shown in Table 3.

TABLE 3: RECOMMENDED AC PAVEMENT SECTION

Pavement Thickness (inches)	Base Aggregate (inches)
6	8

These thicknesses are to be the minimum acceptable and are on the assumption that construction will be completed during dry weather. The pavement should be constructed after the successful preparation of the site. Construction of pavement when subgrade soils are wet will require an increased thickness of crushed rock base or stabilized subgrade.

The required AC mix design level, gradation and binder grade is a Level 2, ½-inch dense with PG 64-28 binder. Asphalt grade is selected based on Table J-5 of the OPDG for rural roadway with ESAL less than 1 million. All aggregate material should meet the requirements of Section 02630 of ODOT Standard Specifications.

9.6.7 PCC Pavement

The 2011 ODOT Pavement Design Guide (OPDG) recommends a minimum 30-year design life for AC pavement. We recommend that a modulus of subgrade reaction (k) of 200 pound per cubic inch (pci) to be used for PCC pavement design.

10.0 LIMITATIONS

The analyses, conclusions, and recommendations contained in this report are based upon site conditions as they presently exist and further assume that the borings are representative of subsurface conditions throughout the site, i.e., the subsurface conditions everywhere are not significantly different from those disclosed by the field explorations.

If, during construction, subsurface conditions different from those encountered in the field explorations are observed or appear to be present beneath excavations, we should be advised at once so that we can review these conditions and reconsider our recommendations where necessary. If there is a substantial lapse of time between the submission of this report and start of work at the site, or if conditions have changed due to natural causes or construction operations at or adjacent to the site, it is recommended that this report be reviewed to determine the applicability of these conclusions and recommendations, considering the changed conditions and the elapsed time.

We recommend that Shannon & Wilson review the geotechnical portions of the plans and specifications, especially those parts that address bridge foundations, retaining walls, embankments, and earthwork to determine if they are consistent with our recommendations.

This report is prepared for the exclusive use of Burns & McDonnell Engineering Company, Inc., for the preliminary design and permitting of the Perennial Power Wind Chaser Project in Hermiston, Oregon. Unanticipated soil conditions are commonly encountered and cannot fully be determined by merely taking soil samples from geotechnical borings. Such unexpected conditions frequently require that additional expenditures be made to attain properly constructed projects. This report is not as a warranty of subsurface conditions described in this report. Shannon & Wilson has prepared the attached, “Important Information About Your Geotechnical Engineering Report,” to assist you and others in understanding the use and limitations of our reports. This attachment is presented in Appendix D of this report.

Please note that the scope of our services did not include any environmental assessment or evaluation regarding the presence or absence of hazardous or toxic materials in the soil, surface water, groundwater, or air, on or below or around the project site.

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11.0 REFERENCES

American Association of State Highway and Transportation Officials (AASHTO), 2012, AASHTO LRFD Bridge Design Specifications: Customary U.S. Units (6th ed.): Washington, D.C., AASHTO, 2 v.

Fang, H.-Y., 1991, Foundation engineering handbook (2nd ed.): N. Y., Van Nostrand Reinhold, 923 p.

Madin, I.P., and Geitgey, R.P., 2007, Preliminary Geologic Map of the Umatilla Basin, Morrow and Umatilla Counties, Oregon: State of Oregon Department of Geology and Mineral Industries, Open-File Report O-07-15, 1:100,000.

Allen, J.E., Burns, Marjorie, Burns, S.F., Cataclysms on the Columbia, Revised Second Edition, 2009, Ooligan Press, Portland, Oregon.

Farooqui, S.M., Beaulieu, J.D., Bunker, R.C,, Stensland, D.E., and Thoms, R.E., 1981, Dalles Group: Neogene formations overlying the Columbia River Basalt Group in north-central Oregon: Oregon Geology, Vol. 43, No. 10, October 1981, p. 131.

Lidke, D.J., compiler, 2002, Fault number 568, Columbia Hills structures, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/hazards/qfaults, accessed 07/17/2013 02:20 PM.

Madin, I.P., and Geitgey, R.P., 2007, Preliminary Geologic Map of the Umatilla Basin, Morrow and Umatilla Counties, Oregon: Oregon Department of Geology and Mineral Industries Open-File Report O-07-15, scale 1:100,000.

Oregon Department of Transportation, 2011, ODOT Pavement Design Guide, Pavement Services Unit, Salem, Oreg., 2 v., available: http://www.oregon.gov/ODOT/HWY/CONSTRUCTION/docs/pavement/pavement_design_guide.pdf.

Oregon Department of Transportation, 2008, Oregon Standard Specifications for Construction, Salem, Oreg., 2.v., available: http://www.oregon.gov/ODOT/HWY/SPECS/Pages/standard_specifications.aspx.

Personius, S.F., and Lidke, D.J., compilers, 2003, Fault number 567, Horse Heaven Hills structures, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/hazards/qfaults, accessed 07/17/2013 02:15 PM.

Personius, S.F., and Lidke, D.J., compilers, 2003, Fault number 845c, Hite fault system, Thorn Hollow section, in Quaternary fault and fold database of the United States: U.S.

Geological Survey website, http://earthquakes.usgs.gov/hazards/qfaults, accessed 07/17/2013 12:53 PM.

Personius, S.F., and Lidke, D.J., compilers, 2003, Fault number 845d, Hite fault system, Agency section, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/hazards/qfaults, accessed 07/17/2013 12:52 PM.

Personius, S.F., and Lidke, D.J., compilers, 2003, Fault number 846, Wallula fault system, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/hazards/qfaults, accessed 07/17/2013 12:56 PM.

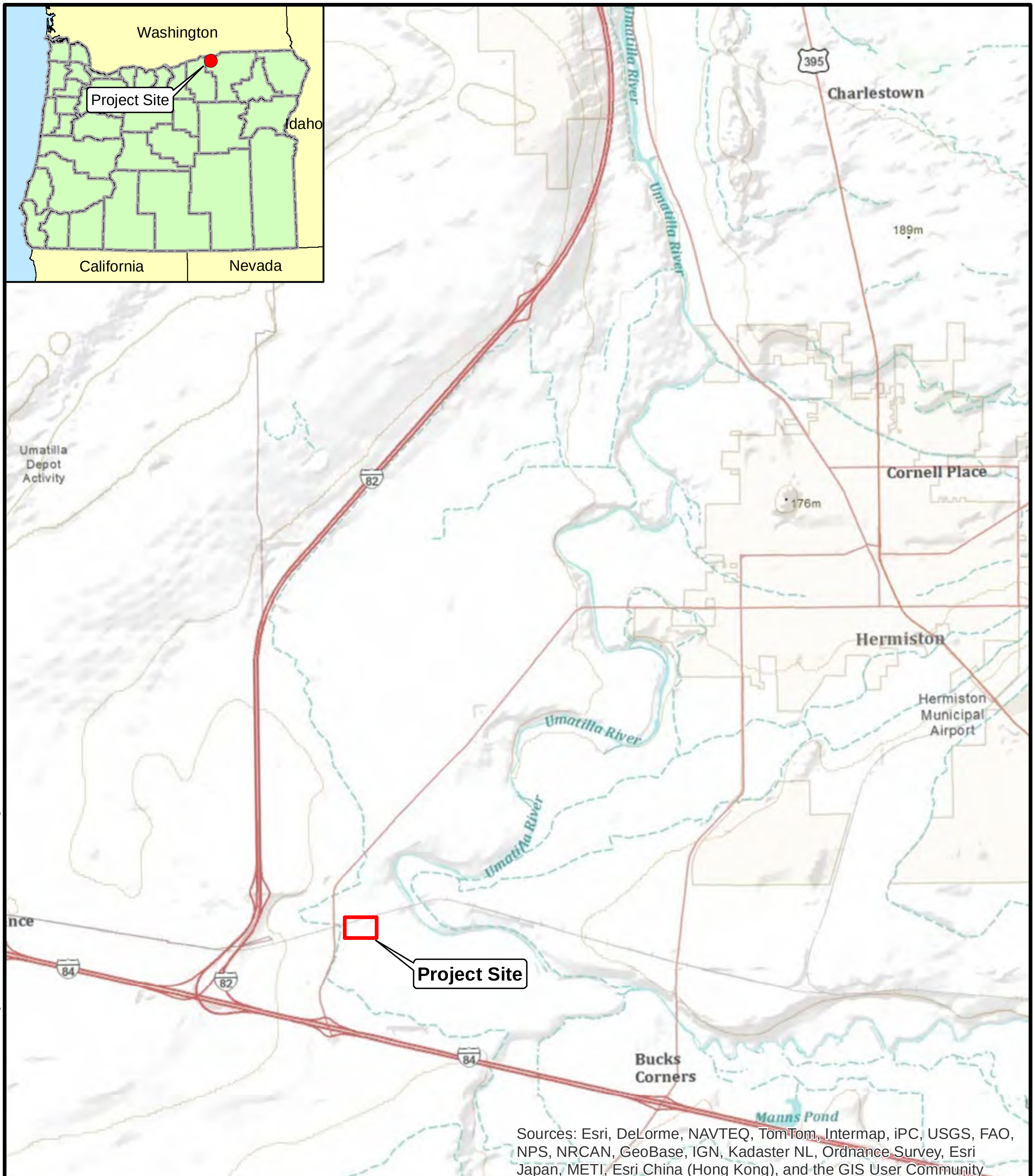
Reidel, S.P., Fecht, K.R., Hagood, M.C., and Tolan, T.L., 1989, The geologic evolution of the central Columbia Plateau, *in* Reidel, S.P., and Hooper, P.R., eds.,Volcanism and tectonism in the Columbia River flood-basalt province: Boulder, Colorado, Geological Society of America, Special Paper 239, p.247-264.

Smith, G.A., Bjornstad, B.N., and Fecht, K.R., 1989, Neogene terrestrial sedimentation on and adjacent to the Columbia Plateau; Washington Oregon, and Idaho, *in* Reidel, S.P., and Hooper, P.R., eds.,Volcanism and tectonism in the Columbia River flood-basalt province: Boulder, Colorado, Geological Society of America, Special Paper 239, p. 187-198.

U.S. Geologic Survey, 2013, Geologic Hazards Science Center website, Oregon Quaternary Faults: http://geohazards.usgs.gov/qfaults/or/Oregon.php.

Waitt, R.B., 1980, About forty late-glacial Lake Missoula jökuhlaups through southern Washington: Journal of Geology, v. 88, p. 653-679.

Walker, G.W., 1973, Reconnaissance Geologic Map of the Pendleton Quadrangle, Oregon and Washington: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-727, scale 1:250,000.



Perennial Wind Chaser Station
Hermiston, Oregon

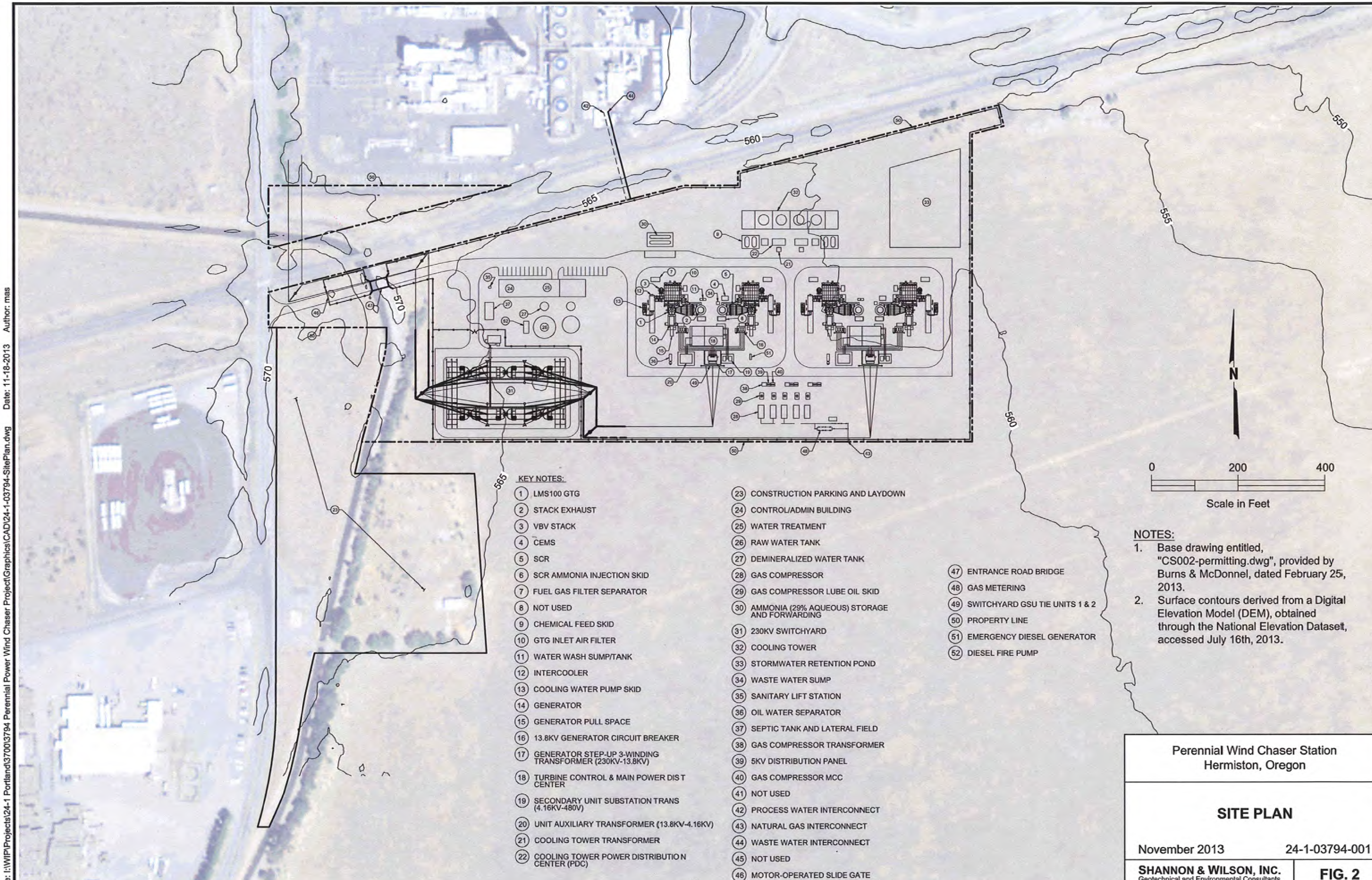
VICINITY MAP

November 2013 24-1-03794-001

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 1

Path: T:\Projects\24-1\3794 Perennial Power Wind Chaser Project\Avmxd\HermistonVicinity.mxd 11/19/2013 ath



KEY NOTES:

1. LMS100 GTG
2. STACK EXHAUST
3. VBV STACK
4. CEMS
5. SCR
6. SCR AMMONIA INJECTION SKID
7. FUEL GAS FILTER SEPARATOR
8. NOT USED
9. CHEMICAL FEED SKID
10. GTG INLET AIR FILTER
11. WATER WASH SUMP/TANK
12. INTERCOOLER
13. COOLING WATER PUMP SKID
14. GENERATOR
15. GENERATOR PULL SPACE
16. 13.8KV GENERATOR CIRCUIT BREAKER
17. GENERATOR STEP-UP 3-WINDING TRANSFORMER (230KV-13.8KV)
18. TURBINE CONTROL & MAIN POWER DIST CENTER
19. SECONDARY UNIT SUBSTATION TRANS (4.16KV-480V)
20. UNIT AUXILIARY TRANSFORMER (13.8KV-4.16KV)
21. COOLING TOWER TRANSFORMER
22. COOLING TOWER POWER DISTRIBUTION CENTER (PDC)
23. CONSTRUCTION PARKING AND LAYDOWN
24. CONTROL/ADMIN BUILDING
25. WATER TREATMENT
26. RAW WATER TANK
27. DEMINERALIZED WATER TANK
28. GAS COMPRESSOR
29. GAS COMPRESSOR LUBE OIL SKID
30. AMMONIA (29% AQUEOUS) STORAGE AND FORWARDING
31. 230KV SWITCHYARD
32. COOLING TOWER
33. STORMWATER RETENTION POND
34. WASTE WATER SUMP
35. SANITARY LIFT STATION
36. OIL WATER SEPARATOR
37. SEPTIC TANK AND LATERAL FIELD
38. GAS COMPRESSOR TRANSFORMER
39. 5KV DISTRIBUTION PANEL
40. GAS COMPRESSOR MCC
41. NOT USED
42. PROCESS WATER INTERCONNECT
43. NATURAL GAS INTERCONNECT
44. WASTE WATER INTERCONNECT
45. NOT USED
46. MOTOR-OPERATED SLIDE GATE
47. ENTRANCE ROAD BRIDGE
48. GAS METERING
49. SWITCHYARD GSU TIE UNITS 1 & 2
50. PROPERTY LINE
51. EMERGENCY DIESEL GENERATOR
52. DIESEL FIRE PUMP

NOTES:

1. Base drawing entitled, "CS002-permitting.dwg", provided by Burns & McDonnel, dated February 25, 2013.
2. Surface contours derived from a Digital Elevation Model (DEM), obtained through the National Elevation Dataset, accessed July 16th, 2013.

Perennial Wind Chaser Station
Hermiston, Oregon

SITE PLAN

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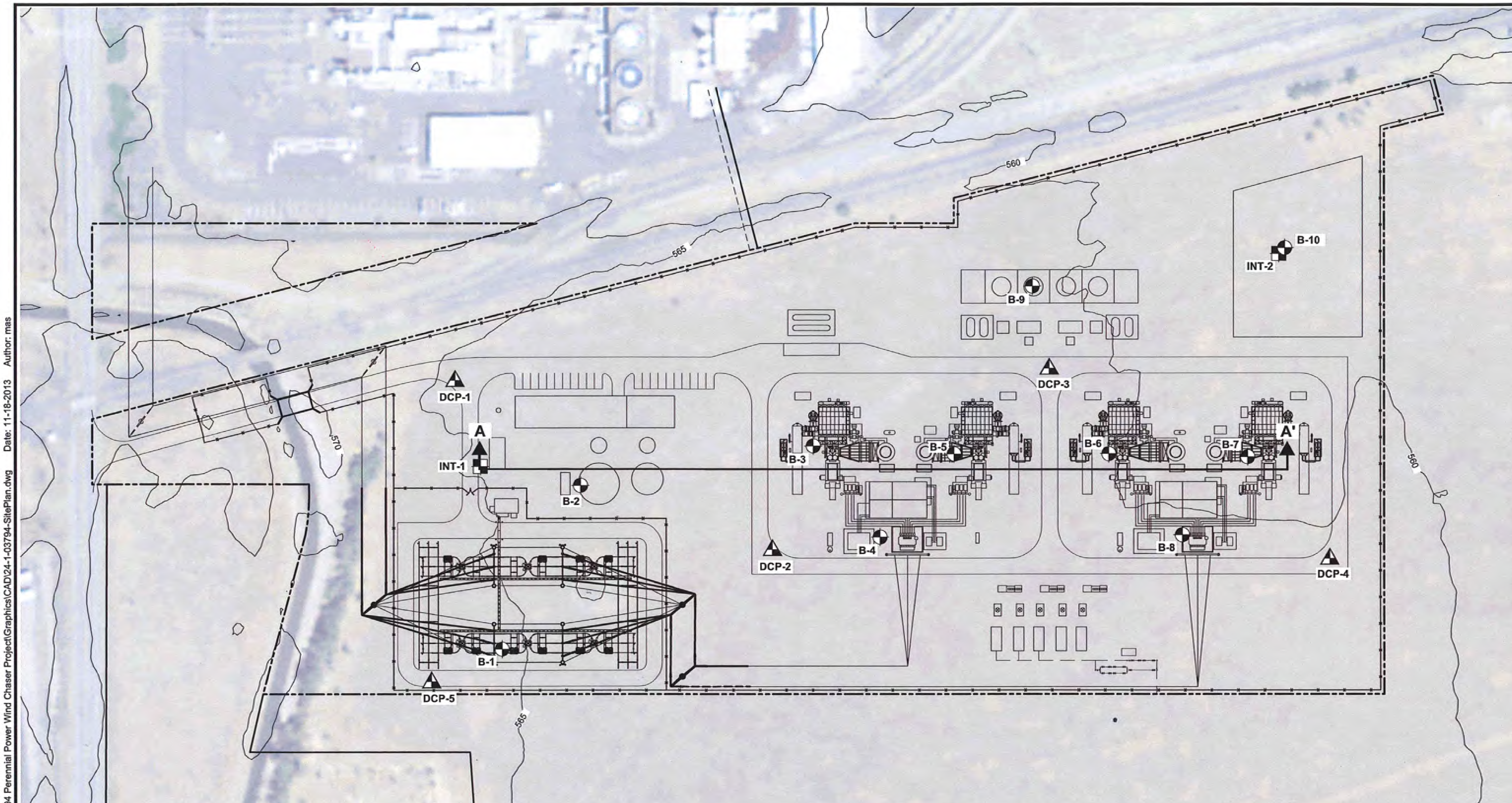
FIG. 2

File: I:\WP\Projects\24-1 Portland\3700\3794 Perennial Power Wind Chaser Project\Graphics\CAD\24-1-03794-SitePlan.dwg Date: 11-18-2013 Author: mas



File: I:\WIP\Projects\24-1 Portland\37000\3794 Perennial Power Wind Chaser Project\Graphics\CAD\24-1-03794-SitePlan.dwg Date: 11-18-2013 Author: mas

EXPLANATION

B-1 Location and Designation of Boring

INT-1 Location and Designation of Infiltration Test

DCP-1 Location and Designation of Dynamic Cone Penetrometer

A A' Location and Designation of Profile

NOTES:

1. Base drawing entitled, "CS002-permitting.dwg", provided by Burns & McDonnel, dated February 25, 2013.
2. Surface contours derived from a Digital Elevation Model (DEM), obtained through the National Elevation Dataset, accessed July 16th, 2013.

0 120 240

Scale in Feet

N

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Hermiston, Oregon

EXPLORATION PLAN

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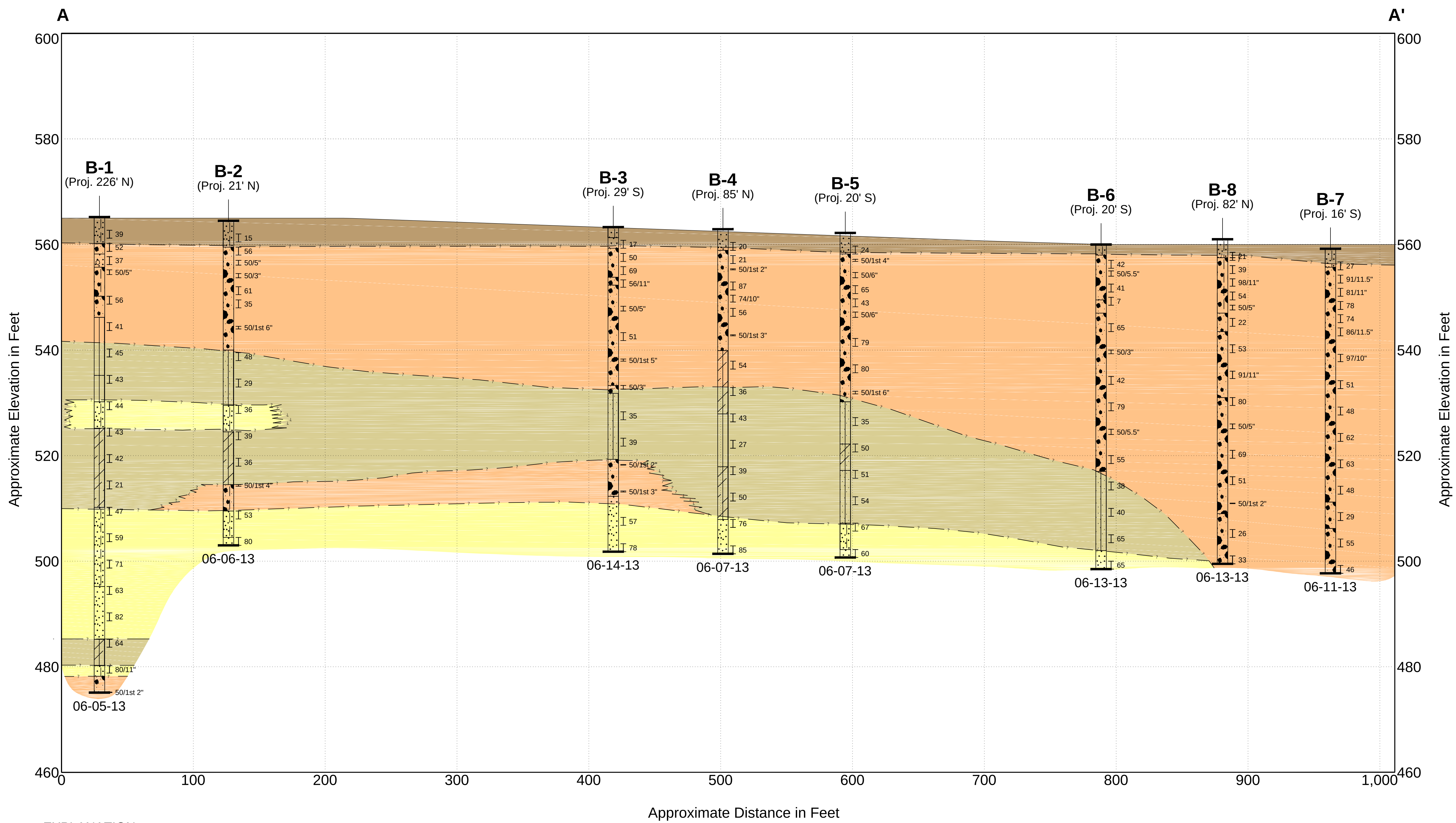
FIG. 3



EXPLANATION

B-1 — Designation of Boring

Sample and Penetration Resistance in Blows/Foot or Blows/Inches Driven

Inferred Subsurface Contact

USCS Symbol (see chart, right)

Bottom of Boring

06-04-07 — Date of Completion

Loess

Catastrophic Flood Deposits

Gravel Facies

Sand Facies

Fine-grained Facies

NOTE

This subsurface profile is generalized from materials observed in soil borings. Variations may exist between profile and actual conditions.

0 80 160

Horizontal Scale in Feet

0 20 40

Vertical Scale in Feet

Vertical Exaggeration = 4X

Perennial Wind Chaser Station
Hermiston, Oregon

PROFILE A-A'

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FIG. 4

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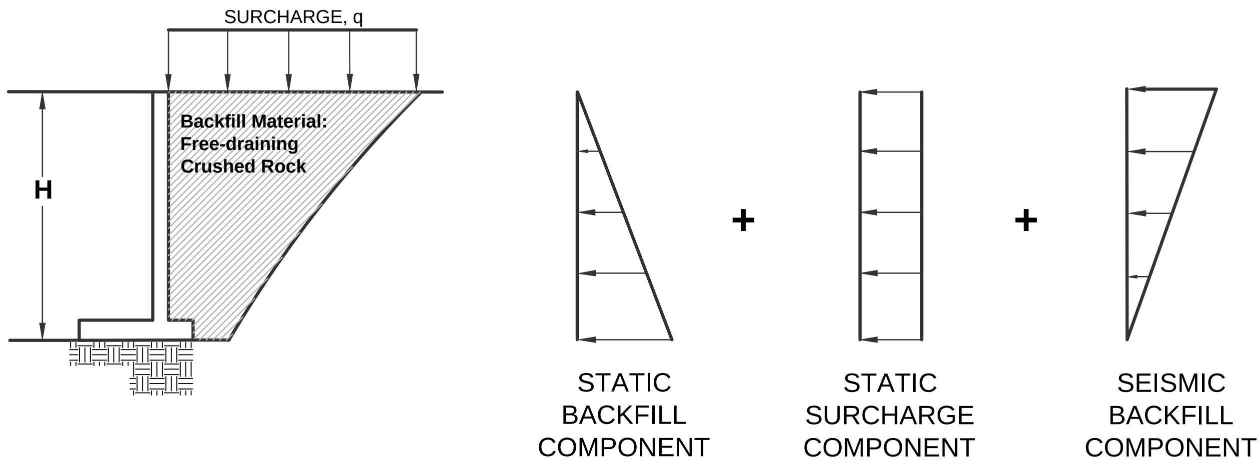
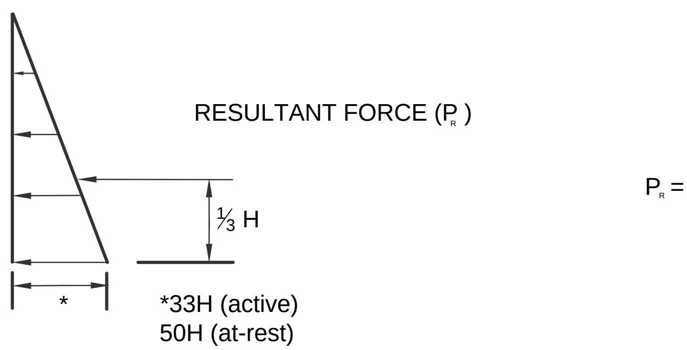
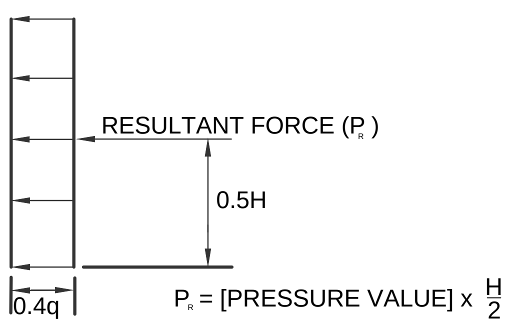
TOTAL LATERAL PRESSURE



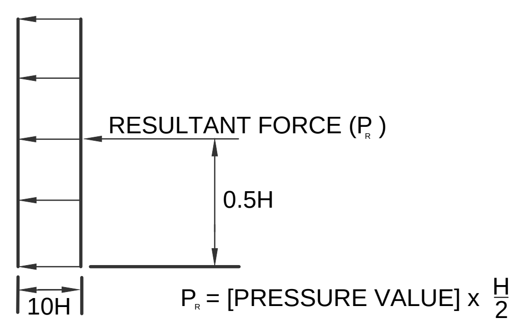
STATIC BACKFILL COMPONENT



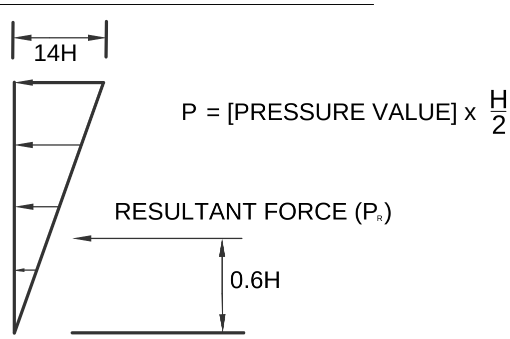
STATIC SURCHARGE COMPONENT



COMPACTION INDUCED COMPONENT



SEISMIC BACKFILL COMPONENT



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LATERAL PRESSURE DISTRIBUTION AND RESULTANT LOCATION

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FIG. 5

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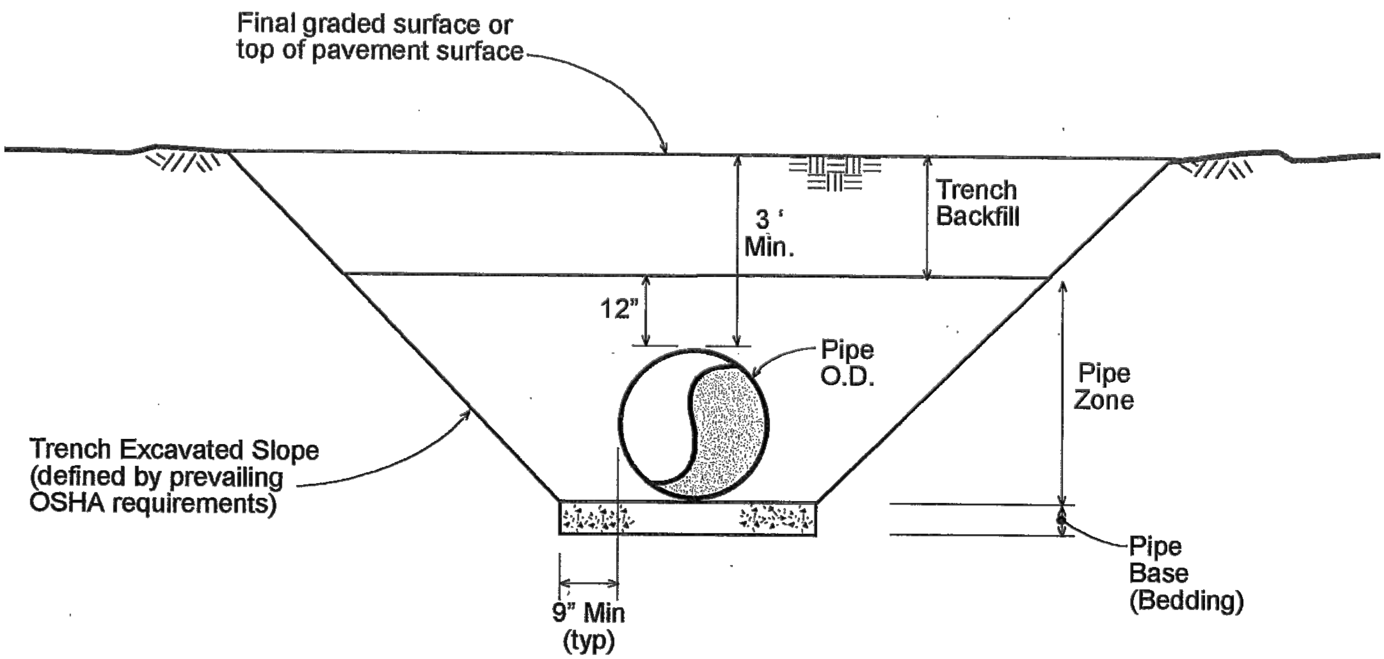

Perennial Wind Chaser Station
Hermiston, Oregon

TRENCH BACKFILL TERMINOLOGY

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FIG. 6

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APPENDIX A

FIELD EXPLORATIONS

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TABLES

FIGURES

APPENDIX A

FIELD EXPLORATIONS

A.1 GENERAL

Shannon & Wilson, Inc., explored subsurface conditions at the project site with ten (10) geotechnical borings, five (5) dynamic cone penetrometer (DCP) tests, and two (2) infiltration tests. The borings were designated B-1 through B-10 and ranged in depth from 31 to 90.1 feet below the ground surface (bgs). The DCP tests were designated DCP-1 through DCP-5 and ranged in depth from 2.3 to 5.4 feet bgs. The infiltration tests were designated INT-1 and INT-2 and ranged in depth from 1.5 to 2.0 feet bgs. The locations of the completed borings, DCPs, and infiltration tests were measured in the field using a handheld GPS unit. Approximate exploration locations are shown on the Exploration Plan, Figure 3. Exploration coordinates, elevations, depths, and other data are presented on the Exploration Summary, Table A1. This appendix describes the techniques used to advance and sample the borings and presents logs of the materials encountered during drilling. It also presents DCP and infiltration testing procedures and results.

A.2 BORINGS

A.2.1 Drilling

Borings B-1 through B-10 were drilled between June 5 and June 14, 2013. The borings were drilled using two CME-75 truck-mounted drill rigs provided and operated by Hardcore Drilling, Inc., of Dundee, Oregon. The two drill rigs were exchanged on June 12, 2013, due to a mechanical problem with the first rig. Boring B-1 was started using hollow stem auger drilling techniques so that the groundwater depth could be discerned, but the augers met refusal in the gravel deposits, above the groundwater table. Boring B-1 was then completed using mud rotary drilling techniques, flushed with water, and left open for several days in order to observe the approximate groundwater level. Borings B-2 through B-10 were drilled using mud-rotary drilling techniques. Shannon & Wilson representatives were present during the explorations to locate the borings, observe the drilling, collect soil samples, and log the materials encountered.

A.2.2 Disturbed Sampling

Disturbed samples were collected in the borings, typically at 2.5- to 5-foot depth intervals, using a standard 2-inch outside diameter (O.D.) split spoon sampler in conjunction with Standard Penetration Testing. In a Standard Penetration Test (SPT), ASTM D1586, the sampler is driven 18 inches into the soil using a 140-pound hammer dropped 30 inches. The number of blows required to drive the sampler the last 12 inches is defined as the standard penetration resistance, or N-value. The SPT N-value provides a measure of in-situ relative density of cohesionless soils (silt, sand, and gravel), and the consistency of cohesive soils (silt and clay). All disturbed samples were visually identified and described in the field, sealed to retain moisture, and returned to our laboratory for additional examination and testing.

SPT N-values can be significantly affected by several factors, including the efficiency of the hammer used. Two different automatic hammer systems were used for the borings performed at the site. Automatic hammers generally have higher energy transfer efficiencies than cathead driven hammers. Based on information we received from Hardcore Drilling, Inc., the energy efficiency of the hammer used on borings B-1, B-2, B-4, B-5, and B-7 was measured at 72 percent in February 2013, and the energy efficiency of the hammer used on borings B-3, B-6, B-8, and B-9 was measured at 85.1 percent in January 2013. In boring B-10, the drill rig and automatic hammer system were changed during drilling. Samples S-1 through S-3 were taken using the hammer with 72 percent energy efficiency and samples S-4 through S-9 were taken using the hammer with 85.1 percent energy efficiency. Hammer efficiencies for each of the borings are presented in Table A1. All N-values presented in this report are in blows per foot, as counted in the field. No corrections of any kind have been applied.

An SPT was considered to have met refusal where more than 50 blows were required to drive the sampler 6 inches. If refusal was encountered in the first six-inch interval (for example, 50 for 1.5”), the count is reported as 50/1st 1.5”. If refusal was encountered in the second six-inch interval (for example, 48, 50 for 1.5”), the count is reported as 50/1.5”. If refusal was encountered in the last six-inch interval (for example, 39, 48, 50 for 1.5”), the count is reported as 98/7.5”.

A.2.3 Undisturbed Sampling

Undisturbed samples were collected in 3-inch O.D. thin-wall Shelby tubes which were pushed into the undisturbed soil at the bottoms of boreholes hydraulically. The soils exposed at the ends of the tubes were examined and described in the field. After examination, the ends of the tubes were sealed to preserve the natural moisture of the samples. The sealed tubes were stored in the upright position and care was taken to avoid shock and vibration during their transport and storage in our laboratory.

A.2.4 Borehole Abandonment

After drilling, boring B-1 was flushed with water and left open with a tremie pipe inserted for several days in order to observe the natural groundwater level. After the groundwater level was recorded, it was backfilled with bentonite cement grout. All other boreholes were backfilled with bentonite cement grout or bentonite chips in accordance with Oregon Water Resource Department regulations. No wells or other instruments were installed in the boreholes.

A.2.5 Material Descriptions

Soil samples were described and identified visually in the field in general accordance with ASTM D2488, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). The specific terminology used is defined in the Soil Description and Log Key, Figure A1. Consistency, color, relative moisture, degree of plasticity, peculiar odors and other distinguishing characteristics of the samples were noted. Once transported to our laboratory, the samples were re-examined, various classification tests were performed, and the field descriptions and identifications were modified where necessary. We refined our visual-manual soil descriptions and identifications based on the results of the laboratory tests, using elements of the Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System), ASTM D2487. However, ASTM D2487 was not followed in full because it requires that a suite of tests be performed to fully classify a single sample.

A.2.6 Logs of Borings

Summary logs of borings are presented in Figures A2 through A11. Soil descriptions and interfaces on the logs are interpretive, and actual changes may be gradual. The left-hand portion of the boring logs gives our description, identification, and geotechnical unit designation for the soils encountered in the boring. The right-hand portion of the boring logs shows a graphic log, sample locations and designations, groundwater information, and a graphical representation of N-values, natural water contents, sample recovery, Atterberg limits, and fines content.

A.3 DYNAMIC CONE PENETROMETER (DCP) TESTING

A Shannon & Wilson geologist performed five (5) dynamic cone penetrometer (DCP) tests, designated DCP-1 through DCP-5, on July 9, 2013. The approximate locations of the DCPs are shown on the Exploration Plan, Figure 3. The DCP is a device widely used to determine in-situ strength properties of base materials and subgrade soils. The tests were performed in general accordance with ASTM D6951, Standard Test Method for the Use of the Dynamic Cone Penetrometer in Shallow Pavement Applications. The four main components of the DCP include the cone, rod, anvil, and hammer. The cone is attached to one end of the DCP rod while the anvil and hammer are attached to the other end. Energy is applied to the cone tip through the rod by dropping the 17.64-pound hammer a distance of 22.6 inches against the anvil. The diameter of the cone is 0.16 inch larger than the rod to ensure that only tip resistance is measured. The number of blows required to advance the cone into the subsurface materials is recorded. The DCP index is the ratio of the depth of penetration to the number of blows of the hammer. This can be correlated to a variety of material properties, including California Bearing Ratio (CBR) and Resilient Modulus. The DCP test data and the resulting Subgrade Resilient Modulus versus depth plots, developed in accordance with the ODOT Pavement Design Guide (2011), are presented in Figure A12 through Figure A16.

A.4 INFILTRATION TESTING

A Shannon & Wilson geologist performed two (2) infiltration tests, designated INT-1 and INT-2, on July 9, 2013. The approximate locations of the infiltration tests are shown on the Exploration Plan, Figure 3. The test was performed in general accordance with the Encased Falling Head Test method, described in the 2008 Portland Stormwater Management Manual, Appendix F2. At each test location, a hole was excavated to a depth between 1.5 and 2.0 feet below the ground surface using a post-hole digger. A six-inch inside diameter polyvinyl chloride (PVC) casing was then inserted and embedded six inches into the bottom of the hole to create a six-inch soil plug. Water was added to the casing to presoak the soil. After the initial pre-soak, testing was performed by adding additional water to the casing and periodically measuring the depth to water from the top of the casing. Infiltration test data are presented in Table A2 and Table A3.

TABLE A1: EXPLORATION SUMMARY

Exploration Designation	Date Started	Date Completed	Northing[1] (ft)	Easting[1] (ft)	Elevation[2] (ft)	Total Depth[3] (ft)	Driller/ Excavator[4]	Equipment	Hammer Efficiency[5] (%)
B-1	6/5/2013	6/5/2013	780334	8490173	565.2	90.1	Hardcore	CME-75 (102)	72.0
B-2	6/6/2013	6/6/2013	780539	8490271	564.5	61.5	Hardcore	CME-75 (102)	72.0
B-3	6/13/2013	6/14/2013	780589	8490563	563.3	61.5	Hardcore	CME-75 (103)	85.1
B-4	6/6/2013	6/7/2013	780475	8490646	562.9	61.5	Hardcore	CME-75 (102)	72.0
B-5	6/7/2013	6/7/2013	780579	8490739	562.2	61.5	Hardcore	CME-75 (102)	72.0
B-6	6/12/2013	6/13/2013	780579	8490933	560.0	61.5	Hardcore	CME-75 (103)	85.1
B-7	6/10/2013	6/11/2013	780575	8491107	559.2	61.5	Hardcore	CME-75 (102)	72.0
B-8	6/13/2013	6/13/2013	780477	8491025	561.0	61.5	Hardcore	CME-75 (103)	85.1
B-9	6/12/2013	6/12/2013	780789	8490838	560.5	40.4	Hardcore	CME-75 (103)	85.1
B-10	6/11/2013	6/12/2013	780837	8491154	558.7	31.0	Hardcore	CME-75 (102 / 103)	72.0 / 85.1
DCP-1	7/9/2013	7/9/2013	780671	8490114	564.9	5.4	S&W	DCP	N/A
DCP-2	7/9/2013	7/9/2013	780459	8490511	563.5	3.8	S&W	DCP	N/A
DCP-3	7/9/2013	7/9/2013	780686	8490859	560.6	2.5	S&W	DCP	N/A
DCP-4	7/9/2013	7/9/2013	780448	8491210	560.3	2.3	S&W	DCP	N/A
DCP-5	7/9/2013	7/9/2013	780293	8490084	565.5	2.9	S&W	DCP	N/A
INT-1	7/9/2013	7/9/2013	780563	8490146	564.9	1.5	S&W	hand tools	N/A
INT-2	7/9/2013	7/9/2013	780830	8491147	558.7	2.0	S&W	hand tools	N/A

1) Horizontal datum is NAD 83, Oregon State Plane North, US feet.
2) Elevation is that of the ground surface at the time of drilling, estimated from surface contours generated using a 10 meter digital elevation model. The vertical datum is NAVD 88.
3) Depths are in feet below the ground surface at the time of drilling.
4) Hardcore = Hardcore Drilling, Inc.; S&W = Shannon & Wilson, Inc.
5) Reported energy efficiency of automatic hammers used for the Standard Penetration Test (SPT). SPT N-values presented in this report are in blows per foot, as counted in the field. No corrections of any kind have been applied.

TABLE A2: INFILTRATION TEST INT-1 DATA

Trial	Time	Depth to Water Below Top of Casing (feet)	Head Over Soil (feet)	Elapsed Time (minutes)	Change in Water Level (feet)	Infiltration Rate (inches/hour)
Pre-Soak	1029	0.92	1.28	N/A	N/A	N/A
	1042	1.17	1.03	13	0.25	13.8
	1108	1.49	0.71	26	0.32	8.9
	1148	1.82	0.38	40	0.33	5.9
	1214	1.97	0.23	26	0.15	4.2
	1245	2.09	0.11	31	0.12	2.8
#1	1247	0.95	1.25	N/A	N/A	N/A
	1313	1.25	0.95	26	0.3	8.3
	1334	1.44	0.76	21	0.19	6.5
	1350	1.56	0.64	16	0.12	5.4
	1436	1.82	0.38	46	0.26	4.1
	1501	1.93	0.27	25	0.11	3.2
#2	1503	1.03	1.17	N/A	N/A	N/A
	1523	1.19	1.01	20	0.16	5.8
	1546	1.35	0.85	23	0.16	5.0
	1606	1.48	0.72	20	0.13	4.7
	1626	1.59	0.61	20	0.11	4.0
	1646	1.69	0.51	20	0.1	3.6
	1721	1.83	0.37	35	0.14	2.9

Date Performed = 7/9/2013
Hole Depth Below Ground Surface = 1.5 feet
Total Casing Length = 2.7 feet
Casing Stickup = 0.7 feet
Soil Plug in Casing (below bottom of hole) = 0.5 feet
Casing Inside-Diameter = 0.5 feet
N/A = not applicable

TABLE A3: INFILTRATION TEST INT-2 DATA

Trial	Time	Depth to Water Below Top of Casing (feet)	Head Over Soil (feet)	Elapsed Time (minutes)	Change in Water Level (feet)	Infiltration Rate (inches/hour)
Pre-Soak	1039	1.08	1.62	N/A	N/A	N/A
	1110	1.32	1.38	31	0.24	5.6
	1120	1.37	1.33	10	0.05	3.6
	1146	1.50	1.20	26	0.13	3.6
	1217	1.66	1.04	31	0.16	3.7
	1241	1.73	0.97	24	0.07	2.1
#1	1243	0.97	1.73	N/A	N/A	N/A
	1315	1.16	1.54	32	0.19	4.3
	1330	1.24	1.46	15	0.08	3.8
	1419	1.42	1.28	49	0.18	2.6
	1432	1.53	1.17	13	0.11	6.1
	1454	1.62	1.08	22	0.09	2.9
#2	1456	0.97	1.73	N/A	N/A	N/A
	1518	1.08	1.62	22	0.11	3.6
	1540	1.18	1.52	22	0.1	3.3
	1600	1.28	1.42	20	0.1	3.6
	1620	1.37	1.33	20	0.09	3.2
	1640	1.45	1.25	20	0.08	2.9
	1700	1.53	1.17	20	0.08	2.9

Date Performed = 7/9/2013
Hole Depth Below Ground Surface = 2.0 feet
Total Casing Length = 3.2 feet
Casing Stickup = 0.7 feet
Soil Plug in Casing (below bottom of hole) = 0.5 feet
Casing Inside-Diameter = 0.5 feet
N/A = not applicable

Shannon & Wilson, Inc. (S&W), uses a soil description system modified from the Unified Soil Classification System (USCS). Elements of the USCS and other definitions are provided on this and the following page. Soil identifications are based on visual-manual procedures (ASTM D2488) unless otherwise noted.

S&W OREGON SOIL CONSTITUENT DEFINITIONS

CONSTITUENTS[2]	FINE-GRAINED SOILS (50% or more fines)[1]	COARSE-GRAINED SOILS (less than 50% fines)[1]
Major All capital letters	CLAY or SILT based on behavior	SAND or GRAVEL based on weight
Modifying (Secondary) Precede major constituent	if fine-grained, silty or clayey based on behavior	if fine-grained, > 12% silty or clayey
	if coarse-grained, > 27% sandy or gravelly	if coarse-grained, > 27% sandy or gravelly
Minor Follow major constituent	> 12% - 27% with sand or with gravel	if fine-grained, 5% - 12% with silt or with clay
		if coarse-grained, > 12% - 27% with sand or with gravel

[1] All percentages are by weight
[2] The order of terms is: modifying MAJOR with minor

CEMENTATION DEFINITIONS

Weak	Crumbles or breaks with handling or slight finger pressure
Moderate	Crumbles or breaks with considerable finger pressure
Strong	Will not crumble or break with finger pressure

ABBREVIATIONS

ATD	At Time of Drilling
Elev.	Elevation
ft	feet
FeO	Iron Oxide
MgO	Magnesium Oxide
HSA	Hollow Stem Auger
I.D.	Inside Diameter
in	inches
lbs	pounds
N	Blows for second two 6-inch increments
N_E	N, corrected for hammer energy
NA	Not applicable or not available
NP	Nonplastic
O.D.	Outside diameter
PID	Photo-ionization detector
ppm	parts per million
PVC	Polyvinyl Chloride
SPT	Standard Penetration Test
USCS	Unified Soil Classification System
q_u	Unconfined Compressive Strength

PARTICLE SIZE DEFINITIONS

DESCRIPTION	SIEVE NUMBER AND/OR SIZE
FINES	< #200 (0.08 mm)
SAND	
- Fine	#200 to #40 (0.08 to 0.4 mm)
- Medium	#40 to #10 (0.4 to 2 mm)
- Coarse	#10 to #4 (2 to 5 mm)
GRAVEL	
- Fine	#4 to 3/4 inch (5 to 19 mm)
- Coarse	3/4 to 3 inches (19 to 76 mm)
COBBLES	3 to 12 inches (76 to 305 mm)
BOULDERS	> 12 inches (305 mm)

RELATIVE DENSITY / CONSISTENCY

COHESIONLESS SOILS		COHESIVE SOILS	
N_E, SPT, BLOWS/FT.	RELATIVE DENSITY	N_E, SPT, BLOWS/FT.	RELATIVE CONSISTENCY
0 - 4	Very loose	Under 2	Very soft
4 - 10	Loose	2 - 4	Soft
10 - 30	Medium dense	4 - 8	Medium stiff
30 - 50	Dense	8 - 15	Stiff
Over 50	Very dense	15 - 30	Very stiff
		Over 30	Hard

WELL AND OTHER SYMBOLS

Bentonite Cement Grout	Surface Cement Seal
Bentonite Grout	Asphalt or Cap
Bentonite Chips	Slough
Silica Sand	Bedrock
PVC Screen	Fill
Pressure Transducer	

PLASTICITY

PLASTICITY ADJECTIVE	PLASTICTY INDEX (PI) RANGE
Nonplastic	0 - 4
Low Plasticity	>4 - 10
Medium Plasticity	>10 - 20
High Plasticity	>20 - 40
Very High Plasticity	>40

Perennial Wind Chaser Station
Hermiston, Oregon

SOIL DESCRIPTION AND LOG KEY

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FIG. A1
Sheet 1 of 2

POST_07_BORING_CLASS1_CRC 24-1-03794-HERMISTON.GPJ SWNEW.GDT 11/18/13

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)
(Modified from US Army Corps of Engineers Tech Memo 3-357)

MAJOR DIVISIONS			GROUP/GRAPHIC SYMBOL	TYPICAL DESCRIPTION
COARSE-GRAINED SOIL *(more than 50% retained on No. 200 sieve)*	Gravel *(more than 50% of coarse fraction retained on No. 4 sieve)*	Gravel or Gravel with silt or clay	GW GW-GM GW-GC	GRAVEL, GRAVEL with sand, sandy GRAVEL, GRAVEL with silt or clay
			GP GP-GM GP-GC	GRAVEL, GRAVEL with sand, sandy GRAVEL, GRAVEL with silt or clay
		Silty Gravel or Clayey Gravel	GM	Silty GRAVEL, silty GRAVEL with sand, sandy silty GRAVEL
			GC	Clayey GRAVEL, clayey GRAVEL with sand, sandy clayey GRAVEL
	Sand *(50% or more of coarse fraction passes the No. 4 sieve)*	Sand or Sand with silt or clay	SW SW-SM SW-SC	SAND, SAND with gravel, gravelly SAND, SAND with silt or clay
			SP SP-SM SP-SC	SAND, SAND with gravel, gravelly SAND, SAND with silt or clay
		Silty Sand or Clayey Sand	SM	Silty SAND, silty SAND with gravel, gravelly silty SAND
			SC	Clayey SAND, clayey SAND with gravel, gravelly clayey SAND
FINE-GRAINED SOIL *(50% or more passes the No. 200 sieve)*	Silt and Clay *(liquid limit less than 50)*	Inorganic	ML	Nonplastic to medium plasticity SILT or clayey SILT; with sand and/or gravel to sandy or gravelly
			CL	Low to very high plasticity silty CLAY or CLAY; with sand and/or gravel to sandy or gravelly
		Organic	OL	Nonplastic to very high plasticity organic SILT, clayey SILT, silty CLAY, or CLAY; with sand and/or gravel to sandy or gravelly
	Silt and Clay *(liquid limit 50 or more)*	Inorganic	MH	Nonplastic to very high plasticity SILT or clayey SILT; with sand and/or gravel to sandy or gravelly
			CH	High to very high plasticity CLAY; with sand and/or gravel to sandy or gravelly
		Organic	OH	Nonplastic to very high plasticity organic SILT, clayey SILT, or CLAY; with sand and/or gravel to sandy or gravelly
HIGHLY-ORGANIC SOIL	Primarily organic matter, dark in color, has organic odor		PT	Peat and other highly organic soils (see ASTM D4427)

NOTE: No. 4 size = 4.75 mm = approx. 0.2 in; No. 200 size = 0.075 mm = approx. 0.003 in

Additional Symbols	This symbol is used to indicate the presence of cobbles and/or boulders.
	Gray shading, when combined with another symbol, indicates cementation.

NOTES

1. Solid lines on the logs are used to group materials with similar characteristics. The groupings shown are an interpretation of the conditions encountered and actual transitions may be more gradational than shown.
2. Dual symbols (symbols separated by a hyphen, i.e., SP-SM, SAND with silt) are used for coarse-grained soils with 10 percent fines or when the liquid limit and plasticity index values plot in the CL-ML area of the plasticity chart.
3. Borderline symbols (symbols separated by a slash, i.e., CL/ML and GW/SW) indicate that the soil may fall into one of two possible basic groups.
4. The soil graphics above represent the various USCS identifications (i.e., GP, SM, etc.) and may be augmented with additional symbology to represent differences within USCS designations. Sandy SILT (ML), for example, may be accompanied by the ML soil graphic with sand grains added.

Perennial Wind Chaser Station
Hermiston, Oregon

SOIL DESCRIPTION AND LOG KEY

November 2013 24-1-03794-001

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A1
Sheet 2 of 2

Total Depth:	90.1 ft.	Northing:	~ 780,334 ft.	Drilling Method:	HSA and Mud Rotary	Hole Diam.:	8 - 5 in.
Top Elevation:	~ 565 ft.	Easting:	~ 8,490,173 ft.	Drilling Company:	Hardcore Drilling	Rod Type:	NWJ
Vert. Datum:	NAD88	Station:	~	Drill Rig Equipment:	CME-75	Hammer Type:	Automatic
Horiz. Datum:	NAVD88	Offset:	~	Other Comments:	Hammer Efficiency = 72%		

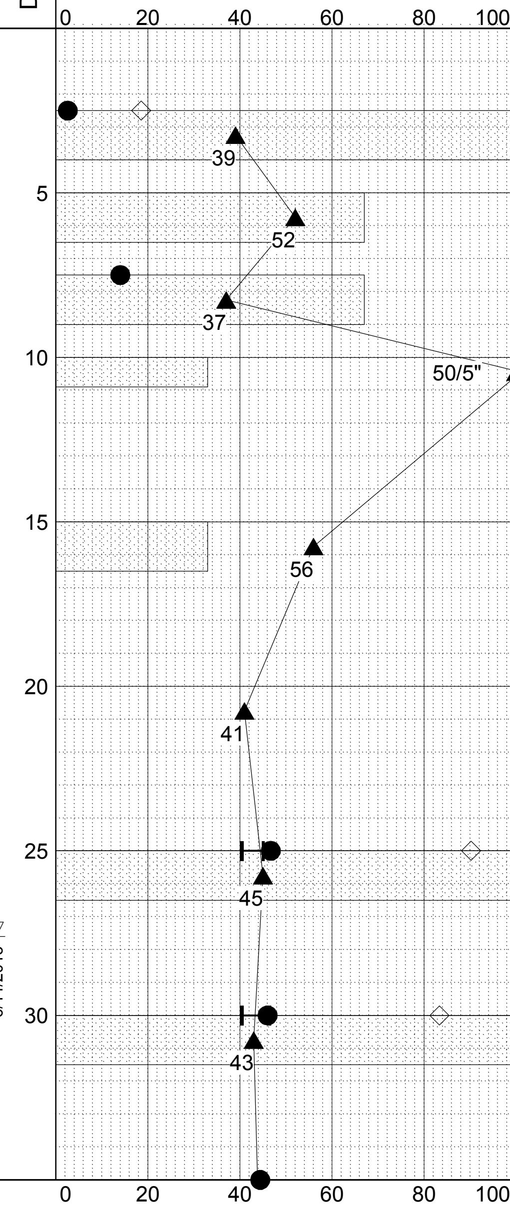
SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. Depth (ft.)	Samples	Ground Water
Dense gray and brown silty SAND, trace gravel; dry; nonplastic fines; fine sand; coarse rounded gravel; micaceous. (SM) **LOESS**		S-1	
Very dense gray and brown sandy GRAVEL with silt and COBBLES and BOULDERS; dry; nonplastic fines; fine sand; fine to coarse rounded gravel. (GP-GM) **CATASTROPHIC FLOOD DEPOSITS GRAVEL FACIES**	560.2 5.0	S-2	
Dense gray gravelly SAND; dry; fine sand; fine to coarse rounded gravel. (SP)	558.2 7.0	S-3	
Very dense gray silty GRAVEL with sand; dry; nonplastic fines; fine sand; fine to coarse rounded gravel. (GM)	555.7 9.5	S-4	
Very dense gray sandy GRAVEL; dry; fine to coarse rounded sand; fine to coarse rounded gravel. (GP) *Lost drilling mud circulation at 15.0 feet.*	550.2 15.0	S-5	
Hard brown SILT, trace sand; moist; low plasticity; fine sand; micaceous. (ML) **CATASTROPHIC FLOOD DEPOSITS FINE-GRAINED FACIES**	546.2 19.0	S-6 * S-7	6/14/2013
Hard brown SILT with sand; moist; low plasticity; fine sand; micaceous. (ML)	535.2 30.0	S-8	

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches



CONTINUED NEXT SHEET

LEGEND

* Sample Not Recovered

Standard Penetration Test

Recovery (%)

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ├──┤ Liquid Limit

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Perennial Wind Chaser Station
Hermiston, Oregon

LOG OF BORING B-1

November 2013 24-1-03794-001

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A2
Sheet 1 of 3

REV 3

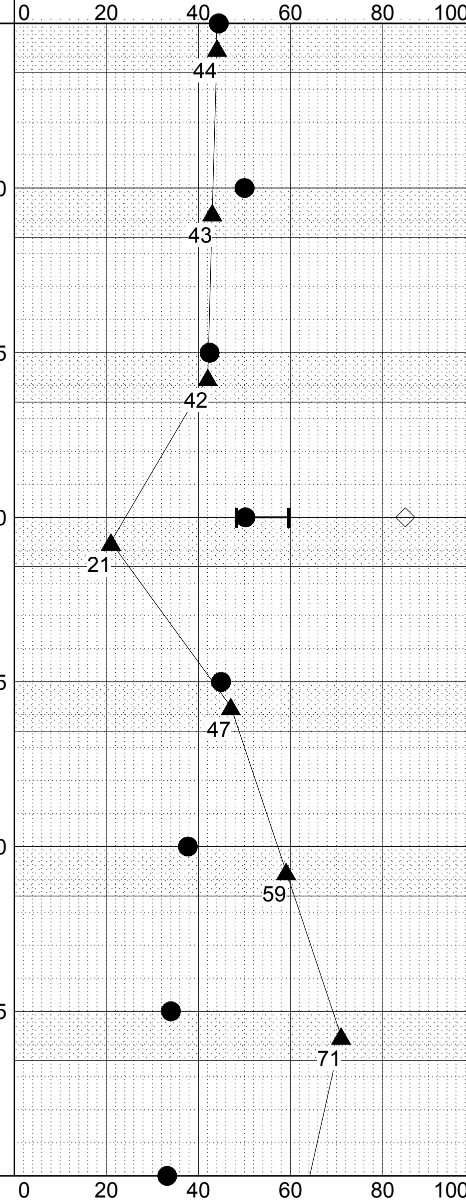
MASTER_LOG_E 24-1-03794-HERMISTON.GPJ SHAN_WIL.GDT 11/18/13 Log: DJH Rev: CKS Typ: MAS

Total Depth:	*90.1 ft.*	Northing:	*~ 780,334 ft.*	Drilling Method:	*HSA and Mud Rotary*	Hole Diam.:	*8 - 5 in.*
Top Elevation:	*~ 565 ft.*	Easting:	*~ 8,490,173 ft.*	Drilling Company:	*Hardcore Drilling*	Rod Type:	*NWJ*
Vert. Datum:	*NAD88*	Station:	*~*	Drill Rig Equipment:	*CME-75*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAVD88*	Offset:	*~*	Other Comments:	*Hammer Efficiency = 72%*		

SOIL DESCRIPTION *Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.*	*Elev.* Depth (ft.)	Samples	Depth, ft.
Dense brown silty SAND; moist; low plasticity fines; fine sand; micaceous. (SM) **CATASTROPHIC FLOOD DEPOSITS SAND FACIES**	*530.2* 35.0	S-9	
Hard brown clayey SILT with sand to sandy clayey SILT; moist; medium plasticity; fine sand; micaceous. (MH) **CATASTROPHIC FLOOD DEPOSITS FINE-GRAINED FACIES** Grades to very stiff at 50.0 feet	*525.2* 40.0	S-10 S-11 S-12	40 45 50
Dense gray silty SAND, moist; nonplastic fines; fine sand; micaceous. (SM) **CATASTROPHIC FLOOD DEPOSITS SAND FACIES** Grades to very dense at 60.0 feet.	*510.2* 55.0	S-13 S-14 S-15	55 60 65

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



CONTINUED NEXT SHEET

LEGEND

* Sample Not Recovered

Standard Penetration Test

Recovery (%)

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ├──┤ Liquid Limit

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Perennial Wind Chaser Station
Hermiston, Oregon

LOG OF BORING B-1

November 2013 24-1-03794-001

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A2

REV 3

Total Depth:	*90.1 ft.*	Northing:	*~ 780,334 ft.*	Drilling Method:	*HSA and Mud Rotary*	Hole Diam.:	*8 - 5 in.*
Top Elevation:	*~ 565 ft.*	Easting:	*~ 8,490,173 ft.*	Drilling Company:	*Hardcore Drilling*	Rod Type:	*NWJ*
Vert. Datum:	*NAD88*	Station:	*~*	Drill Rig Equipment:	*CME-75*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAVD88*	Offset:	*~*	Other Comments:	*Hammer Efficiency = 72%*		

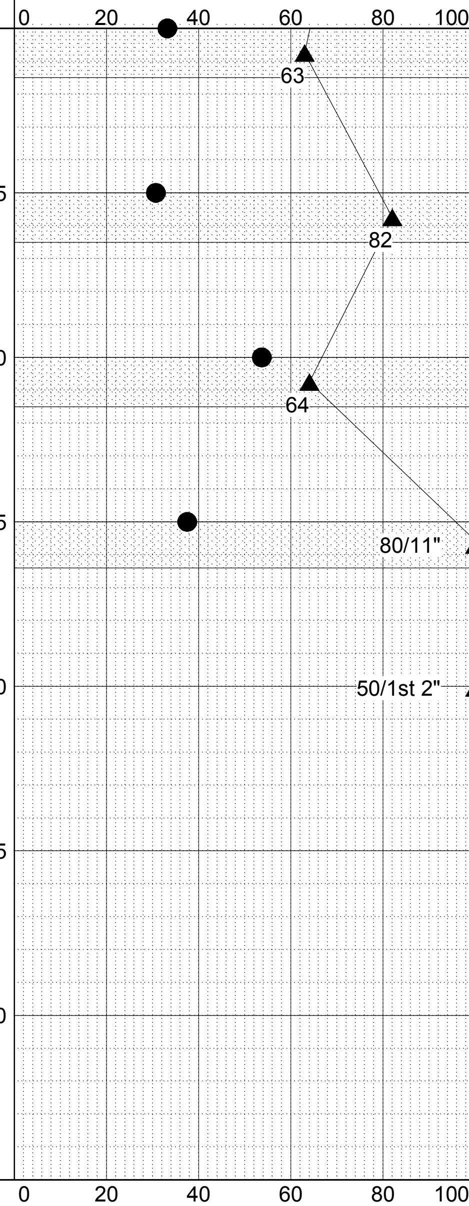
SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. / Depth (ft.)	Samples	Depth, ft.
Very dense gray SAND, trace silt; moist to wet; fine sand; micaceous. (SP) **CATASTROPHIC FLOOD DEPOSITS SAND FACIES**	*495.2* 70.0	S-16 S-17	75
Hard gray and brown SILT, trace sand; moist; low plasticity; fine sand; micaceous. (ML) **CATASTROPHIC FLOOD DEPOSITS FINE-GRAINED FACIES**	*485.2* 80.0	S-18	80
Very dense brown silty SAND; moist; nonplastic fines; fine sand; micaceous. (SM) **CATASTROPHIC FLOOD DEPOSITS SAND FACIES**	*480.2* 85.0	S-19	85
Very dense sandy GRAVEL; moist ; fine to coarse rounded sand; fine to coarse rounded gravel. (GP) *Lost drilling mud circulation at 87.0 feet.* **CATASTROPHIC FLOOD DEPOSITS GRAVEL FACIES**	*478.2* 87.0	S-20 *	90
Completed - June 5, 2013	*475.1* 90.1		95 100

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



LEGEND

* Sample Not Recovered

Standard Penetration Test

Recovery (%)

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ├──┤ Liquid Limit

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Perennial Wind Chaser Station
Hermiston, Oregon

LOG OF BORING B-1

November 2013 24-1-03794-001

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A2
Sheet 3 of 3

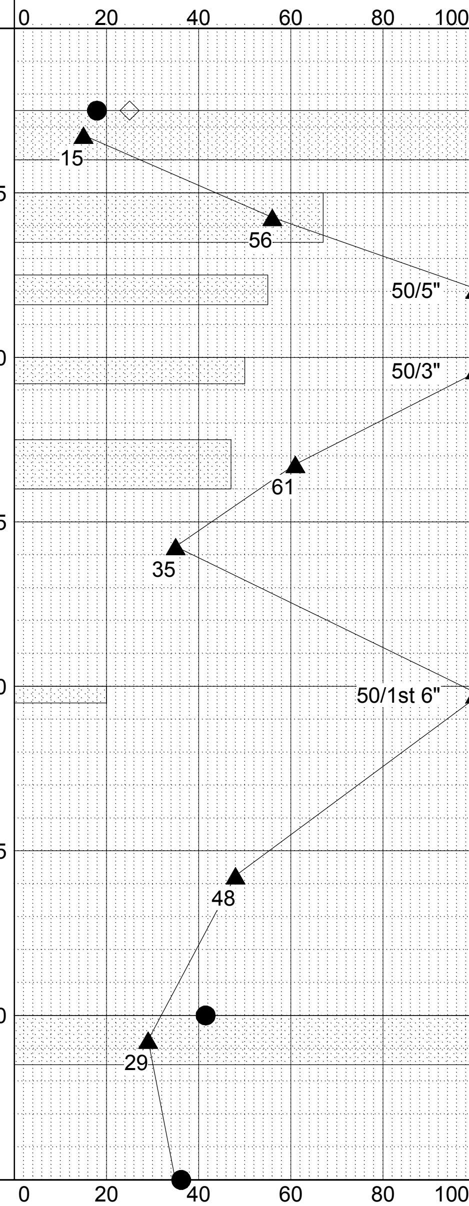
REV 3

Total Depth:	61.5 ft.	Northing:	~ 780,539 ft.	Drilling Method:	Mud Rotary	Hole Diam.:	5 in.
Top Elevation:	~ 565 ft.	Easting:	~ 8,490,271 ft.	Drilling Company:	Hardcore Drilling	Rod Type:	NWJ
Vert. Datum:	NAD88	Station:	~	Drill Rig Equipment:	CME-75	Hammer Type:	Automatic
Horiz. Datum:	NAVD88	Offset:	~	Other Comments:	Hammer Efficiency = 72%		

SOIL DESCRIPTION	Elev. Depth (ft.)	Symbol	Samples	Ground Water	Depth, ft.
Medium dense brown silty SAND; dry; nonplastic fines; fine sand; micaceous. (SM) **LOESS**			S-1		
Dense to very dense gray sandy GRAVEL with COBBLES and BOULDERS; dry; fine to coarse rounded sand; fine to coarse rounded gravel. (GP) *Drilling mud loss from 5.0 to 24.5 feet.* **CATASTROPHIC FLOOD DEPOSITS GRAVEL FACIES**	559.5 5.0		S-2, S-3, S-4, S-5, S-6 *, S-7		5, 10, 15, 20
Very stiff to hard gray and brown sandy SILT; moist; low plasticity; fine sand; micaceous. (ML) **CATASTROPHIC FLOOD DEPOSITS FINE-GRAINED FACIES**	540.0 24.5		S-8 *, S-9		25, 30

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

PENETRATION RESISTANCE, N (blows/ft.)
▲ Hammer Wt. & Drop: 140 lbs / 30 inches



CONTINUED NEXT SHEET

LEGEND
- * Sample Not Recovered
- Standard Penetration Test

Recovery (%)
◇ % Fines (<0.075mm)
● % Water Content
Plastic Limit ├──┤ Liquid Limit

NOTES
1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Perennial Wind Chaser Station
Hermiston, Oregon

LOG OF BORING B-2

November 2013 24-1-03794-001

SHANNON & WILSON, INC.
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FIG. A3
Sheet 1 of 2

REV 3

MASTER_LOG_E 24-1-03794-HERMISTON.GPJ SHAN_WIL.GDT 11/18/13 Log: DJH Rev: CKS Typ: MAS

Total Depth:	61.5 ft.	Northing:	~ 780,539 ft.	Drilling Method:	Mud Rotary	Hole Diam.:	5 in.
Top Elevation:	~ 565 ft.	Easting:	~ 8,490,271 ft.	Drilling Company:	Hardcore Drilling	Rod Type:	NWJ
Vert. Datum:	NAD88	Station:	~	Drill Rig Equipment:	CME-75	Hammer Type:	Automatic
Horiz. Datum:	NAVD88	Offset:	~	Other Comments:	Hammer Efficiency = 72%		

SOIL DESCRIPTION

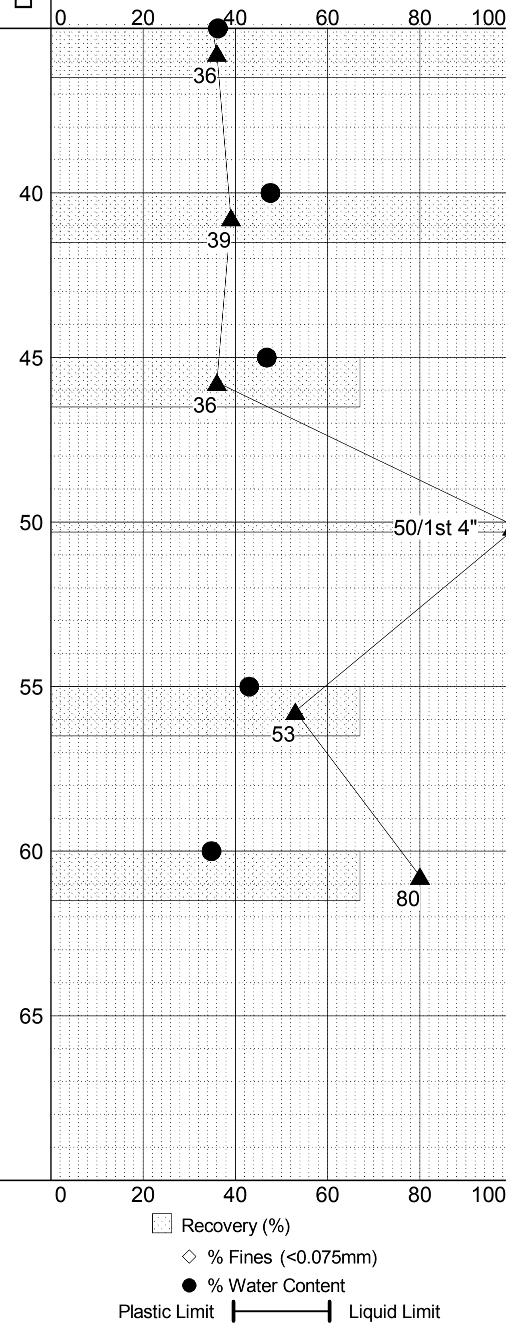
Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. / Depth (ft.)	Samples
Dense brown silty SAND; moist; nonplastic fines; fine sand; micaceous. (SM) **CATASTROPHIC FLOOD DEPOSITS SAND FACIES**	529.5 / 35.0	S-10
Hard brown clayey SILT with sand; moist; medium plasticity; fine sand; micaceous. (MH) **CATASTROPHIC FLOOD DEPOSITS FINE-GRAINED FACIES**	524.5 / 40.0	S-11, S-12
Very dense gray and brown silty sandy GRAVEL; moist; low plasticity fines; fine to coarse rounded sand; fine to coarse rounded gravel. (GM) **CATASTROPHIC FLOOD DEPOSITS GRAVEL FACIES**	514.5 / 50.0	S-13
Very dense gray silty SAND; moist; low plasticity fines; fine sand; micaceous. (SM) **CATASTROPHIC FLOOD DEPOSITS SAND FACIES**	509.5 / 55.0	S-14
Very dense gray SAND with silt; wet; nonplastic fines; fine sand; micaceous. (SM-SP)	504.5 / 60.0 503.0 / 61.5	S-15

Completed - June 6, 2013

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches



LEGEND

* Sample Not Recovered

Standard Penetration Test

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Perennial Wind Chaser Station
Hermiston, Oregon

LOG OF BORING B-2

November 2013 24-1-03794-001

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A3
Sheet 2 of 2

REV 3

MASTER_LOG_E 24-1-03794-HERMISTON.GPJ SHAN_WIL.GDT 11/18/13 Log: DJH Rev: CKS Typ: MAS

Total Depth:	*61.5 ft.*	Northing:	*~ 780,589 ft.*	Drilling Method:	*Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ 563 ft.*	Easting:	*~ 8,490,563 ft.*	Drilling Company:	*Hardcore Drilling*	Rod Type:	*NWJ*
Vert. Datum:	*NAD88*	Station:	*~*	Drill Rig Equipment:	*CME-75*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAVD88*	Offset:	*~*	Other Comments:	*Hammer Efficiency = 85.1%*		

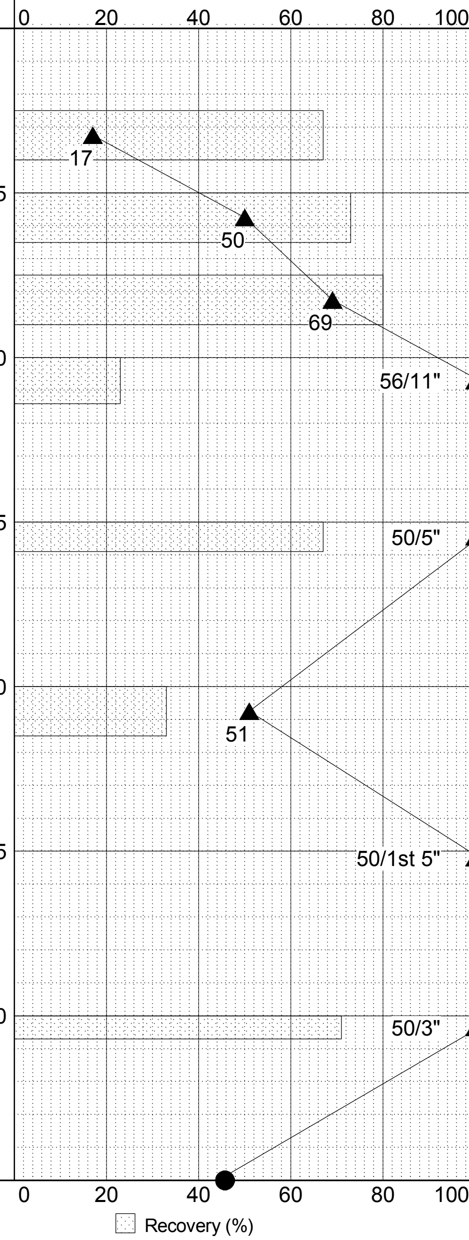
SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

SOIL DESCRIPTION	Elev. Depth (ft.)	Symbol	Samples	Ground Water	Depth, ft.
Medium dense brown silty SAND; dry; nonplastic fines; fine to medium sand; micaceous; occasional roots in upper 6 inches. (SM)	*561.3* 2.0		S-1		
LOESS	*559.3* 4.0				
Medium dense gray SAND, trace silt and gravel; dry; medium to coarse sand; subrounded gravel. (SP) **CATASTROPHIC FLOOD DEPOSITS SAND FACIES**			S-2 S-3		5
Very dense gray-brown sandy GRAVEL, trace silt; dry to moist; fine to coarse sand; rounded to subangular gravel; slight iron-oxide staining. (GP) **CATASTROPHIC FLOOD DEPOSITS GRAVEL FACIES**	*553.8* 9.5 *552.3* 11.0		S-4		10
Medium dense to very dense gray-brown sandy GRAVEL, trace silt; moist; fine to coarse sand; rounded to subangular gravel. (GP) *Approximately 250 gallons drilling mud loss from 9.5 to 11.0 feet.*			S-5		15
Very dense gray-brown sandy GRAVEL, trace silt with COBBLES and BOULDERS; moist to wet; fine to coarse sand; rounded to subangular gravel; scattered cobbles and occasional small boulders. (GP) *Drilling mud loss from 11.0 to 20.0 feet.* Small boulder at 11.5 feet. Cobbles at 18.0 feet. Cobbles at 23.5 feet.			S-6 S-7 *		20 25
Very dense gray and brown sandy GRAVEL with silt; moist; nonplastic fines; fine to medium sand; rounded to subangular gravel; micaceous. (GM-GP)	*533.3* 30.0 *531.8* 31.5		S-8		30

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



CONTINUED NEXT SHEET

LEGEND

* Sample Not Recovered

Standard Penetration Test

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Perennial Wind Chaser Station
Hermiston, Oregon

LOG OF BORING B-3

November 2013 24-1-03794-001

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A4
Sheet 1 of 2

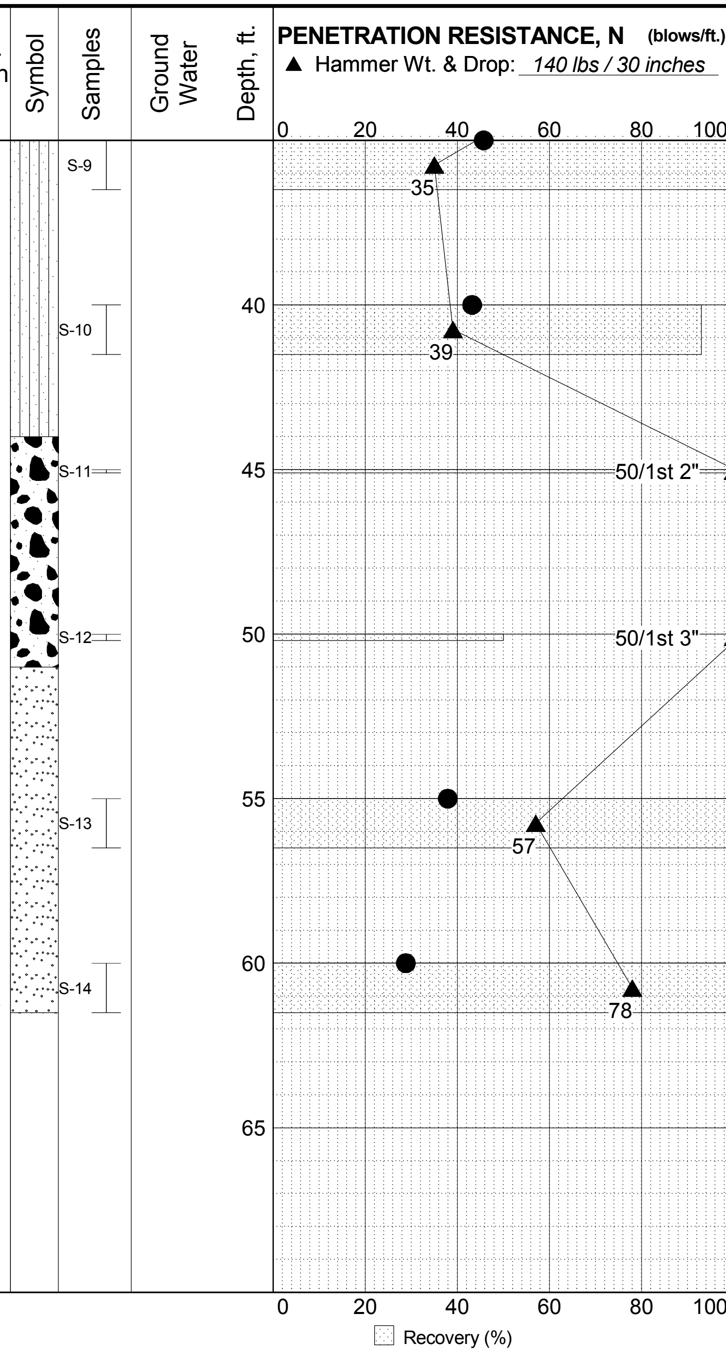
REV 3

Total Depth:	*61.5 ft.*	Northing:	*~ 780,589 ft.*	Drilling Method:	*Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ 563 ft.*	Easting:	*~ 8,490,563 ft.*	Drilling Company:	*Hardcore Drilling*	Rod Type:	*NWJ*
Vert. Datum:	*NAD88*	Station:	*~*	Drill Rig Equipment:	*CME-75*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAVD88*	Offset:	*~*	Other Comments:	*Hammer Efficiency = 85.1%*		

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. Depth (ft.)
Hard brown sandy SILT; moist; low plasticity; fine sand; micaceous; faintly stratified with layers of hard SILT, trace sand. (ML) **CATASTROPHIC FLOOD DEPOSITS FINE-GRAINED FACIES**	
Very dense brown sandy GRAVEL with silt to silty GRAVEL with sand; wet; fine to medium sand; rounded to subangular gravel. (GM-GP/GM) **CATASTROPHIC FLOOD DEPOSITS GRAVEL FACIES**	*519.3* 44.0
Very dense tan-brown SAND, trace silt; wet; fine to medium sand; micaceous; stratified with scattered gray or brown-gray layers and occasional interbeds of silty SAND. (SP) **CATASTROPHIC FLOOD DEPOSITS SAND FACIES**	*512.3* 51.0
Completed - June 14, 2013	*501.8* 61.5



LEGEND

* Sample Not Recovered

Standard Penetration Test

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Perennial Wind Chaser Station
Hermiston, Oregon

LOG OF BORING B-3

November 2013 24-1-03794-001

SHANNON & WILSON, INC.
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FIG. A4
Sheet 2 of 2

REV 3

MASTER_LOG_E 24-1-03794-HERMISTON.GPJ SHAN_WIL.GDT 11/18/13

Log: CKS Rev: CKS Typ: MAS

Total Depth:	*61.5 ft.*	Northing:	*~ 780,475 ft.*	Drilling Method:	*Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ 563 ft.*	Easting:	*~ 8,490,646 ft.*	Drilling Company:	*Hardcore Drilling*	Rod Type:	*NWJ*
Vert. Datum:	*NAD88*	Station:	*~*	Drill Rig Equipment:	*CME-75*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAVD88*	Offset:	*~*	Other Comments:	*Hammer Efficiency = 72%*		

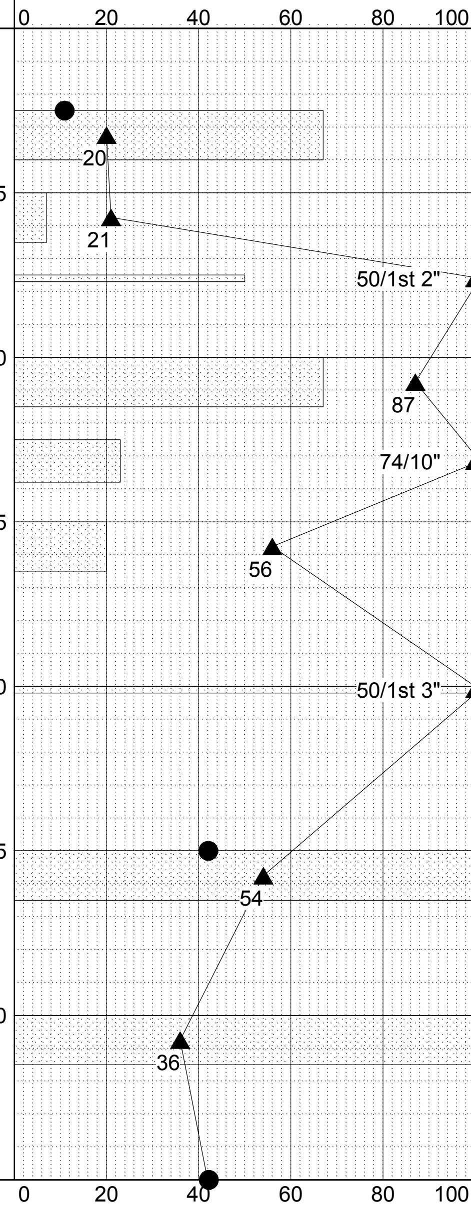
SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. Depth (ft.)	Samples	Depth, ft.
Medium dense gray SAND, trace silt; dry; nonplastic fines; fine sand; micaceous. (SP) **LOESS**		S-1	
Very dense gray and brown sandy GRAVEL, trace silt with COBBLES and BOULDERS; dry; nonplastic fines; fine to coarse rounded sand; fine to coarse rounded gravel. (GP) *Drilling mud loss from 4.0 to 23.0 feet.* *Bore hole caved, approximately 60 gallons of drilling mud loss from 5.0 to 6.0 feet.* **CATASTROPHIC FLOOD DEPOSITS GRAVEL FACIES**	*558.9* 4.0	S-2 S-3 S-4 S-5 S-6 S-7	5 10 15 20
Hard brown clayey SILT, trace sand; moist; low to medium plasticity; fine sand; micaceous. (MH) **CATASTROPHIC FLOOD DEPOSITS FINE-GRAINED FACIES**	*539.9* 23.0	S-8 S-9	25 30

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



CONTINUED NEXT SHEET

LEGEND

* Sample Not Recovered

Standard Penetration Test

Recovery (%)

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ├──┤ Liquid Limit

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Perennial Wind Chaser Station
Hermiston, Oregon

LOG OF BORING B-4

November 2013 24-1-03794-001

SHANNON & WILSON, INC.
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FIG. A5
Sheet 1 of 2

REV 3

MASTER_LOG_E 24-1-03794-HERMISTON.GPJ SHAN_WIL.GDT 11/18/13 Log: DJH Rev: CKS Typ: MAS

Total Depth:	61.5 ft.	Northing:	~ 780,475 ft.	Drilling Method:	Mud Rotary	Hole Diam.:	5 in.
Top Elevation:	~ 563 ft.	Easting:	~ 8,490,646 ft.	Drilling Company:	Hardcore Drilling	Rod Type:	NWJ
Vert. Datum:	NAD88	Station:	~	Drill Rig Equipment:	CME-75	Hammer Type:	Automatic
Horiz. Datum:	NAVD88	Offset:	~	Other Comments:	Hammer Efficiency = 72%		

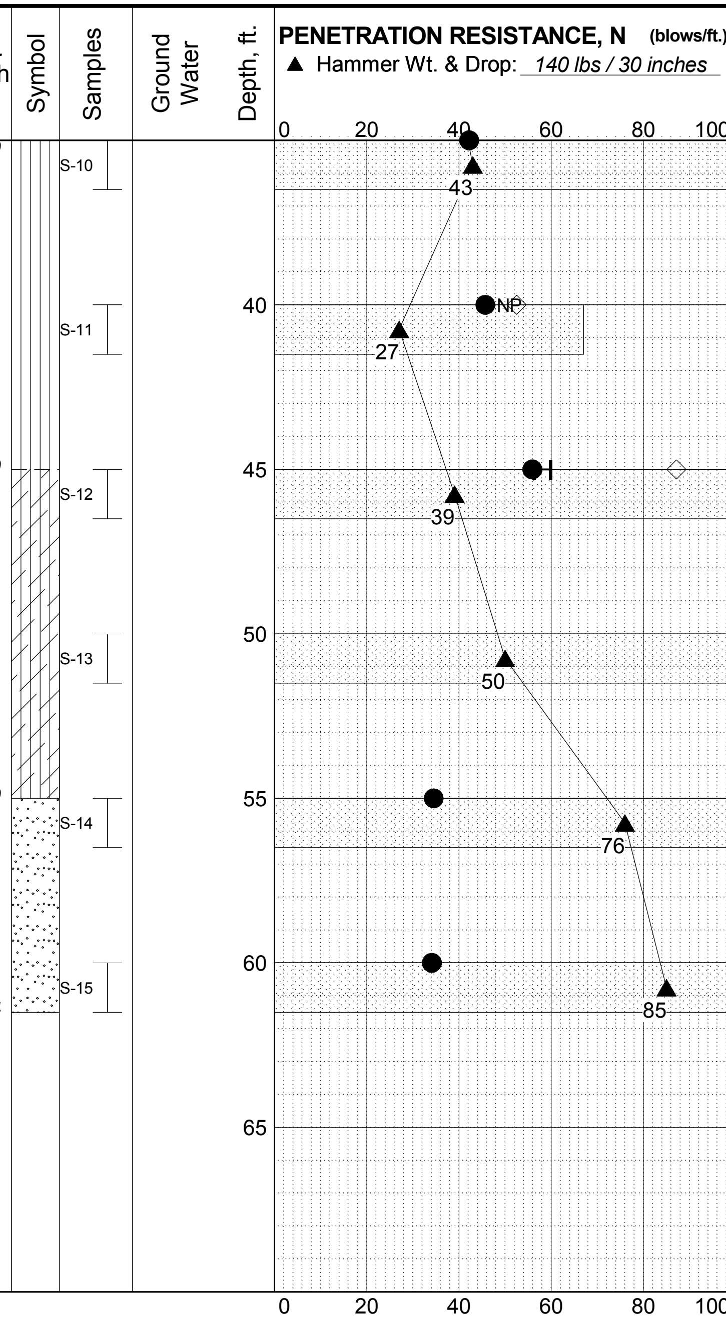
SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

SOIL DESCRIPTION	Elev. Depth (ft.)	Samples
Dense to medium dense brown sandy SILT; moist; nonplastic; fine sand; micaceous. (ML) **CATASTROPHIC FLOOD DEPOSITS FINE-GRAINED FACIES**	*527.9* 35.0	S-10, S-11
Hard yellow, brown, and gray clayey SILT with sand; moist; low to medium plasticity; fine sand. (MH)	*517.9* 45.0	S-12, S-13
Very dense gray SAND with silt; moist; nonplastic fines; fine sand; micaceous. (SP-SM) **CATASTROPHIC FLOOD DEPOSITS SAND FACIES**	*507.9* 55.0	S-14, S-15
Completed - June 7, 2013	*501.4* 61.5	

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches



LEGEND

* Sample Not Recovered

Standard Penetration Test

Recovery (%)

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ├──┤ Liquid Limit

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Perennial Wind Chaser Station
Hermiston, Oregon

LOG OF BORING B-4

November 2013 | 24-1-03794-001

SHANNON & WILSON, INC.
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FIG. A5
Sheet 2 of 2

REV 3

Total Depth:	61.5 ft.	Northing:	~ 780,579 ft.	Drilling Method:	Mud Rotary	Hole Diam.:	5 in.
Top Elevation:	~ 562 ft.	Easting:	~ 8,490,739 ft.	Drilling Company:	Hardcore Drilling	Rod Type:	NWJ
Vert. Datum:	NAD88	Station:	~	Drill Rig Equipment:	CME-75	Hammer Type:	Automatic
Horiz. Datum:	NAVD88	Offset:	~	Other Comments:	Hammer Efficiency = 72%		

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. Depth (ft.)	Samples
Medium dense gray SAND with silt; dry; nonplastic fines; fine sand; micaceous. (SP-SM) **LOESS**		S-1
Dense to very dense gray and brown sandy GRAVEL with silt and COBBLES and BOULDERS; dry; nonplastic fines; fine to coarse rounded sand; fine to coarse rounded gravel; micaceous. (GP-GM) **CATASTROPHIC FLOOD DEPOSITS GRAVEL FACIES**	558.2 4.0	S-2, S-3, S-4, S-5, S-6, S-7, S-8, S-9
Hard brown sandy SILT; moist. (ML) **CATASTROPHIC FLOOD DEPOSITS FINE-GRAINED FACIES**	530.2 32.0	

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches

CONTINUED NEXT SHEET

LEGEND

* Sample Not Recovered

Standard Penetration Test

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Perennial Wind Chaser Station
Hermiston, Oregon

LOG OF BORING B-5

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FIG. A6
Sheet 1 of 2

REV 3

MASTER_LOG_E 24-1-03794-HERMISTON.GPJ SHAN_WIL.GDT 11/18/13 Log: DJH Rev: CKS Typ: MAS

Total Depth:	61.5 ft.	Northing:	~ 780,579 ft.	Drilling Method:	Mud Rotary	Hole Diam.:	5 in.
Top Elevation:	~ 562 ft.	Easting:	~ 8,490,739 ft.	Drilling Company:	Hardcore Drilling	Rod Type:	NWJ
Vert. Datum:	NAD88	Station:	~	Drill Rig Equipment:	CME-75	Hammer Type:	Automatic
Horiz. Datum:	NAVD88	Offset:	~	Other Comments:	Hammer Efficiency = 72%		

SOIL DESCRIPTION

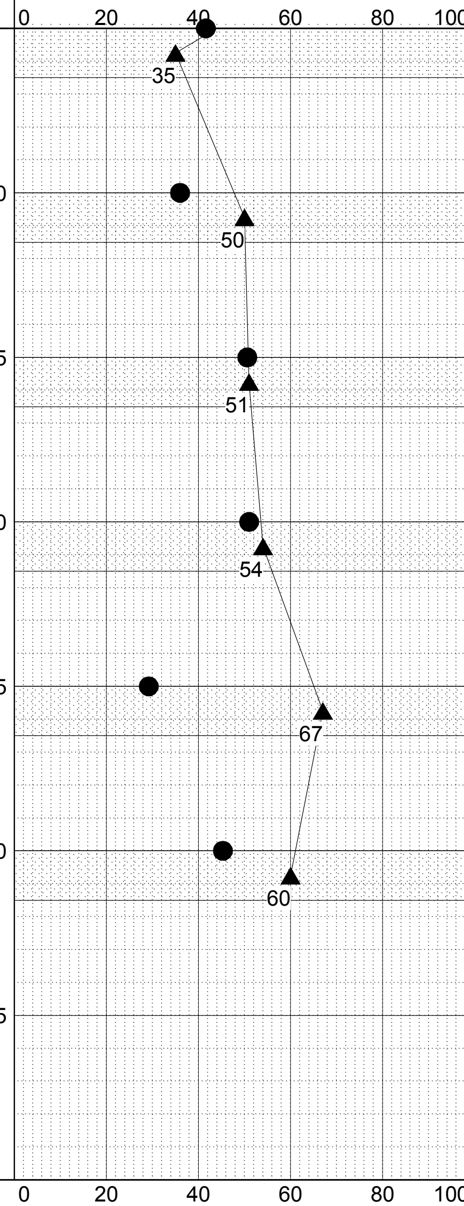
Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

SOIL DESCRIPTION	Elev. Depth (ft.)	Samples
Continued: Hard brown sandy SILT; moist; low plasticity; fine sand; micaceous. (ML) **CATASTROPHIC FLOOD DEPOSITS FINE-GRAINED FACIES**		S-10
Hard brown sandy clayey SILT; moist; low to medium plasticity; fine sand; micaceous. (MH)	522.2 / 40.0	S-11
Hard brown and gray sandy SILT; moist; low plasticity; fine sand; micaceous. (ML)	517.2 / 45.0	S-12, S-13
Very dense gray silty SAND; moist; nonplastic fines; fine sand; micaceous. (SM) **CATASTROPHIC FLOOD DEPOSITS SAND FACIES**	507.2 / 55.0	S-14
Very dense gray SAND, trace silt; moist; fine sand; micaceous. (SP)	502.2 / 60.0	S-15
Completed - June 7, 2013	500.7 / 61.5	

Symbol | Ground Water | Depth, ft.

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches



Recovery (%)

● % Water Content

Plastic Limit Liquid Limit

LEGEND

* Sample Not Recovered

Standard Penetration Test

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

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Hermiston, Oregon

LOG OF BORING B-5

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SHANNON & WILSON, INC.
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FIG. A6
Sheet 2 of 2

REV 3

MASTER_LOG_E 24-1-03794-HERMISTON.GPJ SHAN_WIL.GDT 11/18/13 Log: DJH Rev: CKS Typ: MAS

Total Depth:	*61.5 ft.*	Northing:	*~ 780,579 ft.*	Drilling Method:	*Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ 560 ft.*	Easting:	*~ 8,490,933 ft.*	Drilling Company:	*Hardcore Drilling*	Rod Type:	*NWJ*
Vert. Datum:	*NAD88*	Station:	*~*	Drill Rig Equipment:	*CME-75*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAVD88*	Offset:	*~*	Other Comments:	*Hammer Efficiency = 85.1%*		

SOIL DESCRIPTION

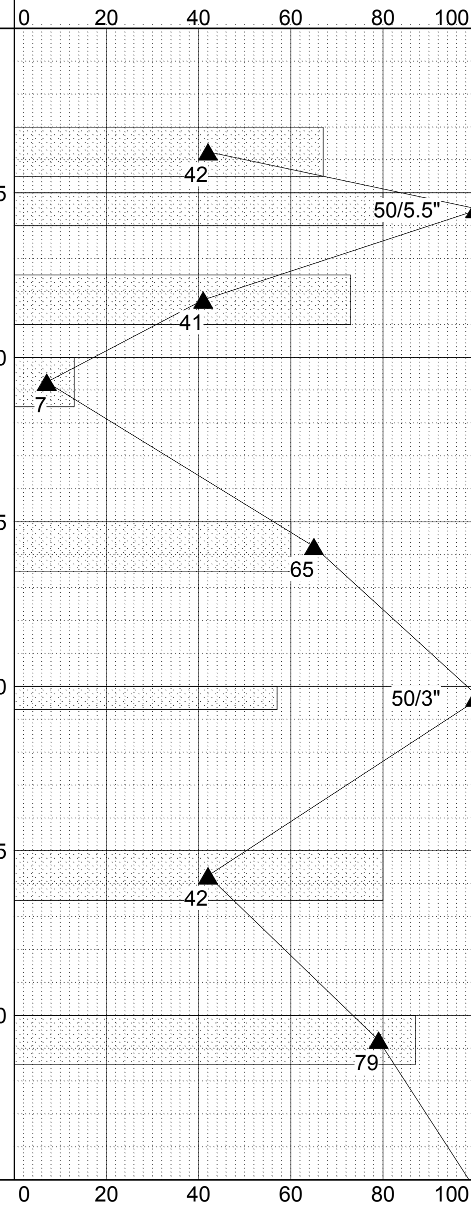
Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. Depth (ft.)	Samples	Depth, ft.
Medium dense brown silty SAND; dry; nonplastic fines; fine to medium sand; micaceous. (SM) **LOESS**	558.0 / 2.0		
Dense to very dense gray-brown sandy GRAVEL, trace silt with COBBLES and BOULDERS; dry to moist; fine to coarse sand; rounded to subangular gravel; occasional cobbles or small boulders. (GP) 12-inch-diameter cobble at 2.0 feet **CATASTROPHIC FLOOD DEPOSITS GRAVEL FACIES**		S-1, S-2, S-3	5
Borehole caving in from 10.0 to 12.5 feet.	549.5 / 10.5	S-4	10
Loose gray-brown sandy GRAVEL, trace silt; moist; fine to coarse sand; rounded to subangular gravel. (GP) *Lost drilling mud circulation at 10.5 feet.*	547.0 / 13.0		
Dense to very dense gray-brown sandy GRAVEL, trace silt; fine to coarse sand; rounded to subangular gravel; slight iron-oxide staining; occasional layers of sandy GRAVEL with silt. (GP)		S-5, S-6, S-7, S-8	15, 20, 25, 30

Symbol | Ground Water

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



Recovery (%)

● % Water Content

Plastic Limit ├──┤ Liquid Limit

CONTINUED NEXT SHEET

LEGEND

* Sample Not Recovered

Standard Penetration Test

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Perennial Wind Chaser Station
Hermiston, Oregon

LOG OF BORING B-6

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SHANNON & WILSON, INC.
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FIG. A7
Sheet 1 of 2

REV 3

Total Depth:	61.5 ft.	Northing:	~ 780,579 ft.	Drilling Method:	Mud Rotary	Hole Diam.:	5 in.
Top Elevation:	~ 560 ft.	Easting:	~ 8,490,933 ft.	Drilling Company:	Hardcore Drilling	Rod Type:	NWJ
Vert. Datum:	NAD88	Station:	~	Drill Rig Equipment:	CME-75	Hammer Type:	Automatic
Horiz. Datum:	NAVD88	Offset:	~	Other Comments:	Hammer Efficiency = 85.1%		

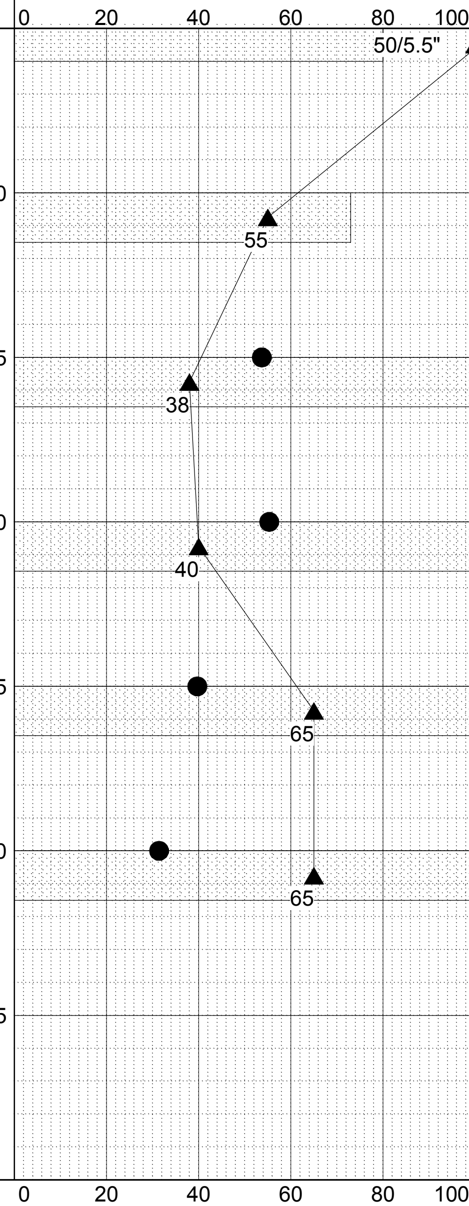
SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

SOIL DESCRIPTION	Elev. Depth (ft.)	Symbol	Samples	Ground Water	Depth, ft.
Continued: Dense to very dense gray-brown sandy GRAVEL, trace silt; fine to coarse sand; rounded to subangular gravel; slight iron-oxide staining; occasional layers of sandy GRAVEL with silt. (GP) **CATASTROPHIC FLOOD DEPOSITS GRAVEL FACIES**			S-9, S-10		40
Hard and dense interbedded tan and brown-tan SILT, trace sand, sandy SILT and silty SAND; wet; low plasticity fines; fine to medium sand; micaceous; stratified. (ML/SM) **CATASTROPHIC FLOOD DEPOSITS FINE-GRAINED FACIES**	517.0 / 43.0		S-11, S-12, S-13		45, 50, 55
Very dense tan-brown SAND, trace silt; moist; fine to medium sand; micaceous; homogeneous. (SP) **CATASTROPHIC FLOOD DEPOSITS SAND FACIES**	502.0 / 58.0		S-14		60
Completed - June 13, 2013	498.5 / 61.5				65

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches



Recovery (%)

● % Water Content

Plastic Limit ├──┤ Liquid Limit

LEGEND

* Sample Not Recovered

Standard Penetration Test

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Perennial Wind Chaser Station
Hermiston, Oregon

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FIG. A7
Sheet 2 of 2

REV 3

MASTER_LOG_E 24-1-03794-HERMISTON.GPJ SHAN_WIL.GDT 11/18/13 Log: CKS Rev: CKS Typ: MAS

Total Depth:	*61.5 ft.*	Northing:	*~ 780,575 ft.*	Drilling Method:	*Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ 559 ft.*	Easting:	*~ 8,491,107 ft.*	Drilling Company:	*Hardcore Drilling*	Rod Type:	*NWJ*
Vert. Datum:	*NAD88*	Station:	*~*	Drill Rig Equipment:	*CME-75*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAVD88*	Offset:	*~*	Other Comments:	*Hammer Efficiency = 72%*		

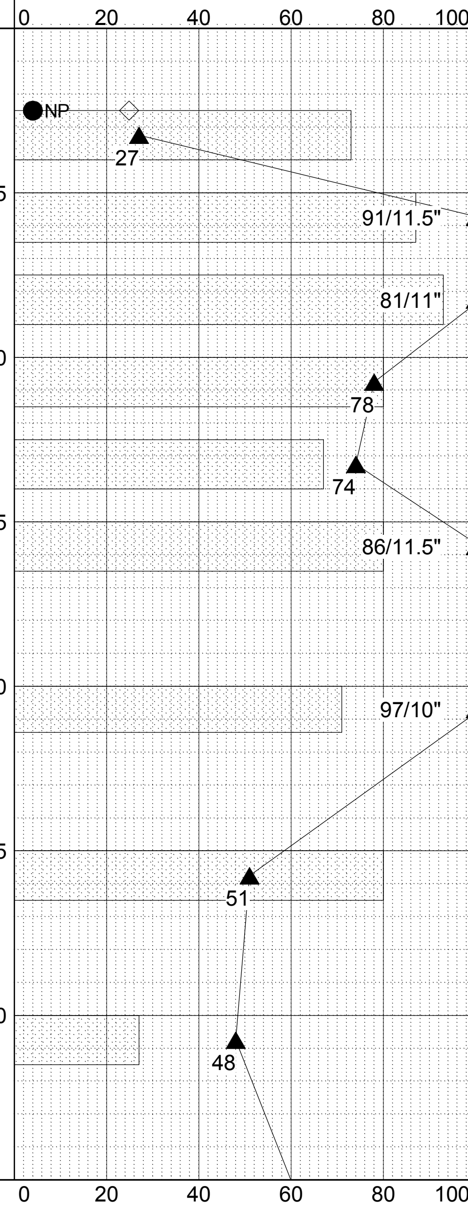
SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. Depth (ft.)	Samples
Medium dense brown silty SAND, trace gravel; dry; nonplastic to low plasticity fines; fine to medium sand; fine gravel; occasional rootlets. (SM) **LOESS**	555.7 / 3.5	S-1
Dense to very dense gray-brown sandy GRAVEL, trace silt; moist; fine to coarse sand; rounded to subangular gravel; slight iron-oxide staining. (GP) **CATASTROPHIC FLOOD DEPOSITS GRAVEL FACIES**		S-2, S-3, S-4, S-5, S-6, S-7, S-8, S-9

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



CONTINUED NEXT SHEET

LEGEND

* Sample Not Recovered

Standard Penetration Test

Recovery (%)

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit —— Liquid Limit

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Perennial Wind Chaser Station
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SHANNON & WILSON, INC.
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FIG. A8
Sheet 1 of 2

REV 3

Total Depth:	61.5 ft.	Northing:	~ 780,575 ft.	Drilling Method:	Mud Rotary	Hole Diam.:	5 in.
Top Elevation:	~ 559 ft.	Easting:	~ 8,491,107 ft.	Drilling Company:	Hardcore Drilling	Rod Type:	NWJ
Vert. Datum:	NAD88	Station:	~	Drill Rig Equipment:	CME-75	Hammer Type:	Automatic
Horiz. Datum:	NAVD88	Offset:	~	Other Comments:	Hammer Efficiency = 72%		

SOIL DESCRIPTION

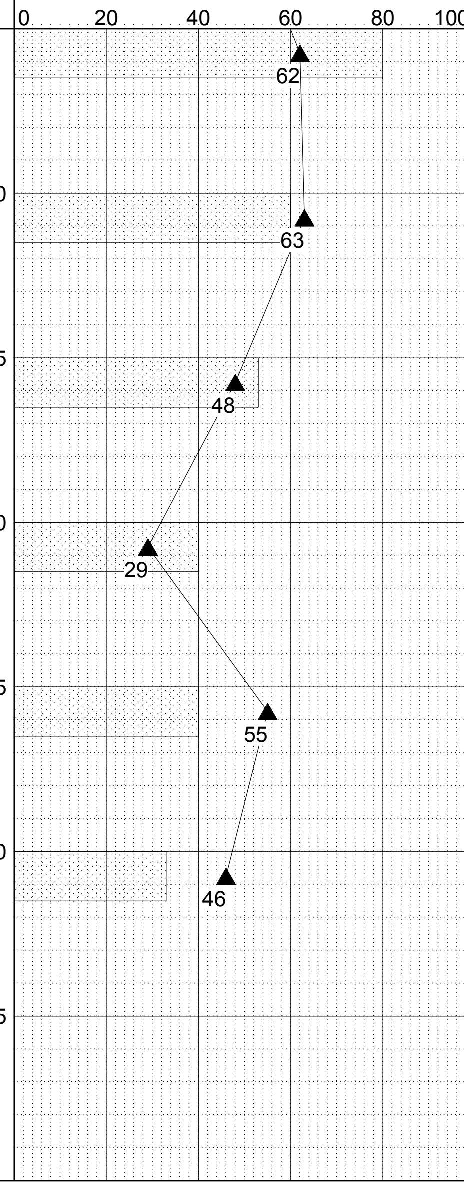
Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. Depth (ft.)	Samples
Continued: Dense to very dense gray-brown sandy GRAVEL, trace silt; moist; fine to coarse sand; rounded to subangular gravel; slight iron-oxide staining. (GP)		S-10
CATASTROPHIC FLOOD DEPOSITS GRAVEL FACIES		S-11
Grades to wet at 45.0 feet.		S-12
Medium dense gray sandy GRAVEL, trace silt; wet; medium to coarse sand; rounded to subrounded gravel. (GP)	511.2 / 48.0	S-13
Dense to very dense gray-brown sandy GRAVEL, trace silt; wet; fine to coarse sand; rounded to subangular gravel. (GP)	506.2 / 53.0	S-14, S-15
Completed - June 11, 2013	497.7 / 61.5	

Symbol / Samples / Ground Water / Depth, ft.

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches



Recovery (%)
◇ % Fines (<0.075mm)
● % Water Content
Plastic Limit ⊢—⊣ Liquid Limit

LEGEND

* Sample Not Recovered
Standard Penetration Test

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Perennial Wind Chaser Station
Hermiston, Oregon

LOG OF BORING B-7

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SHANNON & WILSON, INC.
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FIG. A8
Sheet 2 of 2

REV 3

MASTER_LOG_E 24-1-03794-HERMISTON.GPJ SHAN_WIL.GDT 11/18/13 Log: CKS Rev: CKS Typ: MAS

Total Depth:	*61.5 ft.*	Northing:	*~ 780,477 ft.*	Drilling Method:	*Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ 561 ft.*	Easting:	*~ 8,491,025 ft.*	Drilling Company:	*Hardcore Drilling*	Rod Type:	*NWJ*
Vert. Datum:	*NAD88*	Station:	*~*	Drill Rig Equipment:	*CME-75*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAVD88*	Offset:	*~*	Other Comments:	*Hammer Efficiency = 85.1%*		

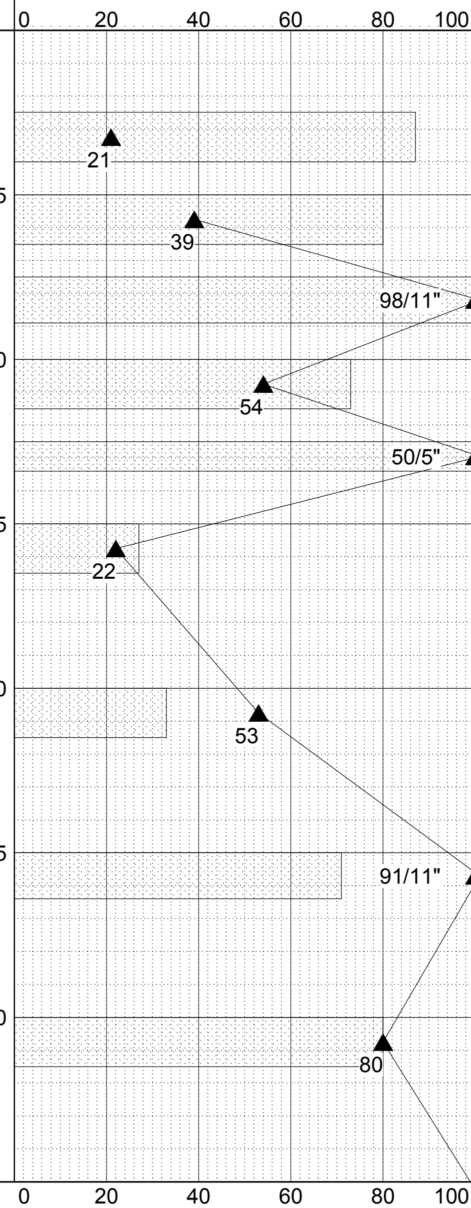
SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. Depth (ft.)	Samples
Medium dense brown silty SAND; dry; nonplastic fines; fine to medium sand; micaceous. (SM) **LOESS**		S-1a
Dense to very dense gray-brown silty GRAVEL with sand grading to sandy GRAVEL, trace silt; dry to moist; fine to coarse sand; rounded to subangular gravel; slight iron-oxide staining. (GP) **CATASTROPHIC FLOOD DEPOSITS GRAVEL FACIES**	*557.5* 3.5	S-1b, S-2, S-3, S-4, S-5
Medium dense gray-brown sandy GRAVEL, trace silt with COBBLES; moist; fine to coarse sand; subrounded to subangular gravel; occasional cobbles. (GP)	*547.0* 14.0	S-6
Very dense gray-brown sandy GRAVEL, trace silt; moist; fine to coarse sand; subrounded to subangular gravel; slight iron-oxide staining. (GP) *Drilling mud loss from 25.0 to 30.0 feet.*	*543.5* 17.5	S-7, S-8
Very dense gray-brown sandy GRAVEL with silt; moist to wet; nonplastic fines; fine to coarse sand; rounded to subangular gravel; micaceous. (GP-GM)	*531.0* 30.0	S-9

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



CONTINUED NEXT SHEET

LEGEND

* Sample Not Recovered

Standard Penetration Test

Recovery (%)

● % Water Content

Plastic Limit ├──┤ Liquid Limit

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Perennial Wind Chaser Station
Hermiston, Oregon

LOG OF BORING B-8

November 2013 24-1-03794-001

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A9
Sheet 1 of 2

REV 3

Total Depth:	61.5 ft.	Northing:	~ 780,477 ft.	Drilling Method:	Mud Rotary	Hole Diam.:	5 in.
Top Elevation:	~ 561 ft.	Easting:	~ 8,491,025 ft.	Drilling Company:	Hardcore Drilling	Rod Type:	NWJ
Vert. Datum:	NAD88	Station:	~	Drill Rig Equipment:	CME-75	Hammer Type:	Automatic
Horiz. Datum:	NAVD88	Offset:	~	Other Comments:	Hammer Efficiency = 85.1%		

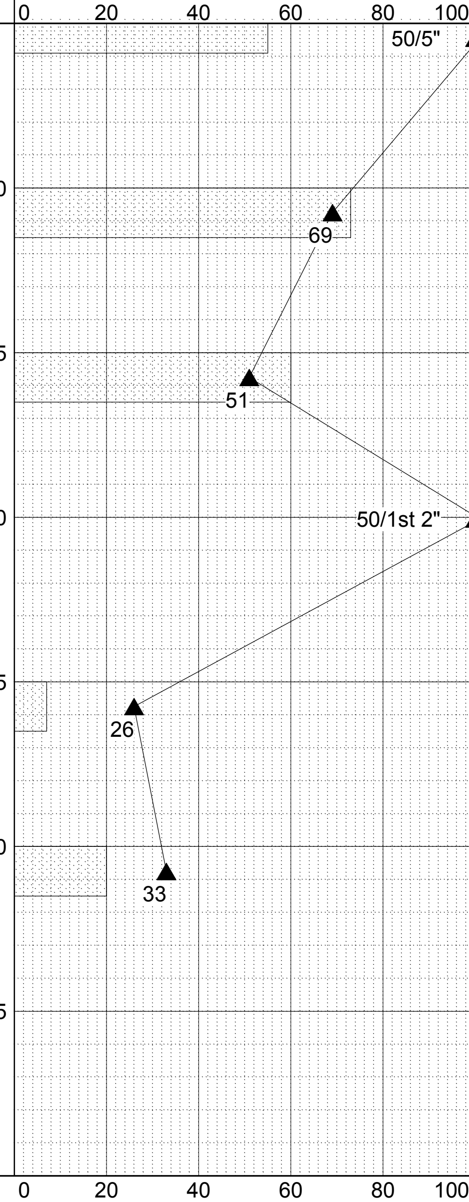
SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

SOIL DESCRIPTION	Elev. Depth (ft.)	Samples	Depth, ft.
Continued: Very dense gray-brown sandy GRAVEL with silt; moist to wet; nonplastic fines; fine to coarse sand; rounded to subangular gravel; micaceous. (GP-GM) **CATASTROPHIC FLOOD DEPOSITS GRAVEL FACIES**		S-10, S-11, S-12, S-13*	40, 45, 50
Medium dense grading to dense gray-brown sandy GRAVEL, trace silt; wet; fine to coarse sand; rounded to subangular gravel. (GP)	*509.0* 52.0	S-14, S-15	55, 60
Completed - June 13, 2013	*499.5* 61.5		65

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches



LEGEND

* Sample Not Recovered

Standard Penetration Test

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Perennial Wind Chaser Station
Hermiston, Oregon

LOG OF BORING B-8

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SHANNON & WILSON, INC.
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FIG. A9
Sheet 2 of 2

REV 3

Total Depth:	40.4 ft.	Northing:	~ 780,789 ft.	Drilling Method:	Mud Rotary	Hole Diam.:	5 in.
Top Elevation:	~ 561 ft.	Easting:	~ 8,490,838 ft.	Drilling Company:	Hardcore Drilling	Rod Type:	NWJ
Vert. Datum:	NAD88	Station:	~	Drill Rig Equipment:	CME-75	Hammer Type:	Automatic
Horiz. Datum:	NAVD88	Offset:	~	Other Comments:	Hammer Efficiency = 85.1%		

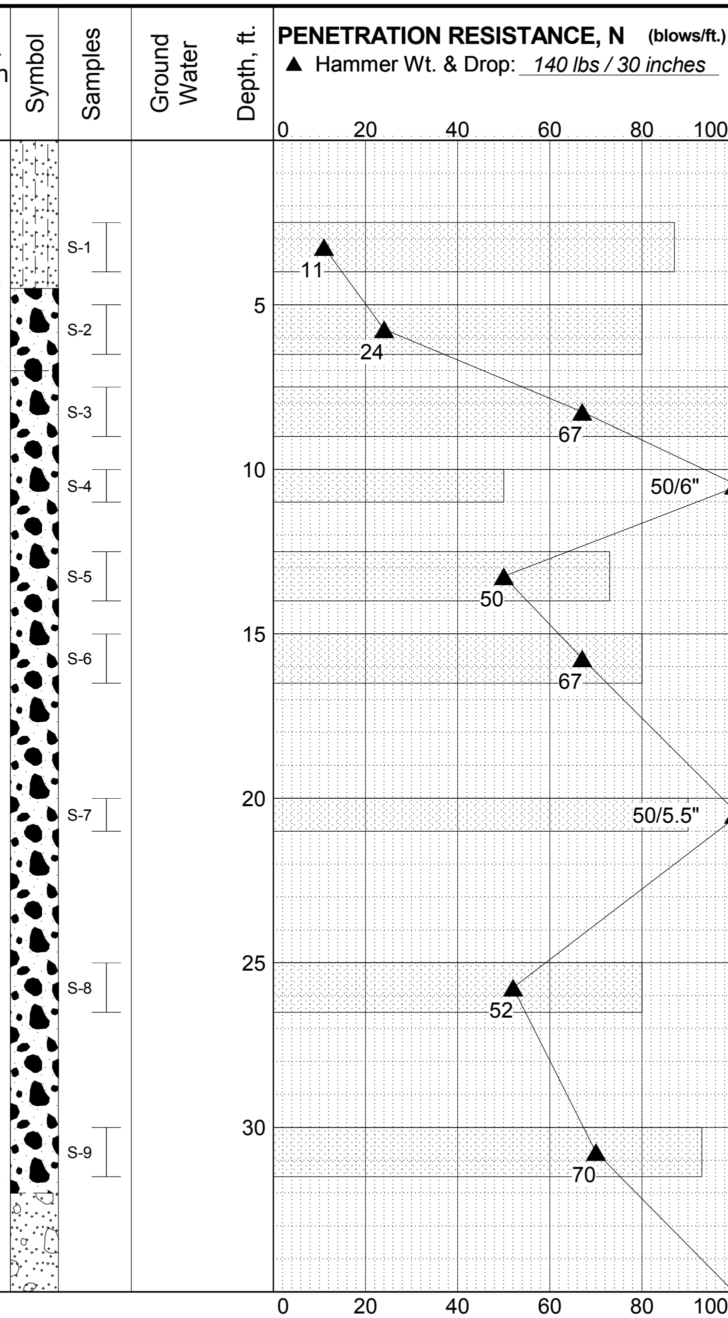
SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. Depth (ft.)	Samples
Medium dense brown silty SAND; dry; nonplastic fines; fine to medium sand; micaceous; occasional rootlets. (SM) **LOESS**		S-1
Medium dense gray sandy GRAVEL, trace silt; dry to moist; fine to coarse sand; rounded to subangular gravel. (GP)	*556.0* 4.5	S-2
Very dense gray-brown sandy GRAVEL, trace silt with COBBLES; moist; fine to coarse sand; rounded to subangular gravel; slight iron-oxide staining; occasional cobbles. (GP) **CATASTROPHIC FLOOD DEPOSITS** **GRAVEL FACIES** *Drilling mud loss from 15.0 to 20.0 feet.*	*553.5* 7.0	S-3, S-4, S-5, S-6, S-7, S-8, S-9
Very dense brown gravelly SAND with to trace silt grading to sandy GRAVEL, trace silt; wet. (GP)	*528.5* 32.0	

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches



CONTINUED NEXT SHEET

LEGEND

* Sample Not Recovered

Standard Penetration Test

Recovery (%)

● % Water Content

Plastic Limit —— Liquid Limit

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Perennial Wind Chaser Station
Hermiston, Oregon

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SHANNON & WILSON, INC.
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FIG. A10
Sheet 1 of 2

REV 3

Total Depth:	*40.4 ft.*	Northing:	*~ 780,789 ft.*	Drilling Method:	*Mud Rotary*	Hole Diam.:	*5 in.*
Top Elevation:	*~ 561 ft.*	Easting:	*~ 8,490,838 ft.*	Drilling Company:	*Hardcore Drilling*	Rod Type:	*NWJ*
Vert. Datum:	*NAD88*	Station:	*~*	Drill Rig Equipment:	*CME-75*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAVD88*	Offset:	*~*	Other Comments:	*Hammer Efficiency = 85.1%*		

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. Depth (ft.)	Symbol	Samples	Ground Water	Depth, ft.
Continued: Very dense brown gravelly SAND with to trace silt grading to sandy GRAVEL, trace silt; wet; fine to medium sand grading to fine to coarse sand; rounded to subrounded gravel; slight dark-brown staining. (GP)			S-10		
CATASTROPHIC FLOOD DEPOSITS GRAVEL FACIES	*520.1* 40.4		S-11		40
Completed - June 12, 2013					45
					50
					55
					60
					65

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*

Recovery (%)

● % Water Content

Plastic Limit ├──┤ Liquid Limit

LEGEND

* Sample Not Recovered

I Standard Penetration Test

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Perennial Wind Chaser Station
Hermiston, Oregon

LOG OF BORING B-9

November 2013 24-1-03794-001

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A10
Sheet 2 of 2

REV 3

Total Depth:	31 ft.	Northing:	~ 780,837 ft.	Drilling Method:	Mud Rotary	Hole Diam.:	5 in.
Top Elevation:	~ 559 ft.	Easting:	~ 8,491,154 ft.	Drilling Company:	Hardcore Drilling	Rod Type:	NWJ
Vert. Datum:	NAD88	Station:	~	Drill Rig Equipment:	CME-75	Hammer Type:	Automatic
Horiz. Datum:	NAVD88	Offset:	~	Other Comments:	Hammer Efficiency = 72.0% (0-10ft); 85.1% (10-31ft)		

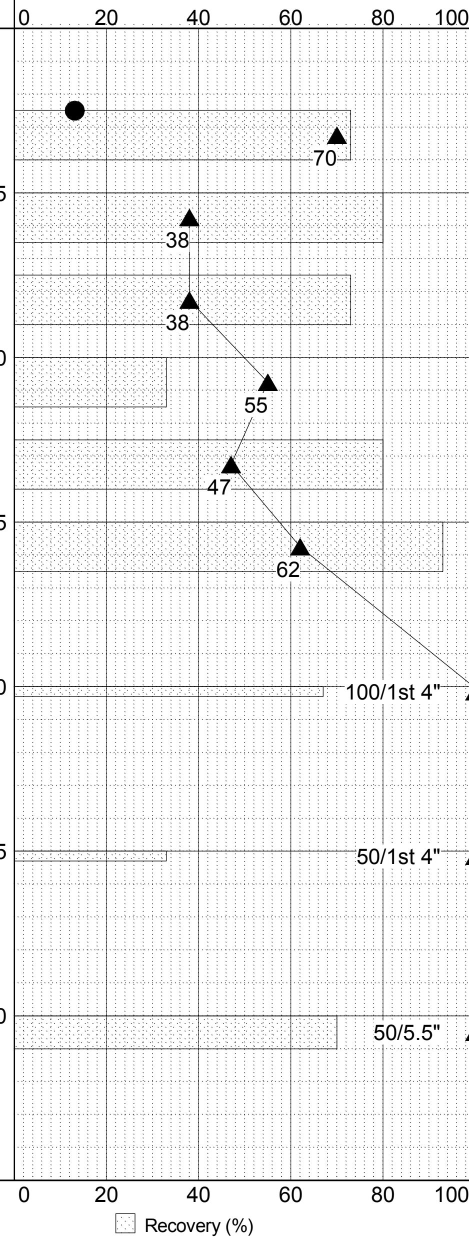
SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

SOIL DESCRIPTION	Elev. Depth (ft.)	Samples	Depth, ft.
Very dense brown silty SAND; dry; nonplastic fines; fine to medium sand; occasional rootlets; micaceous. (SM) **LOESS**	555.7 3.0	S-1a, S-1b	
Dense gray-brown sandy GRAVEL, trace silt with COBBLES and BOULDERS; moist; fine to coarse sand; rounded to subangular gravel; occasional cobbles and small boulders; slight iron-oxide staining. (GP) **CATASTROPHIC FLOOD DEPOSITS GRAVEL FACIES**	549.2 9.5	S-2, S-3	5
Dense to very dense gray-brown sandy GRAVEL, trace silt with COBBLES and BOULDERS; moist; fine to coarse sand; rounded to subangular gravel; scattered cobbles; occasional boulders. (GP) *Drilling mud loss from 12.5 to 15.0 feet.*		S-4, S-5, S-6	10, 15
BOULDER from 18.0 to 20.5 feet.		S-7	20
Cobble layer and lost drilling mud circulation at 24.0 feet.		S-8	25
	527.7 31.0	S-9	30
Completed - June 12, 2013			

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches



LEGEND

* Sample Not Recovered

Standard Penetration Test

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Perennial Wind Chaser Station
Hermiston, Oregon

LOG OF BORING B-10

November 2013 24-1-03794-001

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FIG. A11

REV 3

Typ: MAS Rev: CKS Log: CKS

MASTER_LOG_E 24-1-03794-HERMISTON.GPJ SHAN_WIL.GDT 11/18/13

DCP TEST DATA

Project: *Perennial Power* **Date:** *9-Jul-13*
Location: *DCP-1* **Soil Type(s):** *SM*

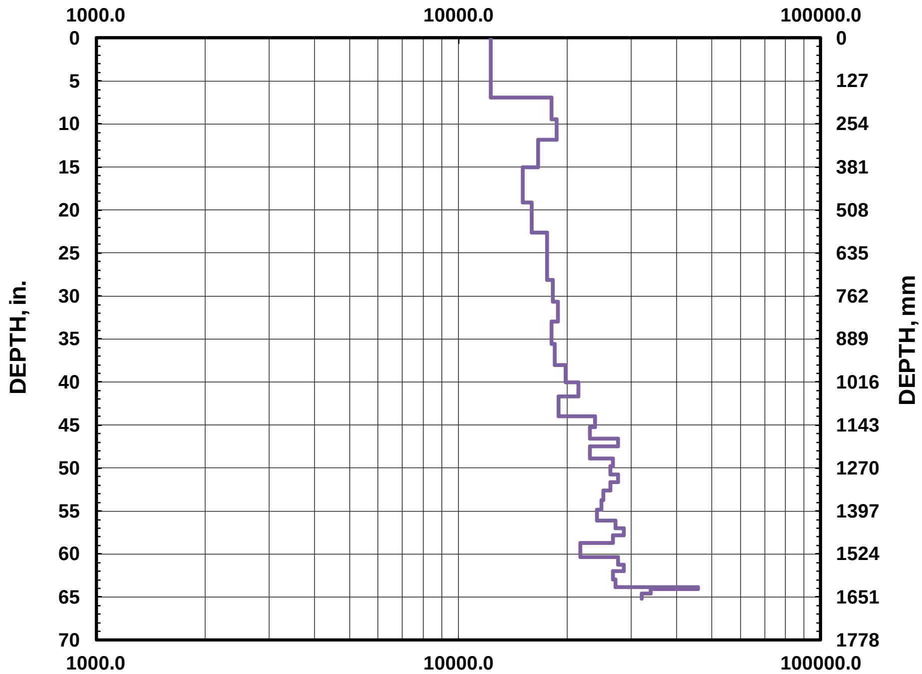
Hammer
- ○ 10.1 lbs.
- ● 17.6 lbs.
- ○ Both hammers used

- ○ CH
- ○ CL
- ● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	1
5	175	1
5	240	1
5	300	1
5	381	1
5	485	1
5	575	1
5	645	1
5	715	1
5	779	1
5	838	1
5	903	1
5	965	1
5	1017	1
5	1059	1
5	1117	1
5	1149	1
5	1184	1
5	1206	1
5	1241	1
5	1265	1
5	1290	1
5	1312	1
5	1337	1
5	1365	1
5	1394	1
5	1425	1
5	1448	1
5	1468	1
5	1492	1
5	1533	1
5	1555	1
5	1575	1
5	1599	1
5	1622	1
5	1628	1
5	1641	1
5	1656	1

Based on approximate interrelationships of MR (ODOT PAVEMENT DESIGN GUIDE 2011)

SUBGRADE MODULUS (MR) psi



CORRECTED SUBGRADE MODULUS (MR) psi

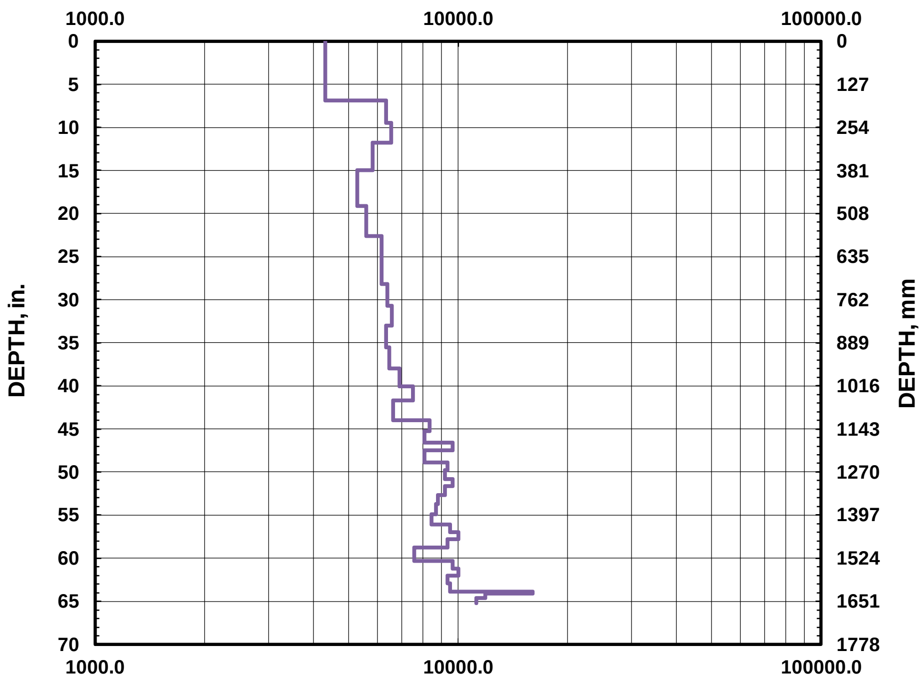


FIG. A12

DCP TEST DATA

Project: *Perennial Power* **Date:** *9-Jul-13*
Location: *DCP-2* **Soil Type(s):** *SM*

Hammer
- ○ 10.1 lbs.
- ● 17.6 lbs.
- ○ Both hammers used

- ○ CH
- ○ CL
- ● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	1
5	93	1
5	158	1
5	206	1
5	248	1
5	283	1
5	323	1
5	362	1
5	413	1
5	465	1
5	517	1
5	563	1
5	634	1
5	722	1
5	764	1
5	779	1
5	789	1
5	800	1
5	824	1
5	845	1
5	858	1
5	868	1
5	879	1
5	889	1
5	901	1
5	914	1
5	929	1
5	945	1
5	962	1
5	980	1
5	994	1
5	1010	1
5	1031	1
5	1048	1
5	1059	1
5	1079	1
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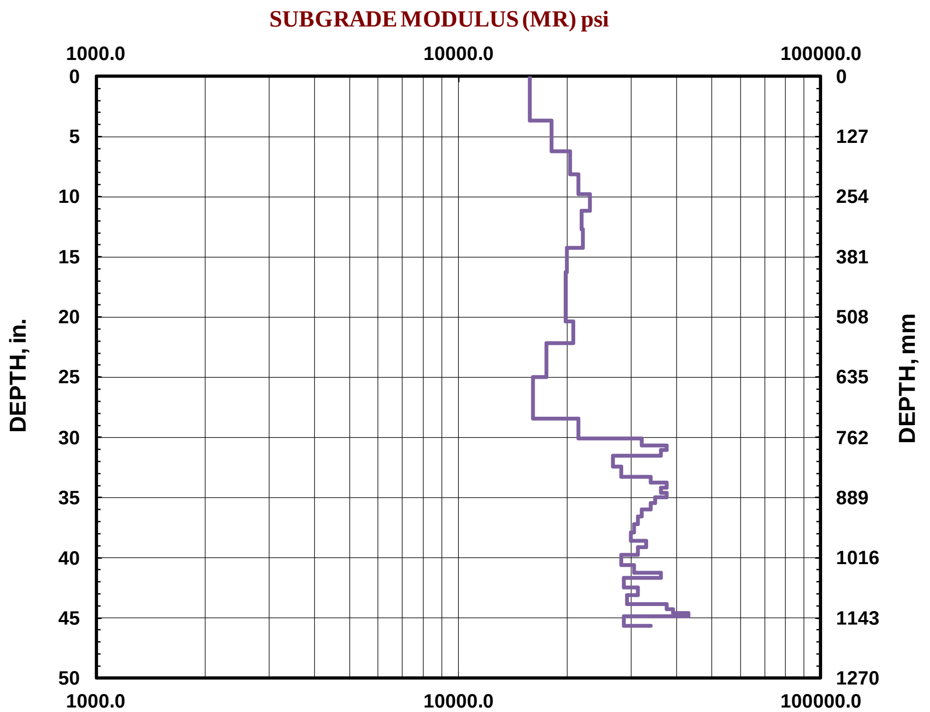
5	1140	1
5	1160	1
5	1173	1



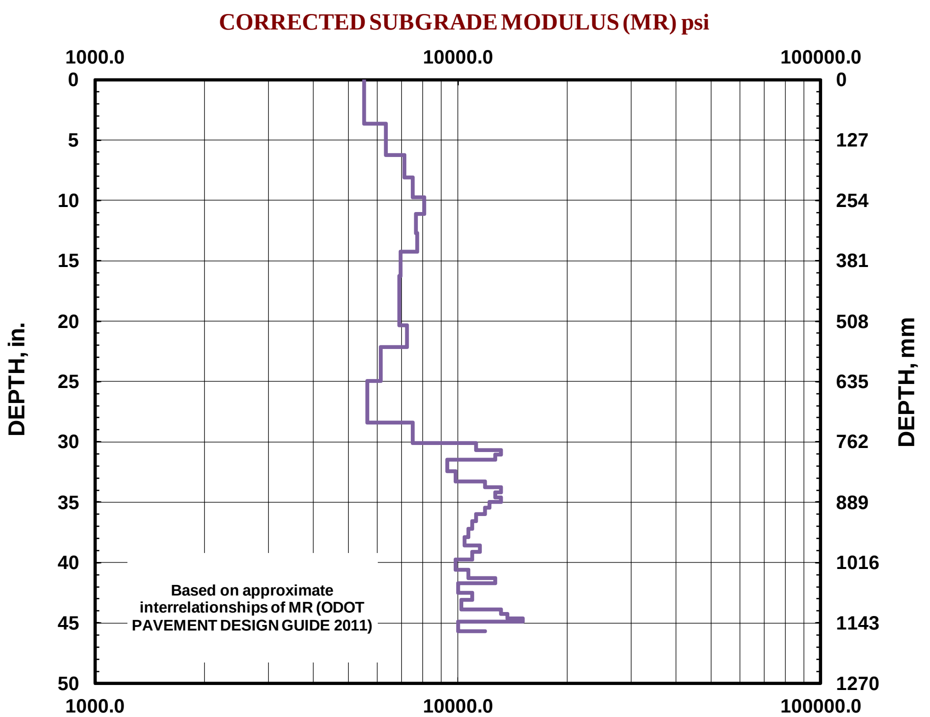


FIG. A13

DCP TEST DATA

Project: *Perennial Power*
Location: *DCP-3*
Date: *9-Jul-13*
Soil Type(s): *SM*

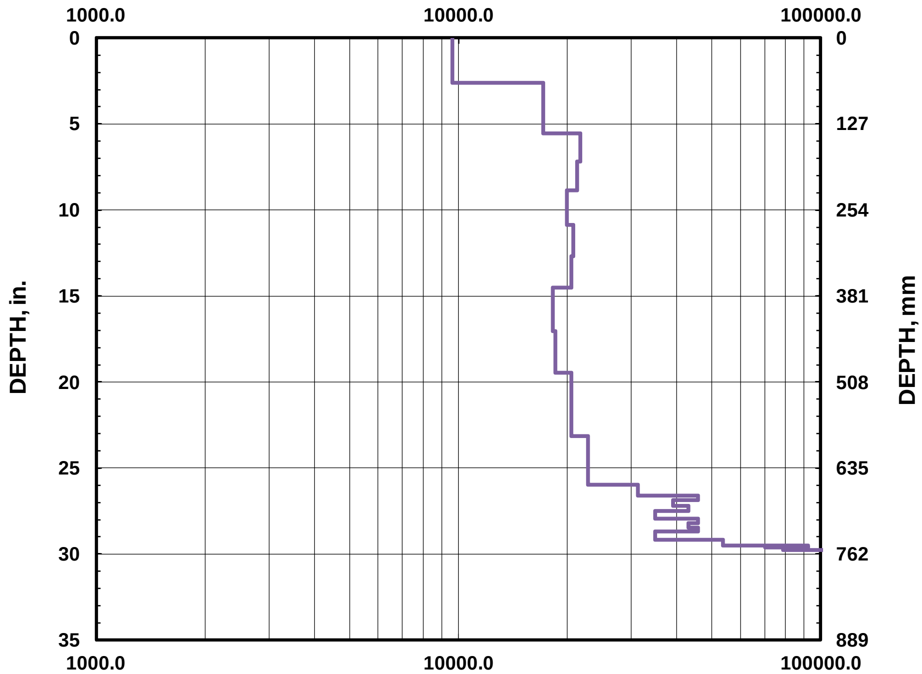
Hammer
- ○ 10.1 lbs.
- ● 17.6 lbs.
- ○ Both hammers used

- ○ CH
- ○ CL
- ● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	1
1	66	1
5	141	1
5	182	1
5	225	1
5	276	1
5	322	1
5	369	1
5	433	1
5	494	1
5	541	1
5	588	1
5	624	1
5	660	1
5	676	1
5	682	1
5	691	1
5	698	1
5	710	1
5	716	1
5	723	1
5	729	1
5	741	1
5	745	1
5	749	1
5	750	1
5	752	1
5	753	1
10	756	1
10	757	1
10	758	1

Based on approximate interrelationships of MR (ODOT PAVEMENT DESIGN GUIDE 2011)

SUBGRADE MODULUS (MR) psi



CORRECTED SUBGRADE MODULUS (MR) psi

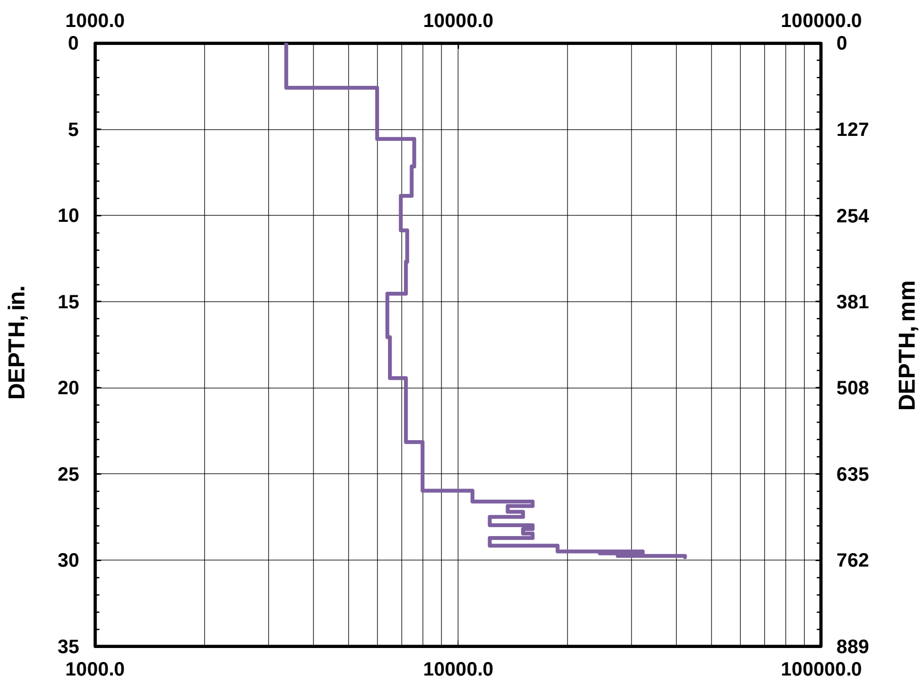


FIG. A14

DCP TEST DATA

Project: *Perennial Power*
Location: *DCP-4*
Date: *9-Jul-13*
Soil Type(s): *SM*

Hammer
- ○ 10.1 lbs.
- ● 17.6 lbs.
- ○ Both hammers used

- ○ CH
- ○ CL
- ● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	1
1	108	1
5	178	1
5	209	1
5	236	1
5	259	1
5	280	1
5	303	1
5	338	1
5	386	1
5	465	1
5	498	1
5	517	1
5	525	1
5	536	1
5	546	1
5	556	1
5	571	1
5	577	1
5	584	1
5	593	1
5	599	1
5	601	1
5	605	1
5	609	1
5	618	1
5	628	1
5	634	1
5	636	1
5	641	1
5	644	1
5	649	1
5	654	1
5	665	1
5	674	1
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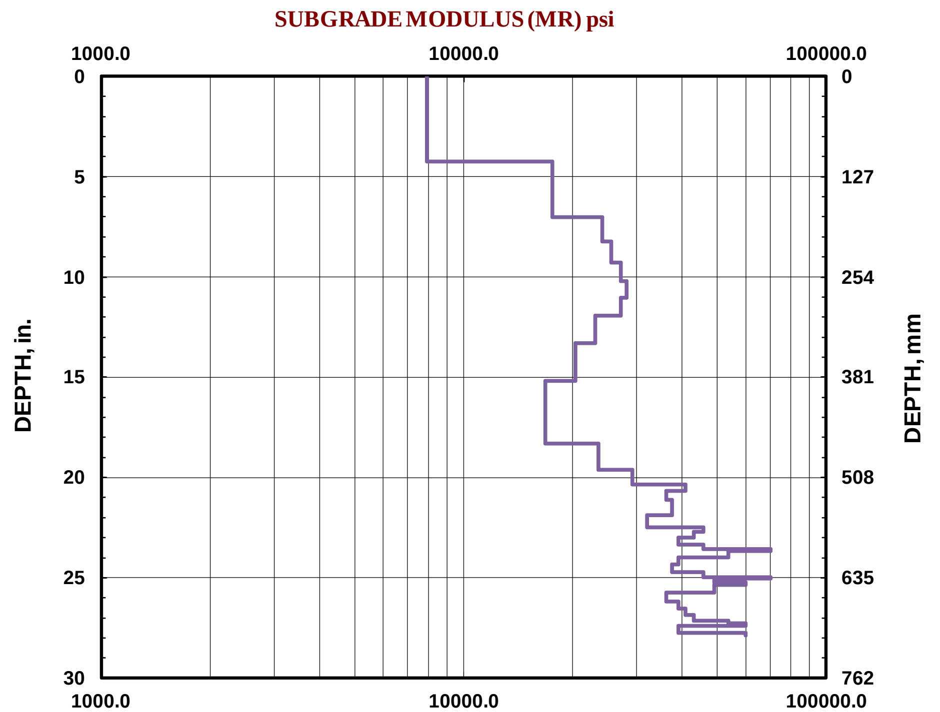
5	689	1
5	693	1
5	696	1
5	705	1
5	708	1



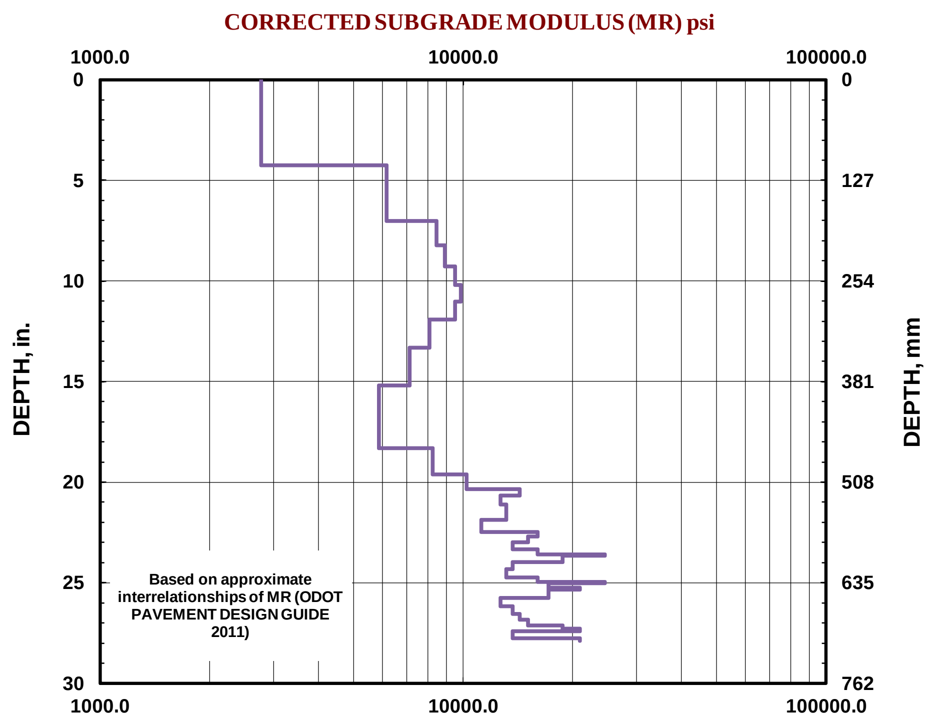


FIG. A15

DCP TEST DATA

Project: *Perennial Power* **Date:** *9-Jul-13*
Location: *DCP-5* **Soil Type(s):** *SM*

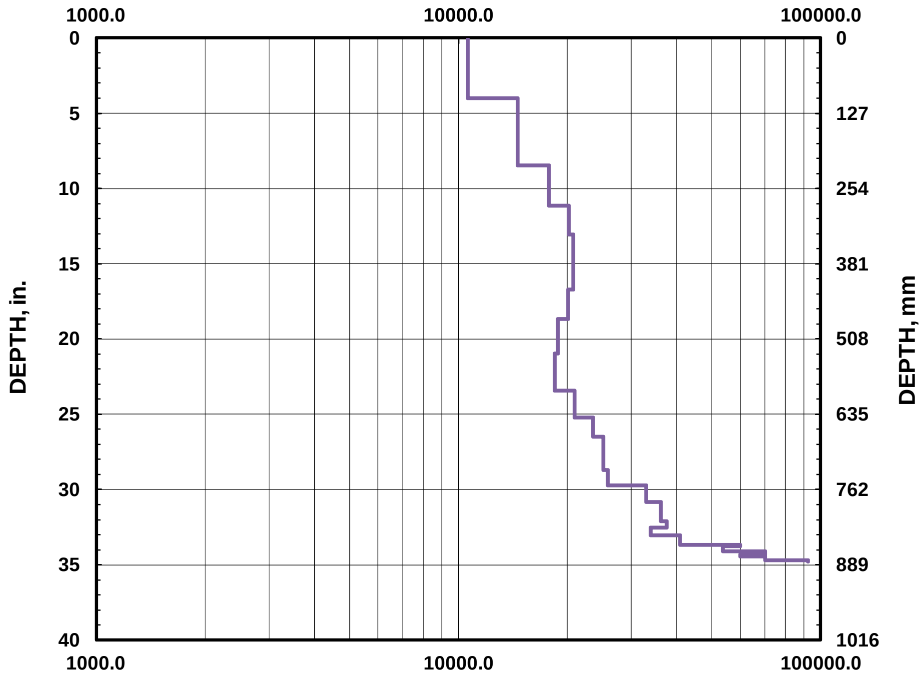
Hammer
- ○ 10.1 lbs.
- ● 17.6 lbs.
- ○ Both hammers used

- ○ CH
- ○ CL
- ● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	1
2	102	1
5	215	1
5	283	1
5	332	1
5	378	1
5	424	1
5	474	1
5	533	1
5	595	1
5	640	1
5	673	1
5	701	1
5	729	1
5	755	1
5	769	1
5	783	1
5	794	1
5	805	1
5	816	1
5	826	1
5	839	1
5	847	1
5	855	1
5	858	1
5	862	1
5	866	1
5	868	1
5	870	1
5	872	1
5	875	1
5	877	1
5	879	1
5	881	1
5	882	1
5	883	1

Based on approximate interrelationships of MR (ODOT PAVEMENT DESIGN GUIDE 2011)

SUBGRADE MODULUS (MR) psi



CORRECTED SUBGRADE MODULUS (MR) psi

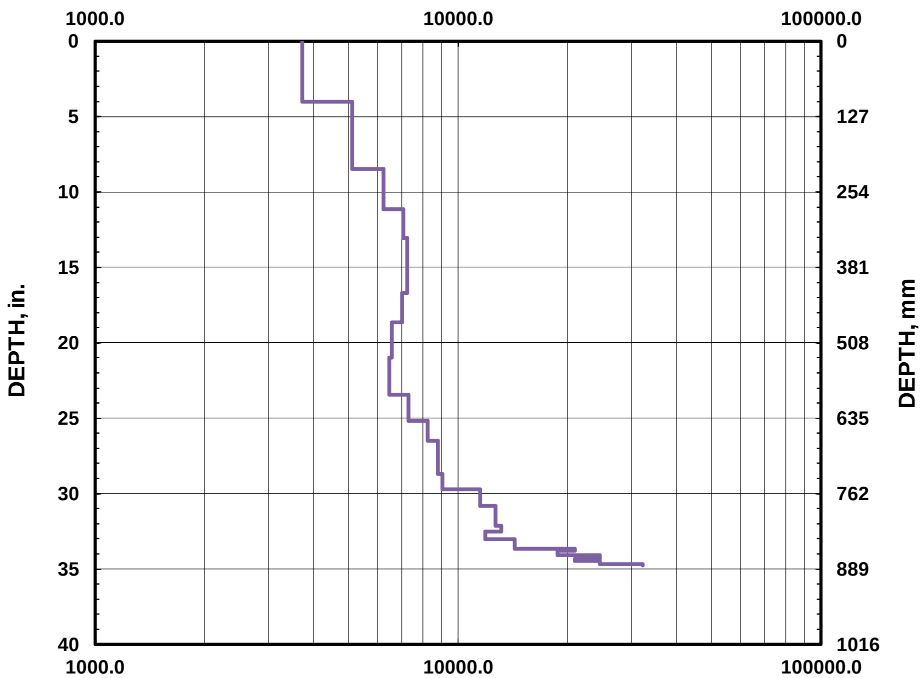


FIG. A16

APPENDIX B

LABORATORY TESTING

TABLE OF CONTENTS

FIGURES

ATTACHMENTS

APPENDIX B

LABORATORY TESTING

B.1 GENERAL

The soil samples obtained during the field explorations were described and identified in the field in general accordance with the Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), ASTM D2488. The specific terminology used is presented in Appendix A, Figure A1. The samples were then reviewed in the laboratory. The physical characteristics of the samples were noted and the field descriptions and identifications were modified where necessary in accordance with terminology presented in Appendix A, Figure A1. Representative samples were selected for various laboratory tests. We refined our visual-manual soil descriptions and identifications based on the results of the laboratory tests, using elements of the Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System), ASTM D2487. The refined descriptions and identifications were then incorporated into the Logs of Borings, presented in Appendix A. Note that ASTM D2487 was not followed in full, because it requires that a suite of tests be performed to fully classify a single sample.

The soil testing program included moisture content analyses, Atterberg Limits tests, particle-size analyses, and analytical testing for corrosivity potential. The testing procedures from our laboratory program are summarized in the following paragraphs. Analytical testing for corrosivity potential was performed by Specialty Analytical of Clackamas, Oregon. All other test procedures were performed by Shannon & Wilson, Inc., in accordance with applicable ASTM International (ASTM) standards.

B.2 SOIL TESTING

B.2.1 Moisture (Natural Water) Content

Natural moisture content determinations were performed in accordance with ASTM D2216 on selected soil samples. The natural moisture content is a measure of the amount of moisture in the soil at the time the explorations are performed, and is defined as the ratio of the weight of water to the dry weight of the soil, expressed as a percentage. The results of the moisture content determinations are presented graphically in the Logs of Borings in Appendix A.

B.2.2 Atterberg Limits

Atterberg limits were determined on selected samples in accordance with ASTM D4318. This analysis yields index parameters of the soil that are useful in soil identification, as well as in a number of analyses, including liquefaction analysis. An Atterberg limit test determines a soil's liquid limit (LL) and plastic limit (PL). These are the maximum and minimum moisture contents at which the soil exhibits plastic behavior. A soil's plasticity index (PI) can be determined by subtracting PL from LL. The LL, PL, and PI of tested samples are presented on the Atterberg Limits Results, Figure B1. The results are also shown graphically in the Logs of Borings in Appendix A. For the purposes of soil description, we use the term nonplastic to refer to soils with a PI range of 0 to 4, low plasticity for soils with a PI range of >4 to 10, medium plasticity for soils with a PI range of >10 to 20, high plasticity for soils with a PI range of >20 to 40, and very high plasticity for soils with a PI greater than 40.

B.2.3 Particle-Size Analyses

Particle-size analyses were conducted on selected samples to determine their grain-size distributions. Grain-size distributions were determined by sieve analysis in accordance with ASTM D422. A wet sieve analysis was performed to determine a percentage (by weight) of the sample passing the No. 200 (0.075 mm) sieve. The material retained on the No. 200 sieve was shaken through a series of sieves to determine the distribution of the plus No. 200 fraction. Results of the particle-size analyses are presented on Figure B2, Grain Size Distribution. For all particle-size analyses, the percentage of material passing the No. 200 sieve is also shown graphically in the Logs of Borings in Appendix A.

B.2.4 Corrosivity Testing

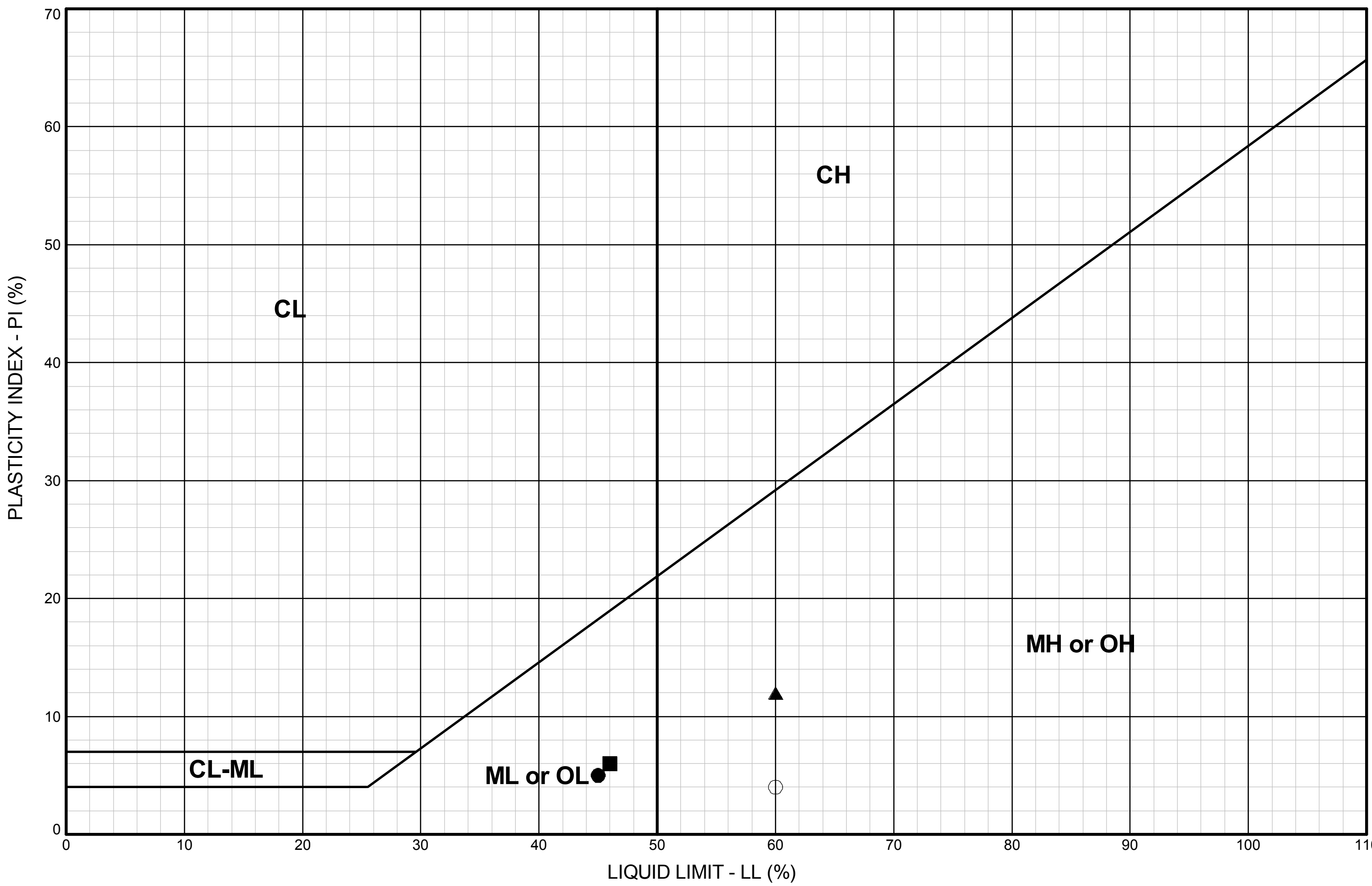
Analytical testing was performed on a composite sample comprised of selected near-surface samples to determine the corrosivity potential of the soil at the site. The corrosivity test suite included chloride concentration, soil pH, oxidation-reduction potential, soil resistivity, sulfate concentration, and sulfide concentration. Analytical testing was performed by Specialty Analytical of Clackamas, Oregon. Their testing report is attached to the end of this appendix.

The corrosion potential of a soil is primarily evaluated by comparing the measured pH, resistivity, and sulfate and chloride concentration to the values from those in Fang (1991) and Tomlison (1987) as specified by AASHTO LFRD Bridge Design Specifications (6th Edition 2012).

Soil pH is a measurement of the hydrogen ion activity of the soil. Soil pH is reported in Standard Units (S.U.) on a scale ranging from 0 to 14, with 7 being neutral. Soils with a pH less than 7 are considered acidic and soils with a pH greater than 7 are considered alkaline. According to the AASHTO specifications, soils with a pH less than 5.5 and soils with a pH between 5.5 and 8.5 that also have high organic content are considered potentially corrosive. Soil pH of the composite sample was 8.34 and little organic matter was observed in the tested sample. Based on pH, the sample does not appear to be corrosive.

Resistivity (expressed as ohms-centimeter or ohms-cm) is the numerical expression of the ability of a soil to impede the transmission of an electrical current. Resistivity is the inverse of conductivity and is dependent on the presence of ions, their concentrations, mobility, and valence, as well as soil moisture and temperature. The AASHTO specifications state that effects of corrosion and deterioration shall be considered if resistivity values are less than 2,000 ohms-cm. The resistivity of the composite sample was 5,000 ohms-cm. Based on resistivity, the composite sample does not appear to be corrosive.

Sulfate and chloride concentrations were measured in the soil sample. Sulfates can be converted to sulfides by naturally occurring bacteria. Sulfides, when allowed to oxidize, will produce sulfuric acid, which is highly corrosive. Chlorides will also chemically react and facilitate dissolution reactions with metals and concrete. According to the AASHTO specifications, the soil is considered corrosive if the concentration of chloride is greater than 100 parts per million (ppm) or the concentration of sulfate is greater than 1,000 ppm. Chloride concentrations in the composite sample were 4.08 ppm, sulfate concentrations were 37.8 ppm, and sulfide concentrations were below the laboratory method reporting limits. Based on the chloride, sulfate, and sulfide concentrations, the composite sample does not appear to be corrosive.



NOTES

1) Atterberg limits tests were performed in general accordance with ASTM D4318 unless otherwise noted in the report.

2) Plasticity adjectives used in sample descriptions correspond to plasticity index as follows:
- Nonplastic (0 - 4%)
- Low Plasticity (>4 - 10%)
- Medium Plasticity (>10 - 20%)
- High Plasticity (>20 - 40%)
- Very High Plasticity (>40%)

BORING AND SAMPLE NO.	DEPTH (feet)	GROUP SYMBOL	SAMPLE DESCRIPTION	LL %	PL %	PI %	NAT. W.C. %	FINES %
● B-1, S-7	25.0	ML	SILT, trace sand, low plasticity	45	40	5	47	90
■ B-1, S-8	30.0	ML	SILT with sand, low plasticity	46	40	6	46	83
▲ B-1, S-12	50.0	MH	Clayey SILT with sand, medium plasticity	60	48	12	50	85
B-4, S-11	40.0	ML	Sandy SILT, nonplastic	NP	NP	NP	46	53
○ B-4, S-12	45.0	MH	Clayey SILT with sand, low plasticity	60	56	4	56	87
B-7, S-1	2.5	SM	Silty SAND, trace gravel, nonplastic	NP	NP	NP	4	25

Perennial Wind Chaser Station
Hermiston, Oregon

ATTERBERG LIMITS RESULTS

November 2013 24-1-03794-001

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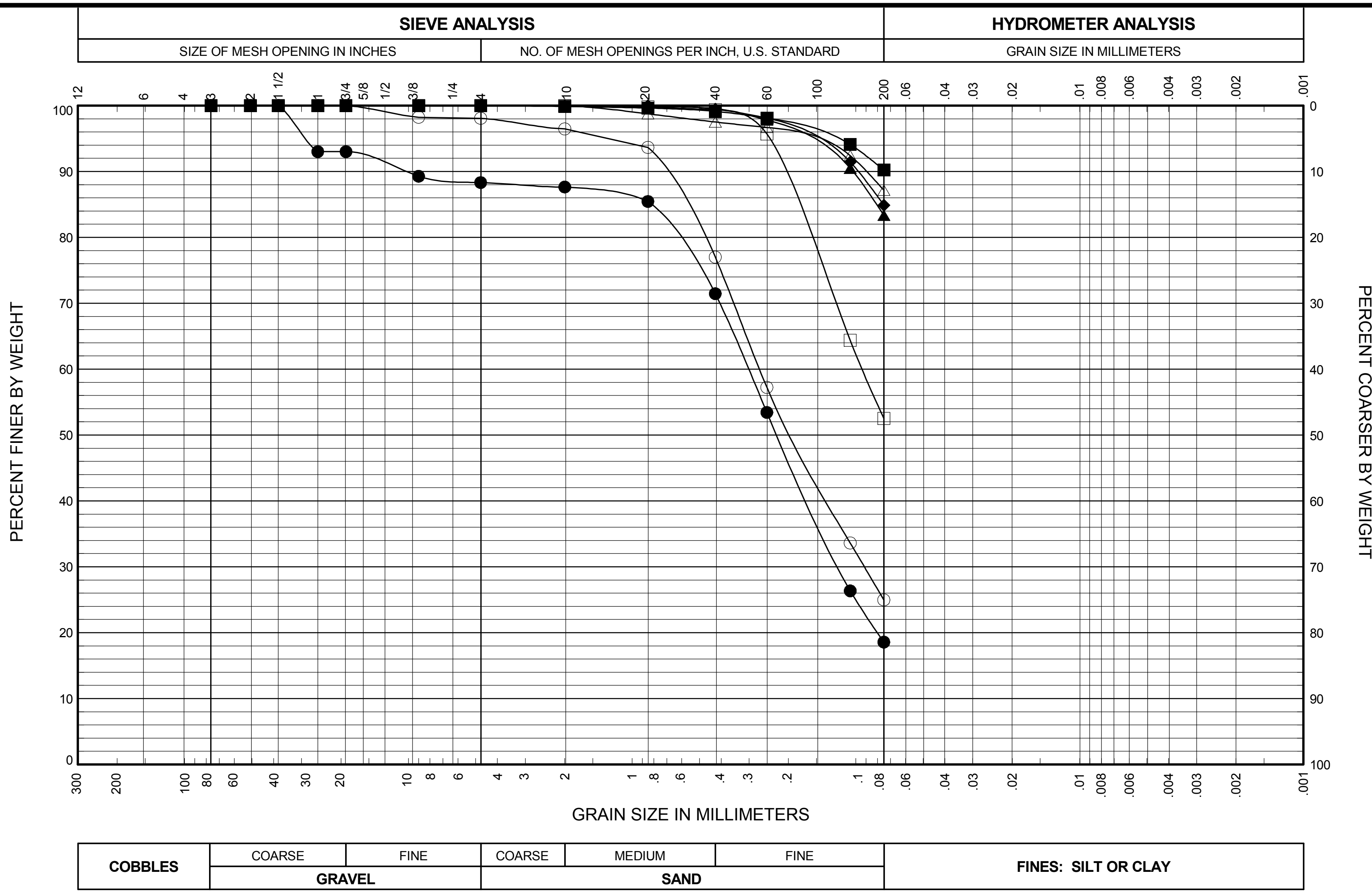
FIG. B1



NOTES:
1) Sieve and hydrometer analyses were performed in general accordance with ASTM D422 unless otherwise noted in the report.
2) Particles retained on the 3-inch (76.2 mm) sieve are noted in the sample descriptions, but are not included in sieve analyses unless otherwise noted in the report.

GSA MAIN 24-1-03794-HERMISTON.GPJ SHAN WIL.GDT 11/18/13

BORING AND SAMPLE NO.	DEPTH (feet)	GROUP SYMBOL	SAMPLE DESCRIPTION	GRAVEL %	SAND %	FINES %	NAT. W.C. %	DRY DENSITY PCF
● B-1, S-1	2.5	SM	Silty SAND, trace gravel	12	70	19	3	
■ B-1, S-7	25.0	ML	SILT, trace sand, low plasticity	0	10	90	47	
▲ B-1, S-8	30.0	ML	SILT with sand, low plasticity	0	17	83	46	
◆ B-1, S-12	50.0	MH	Clayey SILT with sand, medium plasticity	0	15	85	50	
○ B-2, S-1	2.5	SM	Silty SAND	2	73	25	18	
□ B-4, S-11	40.0	ML	Sandy SILT, nonplastic	0	47	53	46	
△ B-4, S-12	45.0	MH	Clayey SILT with sand, low plasticity	0	13	87	56	

Perennial Wind Chaser Station
Hermiston, Oregon

GRAIN SIZE DISTRIBUTION

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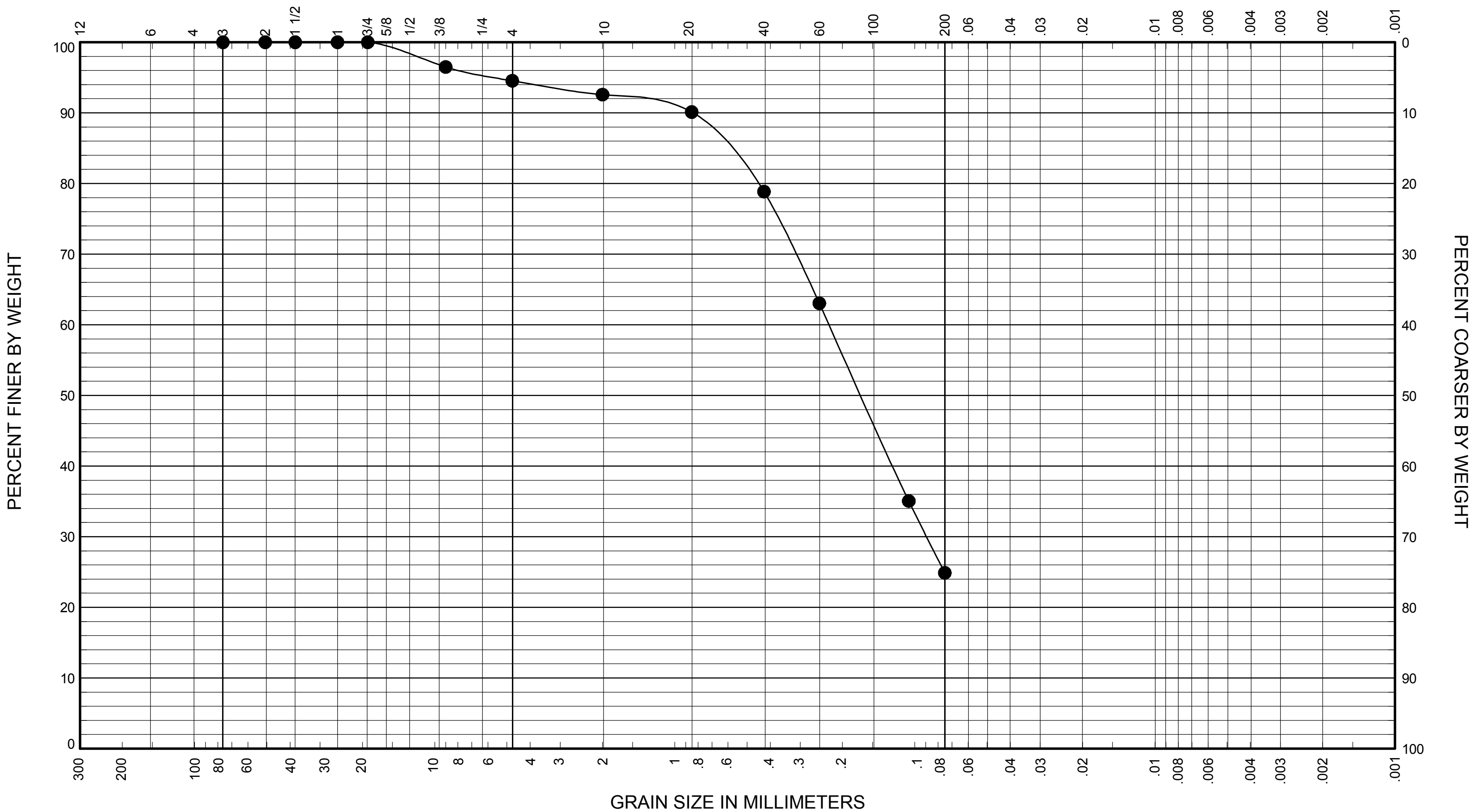
FIG. B2
Sheet 1 of 2

FIG. B2



COBBLES	GRAVEL		SAND			FINES: SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

BORING AND SAMPLE NO.	DEPTH (feet)	GROUP SYMBOL	SAMPLE DESCRIPTION	GRAVEL %	SAND %	FINES %	NAT. W.C. %	DRY DENSITY PCF
● B-7, S-1	2.5	SM	Silty SAND, trace gravel, nonplastic	5	70	25	4	

Perennial Wind Chaser Station
Hermiston, Oregon

GRAIN SIZE DISTRIBUTION

November 2013 24-1-03794-001

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. B2
Sheet 2 of 2

NOTES:
1) Sieve and hydrometer analyses were performed in general accordance with ASTM D422 unless otherwise noted in the report.
2) Particles retained on the 3-inch (76.2 mm) sieve are noted in the sample descriptions, but are not included in sieve analyses unless otherwise noted in the report.

GSA_MAIN 24-1-03794-HERMISTON.GPJ SHAN_WIL.GDT 11/18/13

FIG. B2

Specialty Analytical

11711 SE Capps Road, Ste B
Clackamas, Oregon 97015
TEL: 503-607-1331 FAX: 503-607-1336
Website: www.specialtyanalytical.com

June 27, 2013

David Higgins
Shannon & Wilson
3990 SW Collins Way
Ste. 100
Lake Oswego, OR 97035

TEL: (503) 223-6147
FAX (503) 223-6140

RE: Perennial Power / 24-1-03794-001

Dear David Higgins: Order No.: 1306108

Specialty Analytical received 5 sample(s) on 6/18/2013 for the analyses presented in the following report.

There were no problems with the analysis and all data for associated QC met EPA or laboratory specifications, except where noted in the Case Narrative, or as qualified with flags. Results apply only to the samples analyzed. Without approval of the laboratory, the reproduction of this report is only permitted in its entirety.

If you have any questions regarding these tests, please feel free to call.

Sincerely,

Marty French
Lab Director

Specialty Analytical

Date Reported: **27-Jun-13**

CLIENT:	Shannon & Wilson	**Collection Date:**	6/18/2013
Project:	Perennial Power / 24-1-03794-001		
Lab ID:	1306108-001		
Client Sample ID:	Composite	**Matrix:**	SOIL

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
CHLORIDE ION IN SOIL		**D512**				Analyst: **AT**
Chloride	4.08	1.50		mg/Kg	1	6/24/2013 1:45:00 PM
PH OF SOIL		**D4972**				Analyst: **JRC**
pH	8.34	0		pH Units	1	6/20/2013 1:55:00 PM
OXIDATION-REDUCTION POTENTIAL		**M2580B**				Analyst: **JRC**
Oxidation-Reduction Potential	284	0		Eh	1	6/20/2013 2:15:00 PM
SOIL RESISTIVITY		**T288-91**				Analyst: **JRC**
Minimum Soil Resistivity	5000	1.00		ohm-cm	1	6/21/2013 10:40:00 AM
SULFATE IN SOIL		**D516**				Analyst: **AT**
Sulfate	37.8	1.50		mg/Kg	1	6/24/2013 1:45:00 PM
SULFIDE		**SW9030**				Analyst: **AT**
Sulfide	ND	20.0		mg/Kg	1	6/24/2013 10:00:00 AM

QC SUMMARY REPORT

WO#: **1306108**

27-Jun-13

Specialty Analytical

Client: Shannon & Wilson

Project: Perennial Power / 24-1-03794-001

TestCode: **CL_ASTM_S**

Sample ID: **MB-R10284** SampType: **MBLK** TestCode: **CL_ASTM_S** Units: **mg/Kg** Prep Date: RunNo: **10284**

Client ID: **PBS** Batch ID: **R10284** TestNo: **D512** Analysis Date: **6/24/2013** SeqNo: **130184**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	ND	1.50									

Sample ID: **LCS-R10284** SampType: **LCS** TestCode: **CL_ASTM_S** Units: **mg/Kg** Prep Date: RunNo: **10284**

Client ID: **LCSS** Batch ID: **R10284** TestNo: **D512** Analysis Date: **6/24/2013** SeqNo: **130185**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	28.3	1.50	30.00	0	94.5	80	120				

Sample ID: **CCV** SampType: **CCV** TestCode: **CL_ASTM_S** Units: **mg/Kg** Prep Date: RunNo: **10284**

Client ID: **CCV** Batch ID: **R10284** TestNo: **D512** Analysis Date: **6/24/2013** SeqNo: **130188**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	14.0	0.500	15.00	0	93.2	90	110				

Qualifiers:

B Analyte detected in the associated Method Blank
H Holding times for preparation or analysis exceeded
ND Not Detected at the Reporting Limit
O RSD is greater than RSDlimit
R RPD outside accepted recovery limits
S Spike Recovery outside accepted reco

QC SUMMARY REPORT

WO#: **1306108**

27-Jun-13

Specialty Analytical

Client: Shannon & Wilson

Project: Perennial Power / 24-1-03794-001 **TestCode:** **PH_ASTM**

Sample ID: **1306108-001ADUP** SampType: **DUP** TestCode: **PH_ASTM** Units: **pH Units** Prep Date: RunNo: **10225**

Client ID: **Composite** Batch ID: **R10225** TestNo: **D4972** Analysis Date: **6/20/2013** SeqNo: **129581**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
pH	8.34	0						8.340	0	20	

Qualifiers:						
	B	Analyte detected in the associated Method Blank	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	O	RSD is greater than RSDlimit	R	RPD outside accepted recovery limits	S	Spike Recovery outside accepted reco

QC SUMMARY REPORT

WO#: **1306108**

27-Jun-13

Specialty Analytical

Client: Shannon & Wilson

Project: Perennial Power / 24-1-03794-001

TestCode: **REDOX**

Sample ID: **1306108-001ADUP** SampType: **DUP** TestCode: **REDOX** Units: **Eh** Prep Date: RunNo: **10226**

Client ID: **Composite** Batch ID: **R10226** TestNo: **M2580B** Analysis Date: **6/20/2013** SeqNo: **129584**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Oxidation-Reduction Potential	290	0						284.0	2.09	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
O	RSD is greater than RSDlimit	R	RPD outside accepted recovery limits	S	Spike Recovery outside accepted reco

QC SUMMARY REPORT

WO#: **1306108**

27-Jun-13

Specialty Analytical

Client: Shannon & Wilson

Project: Perennial Power / 24-1-03794-001

TestCode: **SO4_ASTM_S**

Sample ID: **MB-R10285** SampType: **MBLK** TestCode: **SO4_ASTM_** Units: **mg/Kg** Prep Date: RunNo: **10285**

Client ID: **PBS** Batch ID: **R10285** TestNo: **D516** Analysis Date: **6/24/2013** SeqNo: **130189**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfate	ND	1.50									

Sample ID: **LCS-R10285** SampType: **LCS** TestCode: **SO4_ASTM_** Units: **mg/Kg** Prep Date: RunNo: **10285**

Client ID: **LCSS** Batch ID: **R10285** TestNo: **D516** Analysis Date: **6/24/2013** SeqNo: **130190**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfate	29.1	1.50	30.00	0	97.0	70	130				

Sample ID: **CCV** SampType: **CCV** TestCode: **SO4_ASTM_** Units: **mg/Kg** Prep Date: RunNo: **10285**

Client ID: **CCV** Batch ID: **R10285** TestNo: **D516** Analysis Date: **6/24/2013** SeqNo: **130193**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfate	14.7	0.500	15.00	0	98.0	90	110				

Qualifiers: B Analyte detected in the associated Method Blank; H Holding times for preparation or analysis exceeded; ND Not Detected at the Reporting Limit; O RSD is greater than RSDlimit; R RPD outside accepted recovery limits; S Spike Recovery outside accepted reco

QC SUMMARY REPORT

WO#: **1306108**

27-Jun-13

Specialty Analytical

Client: Shannon & Wilson

Project: Perennial Power / 24-1-03794-001

TestCode: **SULFIDE_S**

Sample ID: **1306108-001ADUP** SampType: **DUP** TestCode: **SULFIDE_S** Units: **mg/Kg** Prep Date: RunNo: **10283**

Client ID: **Composite** Batch ID: **R10283** TestNo: **SW9030** Analysis Date: **6/24/2013** SeqNo: **130183**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	ND	20.0						0	0	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
O	RSD is greater than RSDlimit	R	RPD outside accepted recovery limits	S	Spike Recovery outside accepted reco

KEY TO FLAGS

Rev. May 12, 2010

A	This sample contains a Gasoline Range Organic not identified as a specific hydrocarbon product. The result was quantified against gasoline calibration standards
A1	This sample contains a Diesel Range Organic not identified as a specific hydrocarbon product. The result was quantified against diesel calibration standards.
A2	This sample contains a Lube Oil Range Organic not identified as a specific hydrocarbon product. The result was quantified against a lube oil calibration standard.
A3	The result was determined to be Non-Detect based on hydrocarbon pattern recognition. The product was carry-over from another hydrocarbon type.
A4	The product appears to be aged or degraded diesel.
B	The blank exhibited a positive result great than the reporting limit for this compound.
CN	See Case Narrative.
D	Result is based from a dilution.
E	Result exceeds the calibration range for this compound. The result should be considered as estimate.
F	The positive result for this hydrocarbon is due to single component contamination. The product does not match any hydrocarbon in the fuels library.
G	Result may be biased high due to biogenic interferences. Clean up is recommended.
H	Sample was analyzed outside recommended holding time.
HT	At clients request, samples was analyzed outside of recommended holding time.
J	The result for this analyte is between the MDL and the PQL and should be considered as estimated concentration.
K	Diesel result is biased high due to amount of Oil contained in the sample.
L	Diesel result is biased high due to amount of Gasoline contained in the sample.
M	Oil result is biased high due to amount of Diesel contained in the sample.
MC	Sample concentration is greater than 4x the spiked value, the spiked value is considered insignificant.
MI	Result is outside control limits due to matrix interference.
MSA	Value determined by Method of Standard Addition.
O	Laboratory Control Standard (LCS) exceeded laboratory control limits, but meets CCV criteria. Data meets EPA requirements.
Q	Detection levels elevated due to sample matrix.
R	RPD control limits were exceeded.
RF	Duplicate failed due to result being at or near the method-reporting limit.
RP	Matrix spike values exceed established QC limits; post digestion spike is in control.
S	Recovery is outside control limits.
SC	Closing CCV or LCS exceeded high recovery control limits, but associated samples are non-detect. Data meets EPA requirements.
*	The result for this parameter was greater that the maximum contaminant level of the TCLP regulatory limit.

APPENDIX C

PHOTOGRAPH LOG

Boring B-1 Location

Boring B-2 Location

Perennial Wind Chaser Station
Hermiston, Oregon

PHOTOGRAPH LOG

November 2013 24-1-03794-001

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FIG. C1

Boring B-3 Location

Boring B-4 Location

Perennial Wind Chaser Station
Hermiston, Oregon

PHOTOGRAPH LOG

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FIG. C1

Boring B-5 Location

Boring B-6 Location

Perennial Wind Chaser Station
Hermiston, Oregon

PHOTOGRAPH LOG

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FIG. C1

Boring B-7 Location

Boring B-8 Location

Perennial Wind Chaser Station
Hermiston, Oregon

PHOTOGRAPH LOG

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FIG. C1

Boring B-9 Location

Boring B-10 and Infiltation Test INT-2 Location

Perennial Wind Chaser Station
Hermiston, Oregon

PHOTOGRAPH LOG

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FIG. C1

File: I:\WIP\Projects\24-1 Portland\3700\3794 Perennial Power Wind Chaser Project\Field Explorations\field photos\07_09_2013\Photos.indd Date: 11-19-13 Author: AMN

Dynamic Cone Penetrometer DCP-1 Location

Dynamic Cone Penetrometer DCP-2 Location

Perennial Wind Chaser Station
Hermiston, Oregon

PHOTOGRAPH LOG

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FIG. C1

Dynamic Cone Penetrometer DCP-3 Location

Dynamic Cone Penetrometer DCP-4 Location

Perennial Wind Chaser Station
Hermiston, Oregon

PHOTOGRAPH LOG

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FIG. C1

Dynamic Cone Penetrometer DCP-5 Location

Infiltration Test INT-1 Location

Perennial Wind Chaser Station
Hermiston, Oregon

PHOTOGRAPH LOG

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FIG. C1

APPENDIX D

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL/ENVIRONMMENTAL REPORT

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Attachment to and part of Report 24-1-03794-001 Draft Preliminary Geotechnical Engineering Report: Perennial Power Wind Chaser Project

Date: July 2013
To: Burns & McDonnell Engineering Company, Inc.
Attn: Robert Hawkins

Important Information About Your Geotechnical/Environmental Report

CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

THE CONSULTANT'S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical/environmental report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used: (1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors, which were considered in the development of the report, have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical/environmental report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/environmental report. The consultant should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your consultant can work together to help reduce their impacts. Retaining your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your consultant's report are preliminary because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical/environmental report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.

Final boring logs developed by the consultant are based on interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical/environmental reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY.

Because geotechnical/environmental engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in their contracts, reports and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

The preceding paragraphs are based on information provided by the
ASFE/Association of Engineering Firms Practicing in the Geosciences, Silver Spring, Maryland

APPENDIX B: PRELIMINARY REPORT FOR STEP-UP SUBSTATION

Appendix B

Preliminary Geotechnical Engineering Report for Step-Up Substation

Preliminary Geotechnical Engineering Report
Perennial Wind Chaser Station
Step-Up Substation
Umatilla, Oregon

November 19, 2013

SHANNON & WILSON, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Preliminary Geotechnical Engineering Report
Perennial Wind Chaser Station
Step-Up Substation
Umatilla, Oregon

November 19, 2013

SHANNON & WILSON, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Excellence. Innovation. Service. Value
Since 1954

Submitted To:
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PERENNIAL WIND CHASER STATION
STEP-UP SUBSTATION
UMATILLA, OREGON

1.0 INTRODUCTION

Perennial-Wind Chaser LLC is planning to construct a new 415-megawatt power-generating facility in Hermiston, Oregon, as part of the Perennial Wind Chaser Station project. In support of the proposed power-generating facility a Step-up Substation will be constructed immediately south of Bonneville Power Administration (BPA) McNary Substation in Umatilla, Oregon. The proposed Step-up Substation is located in an agricultural field north and west of Scaplehorn Road and 2,500 feet east of I-82, as shown on the Vicinity Map, Figure 1. The step-up substation is separated from McNary Substation by a railroad bed.

Shannon & Wilson, Inc. is providing preliminary geotechnical engineering services for the project under subcontract to Burns & McDonnell Engineering Company, Inc. This Preliminary Geotechnical Engineering Report presents our field exploration and laboratory test data, as well as the results of our preliminary geotechnical engineering evaluations for the design of the proposed substation facility. This report was prepared in general accordance with the Oregon State Board of Geologist Examiners Guidelines for Engineering Geologic Reports and Site-Specific Seismic Hazard Reports.

2.0 PROJECT UNDERSTANDING

2.1 Site Description

The proposed Step-up Substation facility site is immediately south of the center portion of the existing BPA McNary Substaion, which operates independently of the proposed facility. The proposed site is in the north central portion of a large agricultural field bordered on the north by a railroad bed, on the south by a concrete lined canal, on the east by Scaplehorn Road, and on the west by I-82. The site is within the historic flood plain of both the Umatilla River 1 mile to the west and Columbia River a half mile to the north. Site topography is generally flat and it is currently vegetated by tall grass. There are multiple wooden 230 kV and metal 500 kV transmission towers within the proposed footprint of the substation. The transmission towers carry power lines 40 to 60 feet above the ground surface to McNary Substation. There is an abandoned residential compound in the southeast corner of the field that we understand is owned by BPA and will likely be demolished. Isolated basalt boulders up to about four feet in diameter are scattered throughout the surface of the site. These boulders were likely derived from near-surface gravel deposits.

2.2 Substation Components

The Site Plan, Figure 2, shows the proposed location and configuration of the Step-up Substation, as provided to us by Burns & McDonnell Engineering Company, Inc. We understand that the preferred site access has not yet been established but we assume access will use the existing dirt road from Brownell Ditch Road to the south. We also understand the final layout of the proposed facility and final site grades have not yet been determined and that foundation loads are currently unknown. We assume that substation components will consist of transmission towers, a buried transmission cable, transformers associated disconnect switches and circuit breakers, tie-in structure, underground termination structures and adding gravel to the existing dirt roadways.

3.0 GEOLOGY AND SEISMICITY

3.1 Regional Geology

The project site is located within the Umatilla Basin; a broad lowland that is part of the Deschutes-Columbia Plateau geomorphic province. Evolution of the Columbia Plateau is described by Reidel and others (1989). The Deschutes-Columbia Plateau is floored at depth by basalt bedrock of the Columbia River Basalt Group (CRBG). The CRBG were erupted in the middle Miocene epoch, between about 17 and 6 million years ago, from fissure vents near the Idaho border. The CRBG consists of six formations, 14 members, and more than 150 individual flow units. Total thickness of the basalt section is greater than 15,000 feet in the Tri-Cities area to the north, and the section thins to a tapered edge against the flanks of the Blue Mountains to the southeast. The CRBG section is estimated at about 5,000 feet thick in the Umatilla Basin, although no borings are known to have penetrated to that depth.

As the basalt flows were being erupted, tectonic stress began building in the earth's crust, eventually producing many broad folds and faults across the newly forming basalt plateau. The down-warps, or basins, that formed on the basalt surface were filled by sediments eroded from the adjacent uplands and deposited by in-flowing streams along with an influx of air-fall volcanic ash. In the Umatilla Basin, these late Miocene to early Pliocene age (about 6 to 4 million year-old) sedimentary deposits were largely derived from the Blue Mountains to the south, although during this period the ancestral Umatilla River watershed may have included a large area south of the Blue Mountains axis (Smith and others, 1989). These Pliocene sediments were deposited as alluvial fans and north-flowing stream channel deposits and defined by Farooqui and others (1981) as the Alkali Canyon Formation. The Alkali Canyon Formation is exposed lying above the CRBG at higher elevations to the south (Walker, 1973; Madin and Geitgey, 2007) but is not present at the project site where it has been eroded away by the nearby Umatilla and Columbia Rivers.

During the high ice periods of the Pleistocene epoch, catastrophic flooding of glacial Lake Missoula deposited sand and gravel over the older deposits in the Umatilla Basin. Glacial Lake Missoula was impounded behind an ice dam which blocked the mouth of the Clark Fork in western Montana. At least 40, and by some counts (Waitt, 1980) up to about 90, times the lake level was able to overcome the ice and the lake emptied catastrophically, flooding the Columbia River system and back-flooding up tributary stream canyons along its path. The floodwater pooled temporarily in the wide Umatilla Basin forming a lake that for a short period of time was up to 400 feet deep. The high-velocity flood waters initially scoured their way into the basin, then as the flood waters deepened, a tremendous bed load of coarse gravel migrated into the basin filling the flood channels at lower elevations, while in succession, finer gravel and then sand mantled progressively higher topography. As the flood flow waned, silt was deposited out of suspension in the slack water. Then, slowly over a period of several days, the flood waters quietly receded. The process probably recurred at intervals of at least several decades between about 18,000 and 15,000 years ago (Allen and others, 2009).

Since the last flood event, the surface of the Umatilla Basin has been modified by strong easterly winds which have reworked the sand and silt deposited by the Missoula floods along with an influx of wind-blown silt ("loess") eroded from the Palouse of southeastern Washington. Other modifications have included erosion and re-deposition of sediments within the floodplain of the Umatilla and Columbia River and their tributaries.

3.2 Seismic Setting

Earthquakes in the Pacific Northwest occur largely as a result of the collision between the Juan de Fuca plate and the North American plate. These two tectonic plates meet along a mega thrust fault called the Cascadia Subduction Zone (CSZ). The CSZ runs approximately parallel to the coastline from northern California to southern British Columbia. The compressional forces that exist between these two colliding plates cause the denser oceanic plate to descend, or subduct, beneath the continental plate. This process leads to contortion and faulting of both plates and volcanism along the Cascade Range.

Shallow crustal faults and folds throughout Oregon and Washington have been located and characterized by the United States Geological Survey (USGS). The USGS provides approximate fault locations and a detailed summary of the available fault information in the USGS Quaternary Fault and Fold Database (USGS, 2013). The database defines four categories of faults, Classes A through D, based on evidence of tectonic movement known or presumed to be associated with large earthquakes during Quaternary time (less than 1.8 million years ago). For Fault Class A and B faults, geologic evidence has been published that demonstrates the existence of Quaternary deformation and, therefore, the faults are correlated to a higher potential for earthquake generation. Class A faults are known or presumed to be associated with relatively large magnitude earthquakes (moment magnitude [Mw] of 6 to 7). Faults defined as Class B exhibit equivocal geologic evidence of Quaternary deformation, or may not extend deep enough to be considered a source of significant earthquakes.

According to the USGS' Oregon Fault and Fold database, there are two Class A fault systems (a system has multiple fault segments) and two Class B fault systems within approximately 75 kilometers (47 miles) of the project site. Their names, general locations relative to the site, slip rates, and the times since their most recent deformation are summarized in Table 1.

TABLE 1: QUATERNARY FAULTS WITHIN A 75-KM RADIUS OF THE PERENNIAL POWER SITE

Name	Fault Class	Distance and Direction from Site	Most Recent Deformation*	Slip Rate
Hite System – Agency Section	A	61 km Southeast	<1.6 Ma	<0.2 mm/yr
Wallula Fault System	A	32 km East northeast	<15 Ka	<0.2 mm/yr
Columbia Hill Structures	B	5 km North	<1.6 Ma	<0.2 mm/yr
Horse Heaven Hills Structures	B	22 km North northwest	<1.6 Ma	<0.2 mm/yr
Rattlesnake Hills	B	30 km North northwest	<1.6 Ma	<0.2 mm/yr

* Ka = "kiloannum" or thousand years; Ma = "megaannum" or million years.

4.0 FIELD EXPLORATIONS

Shannon & Wilson, Inc., explored the subsurface conditions at the site with two (2) geotechnical borings, four (4) dynamic cone penetrometer (DCP) tests, and two (2) infiltration tests. The borings, designated ST-B-1 and ST-B-2, were drilled between August 14 and August 16, 2013, by Hardcore Drilling, Inc., of Dundee, Oregon. A Shannon & Wilson geologist located the borings, collected soil samples, and logged the materials encountered during drilling. The DCP tests, designated ST-DCP-1 through ST-DCP-4, were conducted to estimate parameters for pavement design. The infiltration tests, designated ST-INT-1 and ST-INT-2, were conducted to estimate infiltration capacity for potential stormwater management facility design. The DCPs and infiltration tests were performed by a Shannon & Wilson geologist between August 14 and August 16, 2013. The locations of the borings, DCPs, and infiltration tests were measured in the field using a handheld GPS unit. Approximate exploration locations are shown on the Site Plan, Figure 2. Details of the exploration program, including boring logs, descriptions of the techniques used to advance and sample the borings, and DCP and infiltration test procedures and results are presented in Appendix A.

5.0 LABORATORY TESTING

Laboratory tests were performed on selected samples from the borings to determine basic index and engineering properties of the soils encountered. The laboratory testing program included moisture content analyses, particle-size analyses, Atterberg Limits tests, and corrosivity testing. Laboratory testing was performed in general accordance with applicable ASTM International (ASTM), American Association of State Highway and Transportation Officials (AASHTO), and United States Environmental Protection Agency (EPA) standard test procedures. Results of the laboratory tests and a brief description of the testing procedures are presented in Appendix B.

6.0 PHOTOGRAPHS OF THE SITE

Site conditions were documented in photographs taken at each geotechnical boring exploration location. A Photograph Log is presented in Appendix C.

7.0 SUBSURFACE CONDITIONS

We grouped the materials encountered in our field explorations into five (5) geotechnical units, as described below. Our interpretation of the subsurface conditions is based on the borings and regional geologic information from published sources. The geotechnical units are as follows:

- *Fine-grained Alluvium*: Loose to Medium dense Silty SAND (SM).
- *Catastrophic Flood Deposits – Gravel Facies*: Very dense Sandy GRAVEL to GRAVEL, trace silt with cobbles and boulders (GP).
- *Catastrophic Flood Deposits – Fine-grained Facies*: Medium dense/stiff to very stiff SILT to SILT with sand (ML).
- *Catastrophic Flood Deposits – Sand Facies*: Medium dense to dense silty SAND to SAND, with varying amounts of silt and gravel (SM, SW-SM, and SP).
- *Columbia River Basalt Group*: Very low to medium high strength BASALT bedrock.

These generalized geotechnical units have been defined by their geologic and engineering properties and their distribution in the subsurface. The units and their inter-relationships are shown on the Geologic Profile A-A’, Figure 3. The location of the profile is shown on the Site Plan, Figure 2. The profile is interpretive, and variations in subsurface conditions may exist between the locations of the borings. Contacts between the units may be more gradational than shown in the profile and in the boring logs in Appendix A.

7.1 Reworked Fine-Grained Alluvium

The unit was deposited by the Columbia and Umatilla Rivers within the floodplain and reworked by high winds. It was encountered in all borings from the ground surface to depths ranging from about 2 to 2.5 feet. The Fine-grained Alluvium generally consists of loose to medium dense

Silty SAND (SM). It is typically dry to moist and micaceous with nonplastic fines, fine sand, and occasional organics. The silty fine sand may be considered a collapsible soil, based on our local experience. Collapsible soil usually has a relative high porosity and a correspondingly low unit weight. Soil collapse can occur by wetting under a moderate normal stress, through vibration, or by subjecting the soil to higher normal stresses without wetting it. Natural moisture content analysis performed on one sample was 2 percent. A fines content determined by sieve analyses was 30 percent by dry weight.

7.2 Catastrophic Flood Deposits

The Catastrophic Flood Deposits are gravel, sand, and fine-grained sediment deposited by the Missoula Floods. We grouped them into three facies based on their grain sizes: Gravel Facies, Fine-grained Facies, and Sand Facies. The different depositional facies reflect changing energy levels in the dynamic flood environment and are described in greater detail below.

7.2.1 Gravel Facies

Gravel Facies deposits were encountered directly below the Fine-grained Alluvium in all borings. The unit was fully penetrated in both borings, with encountered thicknesses ranging from about 5 to 21 feet. The Gravel Facies unit thickens to the east across the site. In general, the unit consists of very dense Sandy GRAVEL to GRAVEL, trace silt with cobbles and boulders (GP). Fines are typically nonplastic, sand is typically fine to coarse, and gravel is typically fine to coarse and rounded to subrounded. Difficult drilling conditions, including mud loss and borehole instability, were observed in the Gravel Facies. Drill action consistent with the presence of cobbles and boulders was observed. About 44 percent of the SPTs attempted in the unit met refusal, where more than 50 blows were required to drive the sampler through a six-inch interval. The non-refusal SPT N-values ranged from 58 to 66 bpf and averaged 63 bpf.

7.2.2 Fine-Grained Facies

A Fine-grained Facies deposit was encountered below the Gravel Facies in borings ST-B-2 and was about 10 feet thick. The Fine-grained Facies consists of medium dense/stiff to very stiff SILT to SILT with sand (ML). The unit is typically moist to wet and micaceous nonplastic to low plasticity fines. SPT N-values in the unit ranged from 12 to 19 bpf and averaged 16 bpf. Natural moisture content analyses of one sample tested was 35 percent. Fines content determined by one sieve analyses was 99 percent by dry weight. An Atterberg Limits test indicated the plasticity index was 3 percent.

7.2.3 Sand Facies

Sand Facies deposits were encountered in both borings, below the Gravel Facies in ST-B-1 and the Fine-grained Facies in ST-B-2. In general, the Sand Facies consists of medium dense to dense silty SAND to SAND, with varying amounts of silt and gravel (SM, SW-SM, and SP). The unit is typically dry to moist and micaceous, with nonplastic fines. SPT N-values in the unit ranged from 26 to 48 bpf and averaged 38 bpf. Natural moisture content analyses was 17 percent in both of the two samples tested. Fines content determined by two sieve analyses was 8 and 17 percent by dry weight.

7.2.4 Columbia River Basalt Group

The Columbia River Basalt bedrock was encountered at the base of both borings. In general, this unit consists of very low to medium high strength (R1-R3), dark brown and gray-brown to gray, slightly to moderately vesicular, slightly to highly weathered BASALT with very close to moderately close medium spaced rough undulating joints with varying amounts of iron-oxide staining, calcite mineralization, and brown clayey infilling. Overall, core recovery ranged from 52 to 100 percent and averaged 77 percent. Rock quality designation (RQD) ranged from 0 to 73 percent, and averaged 15 percent.

7.3 Groundwater

To estimate the depth to groundwater, boring ST-B-2 was flushed with clean water and left open with a tremie pipe inserted to the bottom after drilling. The hole was open from August 15 through August 16, 2013. We attempted to measure the groundwater level in the hole August 16 and the hole was dry. There was not groundwater present in the alluvial overburden or bedrock to the base of the boring. In our opinion, up to a few feet of groundwater may be perched over the surface of the bedrock during the winter season. Groundwater levels should be expected to fluctuate seasonally and with changes in precipitation, land use, and other factors. In general, we expect groundwater levels in this area to be at a seasonal high during the winter and late spring and at a seasonal low during the late summer and early fall.

8.0 SITE-SPECIFIC SEISMIC HAZARD EVALUATION

In accordance with the site classification criteria in the International Build Code (IBC, 2012), we recommend using a Site Class C for designing structures at this site. The following paragraphs describe required seismically-related hazard evaluations on site.

Strong Ground Motions: The maximum considered earthquake (MCE) ground motions at the bedrock level were obtained from the United States Geological Survey's (USGS) Earthquake Hazards Program – 2008 interactive deaggregation website. The ground motions are based on a probabilistic hazard analysis performed by the USGS and the seismic site classification of the project site. Table 2 provides recommendation seismic design parameters.

TABLE 2: RECOMMENDED SEISMIC DESIGN PARAMETERS

Seismic Parameter	Recommended Value
Site Class	C
Peak Ground Acceleration at Bedrock	0.17g
Peak Ground Acceleration at Ground Surface	0.21g
Short Period Spectral Acceleration, S_s	0.41g
1-Second Period Spectral Acceleration, S_1	0.13g
Site Factor, F_v	1.7
Site Factor, F_a	1.2
Short Period Damped Acceleration, S_{DS}	0.33g
1-Second Period Damped Acceleration, S_{D1}	0.15g
Seismic Design Category	D

Note: g = gravity acceleration

Fault Rupture: The project site lies more than 3 miles from the nearest Class B mapped fault and approximately 20 miles from the nearest Class A mapped fault. It is our opinion that the risk of fault rupture at the site is low.

Other Hazards: Due to the location, geography, and subsurface conditions of the site, it is our opinion that the risk for liquefaction, lateral spread, landsliding, tsunami, or seiche at the site is very low.

9.0 CONCLUSIONS AND RECOMMENDATIONS

9.1 General Conclusions

The borings drilled at the site indicate that the project site is mantled by a relatively thin layer of reworked fine-grained alluvium overlying very dense Catastrophic Flood Deposits - Gravel Facies, the medium dense to dense Sand Facies, and stiff to very stiff Fine-grained Facies. Catastrophic Flood Deposit Facies overly very low to medium high strength Columbia River Basalt Group bedrock at a depth of 25 to 37 feet. The following general conclusions are presented based on the results of our engineering analyses and evaluations.

- The 2 to 2.5 feet thick reworked fine-grained alluvium silty sand is potentially collapsible or subject to strength loss based on our local project experience. Collapse or loss of strength of the soil can occur either by wetting, vibrating, or subjecting the soil to higher normal stresses.

Most project structures, such as transformers and associated disconnect switches and circuit breakers, can be supported by shallow foundations; such as mat foundations and spread footings.

- Transmission Towers (if needed) typically are supported by drilled piers due to relatively large lateral load. Alternatively the transmission towers can be supported by a spread footing on top of the dense to very dense alluvial sandy gravel with use of micropiles or anchor tiedowns to develop the lateral resistance through a force couple. The preferred type of foundation will be selected based on the transmission tower types and design loads. At this time, the transmission tower design information is not available. Therefore, the foundation recommendations for the transmission towers are not included in this report.

9.2 Foundation Subgrade Preparation and Earthwork

9.2.1 Foundation Subgrade Preparation

Excavation and subgrade preparation recommendations are provided in the following paragraphs for the various structures including transformers, control buildings, and transmission towers. Foundation excavations should extend to the top of the dense to very dense Catastrophic Flood Deposits Gravel Facies at the depths ranging 2 to 3 feet below the existing ground surface, and graded to provide a smooth soil surface. Prior to placement of structural fill, the underlying Catastrophic Flood Deposits Gravel Facies subgrade should be compacted by several passes of a smooth drum roller with a minimum static weight of 10,000 pounds. Following compaction, proof-rolling should be accomplished while operating the drum roller in the static mode. Any loose of soft materials encountered should be removed and replaced with compacted structural fill.

9.2.2 Cut and Fill Slopes

We recommend that permanent cut and fill slopes on the site should be no steeper than 2 Horizontal to 1 Vertical (2H:1V). Temporary cut slopes may be required for foundations and buried transmission cables or other utilities. We recommend that the temporary cut slope inclination be 1.5H:1V or flatter.

The contractor and subcontractor should be aware of and familiar with applicable local, state, and federal safety regulations, including the current OSHA Excavation and Trench Safety Standards, and OSHA Health and Safety Standards for Excavations, 29 CFR Part 1926, or successor regulations. Construction site safety should be the sole responsibility of the contractor, who also is solely responsible for the means, methods, and sequencing of construction operations. We are providing the following information solely as a service to our client. Under no circumstances should the information provided herein be interpreted to mean that Shannon & Wilson is assuming responsibility for construction site safety or the contractor's activities; such responsibility is not being implied and should not be inferred.

9.2.3 Structural Fill

After the partial or complete removal of the reworked fine-grained alluvium silty sand layer, compacted structural fill should be used to establish foundation bearing grades. Prior to beginning structural fill placement, the foundation excavation subgrades should be prepared as recommended above. Crushed rock should consist of ¾-inch minus angular rock base aggregate, in accordance with Oregon Department of Transportation (ODOT) Standard Specifications for Construction (2008), Section 02630. In addition to the ODOT requirements, material passing the No. 200 sieve shall not exceed 5 percent by weight using a washed sieve analysis, ASTM D1140. We recommend that the backfill material placed to establish foundation bearing grades be compacted to at least 92 percent of its modified Proctor maximum dry density, determined in accordance with ASTM D1557.

An alternative structural fill is fly ash/cement/soil mix. We understand that the material and placement requirements for fly ash/cement/soil mix will be specified by the project civil engineers, if this option is pursued. We believe that the native reworked fine-grained alluvium silty sand is suitable for use with a fly ash or cement admixture.

The native excavated soil with no material passing a 3-inch screen may also be used as structural fill underneath lightly loaded spread footings and mat foundations for transformers or control buildings, but the native excavated soil should not be used as structural fill under the relatively heavy loaded (vertical and lateral) foundations, such as the transmission towers.

9.3 Foundation Design Recommendations

9.3.1 General

The subsurface conditions revealed by the borings indicate that the ground surface across the site is underlain by 2 to 3 feet of reworked alluvial silty sand which, in turn, is underlain by the Catastrophic Flood Deposits. The allowable settlements for the proposed structures are not known at this time. In the preliminary design, based upon our similar project and local geologic experiences, we recommend that the reworked alluvial silty sand be excavated out, and the spread footings should be founded on the dense to very dense alluvial sandy gravel. In all cases, the width of any foundation element should not be less than 24 inches. Based on discussion with the City of Hermiston Public Works Department, a frost depth of 2 feet is used in the Hermiston area for foundation design. Therefore, foundations should be embedded a minimum depth of 24 inches, measured from the top of the floor slab or lowest adjacent finished grade to the base of the foundation. The following paragraphs present geotechnical recommendations for foundation design include soil allowable bearing capacity, estimated settlement, and foundation excavation and backfill requirements.

9.3.2 Spread Footings for Transformers and other Structures

We recommend complete removal of the reworked alluvial silty sand layer to an estimated depth of 2 to 3 feet and replacement with a well-graded, clean, crushed rock structural fill, or a fly ash/cement soil mix structural fill. Subgrade preparation should include compaction and proof-rolling as previously described in Section 9.2.1. We recommend that an allowable bearing pressure of 5,000 psf be used to proportion the spread footings with a factor of safety (FS) of 3. For earthquake loading, this bearing capacity can be increased by one-third (33 percent). The estimated total elastic settlement is less than 0.5 inch. This settlement will occur immediately upon equipment loading. The differential settlement may be approximate 0.25 inch. We recommend using a subgrade modulus of 300 pci for foundation design regardless of foundation dimensions.

9.3.3 Drilled Shaft Foundations for Laterally Loaded Structures

We recommend using drilled shaft foundations to support the laterally loaded structures and equipment, such as bus supports, A-frames, deadends, and lightning masts. Typically the drilled shaft design including diameter and length will be controlled by the lateral loads of the proposed structures and equipments, as well as the subsurface soil conditions. We understand that the design loads of the proposed structures and equipments are unknown at this time.

Further the locations of these structures and equipments have not yet been determined. Therefore, the detail design of the drilled shaft foundations will be performed during the final design phase based upon the additional geotechnical explorations and design information including locations and design lateral loads.

9.4 Floor Slab

For floor slab subgrade preparation, we recommend excavating at least the upper reworked fine-grained alluvial silty sand to a depth of 12 inches below the existing ground surface and backfilling with structural fill. The structural fill may consist of clean, well-graded crushed rock or native sandy/silty soil. If native soil is used as structural fill in the floor slab areas, we recommend a minimum 8 inches of clean crushed rock with less than 2 percent passing Sieve No. 200 be placed beneath the floor slab as a capillary break between subgrade and slab. The structural backfill should be compacted at least to 90 percent of its modified Proctor maximum dry density, determined in accordance with ASTM D1557. We recommend a subgrade modulus of 150 pci be used for floor slab design.

9.5 Buried Transmission Cable

A buried transmission cable is planned to extend from the new Step-up Substation to the existing McNary Substation to the north as shown in Figure 2. The cable depth and final alignment has not yet been determined. The cable will need to cross under existing railroad tracks. Ownership of the railroad and whether or not it is in use is not known. Neither of the existing borings was performed at the proposed location of the buried transmission cable. However, based on surface topography we assume subsurface conditions to be similar to those encountered in the borings. Potential installation methods may include either trenching or trenchless excavation techniques or a combination of both. In our experience trenchless installation methods are typically required when crossing below railroad tracks. Trenches may be excavated using a temporary cut slope inclination of 1.5H:1V or flatter or excavated vertically using shoring or conventional trench shields. Trenchless techniques may include horizontal directional drilling or pipe ramming.

For open trenches the transmission cable zone and bedding should consist of imported, ¾-inch minus crushed aggregate. Compaction should be at least 90 percent of ASTM D1557. Above the transmission cable zone, where trenches pass below foundations, floor slabs, or pavements we recommend trench backfilled be in accordance with structural fill recommendations. In open areas the native excavated soil with no material passing a 3-inch screen may also be used as trench backfill above the transmission cable zone. In open areas trench backfill should be compacted to at least 90 percent of ASTM D1557.

10.0 LIMITATIONS

The analyses, conclusions, and recommendations contained in this report are based upon site conditions as they presently exist and further assume that the borings are representative of subsurface conditions throughout the site, i.e., the subsurface conditions everywhere are not significantly different from those disclosed by the field explorations.

If, during construction, subsurface conditions different from those encountered in the field explorations are observed or appear to be present beneath excavations, we should be advised at once so that we can review these conditions and reconsider our recommendations where necessary. If there is a substantial lapse of time between the submission of this report and start of work at the site, or if conditions have changed due to natural causes or construction operations at or adjacent to the site, it is recommended that this report be reviewed to determine the applicability of these conclusions and recommendations, considering the changed conditions and the elapsed time.

We recommend that Shannon & Wilson review the geotechnical portions of the plans and specifications, especially those parts that address foundations, retaining walls, embankments, and earthwork to determine if they are consistent with our recommendations.

This report is prepared for the exclusive use of Burns & McDonnell Engineering Company, Inc., for the preliminary design and permitting of the Perennial Power Wind Chaser Project, Step-up Substation in Umatilla, Oregon. We recommend additional explorations be performed once final layout of the substation is determined. Unanticipated soil conditions are commonly encountered and cannot fully be determined by merely taking soil samples from geotechnical borings. Such unexpected conditions frequently require that additional expenditures be made to attain properly constructed projects. This report is not as a warranty of subsurface conditions described in this report. Shannon & Wilson has prepared the attached, “Important Information About Your Geotechnical Engineering Report,” to assist you and others in understanding the use and limitations of our reports. This attachment is presented in Appendix D of this report.

Please note that the scope of our services did not include any environmental assessment or evaluation regarding the presence or absence of hazardous or toxic materials in the soil, surface water, groundwater, or air, on or below or around the project site.

SHANNON & WILSON, INC.

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11.0 REFERENCES

American Association of State Highway and Transportation Officials (AASHTO), 2012, AASHTO LRFD Bridge Design Specifications: Customary U.S. Units (6th ed.): Washington, D.C., AASHTO, 2 v.

Fang, H.-Y., 1991, Foundation engineering handbook (2nd ed.): N. Y., Van Nostrand Reinhold, 923 p.

Madin, I.P., and Geitgey, R.P., 2007, Preliminary Geologic Map of the Umatilla Basin, Morrow and Umatilla Counties, Oregon: State of Oregon Department of Geology and Mineral Industries, Open-File Report O-07-15, 1:100,000.

Allen, J.E., Burns, Marjorie, Burns, S.F., Cataclysms on the Columbia, Revised Second Edition, 2009, Ooligan Press, Portland, Oregon.

Farooqui, S.M., Beaulieu, J.D., Bunker, R.C,, Stensland, D.E., and Thoms, R.E., 1981, Dalles Group: Neogene formations overlying the Columbia River Basalt Group in north-central Oregon: Oregon Geology, Vol. 43, No. 10, October 1981, p. 131.

Lidke, D.J., compiler, 2002, Fault number 568, Columbia Hills structures, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/hazards/qfaults, accessed 07/17/2013 02:20 PM.

Madin, I.P., and Geitgey, R.P., 2007, Preliminary Geologic Map of the Umatilla Basin, Morrow and Umatilla Counties, Oregon: Oregon Department of Geology and Mineral Industries Open-File Report O-07-15, scale 1:100,000.

Oregon Department of Transportation, 2011, ODOT Pavement Design Guide, Pavement Services Unit, Salem, Oreg., 2 v., available: http://www.oregon.gov/ODOT/HWY/CONSTRUCTION/docs/pavement/pavement_design_guide.pdf.

Oregon Department of Transportation, 2008, Oregon Standard Specifications for Construction, Salem, Oreg., 2.v., available: http://www.oregon.gov/ODOT/HWY/SPECS/Pages/standard_specifications.aspx.

Personius, S.F., and Lidke, D.J., compilers, 2003, Fault number 567, Horse Heaven Hills structures, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/hazards/qfaults, accessed 07/17/2013 02:15 PM.

Personius, S.F., and Lidke, D.J., compilers, 2003, Fault number 845c, Hite fault system, Thorn Hollow section, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/hazards/qfaults, accessed 07/17/2013 12:53 PM.

Personius, S.F., and Lidke, D.J., compilers, 2003, Fault number 845d, Hite fault system, Agency section, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/hazards/qfaults, accessed 07/17/2013 12:52 PM.

Personius, S.F., and Lidke, D.J., compilers, 2003, Fault number 846, Wallula fault system, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/hazards/qfaults, accessed 07/17/2013 12:56 PM.

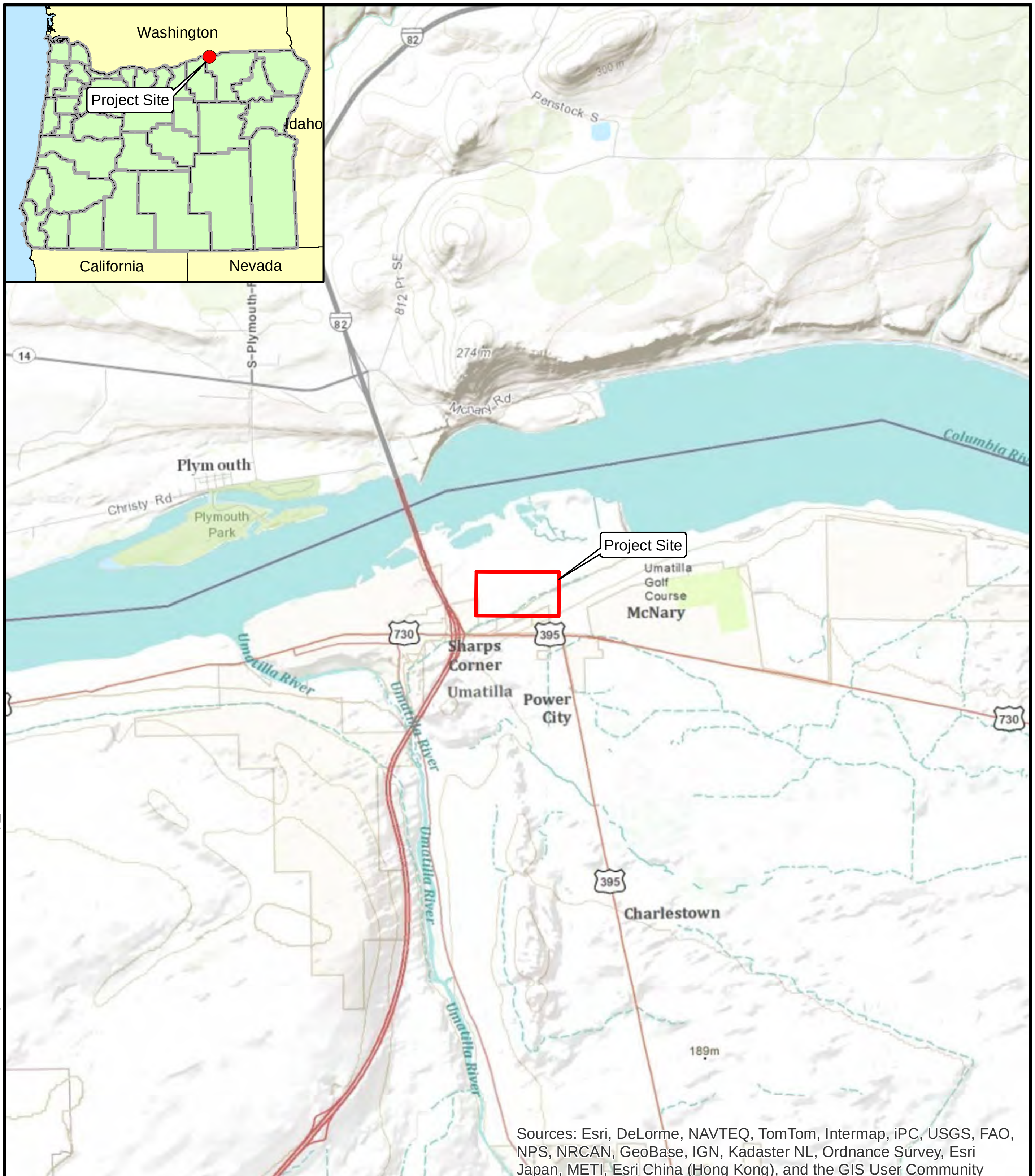
Reidel, S.P., Fecht, K.R., Hagood, M.C., and Tolan, T.L., 1989, The geologic evolution of the central Columbia Plateau, *in* Reidel, S.P., and Hooper, P.R., eds.,Volcanism and tectonism in the Columbia River flood-basalt province: Boulder, Colorado, Geological Society of America, Special Paper 239, p.247-264.

Smith, G.A., Bjornstad, B.N., and Fecht, K.R., 1989, Neogene terrestrial sedimentation on and adjacent to the Columbia Plateau; Washington Oregon, and Idaho, *in* Reidel, S.P., and Hooper, P.R., eds.,Volcanism and tectonism in the Columbia River flood-basalt province: Boulder, Colorado, Geological Society of America, Special Paper 239, p. 187-198.

U.S. Geologic Survey, 2013, Geologic Hazards Science Center website, Oregon Quaternary Faults: http://geohazards.usgs.gov/qfaults/or/Oregon.php.

Waitt, R.B., 1980, About forty late-glacial Lake Missoula jökuhlaups through southern Washington: Journal of Geology, v. 88, p. 653-679.

Walker, G.W., 1973, Reconnaissance Geologic Map of the Pendleton Quadrangle, Oregon and Washington: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-727, scale 1:250,000.



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Perennial Wind Chaser Station
Step-Up Substation
Umatilla, Oregon

VICINITY MAP

November 2013 | 24-1-03794-001

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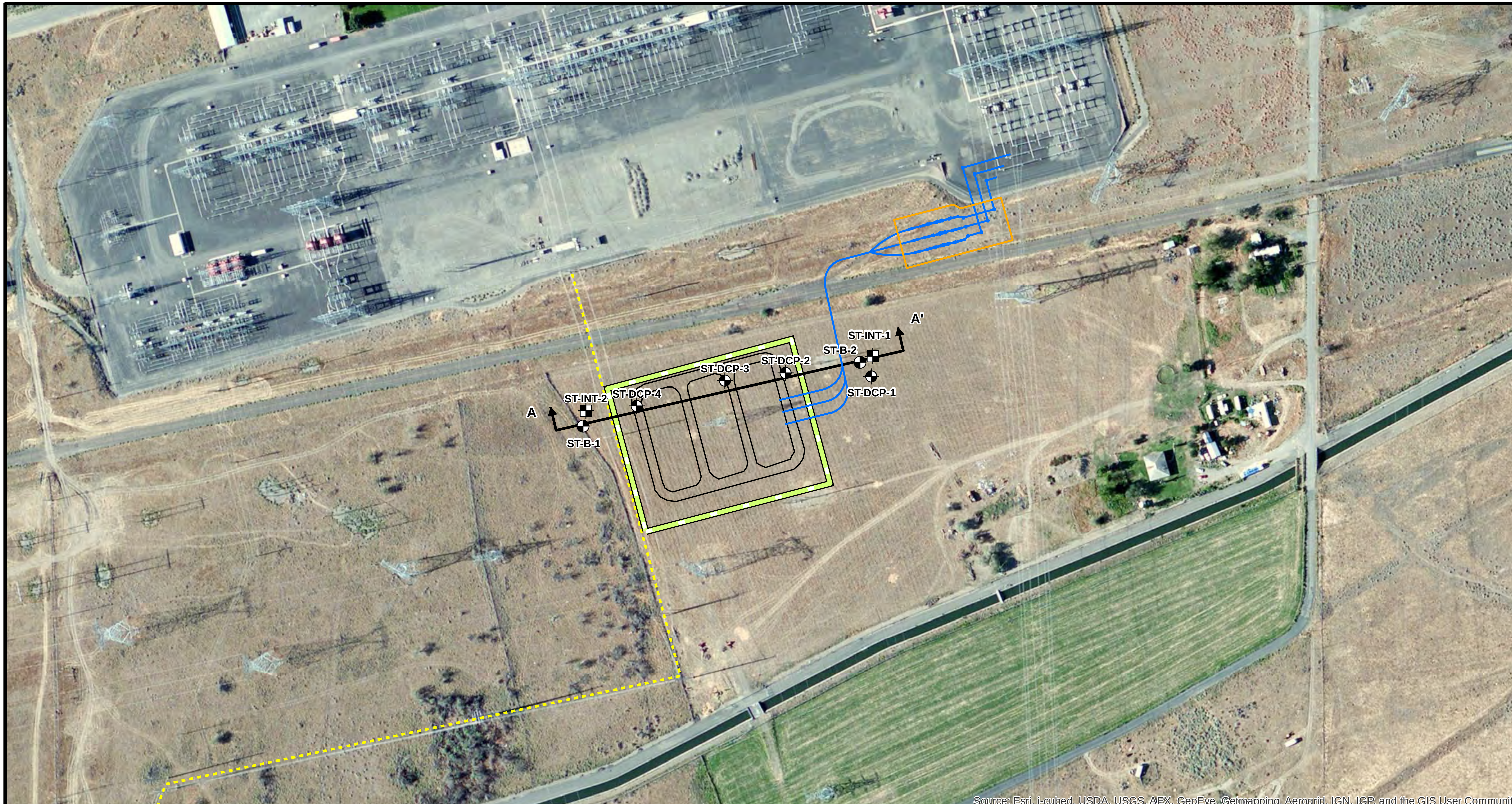
FIG. 1



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LEGEND

- Location and Designation of Boring
- Location and Designation of Dynamic Cone Penetrometer
- Location and Designation of Infiltration Test
- Step-Up Substation Boundary
- Existing McNary Electrical Interconnection
- Proposed Underground Transmission Line
- Proposed Riser Structure Fenced Area
- A A' Location and Designation of Profile

NOTES

1. Project features were georeferenced from Burns and McDonnell figure.
2. Designations are approximate.

0 100 200 400 Feet

N S E W

Perennial Wind Chaser Station
Step-Up Substation
Umatilla, Oregon

SITE PLAN

November 2013 24-1-03794-001

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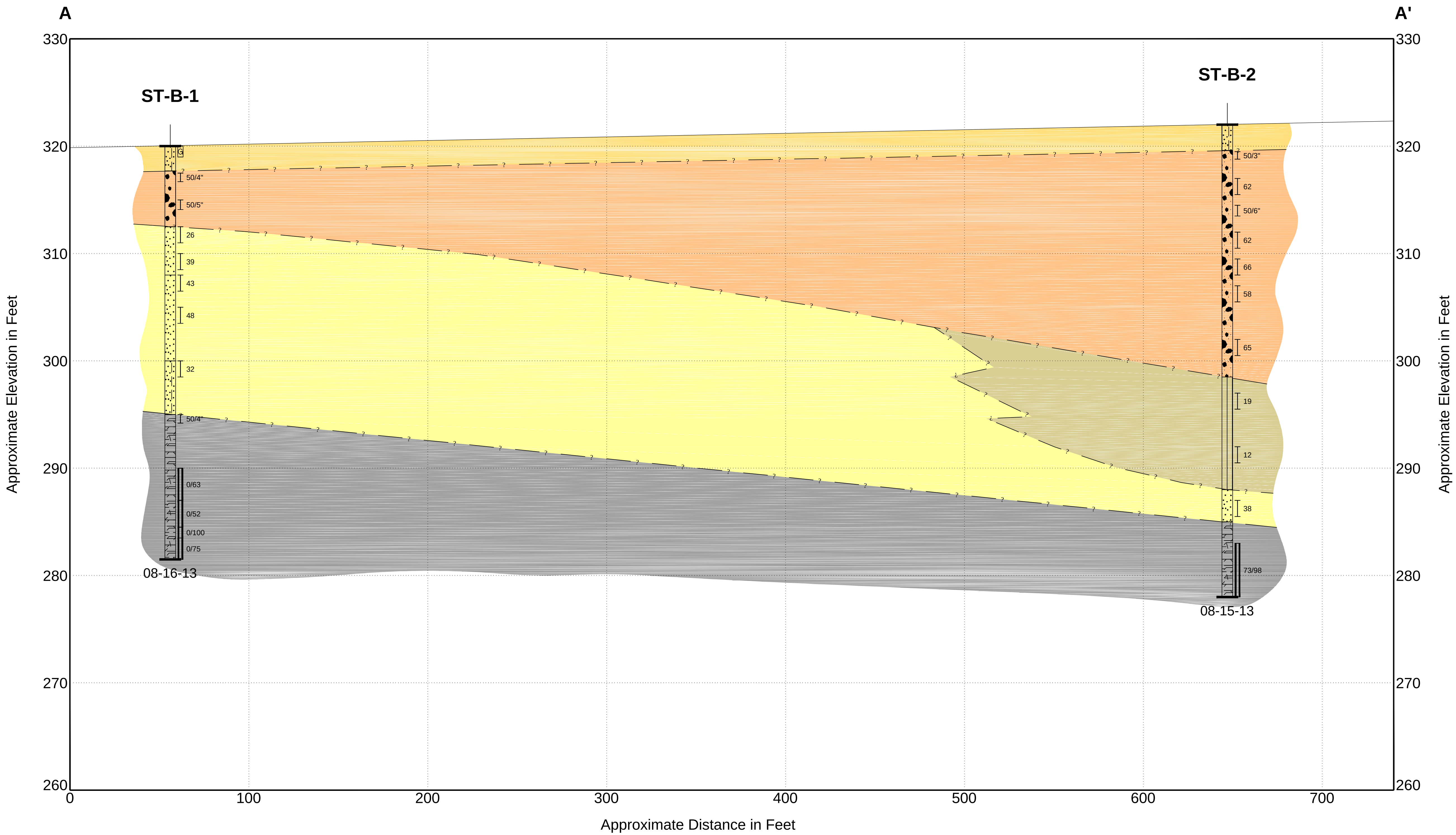
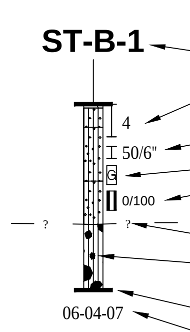
FIG. 2

Filename: I:\WP\Projects\24-1 Portland\3700\3794 Perennial Power Wind Chaser Project\Graphics\CAD\24-1-03794-SitePlan.dwg   Layout: Umatilla\PROFILE A   Date: 11-18-2013   Login: mas



EXPLANATION



Designation of Boring
Sample and Penetration Resistance in Blows/Foot or Blows/Inches Driven
Grab Sample
Rock Core Sample in RQD Value/Percent Recovered
Inferred Subsurface Contact
USCS Symbol (see chart, Figure A1)
Bottom of Boring
Date of Completion

Fine-Grained Alluvium

Catastrophic Flood Deposits

- Gravel Facies
- Sand Facies
- Fine-grained Facies

Columbia River Basalt Group

NOTE

This subsurface profile is generalized from materials observed in soil borings. Variations may exist between profile and actual conditions.

0 60 120

Horizontal Scale in Feet

0 10 20

Vertical Scale in Feet

Vertical Exaggeration = 6X

Perennial Wind Chaser Station
Step-Up Substation
Umatilla, Oregon

PROFILE A-A'

November 2013   24-1-03794-001

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FIG. 3

APPENDIX A

FIELD EXPLORATIONS

TABLE OF CONTENTS

TABLES

FIGURES

APPENDIX A

FIELD EXPLORATIONS

A.1 GENERAL

Shannon & Wilson, Inc., explored subsurface conditions at the project site with two (2) geotechnical borings, four (4) dynamic cone penetrometer (DCP) tests, and two (2) infiltration tests. The borings were designated ST-B-1 and ST-B-2 and ranged in depth from 38.5 to 44.0 feet below the ground surface (bgs). The DCP tests were designated ST-DCP-1 through ST-DCP-4 and ranged in depth from 1.1 to 2.7 feet bgs. The infiltration tests were designated ST-INT-1 and ST-INT-2 and ranged in depth from 1.0 to 2.5 feet bgs. The locations of the completed borings, DCPs, and infiltration tests were measured in the field using a handheld GPS unit. Approximate exploration locations are shown on the Site Plan, Figure 2. Exploration coordinates, elevations, depths, and other data are presented on the Exploration Summary, Table A1. This appendix describes the techniques used to advance and sample the borings and presents logs of the materials encountered during drilling. It also presents DCP and infiltration testing procedures and results.

A.2 BORINGS

A.2.1 Drilling

Borings ST-B-1 and ST-B-2 were drilled between August 14 and August 16, 2013. The borings were drilled using a track-mounted CME-850 drill rig provided and operated by Hardcore Drilling, Inc., of Dundee, Oregon. Both borings were started using mud rotary drilling techniques. Where rock was encountered, the borings were then advanced and continuously sampled using HQ triple-tube wireline coring techniques. A Shannon & Wilson representative was present during the explorations to locate the borings, observe the drilling, collect soil and rock samples, and log the materials encountered.

A.2.2 Disturbed Sampling

Disturbed samples were collected in the borings, typically at 2.5- to 5-foot depth intervals, using a standard 2-inch outside diameter (O.D.) split spoon sampler in conjunction with Standard Penetration Testing. In a Standard Penetration Test (SPT), ASTM D1586, the sampler is driven 18 inches into the soil using a 140-pound hammer dropped 30 inches. The number of blows required to drive the sampler the last 12 inches is defined as the standard penetration resistance, or N-value. The SPT N-value provides a measure of in-situ relative density of cohesionless soils (silt, sand, and gravel), and the consistency of cohesive soils (silt and clay). All disturbed samples were visually identified and described in the field, sealed to retain moisture, and returned to our laboratory for additional examination and testing.

SPT N-values can be significantly affected by several factors, including the efficiency of the hammer used. One automatic hammer system was used for both borings performed at the site. Automatic hammers generally have higher energy transfer efficiencies than cathead driven hammers. Based on information we received from Hardcore Drilling, Inc., the energy efficiency of the hammer used on site was measured at 83.9 percent in January 2013. All N-values presented in this report are in blows per foot, as counted in the field. No corrections of any kind have been applied.

An SPT was considered to have met refusal where more than 50 blows were required to drive the sampler 6 inches. If refusal was encountered in the first six-inch interval (for example, 50 for 1.5”), the count is reported as 50/1st 1.5”. If refusal was encountered in the second six-inch interval (for example, 48, 50 for 1.5”), the count is reported as 50/1.5”. If refusal was encountered in the last six-inch interval (for example, 39, 48, 50 for 1.5”), the count is reported as 98/7.5”.

A.2.3 Continuous Coring

Continuous HQ-wireline coring was used in both borings to sample and advance through rock. Core samples were visually described in the field, then boxed for transport to our laboratory for further examination. The rock core recovery (presented graphically on the boring logs) was calculated by dividing the length of core recovered in the barrel by the length of the total drilled run. This ratio is expressed as a percent.

The rock quality designation (RQD), also presented graphically on the boring logs, is a modified core recovery percentage including only the total length of the specimens of intact rock more than four inches in length, divided by the total length of the core run. The smaller pieces are considered to be the result of close jointing, fracturing, or weathering in the rock mass and are excluded from the determination. Difficulties such as distinguishing natural fractures in the rock core from mechanical breaks due to drilling operations restrict the use of the RQD in evaluating in situ rock properties. However, it does provide a subjective estimate of rock mass quality and a comparison of rock quality in the borings.

A.2.4 Borehole Abandonment

After drilling, boring ST-B-2 was flushed with water and left open overnight in order to observe the natural groundwater level. The following morning, the hole was dry to its total depth of 44 feet. Both borings were backfilled with bentonite cement grout or bentonite chips in accordance with Oregon Water Resource Department regulations. No wells or other instruments were installed in the boreholes.

A.2.5 Material Descriptions

In the field, soil samples were described and identified visually in general accordance with ASTM D2488 Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). Consistency, color, relative moisture, degree of plasticity, peculiar odors, and other distinguishing characteristics of the samples were noted. The rock core was described based on International Society for Rock Mechanics rock description methods. Once returned to the laboratory, soil and rock samples were re-examined, various standard classification tests were performed, and field descriptions and identifications were modified as necessary. We refined our visual-manual soil descriptions and identifications based on the results of the laboratory tests, using elements of the Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System), ASTM D2487. However, ASTM 2487 was not followed in full, because it requires that a suite of tests be performed to classify a single sample. The specific terminology used in the soil and rock descriptions is defined in the Soil Description and Log Key, Figure A1, and the Rock Classification and Log Key, Figure A2.

A.2.6 Logs of Borings

Summary logs of borings are presented in Figures A3 and A4. Photographs of the rock core obtained from the borings are presented in Figures A5 and A6. Material descriptions and interfaces on the logs are interpretive, and actual changes may be gradual. The left-hand portion of the boring logs gives our description, identification, and geotechnical unit designation for the material encountered in the boring. The right-hand portion of the boring logs shows a graphic log, sample locations and designations, groundwater information, and a graphical representation of N-values, natural water contents, sample recovery, RQD, Atterberg limits, and fines content.

A.3 DYNAMIC CONE PENETROMETER (DCP) TESTING

A Shannon & Wilson geologist performed four (4) dynamic cone penetrometer (DCP) tests, designated ST-DCP-1 through ST-DCP-4, on August 14, 2013. The approximate locations of the DCPs are shown on the Site Plan, Figure 2. The DCP is a device widely used to determine in-situ strength properties of base materials and subgrade soils. The tests were performed in general accordance with ASTM D6951, Standard Test Method for the Use of the Dynamic Cone Penetrometer in Shallow Pavement Applications. The four main components of the DCP include the cone, rod, anvil, and hammer. The cone is attached to one end of the DCP rod while the anvil and hammer are attached to the other end. Energy is applied to the cone tip through the rod by dropping the 17.64-pound hammer a distance of 22.6 inches against the anvil. The diameter of the cone is 0.16 inch larger than the rod to ensure that only tip resistance is measured. The number of blows required to advance the cone into the subsurface materials is recorded. The DCP index is the ratio of the depth of penetration to the number of blows of the hammer. This can be correlated to a variety of material properties, including California Bearing Ratio (CBR) and Resilient Modulus. The DCP test data and the resulting Subgrade Resilient Modulus versus depth plots, developed in accordance with the ODOT Pavement Design Guide (2011), are presented in Figure A7 through Figure A10.

A.4 INFILTRATION TESTING

A Shannon & Wilson geologist performed two (2) infiltration tests, designated ST-INT-1 and ST-INT-2, between August 14 and August 16, 2013. The approximate locations of the infiltration tests are shown on the Site Plan, Figure 2. The tests were performed in general accordance with the Encased Falling Head Test method, described in the 2008 Portland Stormwater Management Manual, Appendix F2. At each test location, a hole was excavated to a depth between 1.0 and 2.5 feet below the ground surface using a post-hole digger. A six-inch inside diameter polyvinyl chloride (PVC) casing was then inserted and embedded six inches into the bottom of the hole to create a six-inch soil plug. Water was added to the casing to presoak the soil. After the initial pre-soak, testing was performed by adding additional water to the casing and periodically measuring the depth to water from the top of the casing. Infiltration test data are presented in Table A2 and Table A3.

TABLE A1: EXPLORATION SUMMARY

Exploration Designation	Date Started	Date Completed	Northing[1] (ft)	Easting[1] (ft)	Elevation[2] (ft)	Total Depth[3] (ft)	Driller/ Excavator[4]	Equipment	Hammer Efficiency[5] (%)
ST-B-1	8/15/13	8/16/13	824559	8504029	320	38.5	Hardcore	CME-850 track rig	83.9
ST-B-2	8/14/15	8/15/13	824691	8504605	322	44.0	Hardcore	CME-850 track rig	83.9
ST-DCP-1	8/14/13	8/14/13	824661	8504628	322	2.6	S&W	DCP	N/A
ST-DCP-2	8/14/13	8/14/13	824669	8504450	321	1.1	S&W	DCP	N/A
ST-DCP-3	8/14/13	8/14/13	824653	8504325	321	1.7	S&W	DCP	N/A
ST-DCP-4	8/14/13	8/14/13	824600	8504141	320	2.7	S&W	DCP	N/A
ST-INT-1	8/14/13	8/15/13	824704	8504632	321	1.0	S&W	hand tools	N/A
ST-INT-2	8/15/13	8/16/13	824590	8504036	320	2.5	S&W	hand tools	N/A

1) Horizontal datum is NAD 83, Oregon State Plane North, US feet.
2) Elevation is that of the ground surface at the time of drilling, estimated from the USGS National Elevation Dataset.
3) Depths are in feet below the ground surface at the time of drilling.
4) Hardcore = Hardcore Drilling, Inc.; S&W = Shannon & Wilson, Inc.
5) Reported energy efficiency of automatic hammers used for the Standard Penetration Test (SPT). SPT N-values presented in this report are in blows per foot, as counted in the field. No corrections of any kind have been applied.

TABLE A2: INFILTRATION TEST ST-INT-1 DATA

Trial	Time	Depth to Water Below Top of Casing (feet)	Head Over Soil (feet)	Elapsed Time (minutes)	Change in Water Level (feet)	Infiltration Rate (inches/hour)
Pre-Soak	1020	2.88	0.52	N/A	N/A	N/A
	1042	3.15	0.25	22	0.27	8.8
#1	1352	2.51	0.89	N/A	N/A	N/A
	1403	2.73	0.67	11	0.22	14.4
	1417	2.95	0.45	14	0.22	11.3
	1429	3.12	0.28	12	0.39	23.4
	1438	3.24	0.16	9	0.12	9.6
	1449	3.36	0.04	11	0.12	7.9
	1458	3.48	-0.08	9	0.12	9.6
#2	0732	2.35	1.05	N/A	N/A	N/A
	0741	2.49	0.91	9	0.14	11.2
	0750	2.62	0.78	9	0.13	10.4
	0803	2.77	0.63	13	0.15	8.3
	0811	2.86	0.54	8	0.09	8.1
	0821	2.97	0.43	10	0.35	25.2
	0834	3.11	0.29	13	0.14	7.8
	0846	3.22	0.18	12	0.11	6.6
	0856	3.31	0.09	10	0.09	6.5

Date Performed = 8/14/2013 to 8/15/2013

Hole Depth Below Ground Surface = 1.0 feet

Total Casing Length = 3.9 feet

Casing Stickup = 2.4 feet

Soil Plug in Casing (below bottom of hole) = 0.5 feet

Casing Inside-Diameter = 0.5 feet

N/A = not applicable

TABLE A3: INFILTRATION TEST ST-INT-2 DATA

Trial	Time	Depth to Water Below Top of Casing (feet)	Head Over Soil (feet)	Elapsed Time (minutes)	Change in Water Level (feet)	Infiltration Rate (inches/hour)
Pre-Soak	performed overnight		N/A	N/A	N/A	N/A
#1	0919	2.50	1.00	N/A	N/A	N/A
	0930	2.95	0.55	11	0.45	29.5
	0936	3.19	0.31	6	0.24	28.8
	0943	3.42	0.08	7	0.23	23.7
	0945	3.50	0.00	2	0.08	28.8
#2	0956	2.48	1.02	N/A	N/A	N/A
	1007	2.93	0.57	11	0.45	29.5
	1014	3.17	0.33	7	0.24	24.7
	1020	3.33	0.17	6	0.16	19.2
	1025	3.48	0.02	5	0.15	21.6

Date Performed = 8/15/2013 to 8/16/2013

Hole Depth Below Ground Surface = 2.5 feet

Total Casing Length = 4.0 feet

Casing Stickup = 1.0 feet

Soil Plug in Casing (below bottom of hole) = 0.5 feet

Casing Inside-Diameter = 0.5 feet

N/A = not applicable

Shannon & Wilson, Inc. (S&W), uses a soil description system modified from the Unified Soil Classification System (USCS). Elements of the USCS and other definitions are provided on this and the following page. Soil identifications are based on visual-manual procedures (ASTM D2488) unless otherwise noted.

S&W OREGON SOIL CONSTITUENT DEFINITIONS

CONSTITUENTS[2]	FINE-GRAINED SOILS (50% or more fines)[1]	COARSE-GRAINED SOILS (less than 50% fines)[1]
Major All capital letters	CLAY or SILT based on behavior	SAND or GRAVEL based on weight
Modifying (Secondary) Precede major constituent	if fine-grained, silty or clayey based on behavior	if fine-grained, > 12% silty or clayey
	if coarse-grained, > 27% sandy or gravelly	if coarse-grained, > 27% sandy or gravelly
Minor Follow major constituent	> 12% - 27% with sand or with gravel	if fine-grained, 5% - 12% with silt or with clay
		if coarse-grained, > 12% - 27% with sand or with gravel

[1] All percentages are by weight
[2] The order of terms is: modifying MAJOR with minor

CEMENTATION DEFINITIONS

Weak	Crumbles or breaks with handling or slight finger pressure
Moderate	Crumbles or breaks with considerable finger pressure
Strong	Will not crumble or break with finger pressure

ABBREVIATIONS

ATD	At Time of Drilling
Elev.	Elevation
ft	feet
FeO	Iron Oxide
MgO	Magnesium Oxide
HSA	Hollow Stem Auger
I.D.	Inside Diameter
in	inches
lbs	pounds
N	Blows for second two 6-inch increments
N_E	N, corrected for hammer energy
NA	Not applicable or not available
NP	Nonplastic
O.D.	Outside diameter
PID	Photo-ionization detector
ppm	parts per million
PVC	Polyvinyl Chloride
SPT	Standard Penetration Test
USCS	Unified Soil Classification System
q_u	Unconfined Compressive Strength

PARTICLE SIZE DEFINITIONS

DESCRIPTION	SIEVE NUMBER AND/OR SIZE
FINES	< #200 (0.08 mm)
SAND	
- Fine	#200 to #40 (0.08 to 0.4 mm)
- Medium	#40 to #10 (0.4 to 2 mm)
- Coarse	#10 to #4 (2 to 5 mm)
GRAVEL	
- Fine	#4 to 3/4 inch (5 to 19 mm)
- Coarse	3/4 to 3 inches (19 to 76 mm)
COBBLES	3 to 12 inches (76 to 305 mm)
BOULDERS	> 12 inches (305 mm)

RELATIVE DENSITY / CONSISTENCY

COHESIONLESS SOILS		COHESIVE SOILS	
N_E, SPT, BLOWS/FT.	RELATIVE DENSITY	N_E, SPT, BLOWS/FT.	RELATIVE CONSISTENCY
0 - 4	Very loose	Under 2	Very soft
4 - 10	Loose	2 - 4	Soft
10 - 30	Medium dense	4 - 8	Medium stiff
30 - 50	Dense	8 - 15	Stiff
Over 50	Very dense	15 - 30	Very stiff
		Over 30	Hard

WELL AND OTHER SYMBOLS

Bentonite Cement Grout	Surface Cement Seal
Bentonite Grout	Asphalt or Cap
Bentonite Chips	Slough
Silica Sand	Bedrock
PVC Screen	Fill
Pressure Transducer	

PLASTICITY

PLASTICITY ADJECTIVE	PLASTICTY INDEX (PI) RANGE
Nonplastic	0 - 4
Low Plasticity	>4 - 10
Medium Plasticity	>10 - 20
High Plasticity	>20 - 40
Very High Plasticity	>40

Perennial Wind Chaser Station
Step-Up Substation
Umatilla, Oregon

SOIL DESCRIPTION AND LOG KEY

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FIG. A1
Sheet 1 of 2

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)
(Modified from US Army Corps of Engineers Tech Memo 3-357)

MAJOR DIVISIONS			GROUP/GRAPHIC SYMBOL	TYPICAL DESCRIPTION
COARSE-GRAINED SOIL *(more than 50% retained on No. 200 sieve)*	Gravel *(more than 50% of coarse fraction retained on No. 4 sieve)*	Gravel or Gravel with silt or clay	GW GW-GM GW-GC	GRAVEL, GRAVEL with sand, sandy GRAVEL, GRAVEL with silt or clay
			GP GP-GM GP-GC	GRAVEL, GRAVEL with sand, sandy GRAVEL, GRAVEL with silt or clay
		Silty Gravel or Clayey Gravel	GM	Silty GRAVEL, silty GRAVEL with sand, sandy silty GRAVEL
			GC	Clayey GRAVEL, clayey GRAVEL with sand, sandy clayey GRAVEL
	Sand *(50% or more of coarse fraction passes the No. 4 sieve)*	Sand or Sand with silt or clay	SW SW-SM SW-SC	SAND, SAND with gravel, gravelly SAND, SAND with silt or clay
			SP SP-SM SP-SC	SAND, SAND with gravel, gravelly SAND, SAND with silt or clay
		Silty Sand or Clayey Sand	SM	Silty SAND, silty SAND with gravel, gravelly silty SAND
			SC	Clayey SAND, clayey SAND with gravel, gravelly clayey SAND
FINE-GRAINED SOIL *(50% or more passes the No. 200 sieve)*	Silt and Clay *(liquid limit less than 50)*	Inorganic	ML	Nonplastic to medium plasticity SILT or clayey SILT; with sand and/or gravel to sandy or gravelly
			CL	Low to very high plasticity silty CLAY or CLAY; with sand and/or gravel to sandy or gravelly
		Organic	OL	Nonplastic to very high plasticity organic SILT, clayey SILT, silty CLAY, or CLAY; with sand and/or gravel to sandy or gravelly
	Silt and Clay *(liquid limit 50 or more)*	Inorganic	MH	Nonplastic to very high plasticity SILT or clayey SILT; with sand and/or gravel to sandy or gravelly
			CH	High to very high plasticity CLAY; with sand and/or gravel to sandy or gravelly
		Organic	OH	Nonplastic to very high plasticity organic SILT, clayey SILT, or CLAY; with sand and/or gravel to sandy or gravelly
HIGHLY-ORGANIC SOIL	Primarily organic matter, dark in color, has organic odor		PT	Peat and other highly organic soils (see ASTM D4427)

NOTE: No. 4 size = 4.75 mm = approx. 0.2 in; No. 200 size = 0.075 mm = approx. 0.003 in

Additional Symbols	
	This symbol is used to indicate the presence of cobbles and/or boulders.
	Gray shading, when combined with another symbol, indicates cementation.

NOTES

1. Solid lines on the logs are used to group materials with similar characteristics. The groupings shown are an interpretation of the conditions encountered and actual transitions may be more gradational than shown.
2. Dual symbols (symbols separated by a hyphen, i.e., SP-SM, SAND with silt) are used for coarse-grained soils with 10 percent fines or when the liquid limit and plasticity index values plot in the CL-ML area of the plasticity chart.
3. Borderline symbols (symbols separated by a slash, i.e., CL/ML and GW/SW) indicate that the soil may fall into one of two possible basic groups.
4. The soil graphics above represent the various USCS identifications (i.e., GP, SM, etc.) and may be augmented with additional symbology to represent differences within USCS designations. Sandy SILT (ML), for example, may be accompanied by the ML soil graphic with sand grains added.

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SOIL DESCRIPTION AND LOG KEY

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FIG. A1
Sheet 2 of 2

POST_07_BORING_CLASS2_CRC 24-1-03794-UMATILLA.GPJ SWNEW.GDT 11/18/13

BASED ON INTERNATIONAL SOCIETY FOR ROCK MECHANICS (ISRM) ROCK CLASSIFICATION METHODS [R]

STRATIGRAPHIC STRUCTURE TERMS

MASSIVE - Rock without significant structure

BEDDED - Regular layering from sedimentation

FISSILE - Tendency to break along laminations

FOLIATED - Parallel arrangement or distribution of minerals

for metamorphic rocks:
SCHISTOSE - Parallel arrangement of tabular minerals giving a planar fissility

GNEISSOSE - Segregation of minerals into bands

CLEAVAGE - Tendency to split along secondary, planar textures or structures

ROCK STRENGTH

DESCRIPTION	DESIGNATION	APPROXIMATE UNCONFINED COMPRESSIVE STRENGTH (psi)	FIELD IDENTIFICATION
(use soil description)	R0	28-100	Indented by thumb nail
Very Low Strength	R1	100 - 1,000	Crumbles under firm blows with point of geology pick, can be peeled with a pocket knife
Low Strength	R2	1,000 to 4,000	Can be peeled with a pocket knife with difficulty, shallow indentation made by firm blows of geology pick
Moderate Strength	R3	4,000 to 8,000	Cannot be scraped or peeled with a pocket knife, specimen can be fractured with a single firm blow of geology hammer
Medium High Strength	R4	8,000 to 16,000	Specimen requires more than one blow with a geology hammer to fracture it
High Strength	R5	16,000 to 32,000	Specimen requires many blows of geology hammer to fracture it
Very High Strength	R6	>32,000	Specimen can only be chipped with a geology pick

VESCULARITY

Slightly Vesicular	1 to 10%
Moderately Vesicular	10 to 30%
Highly Vesicular	30 to 50%
Scoriaceous	>50%

JOINT ROUGHNESS

SMALL SCALE	INTERMEDIATE SCALE
Rough	Stepped
Smooth	Undulating
Slickensided	Planar

WEATHERING

TERM	DESCRIPTION
Fresh	No visible signs of rock material weathering: perhaps slight discoloration on major discontinuity surfaces.
Slightly Weathered	Slight penetration of discoloration away from fracture. Fractures may contain thin filling.
Moderately Weathered	Partial to complete discoloration away from fracture. Rock not friable except for poorly cemented rock. Fractures may contain thick filling.
Highly Weathered	All rock is discolored. Rock is friable except for poorly cemented rock. Corestones may be present.
Completely Weathered	All rock is decomposed and/or disintegrated to soil. The original mass is still largely intact.

DISCONTINUITY TERMS

FRACTURE - Collective term for any natural break excluding shears, shear zones, and faults

JOINT (JT) - Planar break with little or no displacement

FOLIATION JOINT (FJ) or BEDDING JOINT (BJ) - Joint along foliation or bedding

INCIPIENT JOINT (IJ) or INCIPIENT FRACTURE (IF) - Joint or fracture not evident until wetted and dried; breaks along existing surface

RANDOM FRACTURE (RF) - Natural, very irregular fracture that does not belong to a set

BEDDING PLANE SEPARATION or PARTING - A separation along bedding after extraction from stress relief or slaking

FRACTURE ZONE (FZ) - Planar zone of broken rock without gouge

MECHANICAL BREAK (MB) - Breaks due to drilling or handling; drilling break (DB), hammer break (HB)

SHEAR (SH) - Surface of differential movement evident by presence of slickensides, striations, or polishing

SHEAR ZONE (SZ) - Zone of gouge and rock fragments bounded by planar shear surfaces

FAULT (FT) - Shear zone of significant extent; differentiation from shear zone may be site-specific

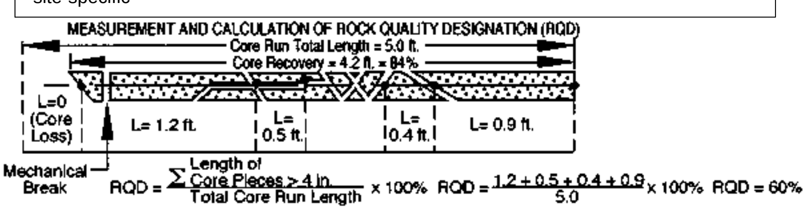
STRUCTURE SPACING TERMS

STRATIGRAPHIC	SPACING	DISCONTINUITY *
Very Thick (massive)	More than 10 ft.	Very Wide
Thick	3 ft. - 10 ft.	Wide
Medium	1 ft. - 3 ft.	Moderately Close
Thin	2 in. - 1 ft.	Close
Very Thin (laminated)	Less than 2 in.	Very Close

* Refers to apparent spacing along core axis unless measured orthogonal to discontinuity; should then report for each set

[R] *Reference: Brown, E.T., ed., 1981, Rock Characterization Testing and Monitoring ISRM Suggested methods. New York, International Society for Rock Mechanics (ISRM).*

NOTE: Unconfined Compressive Strength (UCS) on Log of Boring estimated from point load tests.



Perennial Wind Chaser Station
Step-Up Substation
Umatilla, Oregon

ROCK CLASSIFICATION AND LOG KEY

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FIG. A2

Total Depth:	38.5 ft.	Northing:	~ 824,559 ft.	Drilling Method:	Mud Rotary / HQ Core	Hole Diam.:	5 in.
Top Elevation:	~ 320 ft.	Easting:	~ 8,504,029 ft.	Drilling Company:	Hardcore Drilling	Rod Type:	NWJ
Vert. Datum:	NAD 83	Station:	~	Drill Rig Equipment:	CME-850 track	Hammer Type:	Automatic
Horiz. Datum:	NAVD 88	Offset:	~	Other Comments:	Hammer Efficiency = 83.9%		

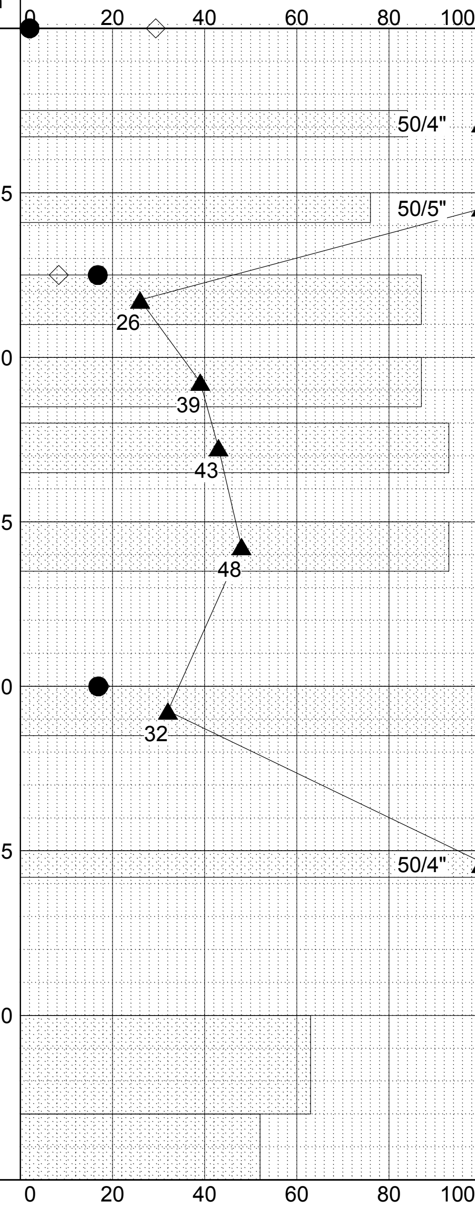
SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

SOIL DESCRIPTION	Elev. Depth (ft.)	Samples
Loose to medium dense brown silty SAND; dry to moist; nonplastic fines; fine sand; micaceous. (SM) **REWORKED FINE-GRAINED ALLUVIUM**		C-1
Very dense gray-brown GRAVEL with sand, trace silt with cobbles and boulders; dry to moist; fine to coarse rounded to subrounded sand; rounded to subrounded gravel; scattered cobbles; occasional boulders. (GP) *Large cobble from 3.3 to 4.0 feet.* **CATASTROPHIC FLOOD DEPOSITS GRAVEL FACIES**	317.7 / 2.3	S-1, S-2
Medium dense to dense gray SAND with silt, trace gravel; dry to moist; nonplastic fines; fine to medium sand; rounded to subrounded gravel; micaceous. (SW-SM)	312.5 / 7.5	S-3, S-4
Dense gray SAND with gravel, trace silt; moist; nonplastic fines; fine to coarse sand; rounded to subrounded gravel. (SP) **CATASTROPHIC FLOOD DEPOSITS SAND FACIES**	308.0 / 12.0	S-5, S-6
Dense gray silty SAND; moist; nonplastic fines; fine to medium sand; micaceous. (SM)	300.0 / 20.0	S-7
WEATHERED BASALT: very low to moderate strength (R1-R3), orange-brown and dark brown, fine grained; slightly vesicular; moderate iron-oxide staining; moderately to highly weathered; remolds to sandy GRAVEL, trace silt. **COLUMBIA RIVER BASALT GROUP**	295.0 / 25.0	S-8
BASALT: moderate strength (R3), gray-brown and gray, fine grained; moderately vesicular; undulating, rough, very close to closely	291.0 / 29.0	R-1, R-2

Symbol | Ground Water | Depth, ft.

PENETRATION RESISTANCE, N (blows/ft.)
▲ Hammer Wt. & Drop: 140 lbs / 30 inches



CONTINUED NEXT SHEET

LEGEND

- * Sample Not Recovered
- Grab Sample
- Standard Penetration Test
- Rock Core

Recovery (%) RQD (%)
◇ % Fines (<0.075mm)
● % Water Content
Plastic Limit ├──┤ Liquid Limit

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Perennial Wind Chaser Station
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LOG OF BORING ST-B-1

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FIG. A3
Sheet 1 of 2

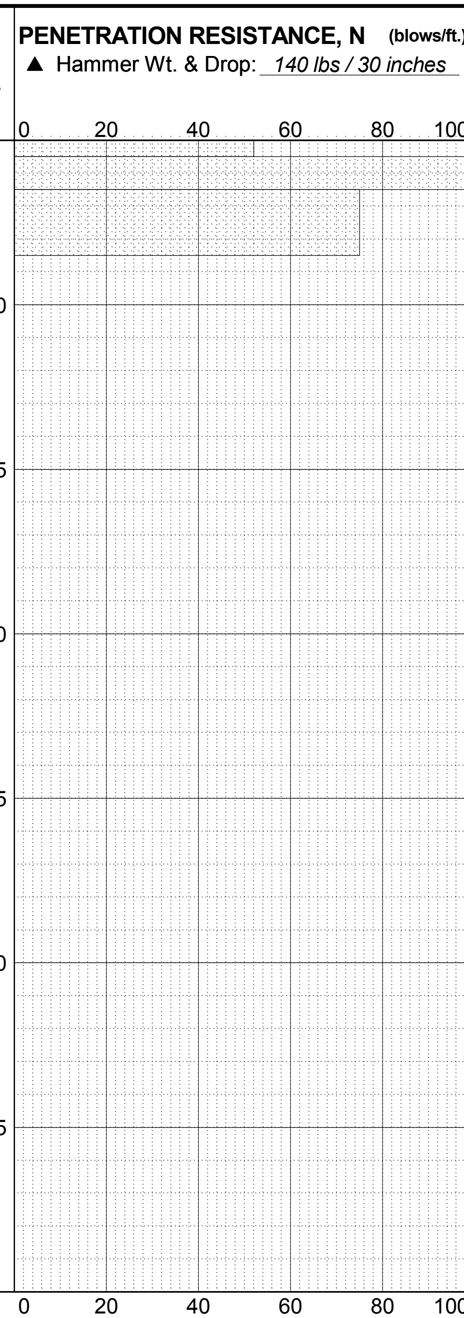
REV 3

Total Depth:	38.5 ft.	Northing:	~ 824,559 ft.	Drilling Method:	Mud Rotary / HQ Core	Hole Diam.:	5 in.
Top Elevation:	~ 320 ft.	Easting:	~ 8,504,029 ft.	Drilling Company:	Hardcore Drilling	Rod Type:	NWJ
Vert. Datum:	NAD 83	Station:	~	Drill Rig Equipment:	CME-850 track	Hammer Type:	Automatic
Horiz. Datum:	NAVD 88	Offset:	~	Other Comments:	Hammer Efficiency = 83.9%		

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. Depth (ft.)	Symbol	Samples	Ground Water	Depth, ft.
spaced, low to high (0°-90°) angle joints with orange-brown and brown staining and 1- to 3-mm-thick brown clayey joint coating; slightly to moderately weathered.	281.5 38.5		R-3 R-4		
Completed - August 16, 2013					40
					45
					50
					55
					60
					65



LEGEND

- * Sample Not Recovered
- Grab Sample
- Standard Penetration Test
- Rock Core

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Perennial Wind Chaser Station
Step-Up Substation
Umatilla, Oregon

LOG OF BORING ST-B-1

November 2013 24-1-03794-001

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

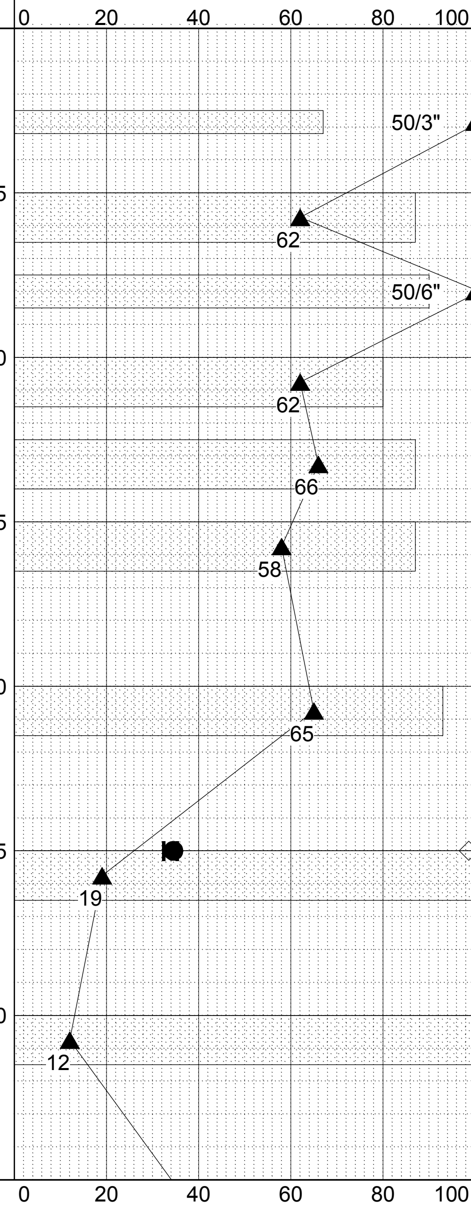
FIG. A3
Sheet 2 of 2

REV 3

Total Depth:	44 ft.	Northing:	~ 824,691 ft.	Drilling Method:	Mud Rotary / HQ Core	Hole Diam.:	5 in.
Top Elevation:	~ 322 ft.	Easting:	~ 8,504,605 ft.	Drilling Company:	Hardcore Drilling	Rod Type:	NWJ
Vert. Datum:	NAD 83	Station:	~	Drill Rig Equipment:	CME-850 track	Hammer Type:	Automatic
Horiz. Datum:	NAVD 88	Offset:	~	Other Comments:	Hammer Efficiency = 83.9%		

SOIL DESCRIPTION *Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.*	Elev. Depth (ft.)	Symbol	Samples	Ground Water	Depth, ft.
Loose to medium dense brown silty SAND; dry; nonplastic fines; fine sand; micaceous. (SM) **REWORKED FINE-GRAINED ALLUVIUM**	319.6 2.4		S-1		
Very dense gray-brown sandy GRAVEL, trace silt with cobbles and boulders; moist; fine to coarse rounded to subrounded sand; rounded to subrounded gravel; scattered cobbles; occasional to scattered boulders. (GP) **CATASTROPHIC FLOOD DEPOSITS GRAVEL FACIES**			S-2 S-3 S-4 S-5 S-6 S-7		5 10 15 20
Medium dense/stiff to very stiff brown SILT to SILT with sand; wet; nonplastic to low plasticity fines; fine sand; micaceous. (ML) **CATASTROPHIC FLOOD DEPOSITS FINE-GRAINED FACIES**	298.5 23.5		S-8 S-9		25 30
	288.0 34.0				

PENETRATION RESISTANCE, N (blows/ft.)
▲ Hammer Wt. & Drop: 140 lbs / 30 inches



CONTINUED NEXT SHEET

LEGEND

* Sample Not Recovered
Standard Penetration Test
Rock Core

Recovery (%) RQD (%)
◇ % Fines (<0.075mm)
● % Water Content
Plastic Limit ├──┤ Liquid Limit

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Perennial Wind Chaser Station
Step-Up Substation
Umatilla, Oregon

LOG OF BORING ST-B-2

November 2013 24-1-03794-001

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A4
Sheet 1 of 2

MASTER_LOG_E 24-1-03794-UMATILLA.GPJ SHAN_WIL.GDT 11/18/13 Log: DJH Rev: AAH Typ: MAS

REV 3

Total Depth:	44 ft.	Northing:	~ 824,691 ft.	Drilling Method:	Mud Rotary / HQ Core	Hole Diam.:	5 in.
Top Elevation:	~ 322 ft.	Easting:	~ 8,504,605 ft.	Drilling Company:	Hardcore Drilling	Rod Type:	NWJ
Vert. Datum:	NAD 83	Station:	~	Drill Rig Equipment:	CME-850 track	Hammer Type:	Automatic
Horiz. Datum:	NAVD 88	Offset:	~	Other Comments:	Hammer Efficiency = 83.9%		

SOIL DESCRIPTION

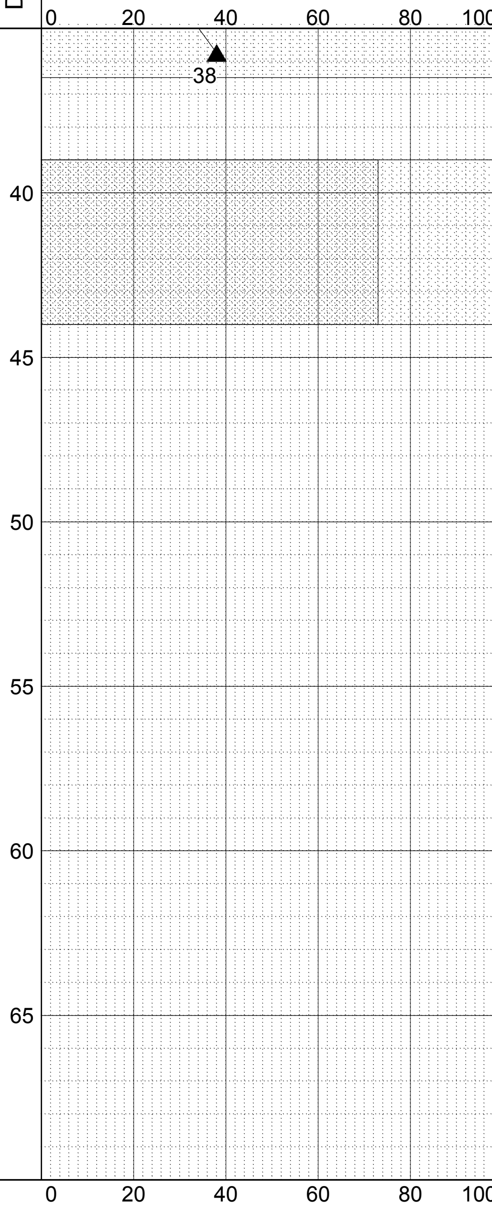
Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. Depth (ft.)	Samples
Dense gray-brown SAND with gravel, trace silt; wet; fine to medium sand; fine to coarse rounded to subrounded gravel; micaceous. (SP) **CATASTROPHIC FLOOD DEPOSITS SAND FACIES**	285.0 37.0	S-10
BASALT: moderate to medium high strength (R3-R4), gray, fine grained; aphanitic; slightly vesicular; undulating, rough, closely to moderately close spaced, low to moderate (0°-60°) and high (70°-90°) angle, open and numerous healed joints with green-black and white secondary mineral infilling and joint coating; fresh to slightly weathered. **COLUMBIA RIVER BASALT GROUP** Thin, <1-mm-thick, iron-oxide coating and secondary pyrite joint coating from 43.5 to 44.0 feet.	278.0 44.0	R-1

Completed - August 15, 2013

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches



Recovery (%) RQD (%)

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ├──┤ Liquid Limit

LEGEND

- * Sample Not Recovered
- Standard Penetration Test
- Rock Core

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Perennial Wind Chaser Station
Step-Up Substation
Umatilla, Oregon

LOG OF BORING ST-B-2

November 2013 24-1-03794-001

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A4
Sheet 2 of 2

REV 3

MASTER_LOG_E 24-1-03794-UMATILLA.GPJ SHAN_WIL.GDT 11/18/13 Log: DJH Rev: AAH Typ: MAS

File: I:\WIP\Projects\24-1 Portland\3700\3794 Perennial Power Wind Chaser Project\Graphics\CAD\ST Core and Site Photos.dwg Date: 11-18-2013 Author: mas

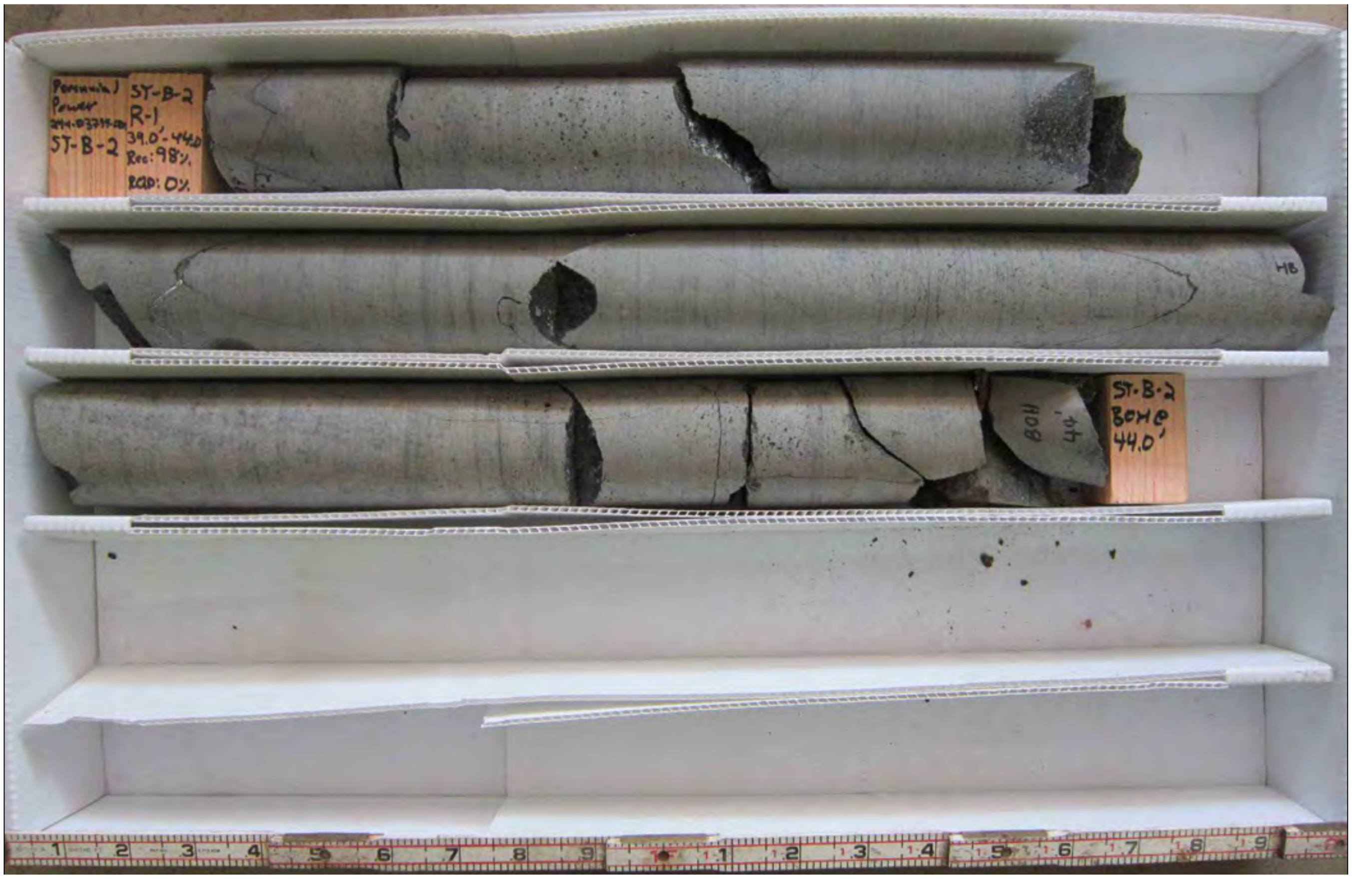
Perennial Wind Chaser Station
Step-Up Substation
Umatilla, Oregon

BORING ST-B-1
CORE PHOTOGRAPHS

November 2013 24-1-03794-001

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A5



File: I:\WIP\Projects\24-1 Portland\3700\3794 Perennial Power Wind Chaser Project\Graphics\CAD\ST Core and Site Photos.dwg Date: 11-18-2013 Author: mas

Perennial Wind Chaser Station
Step-Up Substation
Umatilla, Oregon

BORING ST-B-2
CORE PHOTOGRAPHS

November 2013 24-1-03794-001

SHANNON & WILSON, INC.
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FIG. A6

DCP TEST DATA

Project: *Perennial Power*
Location: *ST-DCP-1*

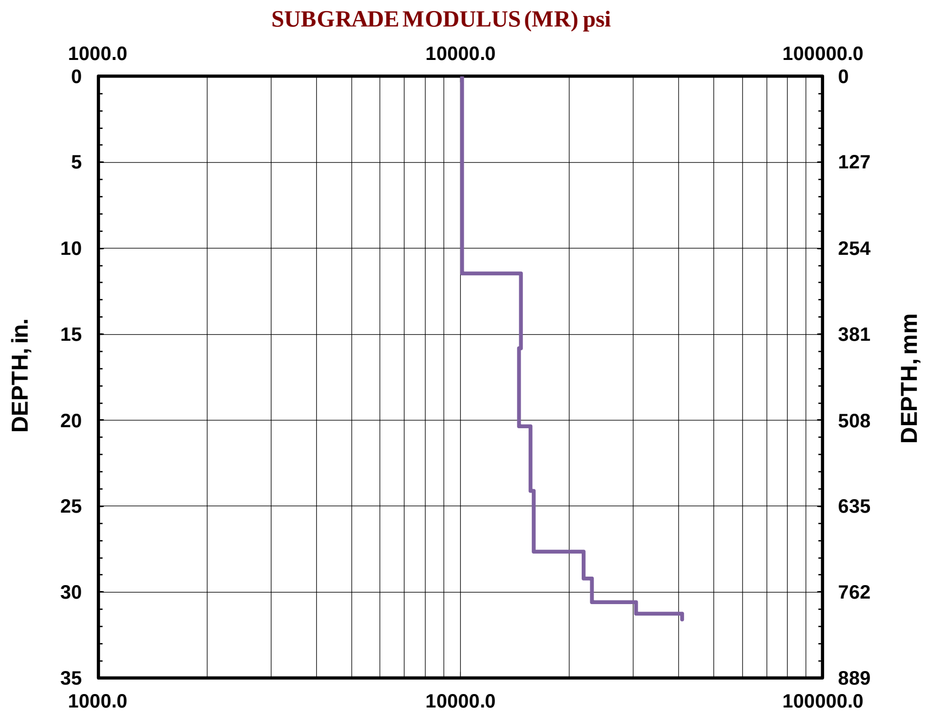
Date: *14-Aug-13*
Soil Type(s): *SM*

Hammer
- ○ 10.1 lbs.
- ● 17.6 lbs.
- ○ Both hammers used

- ○ CH
- ○ CL
- ● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	1
5	291	1
5	402	1
5	517	1
5	612	1
5	702	1
5	742	1
5	777	1
5	794	1
5	802	1

Based on approximate interrelationships of MR (ODOT PAVEMENT DESIGN GUIDE 2011)



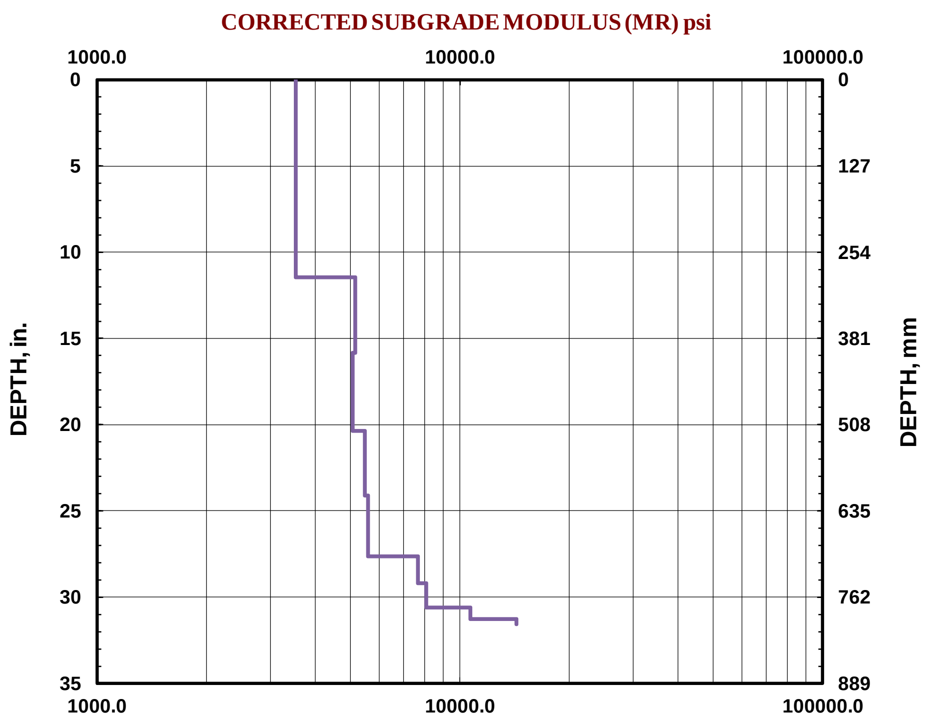


FIG. A7

DCP TEST DATA

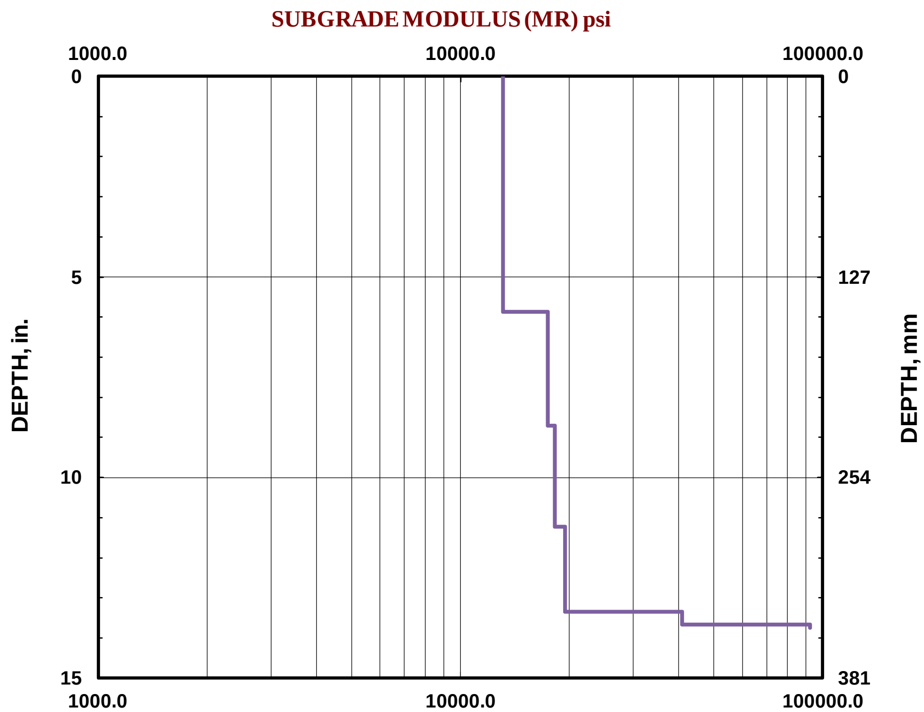
Project: *Perennial Power*
Date: *14-Aug-13*
Location: *ST-DCP-2*
Soil Type(s): *SM*

Hammer
- ○ 10.1 lbs.
- ● 17.6 lbs.
- ○ Both hammers used

- ○ CH
- ○ CL
- ● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	1
5	149	1
5	221	1
5	285	1
5	339	1
5	347	1
5	348	1
5	349	1

Based on approximate interrelationships of MR (ODOT PAVEMENT DESIGN GUIDE 2011)



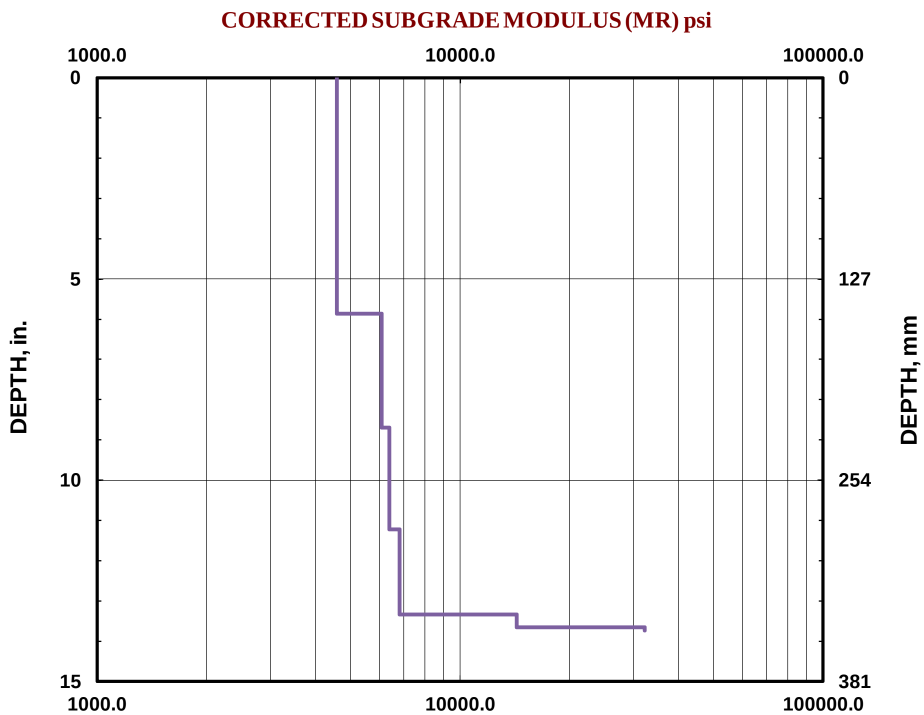


FIG. A8

DCP TEST DATA

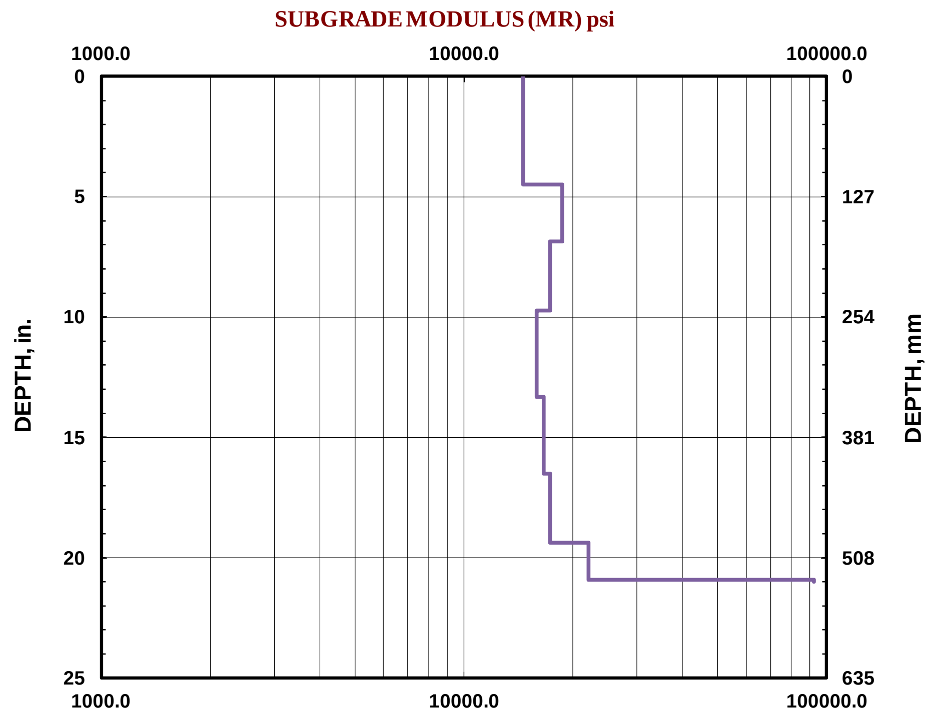
Project: *Perennial Power* **Date:** *14-Aug-13*
Location: *ST-DCP-3* **Soil Type(s):** *SM*

Hammer
- ○ 10.1 lbs.
- ● 17.6 lbs.
- ○ Both hammers used

- ○ CH
- ○ CL
- ● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	1
5	114	1
5	174	1
5	247	1
5	338	1
5	419	1
5	492	1
5	531	1
5	532	1
5	533	1

Based on approximate interrelationships of MR (ODOT PAVEMENT DESIGN GUIDE 2011)



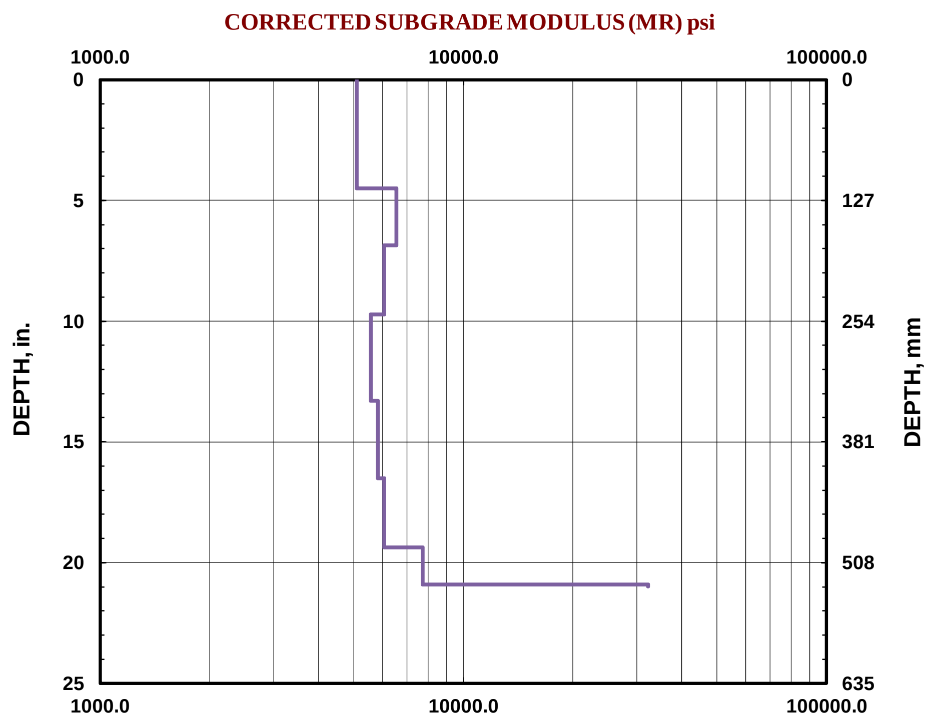


FIG. A9

DCP TEST DATA

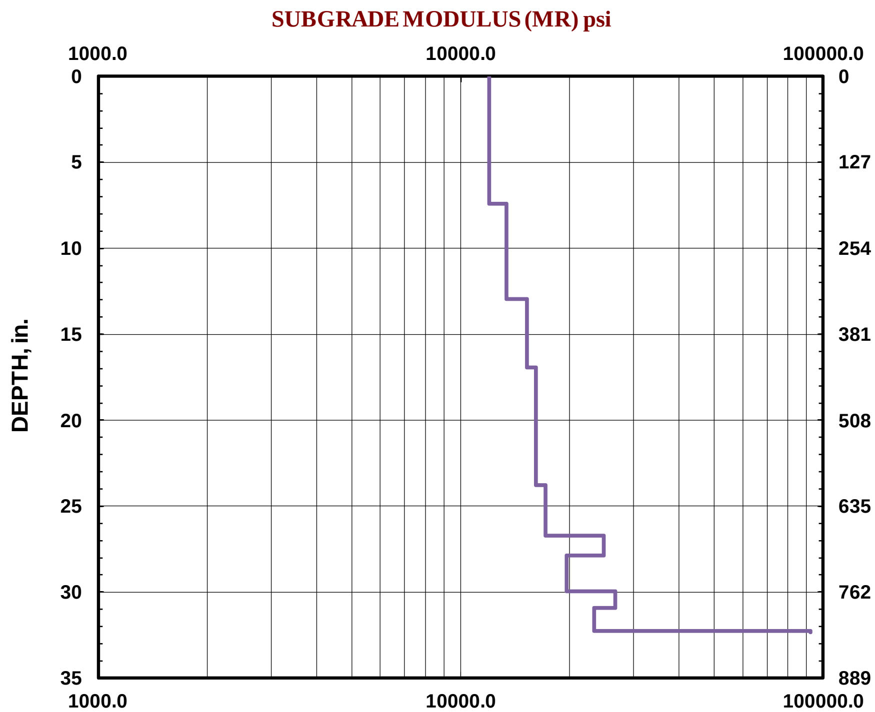
Project: *Perennial Power* **Date:** *14-Aug-13*
Location: *ST-DCP-4* **Soil Type(s):** *SM*

Hammer
- ○ 10.1 lbs.
- ● 17.6 lbs.
- ○ Both hammers used

- ○ CH
- ○ CL
- ● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	1
5	188	1
5	329	1
5	430	1
5	517	1
5	604	1
5	679	1
5	708	1
5	761	1
5	785	1
5	819	1
5	820	1
5	821	1

Based on approximate interrelationships of MR (ODOT PAVEMENT DESIGN GUIDE 2011)



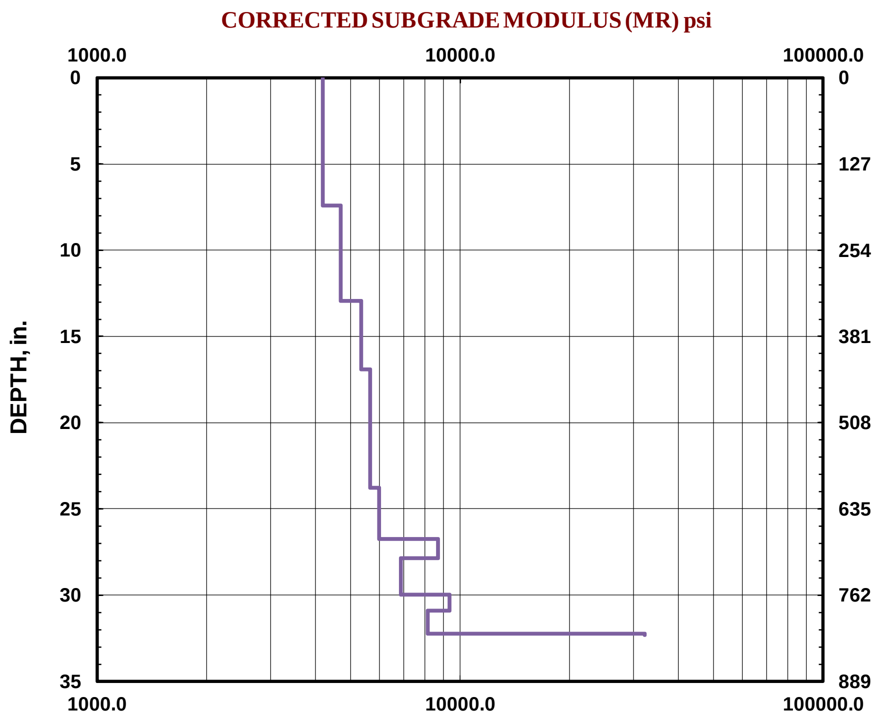


FIG. A10

APPENDIX B

LABORATORY TESTING

TABLE OF CONTENTS

FIGURES

ATTACHMENTS

APPENDIX B

LABORATORY TESTING

B.1 GENERAL

The soil samples obtained during the field explorations were described and identified in the field in general accordance with the Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), ASTM D2488. The specific terminology used is presented in Appendix A, Figure A1. The samples were then reviewed in the laboratory. The physical characteristics of the samples were noted and the field descriptions and identifications were modified where necessary in accordance with terminology presented in Appendix A, Figure A1. Representative samples were selected for various laboratory tests. We refined our visual-manual soil descriptions and identifications based on the results of the laboratory tests, using elements of the Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System), ASTM D2487. The refined descriptions and identifications were then incorporated into the Logs of Borings, presented in Appendix A. Note that ASTM D2487 was not followed in full, because it requires that a suite of tests be performed to fully classify a single sample.

The soil testing program included moisture content analyses, Atterberg Limits tests, particle-size analyses, and analytical testing for corrosivity potential. The testing procedures from our laboratory program are summarized in the following paragraphs. Analytical testing for corrosivity potential was performed by Specialty Analytical of Clackamas, Oregon. All other test procedures were performed by Shannon & Wilson, Inc., in accordance with applicable ASTM International (ASTM) standards.

B.2 SOIL TESTING

B.2.1 Moisture (Natural Water) Content

Natural moisture content determinations were performed in accordance with ASTM D2216 on selected soil samples. The natural moisture content is a measure of the amount of moisture in the soil at the time the explorations are performed, and is defined as the ratio of the weight of water to the dry weight of the soil, expressed as a percentage. The results of the moisture content determinations are presented graphically in the Logs of Borings in Appendix A.

B.2.2 Atterberg Limits

Atterberg limits were determined on a selected sample in accordance with ASTM D4318. This analysis yields index parameters of the soil that are useful in soil identification, as well as in a number of analyses, including liquefaction analysis. An Atterberg limits test determines a soil's liquid limit (LL) and plastic limit (PL). These are the maximum and minimum moisture contents at which the soil exhibits plastic behavior. A soil's plasticity index (PI) can be determined by subtracting PL from LL. The LL, PL, and PI of tested samples are presented on the Atterberg Limits Results, Figure B1. The results are also shown graphically in the Logs of Borings in Appendix A. For the purposes of soil description, we use the term nonplastic to refer to soils with a PI range of 0 to 4, low plasticity for soils with a PI range of >4 to 10, medium plasticity for soils with a PI range of >10 to 20, high plasticity for soils with a PI range of >20 to 40, and very high plasticity for soils with a PI greater than 40.

B.2.3 Particle-Size Analyses

Particle-size analyses were conducted on selected samples to determine their grain-size distributions. Grain-size distributions were determined by sieve analysis in accordance with ASTM D422. A wet sieve analysis was performed to determine a percentage (by weight) of the sample passing the No. 200 (0.075 mm) sieve. For one sample, only the percent passing the No. 200 sieve was determined. For the others, the material retained on the No. 200 sieve was shaken through a series of sieves to determine the distribution of the plus No. 200 fraction. Results of the particle-size analyses are presented on Figure B2, Grain Size Distribution. For all particle-size analyses, the percentage of material passing the No. 200 sieve is also shown graphically in the Logs of Borings in Appendix A.

B.2.4 Corrosivity Testing

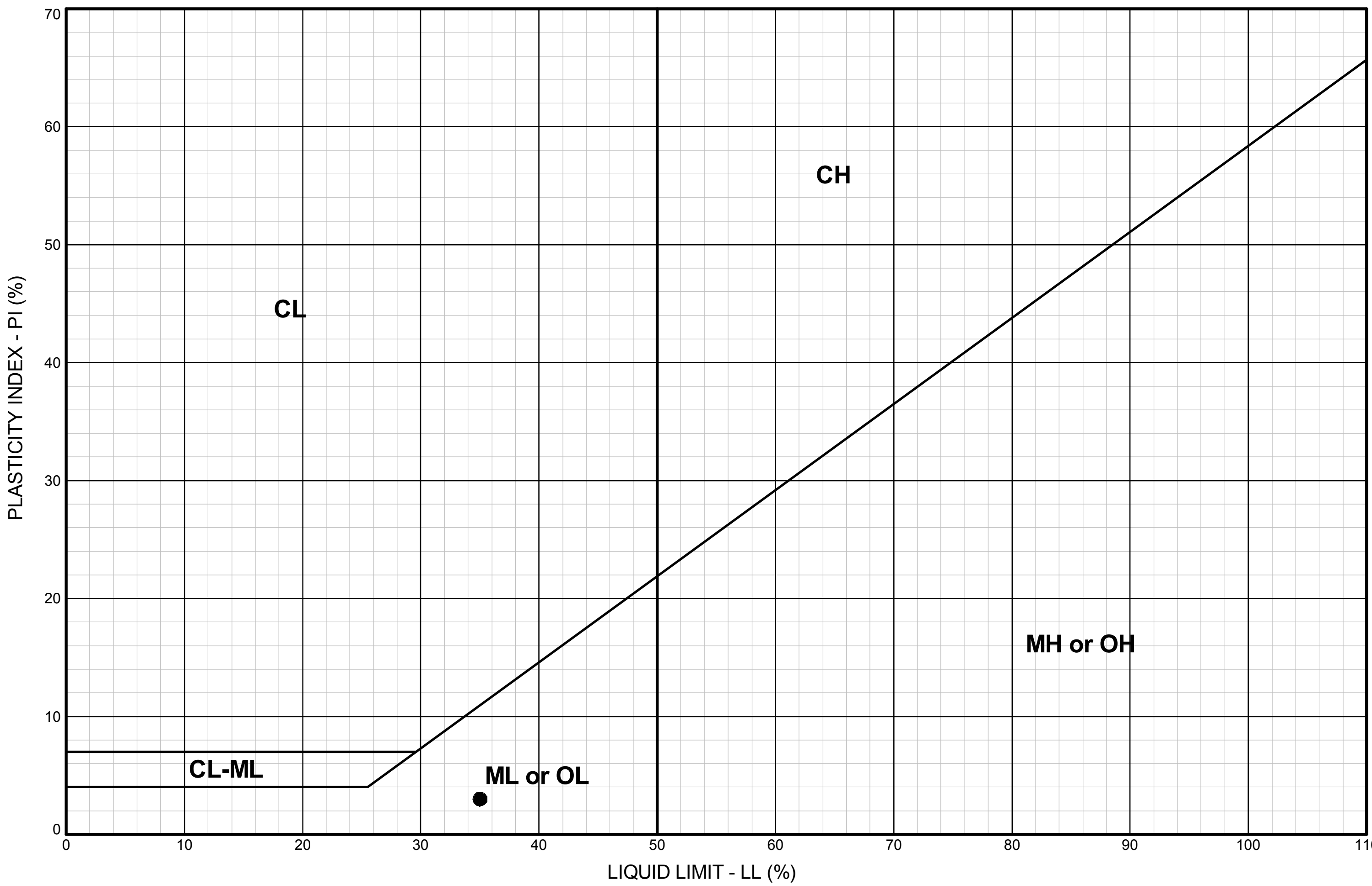
Analytical testing was performed on one near-surface sample and one composite sample (comprised of selected samples between 2.5 and 16.5 feet depth) to determine the corrosivity potential of the soil at the site. The corrosivity test suite included chloride concentration, soil pH, oxidation-reduction potential, soil resistivity, sulfate concentration, and sulfide concentration. Analytical testing was performed by Specialty Analytical of Clackamas, Oregon. Their testing report is attached to the end of this appendix.

The corrosion potential of a soil is primarily evaluated by comparing the measured pH, resistivity, and sulfate and chloride concentration to the values from Fang (1991) and Tomlison (1987) as specified by AASHTO LFRD Bridge Design Specifications (6^{th} Edition 2012).

Soil pH is a measurement of the hydrogen ion activity of the soil. Soil pH is reported in Standard Units (S.U.) on a scale ranging from 0 to 14, with 7 being neutral. Soils with a pH less than 7 are considered acidic and soils with a pH greater than 7 are considered alkaline. According to the AASHTO specifications, soils with a pH less than 5.5 and soils with a pH between 5.5 and 8.5 that also have high organic content are considered potentially corrosive. Soil pH of the tested samples ranged from 7.52 to 8.74, and little organic matter was observed in the tested samples. Based on pH, the samples do not appear to be corrosive.

Resistivity (expressed as ohms-centimeter or ohm-cm) is the numerical expression of the ability of a soil to impede the transmission of an electrical current. Resistivity is the inverse of conductivity and is dependent on the presence of ions, their concentrations, mobility, and valence, as well as soil moisture and temperature. The AASHTO specifications state that effects of corrosion and deterioration shall be considered if resistivity values are less than 2,000 ohm-cm. The resistivity of the tested samples ranged from 4,550 to 9,900 to ohm-cm. Based on resistivity, the tested samples do not appear to be corrosive.

Sulfate and chloride concentrations were measured in the soil samples. Sulfates can be converted to sulfides by naturally occurring bacteria. Sulfides, when allowed to oxidize, will produce sulfuric acid, which is highly corrosive. Chlorides will also chemically react and facilitate dissolution reactions with metals and concrete. According to the AASHTO specifications, soil is considered corrosive if the concentration of chloride is greater than 100 parts per million (ppm) or the concentration of sulfate is greater than 1,000 ppm. Chloride concentrations in the tested samples ranged from 8.04 to 10.4 ppm, sulfate concentrations ranged from 8.58 to 83.1 ppm, and sulfide concentrations were at or below the laboratory method reporting limits. Based on the chloride, sulfate, and sulfide concentrations, the tested samples do not appear to be corrosive.



NOTES

1) Atterberg limits tests were performed in general accordance with ASTM D4318 unless otherwise noted in the report.

2) Plasticity adjectives used in sample descriptions correspond to plasticity index as follows:
- Nonplastic (0 - 4%)
- Low Plasticity (>4 - 10%)
- Medium Plasticity (>10 - 20%)
- High Plasticity (>20 - 40%)
- Very High Plasticity (>40%)

BORING AND SAMPLE NO.	DEPTH (feet)	GROUP SYMBOL	SAMPLE DESCRIPTION	LL %	PL %	PI %	NAT. W.C. %	FINES %
● ST-B-2, S-8	25.0	ML	SILT, nonplastic	35	32	3	35	99

Perennial Wind Chaser Station
Step-Up Substation
Umatilla, Oregon

ATTERBERG LIMITS RESULTS

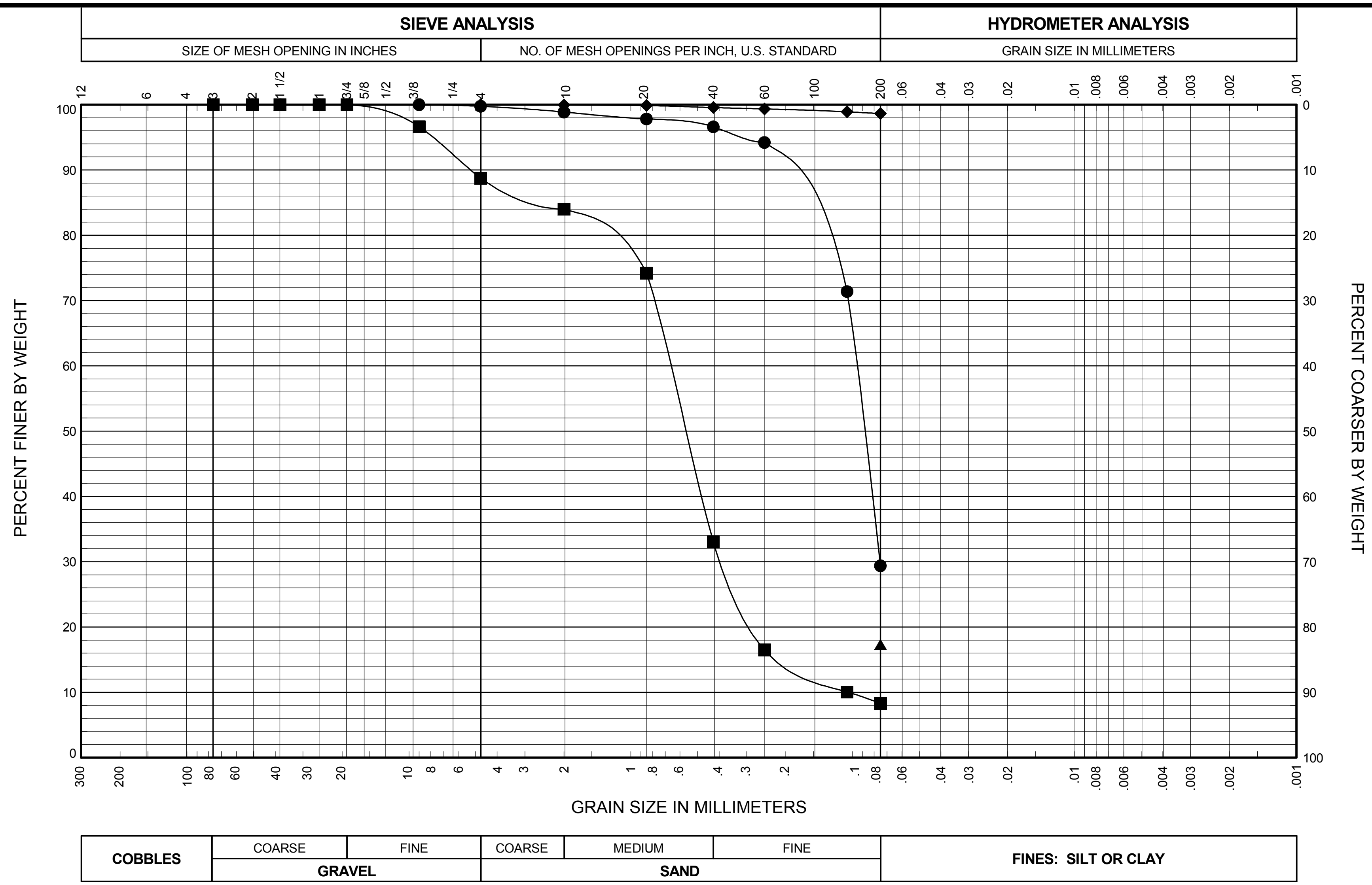
November 2013 24-1-03794-001

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. B1

FIG. B1

ATT MAIN 24-1-03794-UMATILLA.GPJ SHAN WIL.GDT 11/18/13



NOTES:
1) Sieve and hydrometer analyses were performed in general accordance with ASTM D422 unless otherwise noted in the report.
2) Particles retained on the 3-inch (76.2 mm) sieve are noted in the sample descriptions, but are not included in sieve analyses unless otherwise noted in the report.

GSA MAIN 24-1-03794-UMATILLA.GPJ SHAN WIL.GDT 11/18/13

BORING AND SAMPLE NO.	DEPTH (feet)	GROUP SYMBOL	SAMPLE DESCRIPTION	GRAVEL %	SAND %	FINES %	NAT. W.C. %	DRY DENSITY PCF
● ST-B-1, C-1	0.0	SM	Silty SAND	0	70	29	2	
■ ST-B-1, S-3	7.5	SW-SM	SAND with silt, trace gravel	11	80	8	17	
▲ ST-B-1, S-7	20.0	SM	Silty SAND	-	-	17	17	
◆ ST-B-2, S-8	25.0	ML	SILT, nonplastic	0	1	99	35	

Perennial Wind Chaser Station
Step-Up Substation
Umatilla, Oregon

GRAIN SIZE DISTRIBUTION

November 2013 24-1-03794-001

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. B2

FIG. B2

Specialty Analytical

11711 SE Capps Road, Ste B
Clackamas, Oregon 97015
TEL: 503-607-1331 FAX: 503-607-1336
Website: www.specialtyanalytical.com

August 28, 2013

David Higgins
Shannon & Wilson
3990 SW Collins Way
Ste. 100
Lake Oswego, OR 97035

TEL: (503) 223-6147
FAX (503) 223-6140

RE: Perennial Power / 24-1-03794-001

Dear David Higgins: Order No.: 1308125

Specialty Analytical received 5 sample(s) on 8/20/2013 for the analyses presented in the following report.

There were no problems with the analysis and all data for associated QC met EPA or laboratory specifications, except where noted in the Case Narrative, or as qualified with flags. Results apply only to the samples analyzed. Without approval of the laboratory, the reproduction of this report is only permitted in its entirety.

If you have any questions regarding these tests, please feel free to call.

Sincerely,

Marty French
Lab Director

Specialty Analytical

Date Reported: **28-Aug-13**

CLIENT: Shannon & Wilson
Collection Date: 8/15/2013
Project: Perennial Power / 24-1-03794-001
Lab ID: 1308125-001
Client Sample ID: ST-B-1, C-1, 0-2'
Matrix: SOIL

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
CHLORIDE ION IN SOIL		**D512**				Analyst: **JRC**
Chloride	8.04	1.50		mg/Kg	1	8/22/2013 11:05:00 AM
PH OF SOIL		**D4972**				Analyst: **AT**
pH	7.52	0		pH Units	1	8/21/2013 4:20:00 PM
OXIDATION-REDUCTION POTENTIAL		**M2580B**				Analyst: **JRC**
Oxidation-Reduction Potential	310	0		Eh	1	8/21/2013 2:00:00 PM
SOIL RESISTIVITY		**T288-91**				Analyst: **AT**
Minimum Soil Resistivity	9900	1.00		ohm-cm	1	8/22/2013 2:00:00 PM
SULFATE IN SOIL		**D516**				Analyst: **AT**
Sulfate	8.58	1.50		mg/Kg	1	8/22/2013 11:05:00 AM
SULFIDE		**SW9030**				Analyst: **JRC**
Sulfide	2.00	2.00		mg/Kg	1	8/23/2013 10:00:00 AM

Specialty Analytical

Date Reported: **28-Aug-13**

CLIENT: Shannon & Wilson
Collection Date: 8/20/2013 2:33:46 PM
Project: Perennial Power / 24-1-03794-001
Lab ID: 1308125-005
Client Sample ID: Composite
Matrix: SOIL

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
CHLORIDE ION IN SOIL		**D512**				Analyst: **JRC**
Chloride	10.4	1.50		mg/Kg	1	8/22/2013 11:20:00 AM
PH OF SOIL		**D4972**				Analyst: **AT**
pH	8.74	0		pH Units	1	8/21/2013 4:25:00 PM
OXIDATION-REDUCTION POTENTIAL		**M2580B**				Analyst: **JRC**
Oxidation-Reduction Potential	275	0		Eh	1	8/21/2013 2:30:00 PM
SOIL RESISTIVITY		**T288-91**				Analyst: **AT**
Minimum Soil Resistivity	4550	1.00		ohm-cm	1	8/22/2013 2:15:00 PM
SULFATE IN SOIL		**D516**				Analyst: **AT**
Sulfate	83.1	7.50		mg/Kg	5	8/22/2013 11:50:00 AM
SULFIDE		**SW9030**				Analyst: **JRC**
Sulfide	2.00	2.00		mg/Kg	1	8/23/2013 10:20:00 AM

QC SUMMARY REPORT

WO#: **1308125**

28-Aug-13

Specialty Analytical

Client: Shannon & Wilson

Project: Perennial Power / 24-1-03794-001

TestCode: CL_ASTM_S

Sample ID: **LCS** SampType: **LCS** TestCode: **CL_ASTM_S** Units: **mg/Kg** Prep Date: RunNo: **11133**

Client ID: **LCSS** Batch ID: **R11133** TestNo: **D512** Analysis Date: **8/22/2013** SeqNo: **141453**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	31.5	1.50	30.00	0	105	80	120				

Sample ID: **MBLK** SampType: **MBLK** TestCode: **CL_ASTM_S** Units: **mg/Kg** Prep Date: RunNo: **11133**

Client ID: **PBS** Batch ID: **R11133** TestNo: **D512** Analysis Date: **8/22/2013** SeqNo: **141454**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	ND	1.50									

Sample ID: **1308125-005AMS** SampType: **MS** TestCode: **CL_ASTM_S** Units: **mg/Kg** Prep Date: RunNo: **11133**

Client ID: **Composite** Batch ID: **R11133** TestNo: **D512** Analysis Date: **8/22/2013** SeqNo: **141457**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	25.0	1.50	15.00	10.35	97.8	75	125				

Sample ID: **1308125-005AMSD** SampType: **MSD** TestCode: **CL_ASTM_S** Units: **mg/Kg** Prep Date: RunNo: **11133**

Client ID: **Composite** Batch ID: **R11133** TestNo: **D512** Analysis Date: **8/22/2013** SeqNo: **141458**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	25.0	1.50	15.00	10.35	97.4	75	125	25.02	0.240	20	

Qualifiers:
B Analyte detected in the associated Method Blank
H Holding times for preparation or analysis exceeded
ND Not Detected at the Reporting Limit
O RSD is greater than RSDlimit
R RPD outside accepted recovery limits
S Spike Recovery outside accepted reco

QC SUMMARY REPORT

WO#: **1308125**

28-Aug-13

Specialty Analytical

Client: Shannon & Wilson

Project: Perennial Power / 24-1-03794-001

TestCode: **CL_ASTM_S**

Sample ID: **CCV** SampType: **CCV** TestCode: **CL_ASTM_S** Units: **mg/Kg** Prep Date: RunNo: **11133**

Client ID: **CCV** Batch ID: **R11133** TestNo: **D512** Analysis Date: **8/22/2013** SeqNo: **141459**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	47.3	1.50	45.00	0	105	90	110				

Qualifiers:

B	Analyte detected in the associated Method Blank	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
O	RSD is greater than RSDlimit	R	RPD outside accepted recovery limits	S	Spike Recovery outside accepted reco

QC SUMMARY REPORT

WO#: **1308125**

28-Aug-13

Specialty Analytical

Client: Shannon & Wilson

Project: Perennial Power / 24-1-03794-001

TestCode: **PH_ASTM**

Sample ID: **1308125-005ADUP**	SampType: **DUP**	TestCode: **PH_ASTM**	Units: **pH Units**	Prep Date:	RunNo: **11131**
Client ID: **Composite**	Batch ID: **R11131**	TestNo: **D4972**		Analysis Date: **8/21/2013**	SeqNo: **141429**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
pH	8.75	0						8.740	0.114	20	

QC SUMMARY REPORT

WO#: **1308125**

28-Aug-13

Specialty Analytical

Client: Shannon & Wilson

Project: Perennial Power / 24-1-03794-001

TestCode: **REDOX**

Sample ID: **1308125-001ADUP**	SampType: **DUP**	TestCode: **REDOX**	Units: **Eh**	Prep Date:		RunNo: **11113**
Client ID: **ST-B-1, C-1, 0-2'**	Batch ID: **R11113**	TestNo: **M2580B**		Analysis Date: **8/21/2013**		SeqNo: **141176**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Oxidation-Reduction Potential	300	0						309.7	3.02	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
O	RSD is greater than RSDlimit	R	RPD outside accepted recovery limits	S	Spike Recovery outside accepted reco

QC SUMMARY REPORT

WO#: **1308125**

28-Aug-13

Specialty Analytical

Client: Shannon & Wilson

Project: Perennial Power / 24-1-03794-001

TestCode: SO4_ASTM_S

Sample ID: **LCS**	SampType: **LCS**	TestCode: **SO4_ASTM_**	Units: **mg/Kg**	Prep Date:	RunNo: **11134**
Client ID: **LCSS**	Batch ID: **R11134**	TestNo: **D516**		Analysis Date: **8/22/2013**	SeqNo: **141460**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfate	30.8	1.50	30.00	0	103	70	130				

Sample ID: **MBLK**	SampType: **MBLK**	TestCode: **SO4_ASTM_**	Units: **mg/Kg**	Prep Date:	RunNo: **11134**
Client ID: **PBS**	Batch ID: **R11134**	TestNo: **D516**		Analysis Date: **8/22/2013**	SeqNo: **141461**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfate	ND	1.50									

Sample ID: **1308125-005AMS**	SampType: **MS**	TestCode: **SO4_ASTM_**	Units: **mg/Kg**	Prep Date:	RunNo: **11134**
Client ID: **Composite**	Batch ID: **R11134**	TestNo: **D516**		Analysis Date: **8/22/2013**	SeqNo: **141463**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfate	90.0	7.50	15.00	83.10	46.0	65	135				SMC

Sample ID: **CCV**	SampType: **CCV**	TestCode: **SO4_ASTM_**	Units: **mg/Kg**	Prep Date:	RunNo: **11134**
Client ID: **CCV**	Batch ID: **R11134**	TestNo: **D516**		Analysis Date: **8/22/2013**	SeqNo: **141464**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfate	47.0	1.50	45.00	0	104	90	110				

Qualifiers:

B	Analyte detected in the associated Method Blank	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
O	RSD is greater than RSDlimit	R	RPD outside accepted recovery limits	S	Spike Recovery outside accepted reco

QC SUMMARY REPORT

WO#: **1308125**

28-Aug-13

Specialty Analytical

Client: Shannon & Wilson

Project: Perennial Power / 24-1-03794-001

TestCode: SO4_ASTM_S

Sample ID: **1308125-005AMSD** SampType: **MSD** TestCode: **SO4_ASTM_** Units: **mg/Kg** Prep Date: RunNo: **11134**

Client ID: **Composite** Batch ID: **R11134** TestNo: **D516** Analysis Date: **8/22/2013** SeqNo: **141466**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfate	90.6	7.50	15.00	83.10	50.0	65	135	90.00	0.664	20	SMC

Sample ID: **CCV** SampType: **CCV** TestCode: **SO4_ASTM_** Units: **mg/Kg** Prep Date: RunNo: **11134**

Client ID: **CCV** Batch ID: **R11134** TestNo: **D516** Analysis Date: **8/22/2013** SeqNo: **141467**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfate	47.1	1.50	45.00	0	105	90	110				

Qualifiers:

B	Analyte detected in the associated Method Blank	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
O	RSD is greater than RSDlimit	R	RPD outside accepted recovery limits	S	Spike Recovery outside accepted reco

QC SUMMARY REPORT

WO#: **1308125**

28-Aug-13

Specialty Analytical

Client: Shannon & Wilson

Project: Perennial Power / 24-1-03794-001

TestCode: **SULFIDE_S**

Sample ID: **1308125-005ADUP** SampType: **DUP** TestCode: **SULFIDE_S** Units: **mg/Kg** Prep Date: RunNo: **11154**

Client ID: **Composite** Batch ID: **R11154** TestNo: **SW9030** Analysis Date: **8/23/2013** SeqNo: **141628**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	2.00	2.00						2.000	0	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
O	RSD is greater than RSDlimit	R	RPD outside accepted recovery limits	S	Spike Recovery outside accepted reco

KEY TO FLAGS

Rev. May 12, 2010

A This sample contains a Gasoline Range Organic not identified as a specific hydrocarbon product. The result was quantified against gasoline calibration standards

A1 This sample contains a Diesel Range Organic not identified as a specific hydrocarbon product. The result was quantified against diesel calibration standards.

A2 This sample contains a Lube Oil Range Organic not identified as a specific hydrocarbon product. The result was quantified against a lube oil calibration standard.

A3 The result was determined to be Non-Detect based on hydrocarbon pattern recognition. The product was carry-over from another hydrocarbon type.

A4 The product appears to be aged or degraded diesel.

B The blank exhibited a positive result great than the reporting limit for this compound.

CN See Case Narrative.

D Result is based from a dilution.

E Result exceeds the calibration range for this compound. The result should be considered as estimate.

F The positive result for this hydrocarbon is due to single component contamination. The product does not match any hydrocarbon in the fuels library.

G Result may be biased high due to biogenic interferences. Clean up is recommended.

H Sample was analyzed outside recommended holding time.

HT At clients request, samples was analyzed outside of recommended holding time.

J The result for this analyte is between the MDL and the PQL and should be considered as estimated concentration.

K Diesel result is biased high due to amount of Oil contained in the sample.

L Diesel result is biased high due to amount of Gasoline contained in the sample.

M Oil result is biased high due to amount of Diesel contained in the sample.

MC Sample concentration is greater than 4x the spiked value, the spiked value is considered insignificant.

MI Result is outside control limits due to matrix interference.

MSA Value determined by Method of Standard Addition.

O Laboratory Control Standard (LCS) exceeded laboratory control limits, but meets CCV criteria. Data meets EPA requirements.

Q Detection levels elevated due to sample matrix.

R RPD control limits were exceeded.

RF Duplicate failed due to result being at or near the method-reporting limit.

RP Matrix spike values exceed established QC limits; post digestion spike is in control.

S Recovery is outside control limits.

SC Closing CCV or LCS exceeded high recovery control limits, but associated samples are non-detect. Data meets EPA requirements.

* The result for this parameter was greater that the maximum contaminant level of the TCLP regulatory limit.

Job Name:
Perennial Power

Shannon & Wilson, Inc.
503-210-4781

1308125

LABORATORY TESTING PROGRAM

JOB. NO. 24-1-03794-001 PREPARED BY David Higgins

DATE 8/20/13 DUE DATE ____ ACKNOWLEDGED BY [signature] 8/20/13

8/15/2013 ★ 2 Jars

01/15/2013

BORING NUMBER	SAMPLE NUMBER	DEPTH IN FEET	VISUAL CLASSIFICATION	WATER CONTENT	ATTERBERG LIMITS	MECHANICAL ANALYSIS	HYDROMETER	COMBINED-ANALYSES	Qu	IN-PLACE δ	MIN. & MAX. δ	Chloride 0512	pH 04972	Resistivity T288	Sulfate-0516	Redox	Sulfide
★ ST-B-1	C-1	0-2'										/	/	/	/	/	/
* ST-B-1	S-1	2.5'-3.3'										/	/	/	/	/	/
* ST-B-1	S-5	12-13.5'										/	/	/	/	/	/
* ST-B-1	S-6	15'-16.5'										/	/	/	/	/	/

CONSOLIDATION (1)

COMPACTION (2)

TRIAXIAL (3)

REMARKS

★ Composite Sample of Silty SAND

* Composite Sample of Gravel

Two testing suites
one of:
★ Silty sand
one of:
* Gravel

(1) SPECIFY LOADING PROCEDURE (2) SPECIFY STANDARDS (3) SPECIFY TESTING PROCEDURE

APPENDIX C

PHOTOGRAPH LOG


Boring ST-B-1 Location


Boring ST-B-2 Location

Perennial Wind Chaser Station
Step-Up Substation
Umatilla, Oregon

PHOTOGRAPH LOG

November 2013 24-1-03794-001

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. C1

APPENDIX D

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL/ENVIRONMMENTAL REPORT

Important Information About Your Geotechnical/Environmental Report

CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

THE CONSULTANT'S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical/environmental report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used: (1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors, which were considered in the development of the report, have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical/environmental report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/environmental report. The consultant should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your consultant can work together to help reduce their impacts. Retaining your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your consultant's report are preliminary because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical/environmental report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.

Final boring logs developed by the consultant are based on interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical/environmental reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY.

Because geotechnical/environmental engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in their contracts, reports and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

The preceding paragraphs are based on information provided by the
ASFE/Association of Engineering Firms Practicing in the Geosciences, Silver Spring, Maryland

APPENDIX C: IMPACT FROM GROUNDWATER PUMPING FOR GENERATING FACILITY

Appendix C

Evaluation of Potential Impact from Groundwater Pumping for Generating Facility

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GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

ALASKA
CALIFORNIA
COLORADO
FLORIDA
MISSOURI
OREGON
WASHINGTON
WISCONSIN

July 25, 2014

Mr. Robert J. Hawkins, Jr., PE
Burns & McDonnell Engineering Company, Inc.
9400 Ward Parkway
Kansas City, Missouri 64114

**RE: PERENNIAL WIND CHASER STATION
EVALUATION OF POTENTIAL IMPACT FROM GROUNDWATER PUMPING
POWER-GENERATING FACILITY
HERMISTON, OREGON**

INTRODUCTION

The purpose of this evaluation is to estimate the potential radial drawdown effects of pumping one on-site well at the power-generating facility and the impacts to other existing supply wells. This letter summarizes our evaluation and finings and is supplemental to the findings in our Preliminary Geotechnical Engineering Report, Perennial Wind Chaser Station, dated November 19, 2013.

LOCAL GEOLOGY AND HYDROGEOLOGY

Our interpretation of the subsurface conditions is based on the borings and regional geologic information from published sources. We grouped the materials encountered in our field explorations into four geologic units, downward from land surface as described below.

- **Loess:** Medium-dense to dense silty sand to sand, trace silt (SM, SP-SM, and SP).
- **Catastrophic Flood Deposits – Gravel Facies:** Dense to very dense sandy gravel, trace silt with cobbles and boulders (GP).
- **Catastrophic Flood Deposits – Fine-Grained Facies:** Very stiff to hard silt to sandy silt and clayey silt with sand to trace sand (ML and MH).
- **Catastrophic Flood Deposits – Sand Facies:** Dense to very dense silty sand to sand, trace silt (SM, SP-SM, and SP).

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www.shannonwilson.com

These generalized geologic units have been defined by their geologic and engineering properties and their distribution in the subsurface. The units and their inter-relationships are shown on the Geologic Profile A-A', Figure 4, in Shannon & Wilson's 2013 Preliminary Geotechnical Engineering Report. The location of the profile is shown on the Exploration Plan, Figure 3, of our November 19, 2013 report. The profile is interpretive, and variations in subsurface conditions may exist between the locations of the borings. Contacts between the units may be more gradational than shown in the profiles and in the boring logs in Appendix A.

CONCEPTUAL MODEL

We developed a conceptual hydrogeologic model, consisting of three discrete layers, as follows.

- **Layer 1 –** Consists of the first two geological units (loess and catastrophic flood deposits – gravel facies), described above. The layer thickness is 32.5 feet. We assigned a horizontal hydraulic conductivity of 7.5 feet/day (low case) and 15 feet/day (high case).
- **Layer 2 –** Consists of the third geological unit (catastrophic flood deposits – clayey silt) described above. The layer thickness is 17.5 feet. We assigned a horizontal hydraulic conductivity of 0.1 feet/day. Layer 2 is a confining layer that separates the upper aquifer from the basalt aquifer.
- **Layer 3 –** Consists of the fourth geological units (catastrophic flood deposits – sand facies and basalt formation) described above. Although the total thickness of Layer 3 is unknown, we assumed a thickness of 30 feet. We assigned a horizontal hydraulic conductivity of 10 feet/day (low case) and 20 feet/day (high case).

ANALYSIS AND RESULTS

We developed a basic 3-D groundwater flow model to simulate these units and pumping. All modeled layers were horizontal. The depth to groundwater was set at 27 feet below surface. We inserted one well and assigned a pumping rate to Layer 3. We simulated the proposed pumping rate of 5,000 gpd (or 3.5 gpm) and ran the model to steady-state (long-term). The predicted maximum drawdown at the pumped well would be between 1.5 and 3 feet (assuming a 100-percent efficient well), and the distance to a drawdown of 0.5 feet would be between 250 and 850 feet.

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For a sensitivity analysis, we increased the pumping rate to 10,000 gpd (7.0 gpm). For this case, the maximum drawdown at the pumped well ranged between would be 2.7 and 4.4 feet, and the distance to a drawdown of 0.5 feet would be between 900 and 2,000 feet.

Figure 1 shows the locations of the project site, the maximum radius of influence for the 5,000 gpd case (500 feet), the maximum radius of influence for the 10,000 gpd case (2,000 feet), and the existing water rights in the area (from Oregon Department of Water Resource's online database mapping tool).

The search shows no water rights within the 850-foot zone, and one water right within the 2,000-foot zone. The priority date for this water rights (owned by E.T. Johnson, ID T8066) is 1968. The permit consists of pumping up to 1.77 cubic foot per second (or 800 gpm) for irrigation use from a 190-foot-deep well completed in the basalt. Therefore, the capacity of this permitted well far exceeds that planned for the Wind Chaser project. We do not have operational drawdown information for the Johnson well. However, it is unlikely that the radial drawdown created by pumping the Wind Chaser well would have a significant impact on the operation of the Johnson well.

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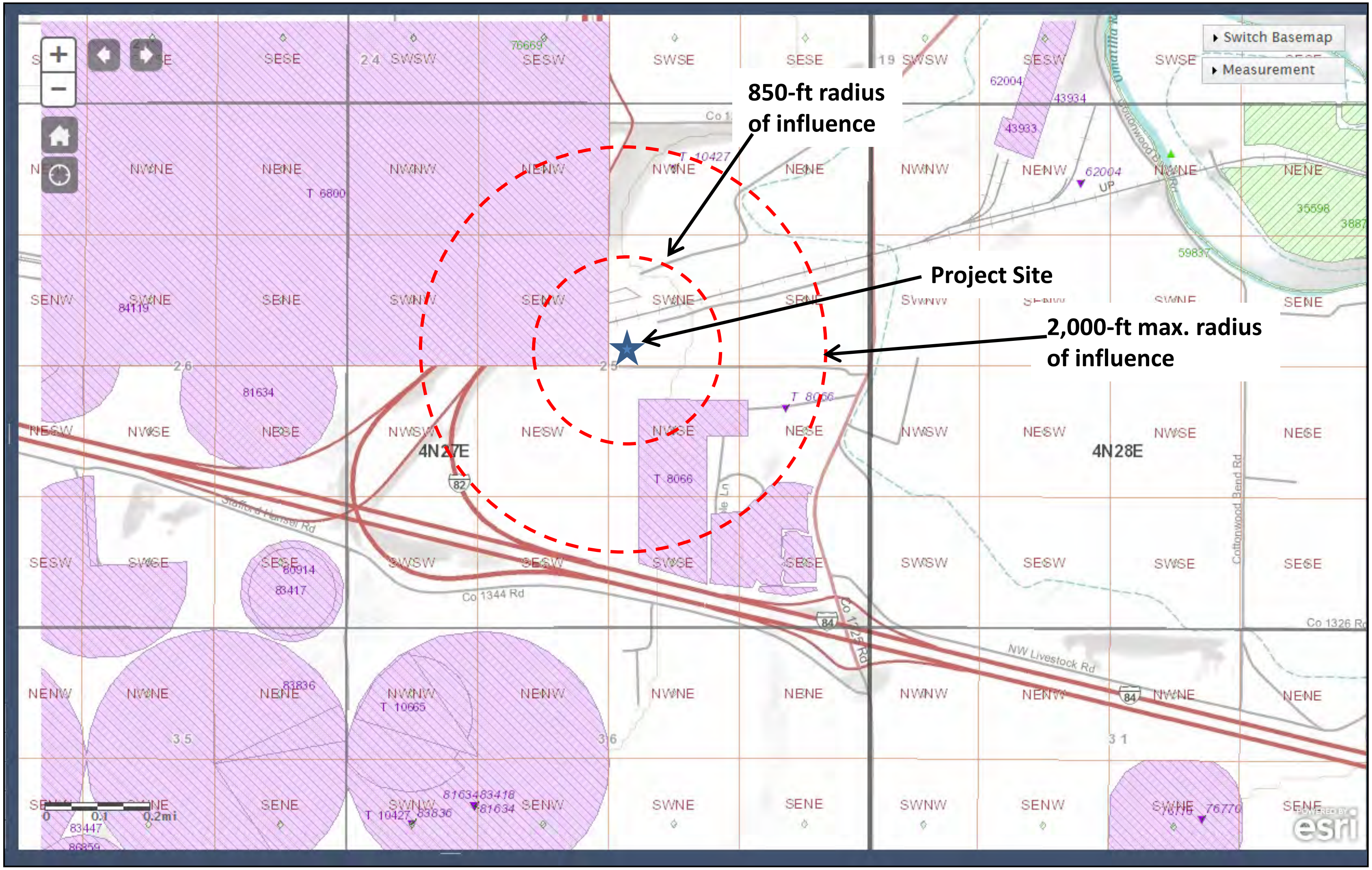
CERTIFIED
OREGON
DAVID J. HIGGINS
E 2026
ENGINEERING GEOLOGIST
Expires: 12/31/14

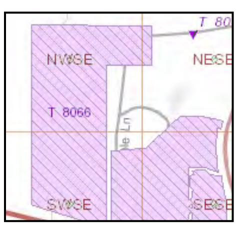
David J. Higgins, CEG
Associate | Engineering Geologist

SDT/LIM:DJH/amn

Attachments: Figure 1, Water Rights Map and Potential Pumping Radius of Influence



Source: http://apps.wrd.state.or.us/apps/gis/wr/Default.aspx



Water right place
of diversion
And use area
(shaded)

0 1,000 2,000

Scale in Feet

Perennial Power Holdings, Inc.
Wind Chaser Station Project
Hermiston, Oregon

WATER RIGHTS MAP AND POTENTIAL PUMPING RADIUS OF INFLUENCE

July 2014 24-1-03794

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 1

APPENDIX D: DOCUMENTATION OF DOGAMI CONSULTATION

Appendix D

Documentation of DOGAMI Consultation

CONTENTS

- Email documentation of 2013 consultation
- Email documentation of 2018 consultation

Eric Paslack

From: David Higgins
Sent: Wednesday, September 11, 2013 6:11 PM
To: Eric Paslack
Subject: Fwd: Perennial Power proposed generating facility and substation

Sent from my iPhone

Begin forwarded message:

> **From:** Bill Burns <bill.burns@dogami.state.or.us>
> **Date:** September 11, 2013, 5:55:23 PM PDT
> **To:** David Higgins <DJH@shanwil.com>
> **Cc:** Mark Ethen <mark.ethen@dogami.state.or.us>
> **Subject: RE: Perennial Power proposed generating facility and substation**
>
> Hi David. It was nice talking with you about this project. Please call or email me with any questions. Bill
>
> Bill Burns, MS, CEG
> Engineering Geologist
> Oregon Department of Geology and Mineral Industries
> 800 NE Oregon Street, Portland, OR 97232
> (971) 673-1538
> bill.burns@dogami.state.or.us
> http://www.oregongeology.org/
>
> ---
>
> **From:** David Higgins [mailto:DJH@shanwil.com]
> **Sent:** Friday, September 06, 2013 10:58 AM
> **To:** Bill Burns
> **Subject:** Perennial Power proposed generating facility and substation
>
> Bill,
>
> Thank you for the phone call yesterday and discussing with me the proposed Perennial Power generating facility in Hermiston and substation in Umatilla.
>
> The purpose of our phone call was to meet the requirements of OAR 345-021-0010(1)(h)(c). We discussed available geologic mapping and literature in the area as well as explorations that we have performed for the generating facility and the substation.
>
> Please provide references for area geologic studies you mentioned in our conversation that you suggested we review.
>
> Thank you,
>
> SHANNON & WILSON, INC.

David J. Higgins, CEG/LEG* | Senior Principal Engineering Geologist
3990 Collins Way, Suite 100
Lake Oswego, Oregon 97035
www.shannonwilson.com
Phone: (503) 210-4750   Fax: (503) 210-4890
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Adrian Holmes

From: CLIFFORD Katie * ODOE <Katie.Clifford@oregon.gov>
Sent: Saturday, December 01, 2018 10:21 PM
To: Howell, Chris
Cc: 'JJ Jamieson'; 'Bradley Knight'; Adrian Holmes; Stephen McLandrich; Paul Neil; Hawkins, Jim; WANG Yumei * DGMI
Subject: RE: Perennial Power Wind Chaser - DOGAMI Consultation Meeting Notes [Filed 03 Dec 2018 13:09]

Hi Chris,

Thank you for providing the consultation notes. Yumei and I coordinated our review of the notes, and have the following comments:

1. DOGAMI asks the certificate holder to address all earthquake faults that could negatively impact the property. DOGAMI asks the certificate holder to discuss long-period ground motion hazards, and how the certificate holder plans to design, engineer, and construct the facility to avoid dangers to human safety and the environment presented by those hazards.

   The Perennial team's notes currently state: "Yumei stated that it should be considered that CSZE has a long-period bump that is seen further to the east." We believe a more precise summary of that part of the consultation would be, "Yumei stated that site-specific seismic evaluations should include evaluation of long period ground motions from CSZE. This is because site-specific long period ground motions can be high in eastern Oregon and special design considerations of long period structures may be necessary."

2. DOGAMI asks the certificate holder to be explicit about what codes and standards are being used for design (e.g., National Electric Safety Code for transmission lines) for the facility, including specific components (e.g., IEEE 693 for power transformers), and its related and supporting facilities. ODOE notes that this applies to all related and supporting facilities described in ASC Exhibit B, including those related and supporting facilities that would be owned and operated by Umatilla Electric Cooperative and Cascade Natural Gas Corporation.

3. DOGAMI asks the certificate holder to provide a discussion of disaster resilience design, as discussed during the consultation, to address Division 21 requirements. ODOE notes that the pRFA currently does not include a response to OAR 345-021-0010(1)(h)(F)(i).

4. DOGAMI asks the certificate holder to provide a discussion of designing for future climate conditions, as discussed during the consultation, to address Division 21 requirements. ODOE notes that the pRFA currently does not include a response to OAR 345-021-0010(1)(h)(F)(ii).

   The Perennial team's notes currently state: "They don't expect us to address future wind conditions." We believe a more precise summary of that part of the consultation would be, "DOGAMI does not expect the certificate holder to conduct scientific studies of future wind conditions. DOGAMI expects that the best available scientific information on future climate be obtained and considered in proposed designs."

   As an example, the USGS is conducting a study of future climate impacts on the Columbia River levees in the Portland area. Similar scientific studies for the vicinity of the site boundary should be investigated, and the USGS scientists conducting the Columbia River levees could be contacted to provide technical input on expected future wind conditions: https://www.usgs.gov/centers/or-water/science/future-climate-effects-columbia-and-willamette-river-levees?qt-science_center_objects=0#qt-science_center_objects

5. DOGAMI asks the certificate holder to provide a description and schedule of site-specific geotechnical work that will be performed before construction for inclusion in the site certificate as conditions.

Please let us know if you have any questions.

Katie

Katie Clifford
Senior Siting Analyst
Oregon Department of Energy
O: (503) 373-0076
C: (503) 302-0267

From: Howell, Chris [mailto:chowell@burnsmcd.com]
Sent: Wednesday, November 28, 2018 9:27 AM
To: WANG Yumei * DGMI <Yumei.WANG@oregon.gov>; CLIFFORD Katie * ODOE <Katie.Clifford@oregon.gov>
Cc: 'JJ Jamieson' <JJ.Jamieson@perennialpower.net>; 'Bradley Knight' <bradley.knight@perennialpower.net>; Adrian Holmes <AAH@shanwil.com>; Stephen McLandrich <SMM@shanwil.com>; Paul Neil <pneil@rtpenv.com>; Hawkins, Jim <jhawkins@burnsmcd.com>
Subject: Perennial Power Wind Chaser - DOGAMI Consultation Meeting Notes

Yumei and Katie,

Attached are meeting notes from our call on 11/14. Apologies for not getting these out sooner, I wanted to make sure I had all of our comments incorporated before sending to you for concurrence. Please let me know you received these, and don't hesitate to call if you have any comments, questions, or corrections.

Have a great day!
Chris

Chris Howell
Project Manager
o 816-822-4243
chowell@burnsmcd.com

Meeting Notes

BURNS & McDONNELL

Meeting Subject:	DOGAMI Consultation
Meeting Date:	11/14/2018
Start Time:	10 AM PST
End Time:	11 AM PST
Location:	Teleconference

Project Name:	Perennial Power WindChaser
Project No.:	Click here to enter project no.

Attendees	Organization	Title
Yumei Wang, PE	DOGAMI	Resilience Engineer
Katie Clifford	ODOE	Senior Siting Analyst
Luke May	ODOE	Siting Analyst
JJ Jamieson	Perennial Power Holdings	VP Operations and Development
Paul Neil, PE, BCEE	RTP Environmental	Principal
Adrian Holmes, CEG	Shannon & Wilson	Senior Engineering Geologist
Stephen McLandrich, PE, GE	Shannon & Wilson	Associate
Jim Hawkins, PE	Burns & McDonnell	Associate Geotechnical Engineer
Chris Howell*	Burns & McDonnell	Project Manager

* Indicates meeting organizer

Date Notes Issued: 11/28/2018 (Revised 12/07/2018)

Meeting Notes:

Introductions were made.

Discussion kicked off regarding what we have provided in the original Exhibit H and the update. Both were based on older code (IBC 2009).

Yumei indicated that Exhibit H and the site-specific studies need to be updated per current codes, with new codes likely coming out next year.

We indicated that we will add language regarding what codes we specifically looked at, and then address the current year's codes during final design.

Katie agreed with this approach, stating that it will become a condition of the permit that all of the analyses will be redone for the submittal year's codes.

Yumei detailed that site-specific analysis must be completed, including: fault hazards, landslides, etc. and that it must follow the DOGAMI Scope of Review for EFSC. She expects the Geotech report will have appropriate info according to guidelines set forth by the Oregon State Board of Geologist Examiners. Further, Yumei indicated that the USGS fault database is not sufficient to be the only reference used for the fault study. Additional appropriate resources would be the

DOGAMI fault database and review of LIDAR. Additional LIDAR in excess of what is currently available through the DOGAMI website may be required for Final Design, if the current study shows potential for fault rupture.

Katie indicated that counsel will include preconstruction conditions that risk analyses will need to be reanalyzed for current codes. If Perennial can show that there is enough info to demonstrate no serious risk, we may be able to move forward without full LIDAR coverage at this point. But if preliminary info shows risks, Perennial will need to get LIDAR data now.

There was a discussion of site-specific shear wave velocity measurements and a site-specific ground motion study. Conclusion: This type of detailed study would not be required for the revision of Exhibit H but would be a requirement for Final Design.

Yumei stated that it should be considered that CSZE has a long-period bump that is seen further to the east.

EFSC has adopted new structural standards which require a discussion of disaster resiliency and future climate change considerations. These can be addressed at a high level in the revision. Yumei said to keep in mind that climate conditions now aren't going to be the same as in the future. So state what we expect the future to be and how we are going to address those. They don't expect us to address future wind conditions. Resilience, energy facility will feed into macrogrid, so what happens if it's damaged? What steps has Perennial considered to make sure that you'll limit damage and can recover operations asap. Backup generators (limited emergency electricity for the power plant to get back online), etc.? Snow storms, ice storms, other hazards. Have a separate section addressing these.

We then proceeded to have a general discussion regarding what the plant is and what equipment is involved. The plant will be a 4x100-MW GE LMS100 power plant. There is a step-up substation being built for the project. It is directly adjacent to the existing transmission line and to the McNary Substation, so except for a short connection to the existing transmission line, the poles of the existing transmission line will be utilized. The design, construction and operation of the substation is WindChaser's responsibility. Cascade Natural Gas Corp. will provide gas to WindChaser with a new pipeline. The design, construction and operation of the pipeline is WindChaser's responsibility. Specific boring locations were taken based on where the generation equipment will be. S&W indicated that the last work done for the project was in 2014. No site-specific study was done at that time, it was all code based. No shear wave velocity measurements were taken at the site.

Shear wave velocity measurements are not planned for the update to Exhibit H, but will be recommended for Final Design. Geohazards studies, etc. will be done, but site-specific ground motion studies wouldn't be completed at this time.

Yumei indicated that the Geotech report should include those site-specific things prior to construction. Katie indicated that they will be required as part of final Geotech study, but not necessarily part of this update. Yumei agreed.

Please note that we received the DOGAMI Scope of Review document and we have reviewed it.

IMPORTANT INFORMATION

Important Information

About Your Geotechnical/Environmental Report

IMPORTANT INFORMATION

CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

THE CONSULTANT'S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical/environmental report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used (1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors that were considered in the development of the report have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical/environmental report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/environmental report. The consultant should be kept apprised of any such events and should be consulted to determine if additional tests are necessary.

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your consultant can work together to help reduce their impacts. Retaining

IMPORTANT INFORMATION

your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your consultant's report are preliminary, because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical/environmental report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.

Final boring logs developed by the consultant are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical/environmental reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY.

Because geotechnical/environmental engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims

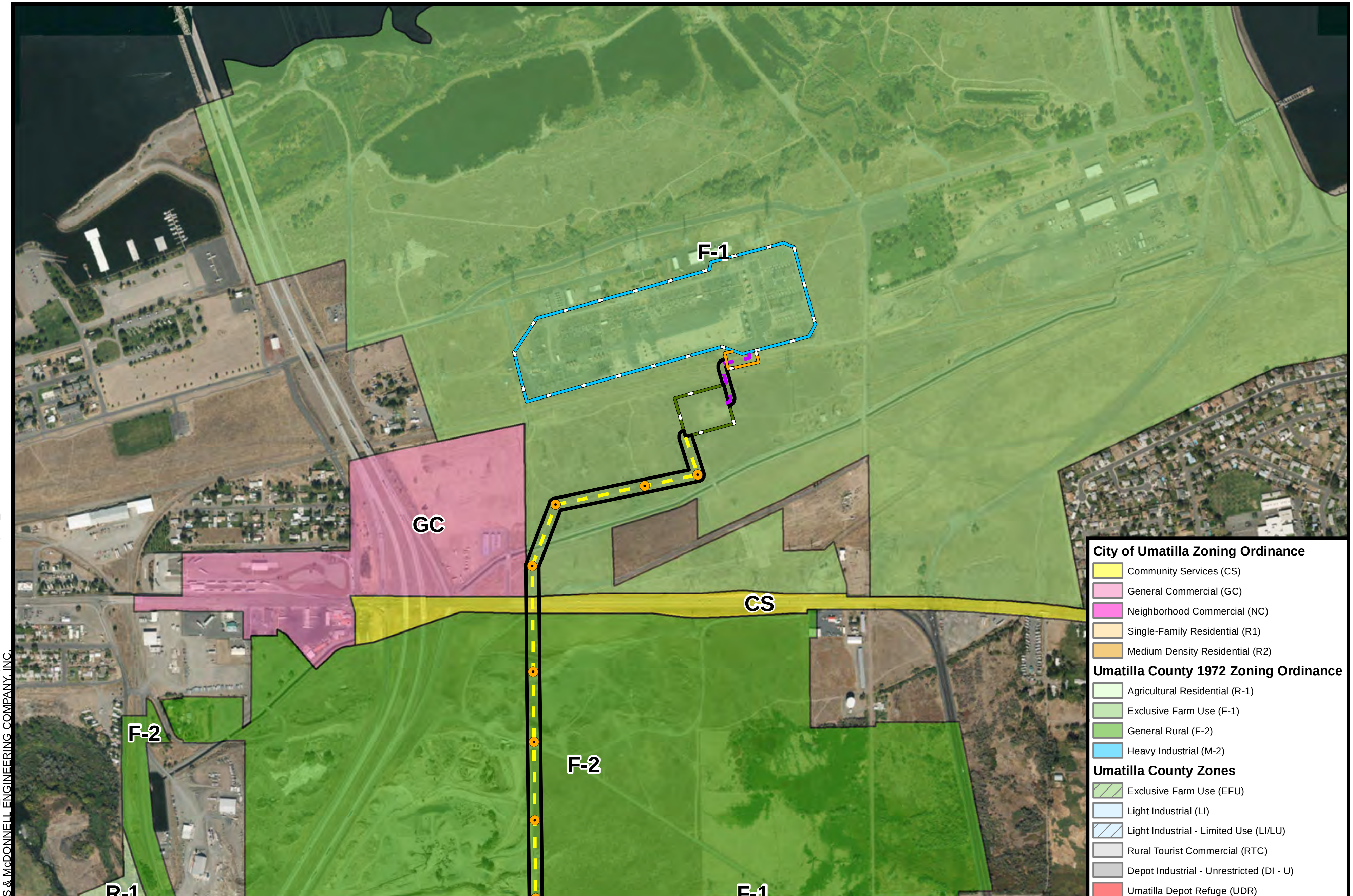
IMPORTANT INFORMATION

being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in their contracts, reports, and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

The preceding paragraphs are based on information provided by the ASFE/Association of Engineering Firms Practicing in the Geosciences, Silver Spring, Maryland

ATTACHMENT 6

Figure K-1 - Zoning Map and Figure K-2 - Aspect Criteria For Viticultural Area



Legend

Energy Facility Site
Site Boundary
Step-up Substation Boundary
McNary Substation
Existing Transmission Line
Proposed Underground Transmission Line
Proposed Transmission Line
Proposed Riser Structure Fenced Area
Proposed Gas Line
Existing Transmission Structure
Proposed Transmission Structure

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Scale in Feet

Hermis

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Figure K-1
Project Overview
Perennial Wind Chaser Station
Umatilla County, Oregon

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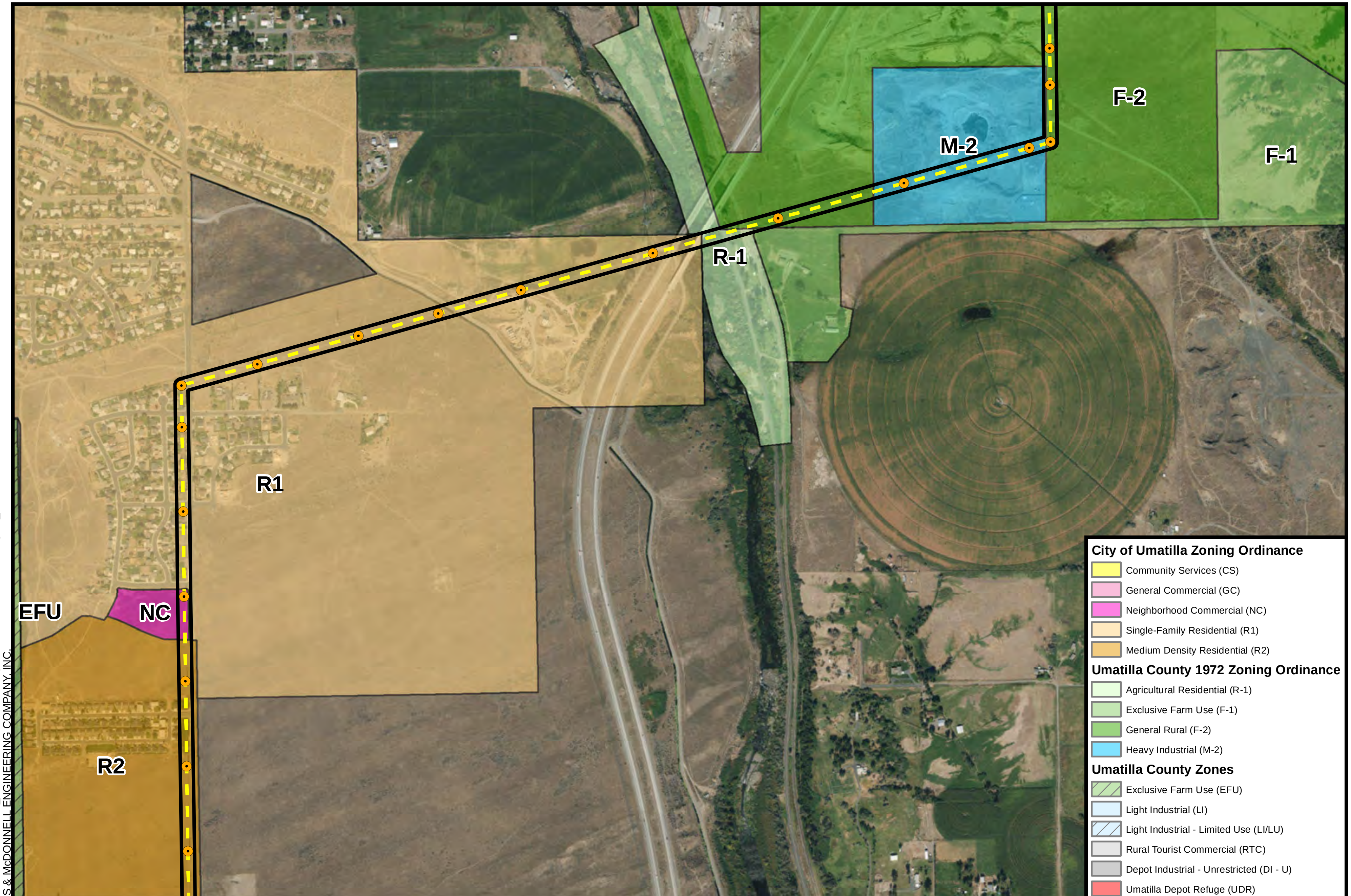
Issued: September, 26 2018
Source: City of Umatilla, ESRI and Burns & McDonnell Engineering, Inc.



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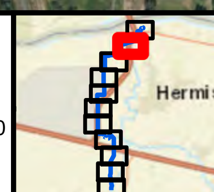

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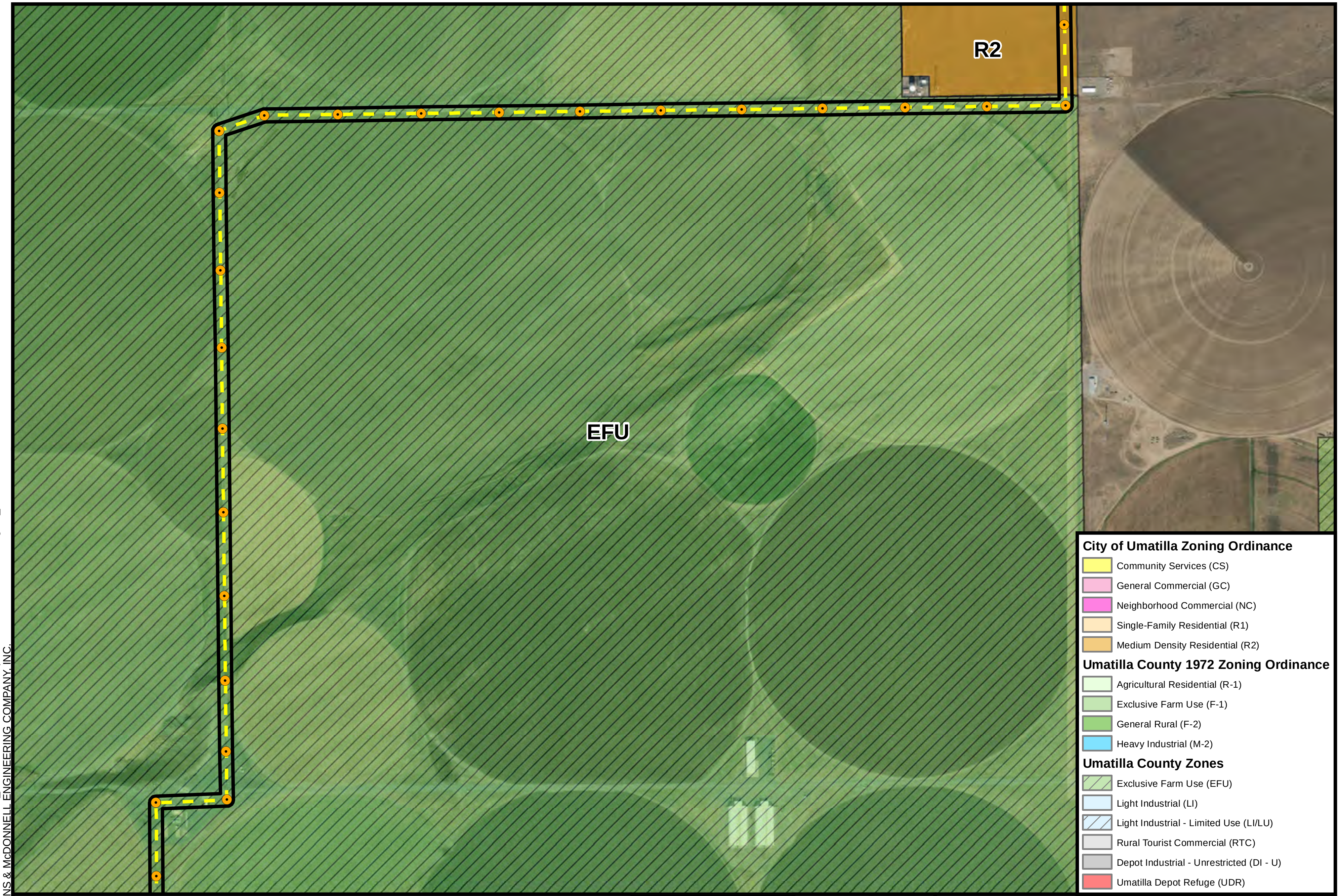

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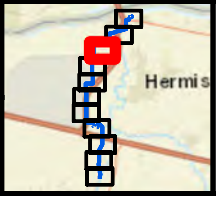

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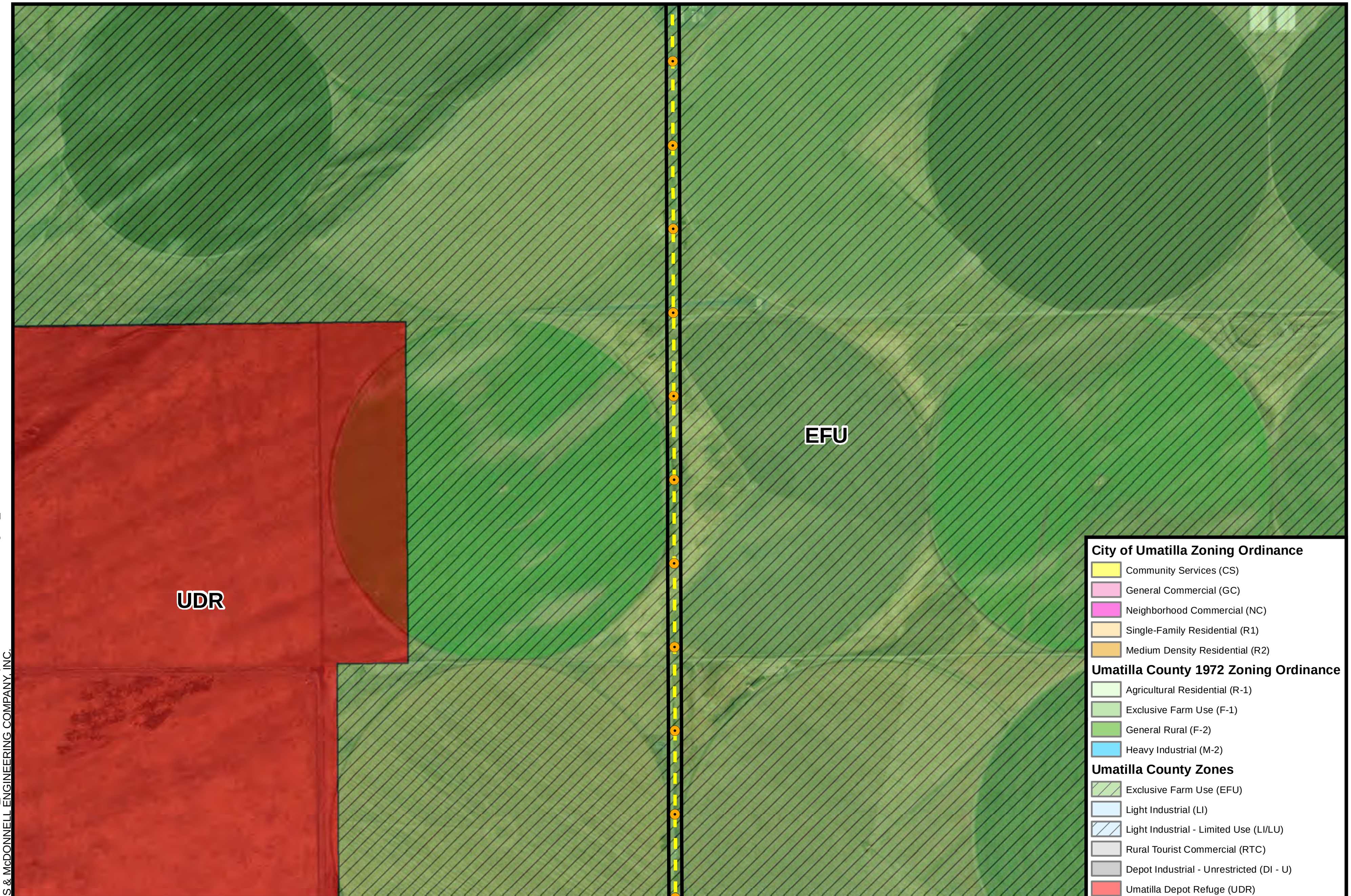

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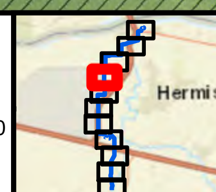

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Page 4 of 11

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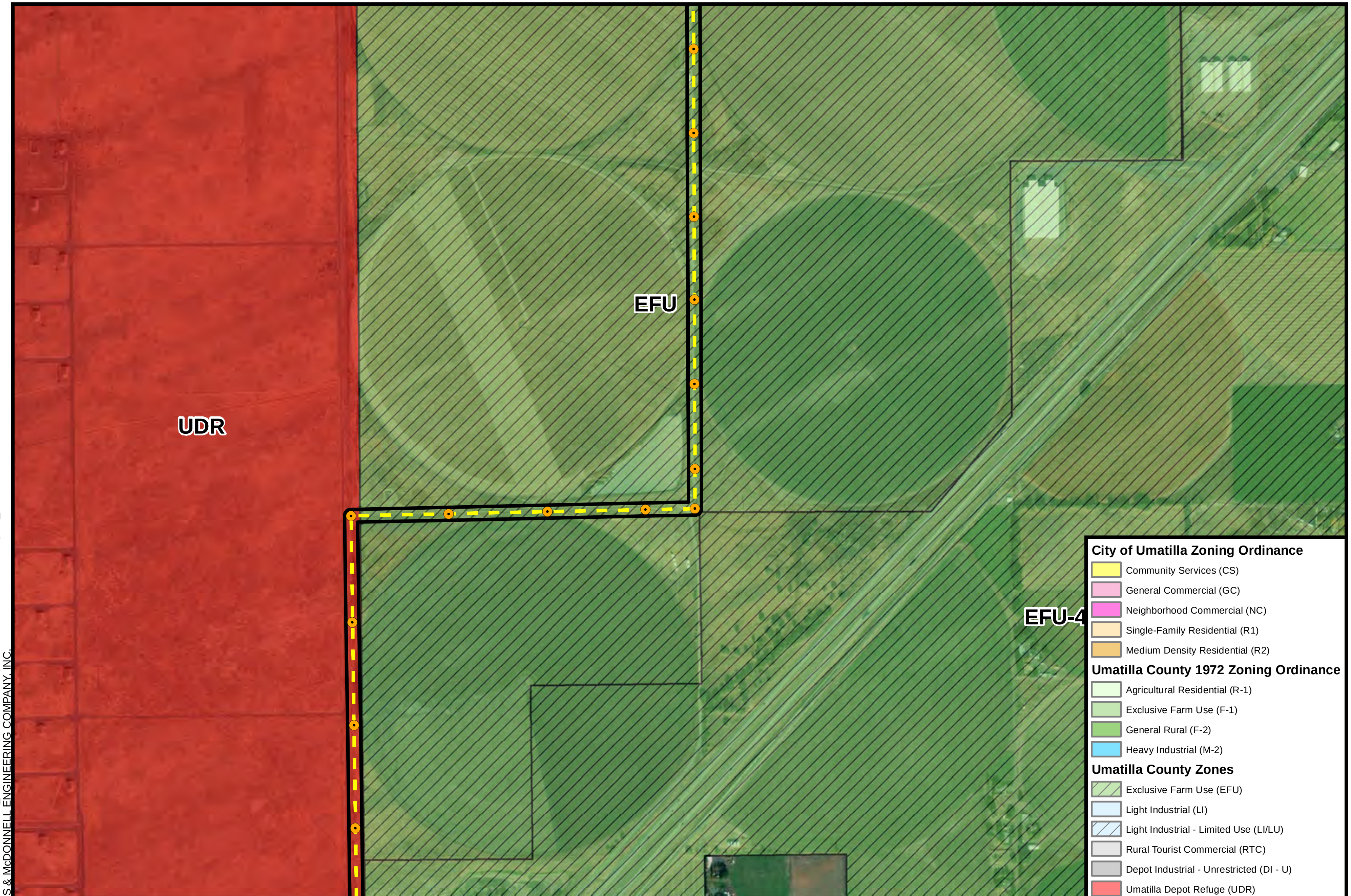

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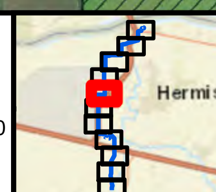

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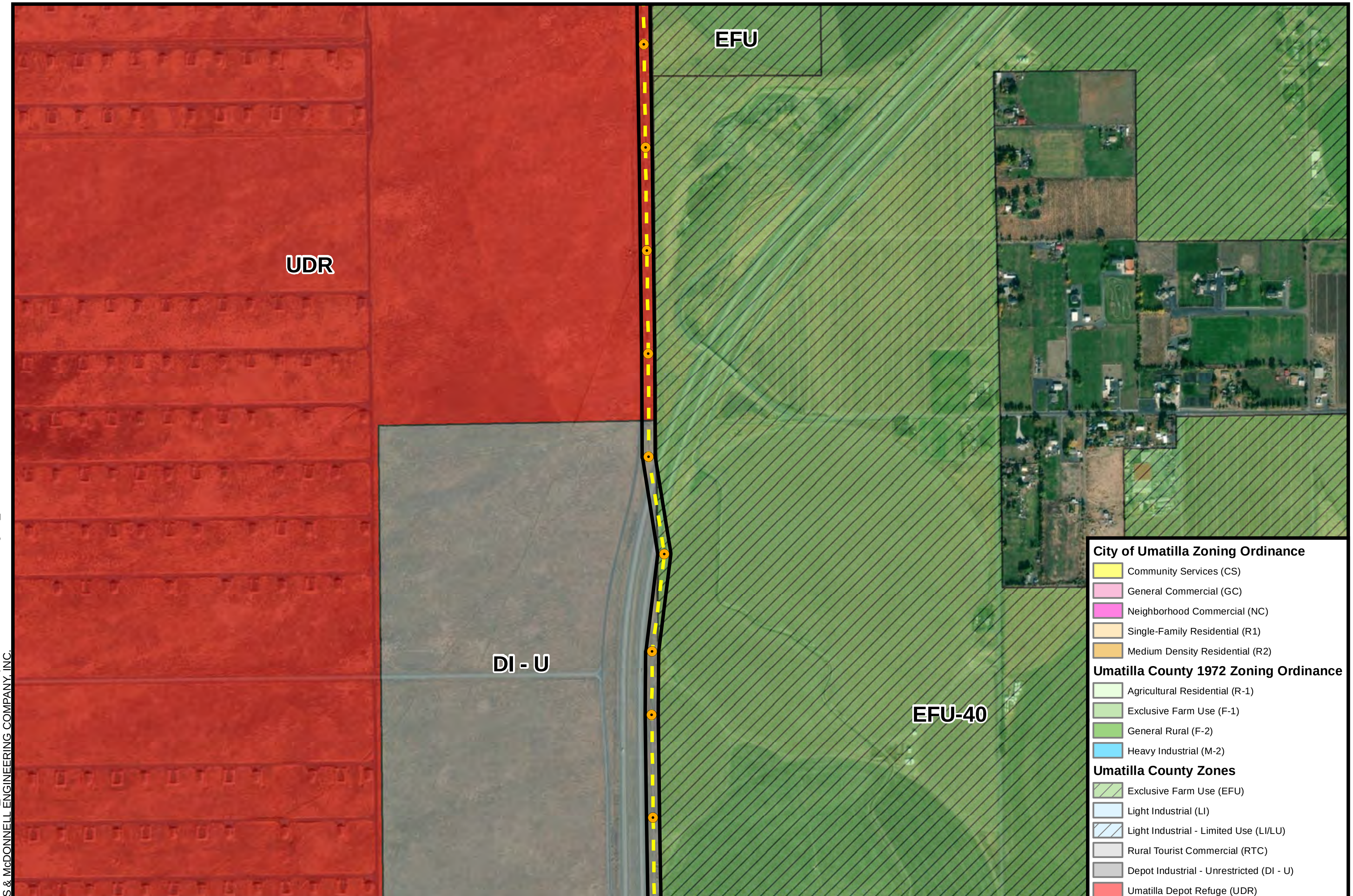

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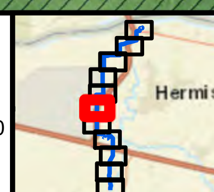

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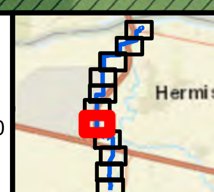

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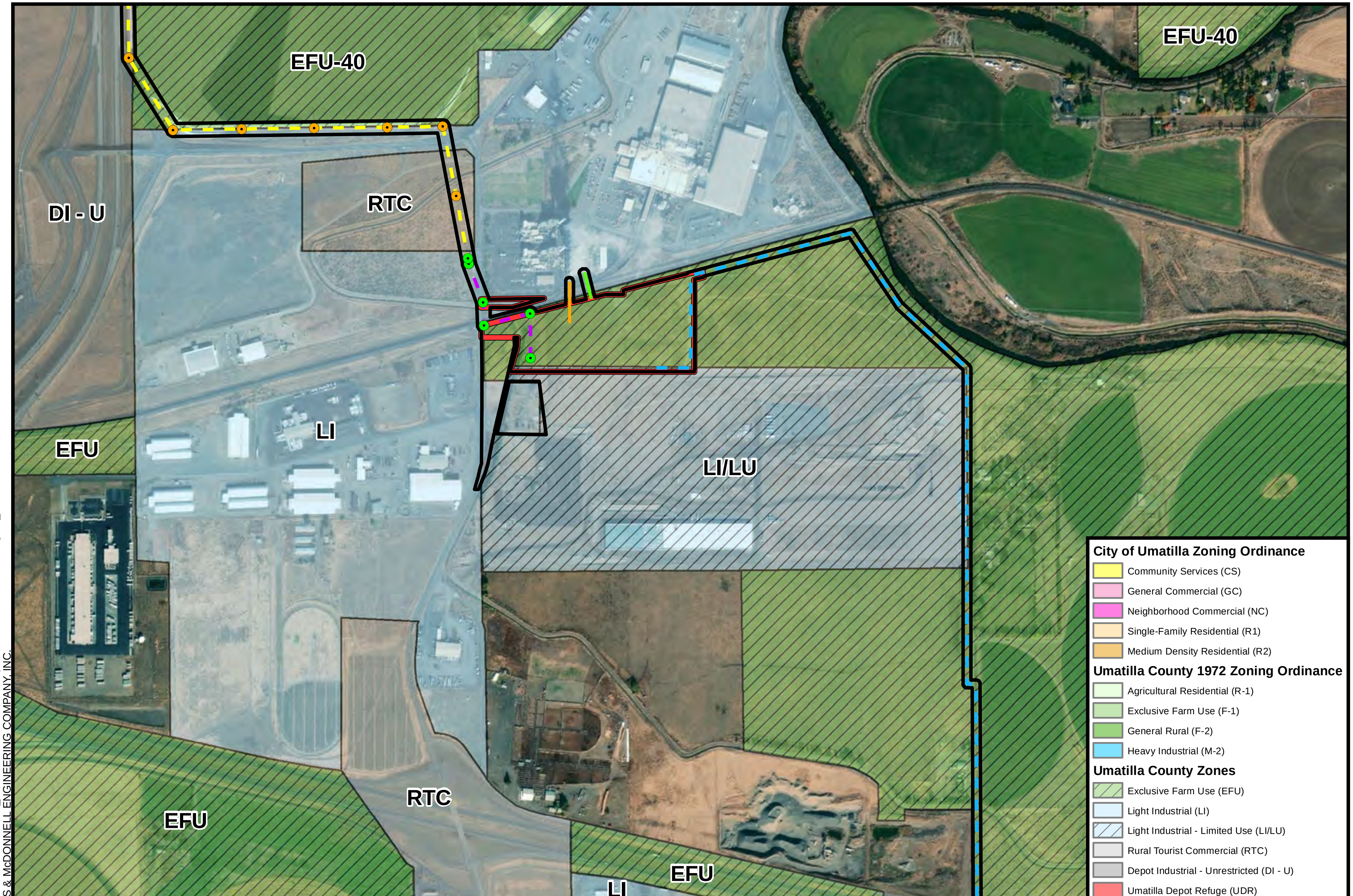

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Umatilla County, Oregon

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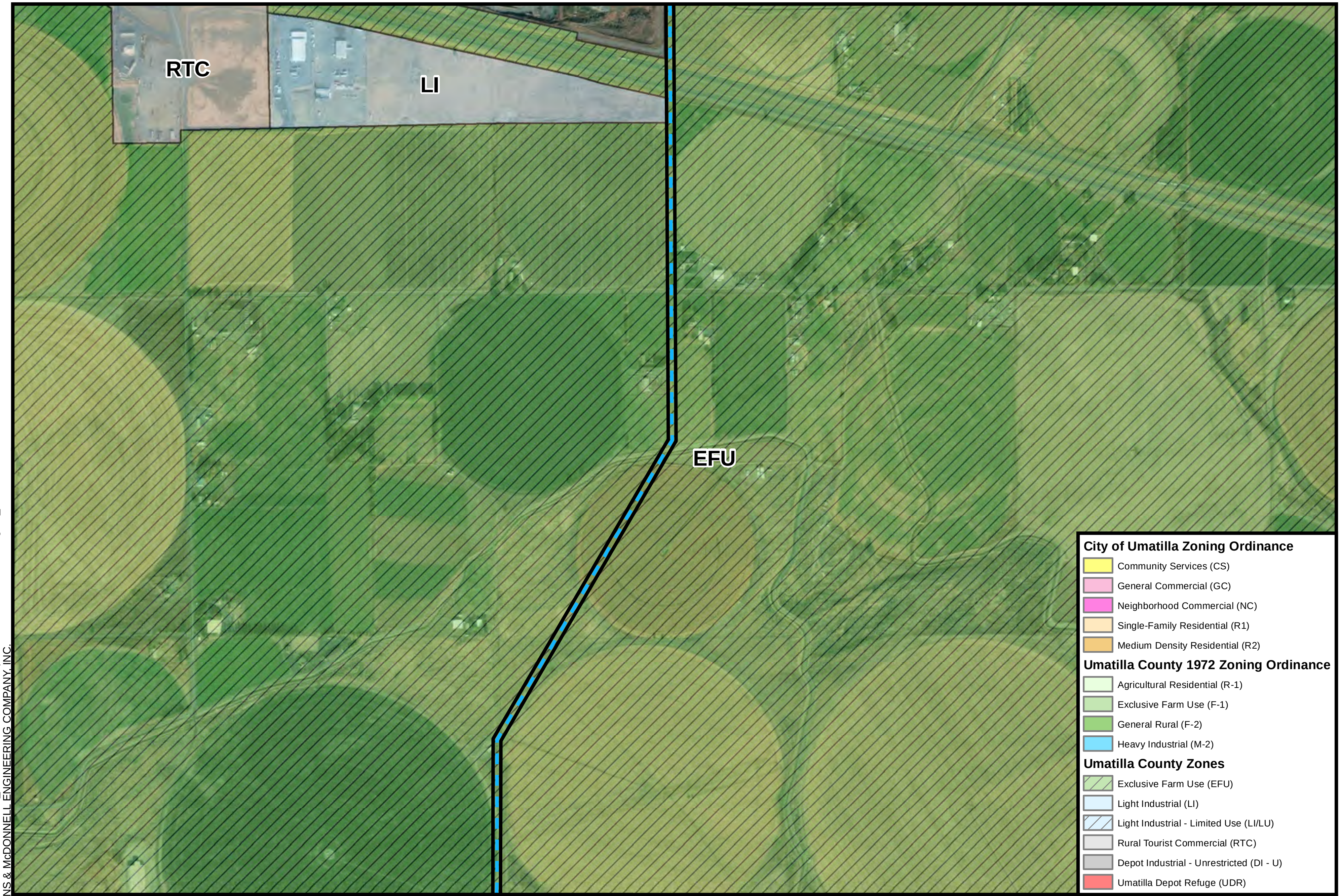

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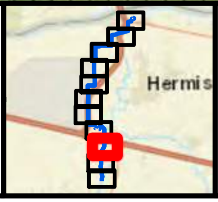
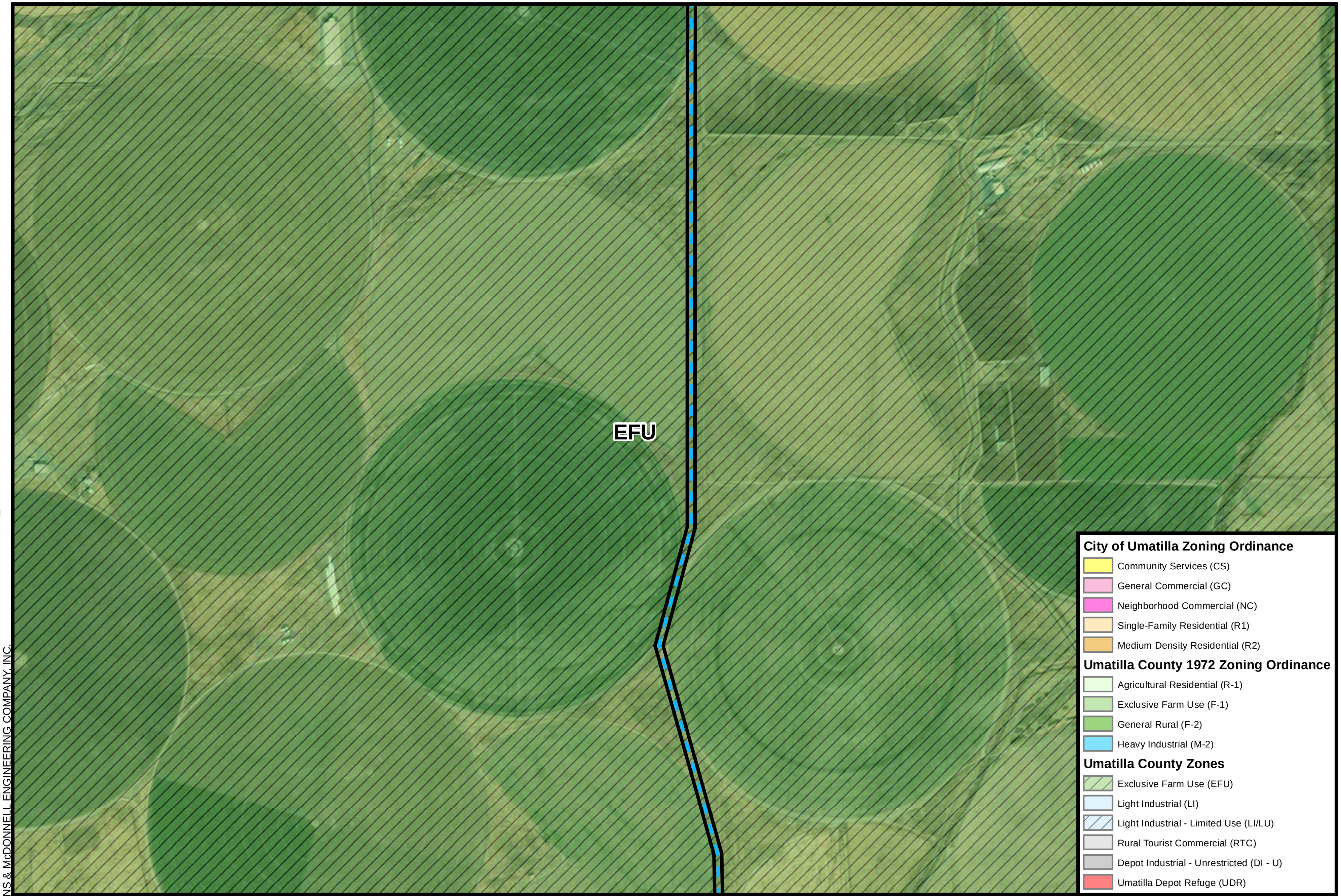


BURNS & McDONNELL

Figure K-1
Project Overview
Perennial Wind Chaser Station
Umatilla County, Oregon

Issued: September, 26 2018
Source: City of Umatilla, ESRI and Burns & McDonnell Engineering, Inc.



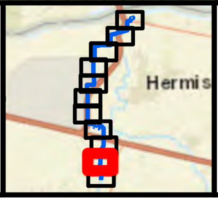
Legend

- Energy Facility Site
- Site Boundary
- Step-up Substation Boundary
- McNary Substation
- Existing Transmission Line
- Proposed Underground Transmission Line
- Proposed Transmission Line
- Proposed Riser Structure Fenced Area
- Proposed Gas Line
- Existing Transmission Structure
- Proposed Transmission Structure

N

500 250 0 500

Scale in Feet



BURNS McDONNELL

Figure K-1
Project Overview
Perennial Wind Chaser Station
Umatilla County, Oregon

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Issued: September, 26 2018
Source: City of Umatilla, ESRI and Burns & McDonnell Engineering, Inc.

City of Umatilla Zoning Ordinance
- Community Services (CS)
- General Commercial (GC)
- Neighborhood Commercial (NC)
- Single-Family Residential (R1)
- Medium Density Residential (R2)

Umatilla County 1972 Zoning Ordinance
- Agricultural Residential (R-1)
- Exclusive Farm Use (F-1)
- General Rural (F-2)
- Heavy Industrial (M-2)

Umatilla County Zones
- Exclusive Farm Use (EFU)
- Light Industrial (LI)
- Light Industrial - Limited Use (LI/LU)
- Rural Tourist Commercial (RTC)
- Depot Industrial - Unrestricted (DI - U)
- Umatilla Depot Refuge (UDR)

Legend
- Energy Facility Site
- Site Boundary
- Step-up Substation Boundary
- McNary Substation
- Existing Transmission Line
- Proposed Underground Transmission Line
- Proposed Transmission Line
- Proposed Riser Structure Fenced Area
- Proposed Gas Line
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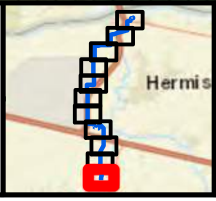
N

500 250 0 500

Scale in Feet



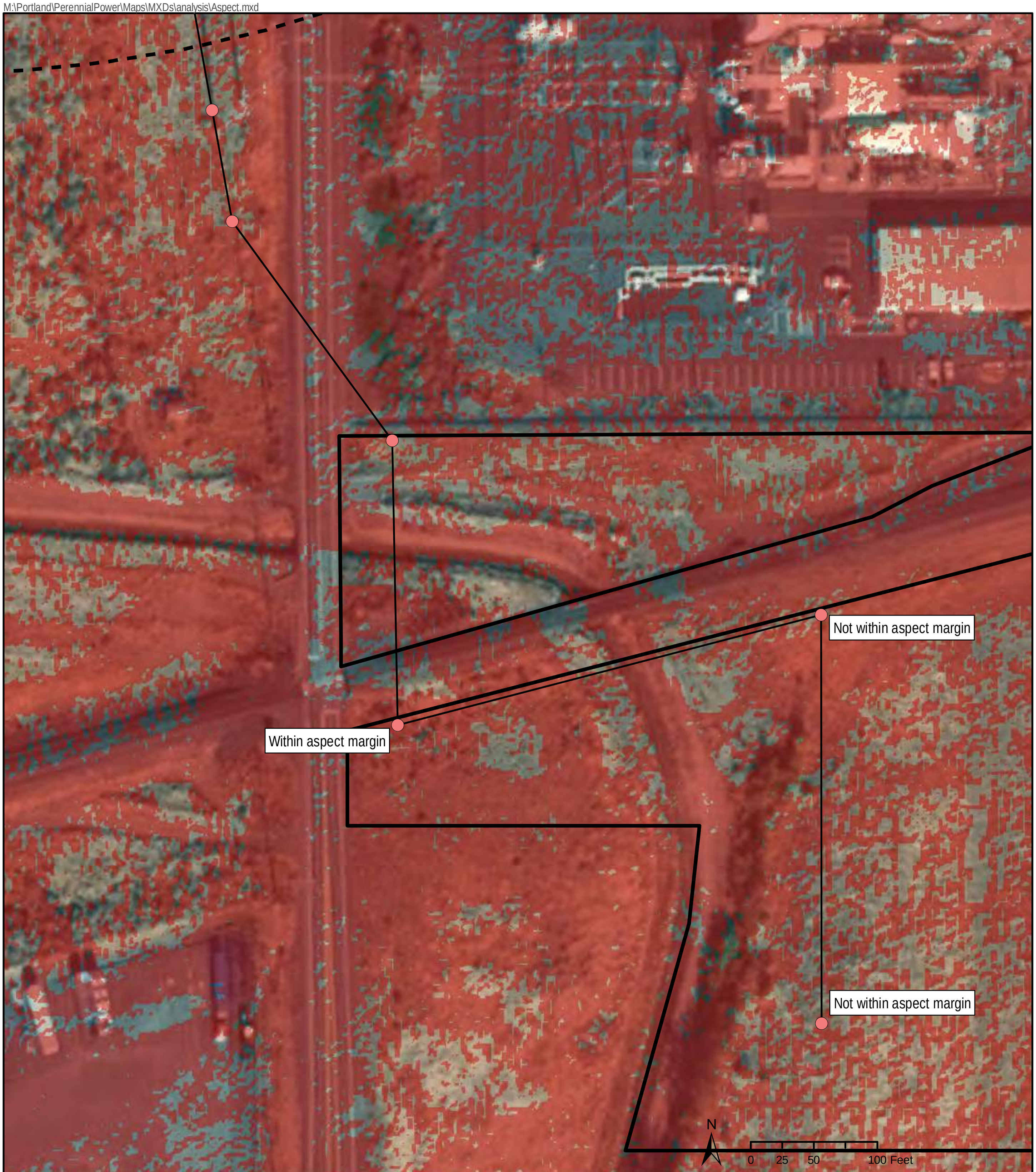
BURNS & McDONNELL

Figure K-1
Project Overview
Perennial Wind Chaser Station
Umatilla County, Oregon

Path: \\bmcdfs\Clients\ENS\Perennial\107891_WindChaser\Studies\Geospatial\DataFiles\ArcDocs\Figure_R.mxd

Issued: September, 26 2018
Source: City of Umatilla, ESRI and Burns & McDonnell Engineering, Inc.

M:\Portland\PerennialPower\Maps\MXDs\analysis\Aspect.mxd



New Pole
Mileposts
Natural Gas Pipeline
Existing Transmission Line
Stringing Areas 1,000-foot Buffer
Energy Facility Site

Source: NWI 2018; NHD 2018

Aspect
-1 - 67.5 degrees
67.5 - 292.5 degrees

Figure K-2

Aspect Criteria for Viticultural Area Transmission Poles Within High Value Farm Land

Perennial Wind Chaser Station

January 2019

ATTACHMENT 7

Financial Capability Letter and Exhibit W – Facility Retirement

MUFG

October 5, 2018

Shigenobu Hamada
President
Perennial Power Holdings, Inc.
300 Madison Ave., NY, New York, 10017

Dear Mr. Hamada,

MUFG Bank, Ltd. ("MUFG") has an important business relationship with Perennial Power Holdings, Inc. ("PPH") and its parent, Sumitomo Corporation ("Sumitomo"), supporting its various financing needs across the world throughout the history of the company. As one of your key relationship banks, we are very interested in continuing to expand and strengthen our relationship by seeking to lead future project financing transactions.

We have been discussing with you the nominally rated 415 MW project currently under development adjacent to your existing Hermiston Generating Plant (the "Project"), located in Hermiston, Oregon. We understand that you need to arrange a letter of credit to Perennial WindChaser LLC (PWC), a wholly owned subsidiary of PPH in an amount of approximately $6.5 million dollars ($ 6,500,000) for the purpose of ensuring PWC's obligation to assure the site of the Perennial Wind Chaser Station will be restored to a useful non-hazardous condition at the end of the operation period.

MUFG is willing to arrange the required letter of credit subject to receipt of further information, our customary due diligence and internal credit approval.

Sincerely,

MUFG Bank, Ltd.

By:______________________________
Name: Takaki Sakai
Title: Managing Director

EXHIBIT W

FACILITY RETIREMENT

OAR 345-021-0010(1)(w)

TABLE OF CONTENTS

APPENDICES

W.1 INTRODUCTION

OAR 345-021-0010(1)(w) *Information about site restoration, providing evidence to support a finding by the Council as required by OAR 345-022-0050(1).*

Response: Under Oregon Administrative Rule (OAR) 345-022-0050(1), before the Oregon Energy Facility Siting Council (Council) can approve the Perennial Wind Chaser Station project (Project), it must determine that the Project site can be restored adequately to a useful, non-hazardous condition following permanent cessation of construction or operation of the Project. This updated exhibit describes the expected operating life of the Project, how it will be retired, and how the site will be restored at the end of its useful life. The reasons for the extensive update is to first express the cost estimate in 2018 dollars, and second because the Oregon Department of Energy has not updated the retirement cost estimate workbooks or guidance since Jan 2011, and no longer recommends these be used in retirement cost estimating because the unit costs are outdated. Thus, the updated exhibit uses a proven approach from Perennial's engineering firm, Burns & McDonnell, to developing retirement and restoration estimates. This exhibit also explains how Perennial-WindChaser LLC (Perennial) will manage and monitor hazardous waste at the Site.

W.2 SUMMARY

For the purpose of this Application for Site Certificate (ASC), the useful life of the Project is 30 years. At the end of its useful life, the Project will be retired and the site restored to a useful, non-hazardous condition in accordance with the approved retirement plan and in compliance with all laws and regulations in effect at the time of retirement. The cost of site restoration is expected to be $6.26 million, expressed in 2018 dollars.

In addition, Perennial is keeping the installation of a zero liquid discharge (ZLD) system at the Project site as a potential alternative. Since this option would affect the restoration cost estimate, this updated exhibit also addresses compliance with OAR 345-022-0050(1) as an alternative scenario. The cost of site restoration if a ZLD system is installed is expected to be $6.27 million, expressed in 2018 dollars.

W.3 USEFUL LIFE

OAR 345-021-0010(1)(w)(A) *The estimated useful life of the proposed facility.*

Response: Perennial plans to operate the Project for as long as a market exists for the electrical energy that it produces. For the purpose of the ASC, the estimated useful life of the Project is 30 years. When it is determined that there is no future market for the electrical energy produced by the Project, a retirement plan will be developed that is appropriate for the intended use of the site and then-current technology and submitted to the Council for its approval. The retirement plan will outline how the Project will be retired and the site restored to a useful, non-hazardous condition.

W.4 RETIREMENT AND SITE RESTORATION

OAR 345-021-0010(1)(w)(B) *The specific actions and tasks to restore the site to a useful, non-hazardous condition.*

Response: When the decision is made to retire the Project, the site will be restored to a useful, non-hazardous condition in accordance with the approved retirement plan. For the purposes of the retirement and financial assurance standard, a 'useful, non-hazardous condition' is a condition consistent with the applicable local comprehensive land use plan and land use regulations[1]. The Project and the natural gas pipeline will be sited on land in areas currently zoned for Exclusive Farm Use (EFU). The transmission line will cross lands with a variety of zoning designations, including EFU and urban designations within Umatilla County and City of Umatilla. Site restoration will be conducted in compliance with conditions in the approved retirement plan and in compliance with all contemporary laws and regulations in effect at the time of retirement. Site restoration will consist primarily of the dismantling and removing most equipment and structures and restoring the site to a useful condition. Transmission line tower foundations, if not being used by another energy source, will be removed to a depth of 4 feet below grade. Water pipelines will be capped and left in place. Water supply wells, if any are installed and if not used by another entity, will be abandoned in accordance with applicable Oregon laws and regulations. The natural gas pipeline will be disconnected from the header and capped, and the pipes will be left in place. Two years prior to the date on which Perennial expects to permanently shut down the Project, a site restoration plan will be developed and submitted to the Council for approval.

W.5 ESTIMATED COST OF RETIREMENT

OAR 345-021-0010(1)(w)(C) *An estimate, in current dollars, of the total and unit costs of restoring the site to a useful, non-hazardous condition.*

OAR 345-021-0010(1)(w)(D) *A discussion and justification of the methods and assumptions used to estimate site restoration costs.*

[1] Oregon Energy Facility Siting Council, In the Matter of the Application for a Site Certificate for the Port Westward Generating Project, Final Order 46 (Nov. 8, 2002).

Response: The costs to retire the Project and restore the Project site are estimated to be $6.26 million, assuming that all structures are to be removed from site, and with no credit for scrap. For the alternative scenario with ZLD, the costs to retire and restore the site are estimated to be $6.27 million. The final costs to restore the Project site will depend on the nature of the zoning regulations and the approved retirement plan.

The estimate was developed using a proven approach from Perennial's engineering firm, Burns & McDonnell, to developing retirement and restoration estimates. Table W-1 shows a summary breakdown of the retirement cost estimates; Table W-2 shows a summary breakdown of the retirement cost estimates for the alternative scenario with ZLD.

The retirement and restoration costs presented above include the costs to return the site to a condition compatible with the surrounding land, similar to the conditions that existed before development of the Project. This includes the costs to dismantle the four LMS100 combustion turbine generators owned by Perennial, as well as the costs to dismantle all Perennial-owned balance of plant facilities.

The site retirement costs were developed based on order-of-magnitude quantities using in-house information available to Perennial's engineering firm, Burns & McDonnell, and historical quantities data from other similar projects.

The following assumptions are included in this determination of the retirement costs for the Project:

1. Cost estimates are presented in 2018 dollars.
2. Labor costs are developed using unit rates in RSMeans online.
3. Project-related indirect costs are included at 5 percent, which differs from the previous study. In a draft submittal of Exhibit W to ODOE, Burns & McDonnell was told that ODOE no longer uses the 2011 guidance and therefore Burns & McDonnell used 5 percent which is consistent with other decommissioning studies conducted by Buns & McDonnell and feedback received from clients on actual decommissioning projects.
4. Contingencies are included at 20 percent.
5. All above-grade structures and buildings are included for demolition, unless otherwise noted herein.
6. Cost estimates include the demolition of all buildings onsite, including administration buildings, the water treatment building, and any other ancillary buildings. To the extent possible, any spare parts, tools, inventory, or equipment in the buildings will be transferred to another facility or sold prior to decommissioning activities commencing and remaining spare parts will be scrapped by the demolition contractor.

7. All facilities will be decommissioned to zero generating output. Existing utilities will remain in place for use by the contractor for the duration of these demolition activities.
8. The onsite 230-kilovolt (kV) switchyard, and the 500-kV step-up substation are included in the demolition scope. Additionally, the five transmission towers between the tie-in to the 230-kV system and the 500-kV step-up substation are included in the scope and will be removed from site upon decommissioning and demolition of the plant.
9. The 11.59-mile conductor line is included in the demolition scope; however, the existing transmission towers are not.
10. The underground wiring to the McNary Substation is included in the cost estimates.
11. The natural gas pipeline lateral will be disconnected from the Gas Transmission Northwest (GTN) interstate transmission pipeline header and capped. The pipeline from the GTN tie-in to the Site Boundary will be left in place.
12. All burnable lubricating oil, fuel oil, and other chemicals will be consumed prior to commencement of demolition activities. Costs to handle and dispose of fuels and chemicals are not included in this estimate.
13. Site areas will be graded to achieve suitable site drainage to natural drainage patterns, but grading will be minimized to the greatest extent possible.
14. Cost for offsite disposal is included for all materials, including debris and concrete.
15. Crushed rock is assumed to be disposed of onsite by using it for clean fill, or it will be recycled by the demolition contractor for beneficial use.
16. All structures 4 feet below grade and above grade will be demolished. All structures below 4 feet will be abandoned in place unless otherwise stated in the assumptions as being demolished.
17. Since no asbestos, underground storage tanks, or lead paint are expected onsite, inspection costs for these items are not included.
18. It is anticipated that sufficient onsite material will be available to backfill the stormwater basin, thus an additional cost for bringing in outside fill has not been included.
19. Owner’s costs are not included.
20. Disturbed site areas will be seeded after they are graded to provide suitable ground cover to prevent soil erosion.
21. Salvage value for equipment and scrap values are not included in the cost estimates.

W.6 MONITORING PLAN

OAR 345-021-0010(1)(w)(E) *For facilities that might produce site contamination by hazardous materials, a proposed monitoring plan, such as periodic environmental site assessment and reporting, or an explanation why a monitoring plan is unnecessary.*

Response: Hazardous materials to be stored and used at the Project site include, but are not limited to, lubricating oils, aqueous ammonia, chemicals fed into the cooling tower and used for turbine wash, and pipe cleaning, solvents, and batteries. Hazardous materials will be used and stored in a manner that will minimize the chance of accidental release to the environment and be consistent with a site-specific materials management and monitoring plan that Perennial will develop and implement. Hazardous waste will be disposed of through an appropriate waste disposal service provider. Condition PRE-SP-01 of the Site Certificate requires that the certificate holder develop and implement a Hazardous Materials Management and Monitoring Plan.

APPENDIX W-1

Detailed Cost Estimate Spreadsheet

Table W-1
Wind Chaser
Decommissioning Cost Summary

	Labor	Material and Equipment	Disposal	Environmental	Total Cost	Scrap Value
Wind Chaser						
CTs 1-4						
Turbines & Foundations	$ 960,000	$ 1,086,000	$ -	$ -	$ 2,047,000	$ -
GSUs	$ 18,000	$ 21,000	$ -	$ -	$ 39,000	$ -
On-site Concrete Crushing & Disposal	$ -	$ -	$ 34,000	$ -	$ 34,000	$ -
Debris	$ -	$ -	$ 15,000	$ -	$ 15,000	$ -
Scrap	$ -	$ -	$ -	$ -	$ -	$ -
Subtotal	**$ 979,000**	**$ 1,107,000**	**$ 49,000**	**$ -**	**$ 2,135,000**	**$ -**
Common						
Switchyard and Substation	$ 60,000	$ 68,000	$ -	$ -	$ 128,000	$ -
BOP Misc.	$ 500,000	$ 565,000	$ -	$ -	$ 1,065,000	$ -
Roads	$ 26,000	$ 29,000	$ -	$ -	$ 55,000	$ -
All BOP Buildings	$ 7,000	$ 7,000	$ -	$ -	$ 14,000	$ -
Fuel Equipment	$ 55,000	$ 63,000	$ -	$ -	$ 118,000	$ -
All Other Tanks	$ 17,000	$ 19,000	$ -	$ -	$ 36,000	$ -
Transformers & Foundation	$ 160,000	$ 181,000	$ -	$ -	$ 341,000	$ -
Cooling Towers and Basin	$ 101,000	$ 115,000	$ -	$ -	$ 216,000	$ -
Hazardous Waste Disposal	$ -	$ -	$ -	$ 500,000	$ 500,000	$ -
Concrete Removal, Crushing, & Disposal	$ -	$ -	$ 66,000	$ -	$ 66,000	$ -
Grading & Seeding	$ -	$ -	$ -	$ 317,000	$ 317,000	$ -
Debris	$ -	$ -	$ 18,000	$ -	$ 18,000	$ -
Scrap	$ -	$ -	$ -	$ -	$ -	$ -
Subtotal	**$ 926,000**	**$ 1,047,000**	**$ 84,000**	**$ 817,000**	**$ 2,874,000**	**$ -**
Wind Chaser Subtotal	**$ 1,905,000**	**$ 2,154,000**	**$ 133,000**	**$ 817,000**	**$ 5,009,000**	**$ -**
TOTAL DECOM COST (CREDIT)					**$ 5,009,000**	**$ -**
PROJECT INDIRECTS (5%)					**$ 250,000**	
CONTINGENGY (20%)					**$ 1,002,000**	
TOTAL PROJECT COST (CREDIT)					**$ 6,261,000**	**$ -**
TOTAL NET PROJECT COST (CREDIT)					**$ 6,261,000**	

APPENDIX W-2

Detailed Cost Estimate Spreadsheet Alternative Scenario with Zero Liquid Discharge

Table W-2
Wind Chaser
Decommissioning Cost Summary

	Labor	Material and Equipment	Disposal	Environmental	Total Cost	Scrap Value
Wind Chaser						
CTs 1-4						
From	Categories		$ -	$ -	$ 2,047,000	$ -
Dowdell, Chris			$ -	$ -	$ 39,000	$ -
On-site Concrete Crushing & Disposal	$ -	$ -	$ 34,000	$ -	$ 34,000	$ -
Debris	$ -	$ -	$ 15,000	$ -	$ 15,000	$ -
Scrap	$ -	$ -	$ -	$ -	$ -	$ -
Subtotal	**$ 979,000**	**$ 1,107,000**	**$ 49,000**	**$ -**	**$ 2,135,000**	**$ -**
Common						
Switchyard and Substation	$ 60,000	$ 68,000	$ -	$ -	$ 128,000	$ -
BOP Misc.	$ 482,000	$ 546,000	$ -	$ -	$ 1,028,000	$ -
Roads	$ 26,000	$ 29,000	$ -	$ -	$ 55,000	$ -
All BOP Buildings	$ 7,000	$ 7,000	$ -	$ -	$ 14,000	$ -
Fuel Equipment	$ 55,000	$ 63,000	$ -	$ -	$ 118,000	$ -
All Other Tanks	$ 17,000	$ 19,000	$ -	$ -	$ 36,000	$ -
Transformers & Foundation	$ 160,000	$ 181,000	$ -	$ -	$ 341,000	$ -
Cooling Towers and Basin	$ 101,000	$ 115,000	$ -	$ -	$ 216,000	$ -
ZLD	$ 22,000	$ 25,000	$ -	$ -	$ 47,000	$ -
Hazardous Waste Disposal	$ -	$ -	$ -	$ 500,000	$ 500,000	$ -
Concrete Removal, Crushing, & Disposal	$ -	$ -	$ 66,000	$ -	$ 66,000	$ -
Grading & Seeding	$ -	$ -	$ -	$ 317,000	$ 317,000	$ -
Debris	$ -	$ -	$ 18,000	$ -	$ 18,000	$ -
Scrap	$ -	$ -	$ -	$ -	$ -	$ -
Subtotal	**$ 930,000**	**$ 1,053,000**	**$ 84,000**	**$ 817,000**	**$ 2,884,000**	**$ -**
Wind Chaser Subtotal	**$ 1,909,000**	**$ 2,160,000**	**$ 133,000**	**$ 817,000**	**$ 5,019,000**	**$ -**
TOTAL DECOM COST (CREDIT)					**$ 5,019,000**	**$ -**
PROJECT INDIRECTS (5%)					**$ 251,000**	
CONTINGENGY (20%)					**$ 1,004,000**	
TOTAL PROJECT COST (CREDIT)					**$ 6,274,000**	**$ -**
TOTAL NET PROJECT COST (CREDIT)					**$ 6,274,000**	

ATTACHMENT 8

Biological Resources Survey Report

Perennial Wind Chaser Station

2019 Biological Resources Survey Report

Prepared for:
Perennial-WindChaser LLC
600 Third Avenue, 30F
New York, New York 10016

June 2019

Table of Contents

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Figure **Page**

List of Abbreviations and Acronyms

E & E	Ecology and Environment, Inc.
GPS	global positioning system
HGP	Hermiston Generating Plant
kV	kilovolt
NHD	National Hydrography Dataset
NWI	National Wetland Inventory
ODA	Oregon Department of Agriculture
ODFW	Oregon Department of Fish and Wildlife
OR GAP	Oregon National Gap Analysis Program
Perennial	Perennial-WindChaser LLC
Project	Perennial Wind Chaser Station
ROW	right-of-way
USFWS	U.S. Fish and Wildlife Service

1.0 Purpose and Scope

Perennial-WindChaser LLC (Perennial) proposes to construct a natural gas combustion turbine electrical generating plant and an associated transmission line and natural gas pipeline (the Perennial Wind Chaser Station, which is referred to herein as the Project) in western Umatilla County, near Hermiston, Oregon (see Appendix A, Figure 1). On September 23, 2015, the Oregon Energy Facility Siting Council issued a Site Certificate approving the Project. The Project has not yet been constructed, and Perennial is currently in the process of preparing a Request for Amendment of the Site Certificate to extend the construction deadlines. The 20-acre power plant site is currently open farmland adjacent to the existing Hermiston Generating Plant (HGP) and other heavy and light industrial uses. The Project will have a peak generating capacity of up to 415 megawatts, produced by four simple-cycle generating blocks. Its estimated operation is an equivalent of 4,400 hours annually at full load, thus enabling the balancing and supplementing of energy generated from wind facilities within the grid.

The Project includes the 20-acre power plant site and associated staging areas; an existing 12-mile, 230-kilovolt (kV) transmission line that connects the HGP to the Bonneville Power Administration McNary Substation (the transmission line will be partially reconductored); a new 5-acre step-up substation and short underground interconnection near the McNary Substation; and a new 4.63-mile-long natural gas pipeline lateral within the existing 50-foot natural gas line right-of-way (ROW) that serves the HGP. This Biological Resources Survey Report has been prepared to support the Request for Amendment of the Site Certificate to extend the construction deadlines.

This report describes surveys that were conducted on April 22 and 23, and May 10, 2019, by Ecology and Environment, Inc. (E & E), to describe vegetation communities in the transmission line disturbance areas (i.e., pulling-tensioning sites), to verify (ground truth) the presence or lack of wetlands/waters in the Project area, and to evaluate Washington ground squirrel (*Urocitellus washingtoni*) and other special status species presence. The field surveys were focused primarily on Project areas that may be disturbed during construction. These areas include the proposed facility site, the proposed step-up substation, the entire length of the 50-foot-wide proposed gas pipeline ROW, and 11 proposed pulling-tensioning sites (staging areas) and two new pole sites along the 230-kV transmission line (see Appendix A, Figures 1 and 2). Each pulling-tensioning site is 50 feet wide and 100 feet long and located under the existing transmission line.

2.0 Survey Methods

Two E & E biologists visited the site on April 22 and 23, and May 10, 2019, to complete the surveys and assessments described below.

The study area for special status plant and wildlife species, habitat types, and wetland/stream verification included all proposed Project disturbance areas:

- Generating facility site and associated staging areas;
- Step-up substation site and underground interconnection corridor adjacent to the McNary Substation;
- Entire length of the 50-foot-wide natural gas pipeline ROW; and
- Eleven pulling-tensioning sites/staging areas (each 50 feet by 100 feet) and two new pole sites along the 230-kV transmission line (see Appendix A, Figures 1 and 2).

For raptor nests, the study area included areas up to approximately 0.25 miles from the areas listed above.

2.1 Vegetation and Habitat Mapping

Vegetation communities and habitat types were mapped in and around the 11 proposed pulling-tensioning sites associated with the 230-kV transmission line, using a two-step process. First, desktop analyses were conducted utilizing information from existing databases. The Oregon National Gap Analysis Program (OR GAP) maintains the most current—but coarse scale—spatial land cover dataset available for the Project area (OR GAP 1999). Second, the results of these desktop analyses were verified and mapped at a finer scale detail to the habitat with field observations. The combined desktop analyses and field verification were used to evaluate vegetation and habitat types present in areas anticipated to be disturbed by the Project. The biologists mapped and labeled vegetation communities in the pulling-tensioning sites and described the dominant plant species present. They also described habitat quality, noting natural or anthropogenic disturbances and presence of designated noxious weeds and other non-native plant species. For all other parts of the study area, the biologists verified vegetation communities and habitats mapped by E & E in 2013 (E & E 2013).

2.2 Special Status Plants

E & E searched for special status plant species in the study area. A table of species listed by the U.S. Fish and Wildlife Service (USFWS) and Oregon Department of Agriculture

(ODA) that potentially occur in the study area was created prior to initiating field surveys (see Table 1).

Table 1 Special Status Plant Species Listed by the USFWS and ODA that Potentially Occur in the Study Area

Common Name	Scientific Name	Status	Phenology	Habitat
Robinson's onion	*Allium robinsonii*	SC	April–May	Shrub-steppe, proximity to high water mark in Columbia River (eFlora 2019)
Laurence's milkvetch	*Astragalus collinus var. laurentii*	SC, ST	April–May	Shrub-steppe, sandy or rocky soils on dry slopes (ODA 2013)
Columbia cress	*Rorippa columbiae*	C	April–October	Proximity to water (NatureServe 2019)

Key:
C = Oregon Department of Agriculture listed as Candidate
ODA = Oregon Department of Agriculture
SC = U.S. Fish and Wildlife Service listed as Species of Concern
ST = Oregon Department of Agriculture listed as Threatened
USFWS = U.S. Fish and Wildlife Service

2.3 Wetlands and Waterbodies

E & E biologists surveyed the 11 pulling-tensioning sites/staging areas (each 50 feet by 100 feet) for wetlands and waterbodies. In all other parts of the study area, the biologists verified previously-mapped (E & E 2013) wetlands and waterbodies. The biologists were equipped with aerial image maps that included areas identified as potential wetlands and streams, which incorporated the most current data available in the National Wetland Inventory (NWI) and the National Hydrography Dataset (NHD).

2.4 Fish and Wildlife Resources

Literature review and queries of available databases were conducted to identify the special status wildlife species with the potential to occur in the vicinity (within 5 miles) of the Project (see Table 2). Potential presence was determined using species' range, habitat requirements, and occurrence data in the analysis area. Resources used to identify these species included, but were not limited to:

- *Atlas of Oregon Wildlife* (Csuti et al. 1997);
- Birds of North America (Poole 2005);
- eBird (2019);
- NatureServe (2019);
- *Oregon Birds* (Marshall et al. 2006);

- Oregon Biodiversity Information Center (ORBIC 2018); and
- Oregon Wildlife Explorer (2019).

Table 2 Special Status Wildlife Species that Potentially Occur in the Study Area

Common Name	Scientific Name	Status[1]
Fish		
Inland Columbia redband trout	*Onchorhynchus mykiss gairdneri*	SS
Bull trout	*Salvelinus confluentus*	FT, SS
Margined sculpin	*Cottus marginatus*	SC
Pacific lamprey	*Lampetra tridentata*	SC, SS
Amphibians		
Western toad	*Anaxyrus boreas*	SS
Reptiles		
Northern sagebrush lizard	*Sceloporus graciosus*	SC, SS
Birds		
Swainson's Hawk	*Buteo swainsoni*	SS
Ferruginous Hawk	*Buteo regalis*	SC, SS
Long-billed Curlew	*Numenius americanus*	SS
Burrowing Owl	*Athene cunicularia*	SC, SS
Lewis's Woodpecker	*Melanerpes lewis*	SC, SS
Willow Flycatcher	*Empidonax traillii adastus*	SC, SS
Loggerhead Shrike	*Lanius ludovicianus*	SS
Sage Sparrow	*Amphispiza belli*	SS
Grasshopper Sparrow	*Ammodramus savannarum*	SS
Yellow-breasted Chat	*Icteria virens*	SC
Tricolored Blackbird	*Agelaius tricolor*	SC
Mammals		
Small-footed myotis	*Myotis ciliolabrum*	SC
Long-eared myotis	*Myotis evotis*	SC
California myotis	*Myotis californicus*	SS
Long-legged myotis	*Myotis volans*	SC, SS
Yuma myotis	*Myotis yumanensis*	SC
Pallid bat	*Antrozous pallidus*	SC, SS
White-tailed jackrabbit	*Lepus townsendii*	SS
Washington ground squirrel	*Urocitellus washingtoni*	FC, SE

Note:
[1]The “Status” column identifies each species designation by the U.S. Fish and Wildlife Service and/or Oregon Department of Fish and Wildlife.
Key:
FC = U.S. Fish and Wildlife Service listed as Candidate
FT = U.S. Fish and Wildlife Service listed as Threatened

Table 2 Special Status Wildlife Species that Potentially Occur in the Study Area

Common Name	Scientific Name	Status[1]

SC = U.S. Fish and Wildlife Service listed as Species of Concern
SE = Oregon Department of Fish and Wildlife listed as Endangered
SS = Oregon Department of Fish and Wildlife listed as Sensitive

2.4.1 General Wildlife Surveys

E & E biologists recorded all wildlife observed incidentally while mapping habitat, identifying wetlands and waterbodies, and documenting special status plants and noxious weeds. The biologists searched for special status wildlife (see Table 2); however, these searches were conducted during the course of searches for Washington ground squirrels, and any observations would be considered incidental to those efforts. Detections of common (i.e., non-special status) species were recorded as notes. All detections of special status species listed in Table 2 were recorded on global positioning satellite (GPS) units and in notes. Biologists maintained a daily record of all wildlife species observed.

The resource-specific methods described below are based on survey protocols established by agency personnel or approved during consultation with agency specialists.

2.4.2 Washington Ground Squirrels

E & E biologists conducted species-specific surveys based on Oregon Department of Fish and Wildlife (ODFW) protocols for Washington ground squirrels in locations where E & E identified suitable habitat in the study area, and where land access was available.

The Washington ground squirrel is listed as endangered by ODFW. Washington ground squirrels have shown an affinity for grassland and shrub-steppe habitats of the Columbia Plateau that occur over silty loam soils, particularly Warden and Sagehill soils (Greene 1999; Morgan 2002). This species occurs east of the Columbia River in Washington and south of the Columbia River in Oregon (USFWS 2013). It can also be found in habitats containing sandy loam soils, although the soil must be able to support burrowing structures.

Surveys were conducted during the species' peak activity period (April to May), in compliance with ODFW survey recommendations. ODFW survey protocols require surveying within at least 785 feet, but sometimes up to 1,000 feet, of all project areas subject to potential ground disturbance where suitable habitat exists, where land access was available. However, E & E was not able to obtain landowner approval to access lands beyond the existing transmission line and natural gas pipeline ROWs, or the proposed sites for the generation station and associated staging areas, and the substation and underground interconnection near McNary Substation. Therefore, surveys were focused on areas that primarily contained native grasslands or shrublands (i.e., not active agricultural lands or other disturbed areas) in suitable habitat in the 50-foot-wide pipeline ROW; within 1,000 feet of the 11 pulling-tension sites for the transmission line (but only within the 100-foot wide transmission line ROW); in the generation station and associated staging areas; and in the substation and underground interconnection near McNary Substation.

Surveys were conducted in the morning and early afternoon hours. E & E biologists surveyed proposed disturbance areas with 100 percent coverage. The biologists used both visual and audible detections to determine Washington ground squirrel presence. Visual indicators of the species' presence include observations of individuals or their scat and potential burrows, while audible indicators include high-tone alarm calls. The suitability of any observed burrows was to be determined based on their size and condition. Washington ground squirrels can occupy burrows with various entrance diameters, and active burrows are typically clear of vegetation, free of spider webs, and structurally sound. The scat of Washington ground squirrels can be differentiated from other burrow-dwelling species that are common in the area by analyzing its shape and size. Washington ground squirrel scat is typically elongate and irregular in shape and larger than the scat of the local mouse and rat species.

According to the survey protocol, if the biologists observed any Washington ground squirrels, their scat, or possible burrows, the surrounding area would be intensively searched to delineate the extent of the potential colony within the ROW. Observed burrows and burrow complexes would be documented on GPS units, with polygons delineating larger complexes. Burrows would be enumerated, habitat described, and additional relevant information recorded in field logbooks. In any areas where the potential for Washington ground squirrel presence was strongly suspected, but squirrel-like burrows were observed without any other sign of the species' presence, the biologists were to note the location on maps and identify the site for possible future investigation.

2.4.3 Raptor Nests

The biologists searched for active and inactive raptor nests up to approximately 0.25 miles from the Project areas using high-powered binoculars. A number of raptor species, including species of hawks, falcons, eagles, and owls, may nest in or near the Project area. These species may nest on a variety of substrates, including, but not limited to, trees and shrubs, utility poles and towers, the ground, abandoned buildings, and underground burrows.

3.0 Results and Discussion

3.1 Vegetation and Habitat Mapping

Vegetation communities observed in the 50-foot-wide pipeline ROW, the generation station and associated staging areas, and in the substation and underground interconnection near McNary Substation were the same as previously identified during 2013 surveys (E & E 2013). Vegetation communities in the 11 pulling-tensioning sites in the transmission ROW included combinations of shrub-steppe, non-native grassland, agricultural land, and developed area (described below). No designated noxious weeds were observed in the pulling-tensioning sites.

Habitat types observed in pulling-tensioning sites included:

Shrub-steppe – This habitat consisted of rubber rabbitbrush (*Ericameria nauseosa*), yellow rabbitbrush (*Chrysothamnus viscidiflorus*), and sagebrush (*Artemisia spp.*), typically with an understory that included fiddleneck (*Amsinckia spp.*) and non-native species, such as cheatgrass (*Bromus tectorum*), mustards (*Brassica spp.*), and redstem stork's bill (*Erodium cicutarium*).

Weedy Grassland – This habitat consisted of mixtures of cheatgrass, cereal rye (*Secale cereale*), bulbous bluegrass (*Poa bulbosa*), foxtail barley (*Hordeum jubatum*), various non-native thistles (e.g., *Onopordum acanthium*), mustards, fiddlenecks, and prickly Russian thistle. Cheatgrass often contributed 30 to 40 percent absolute ground cover in this habitat. Native grasses, such as Sandberg's bluegrass (*Poa secunda*), and native shrubs, including rubber rabbitbrush, yellow rabbitbrush, and sagebrush, were rare or not present.

Agriculture – This habitat consists entirely of active circular crop fields, or interstitial areas that have been plowed in the recent past.

Developed – This category was used to denote any area that had been completely disturbed or altered from its natural state for anthropogenic uses, excluding "Agriculture." "Developed" areas included, but were not limited to, roads, residential and commercial buildings, lawns, and farm and cattle yards.

Habitats within the 11 pulling-tensioning sites/staging areas and location descriptions and an area within 1,000 feet (see Appendix A, Figure 2) are described below. All pulling-tensioning sites are located under the existing transmission line. See Table 3 for a description of the habitat at each site, the habitat category and, based on aerial photography (Google Earth imagery dated 7/20/18) and field observations, habitat within 1,000 feet of the area of disturbance. Photos of each site are provided in Appendix B.

Table 3 Habitat at Pulling-Tensioning Sites

Site	Survey Results (Habitat within Pulling-Tensioning Sites)	Habitat Category	Habitat within 1,000 ft
#1	This site consists of weedy grassland and includes several dead or dying Russian olive trees (*Elaeagnus angustifolia*). The site is situated about 55 feet north of an unpaved road and 65 feet north of a concrete-lined irrigation canal.	Category 5	Habitat is similar to Site #1 conditions and is bisected by I-84, other highways, an irrigation canal, some commercial development and a hay field. Unlikely to provide suitable WGS habitat.
#2	This site consists of a developed (disturbed) gravel area and is situated between several unpaved roads associated with active quarry operations.	Category 6	Habitat to the north, west and south of this site is characterized as both active and in-active quarry operations. Habitat to the east of the site consists of weedy grassland. Unlikely to provide suitable WGS habitat.
#3	This site consists of weedy grassland, edged by residential ornamental trees and situated between residences and a wall adjacent to a sidewalk and paved road.	Category 6 with a small area classified as Category 5	Habitat primarily consists of a residential subdivision, with weedy grasslands to the north and northeast of the site. Unlikely to provide suitable WGS habitat.
#4	This site consists of a gravel road and a paved road with weedy grasslands to the south and shrub-steppe to the	Category 5 & 6	Habitat primarily consists of a crop circle (hay) to the south and

Table 3 Habitat at Pulling-Tensioning Sites

Site	Survey Results (Habitat within Pulling-Tensioning Sites)	Habitat Category	Habitat within 1,000 ft
	north. The pulling/tensioning site will be located to the south to avoid the shrub-steppe habitat.		southeast. Habitat to the north and northeast of the site is low quality shrub-steppe and is unlikely to provide suitable WGS habitat.
#5	The site consists of weedy grassland and is situated between an active crop circle and two unpaved gravel roads.	Category 5	Except for weedy grassland immediately adjacent to the site, this site is surrounded on all four sides by crop circles. It is unlikely to provide suitable WGS habitat.
#6	The site consists of a developed (disturbed) gravel area and is situated immediately south of a gravel road and between several buildings associated with active agricultural operations.	Category 6.	The site is surrounded by active crop circles and does not provide suitable WGS habitat.
#7	The site consists of weedy grassland and is situated between an active crop circle and a gravel road.	Category 5	The site has crop circles to the north, northeast and south of the site including an irrigation pond to the north. The habitat is weedy grassland to the east and southeast of the site. Unlikely to provide suitable WGS habitat.
#8	The site consists of weedy grassland and is situated adjacent to an active crop circle and a two-track access	Category 5	A large area of shrub-steppe is present to the west of the site, on

Table 3 Habitat at Pulling-Tensioning Sites

Site	Survey Results (Habitat within Pulling-Tensioning Sites)	Habitat Category	Habitat within 1,000 ft
	road. The site appears to have been mowed and cleared of vegetation in the past.		Umatilla Army Depot lands. This area would likely be Category 4 habitat and would potentially provide suitable WGS habitat. Habitat to the east of the site is weedy grasslands and crop circles and does not provide suitable WGS habitat.
#9	This site consists of weedy grassland and is situated adjacent to an active crop circle and an unpaved gravel farm road. The site may have been mowed and cleared of vegetation in the past.	Category 5	A large area of shrub-steppe is present to the west of the site, on Umatilla Army Depot lands. This area would likely be Category 4 habitat and potentially provides suitable WGS habitat. Habitat to the east of the site is weedy grasslands and crop circles and does not provide suitable WGS habitat.
#10	This site consists of weedy grassland and is situated between an active crop circle and a paved road (on-ramp to I-82).	Category 5	Habitat to the northeast, east, and southeast of the site includes an industrial area consisting of paved surfaces and buildings. Habitat to the northwest of the

Table 3 Habitat at Pulling-Tensioning Sites

Site	Survey Results (Habitat within Pulling-Tensioning Sites)	Habitat Category	Habitat within 1,000 ft
			site includes an active crop circle. Habitat to the southwest includes sparsely vegetated and disturbed area. Unlikely to provide suitable WGS habitat.
#11	This site consists of weedy grassland and is situated between an active crop circle and a paved road (County 1232 Road).	Category 5	Habitat to the north of the site is an active crop circle and to the east is primarily industrial land and is not suitable WGS habitat. Habitat south of the project site is a cleared area for future development and is not WGS habitat. Southwest of the site is a weedy grassland field bisected by an irrigation canal and is unlikely WGS habitat.

Key:
ft = feet
WGS = Washington Ground Squirrel

Habitat and vegetation communities within 1,000 feet of the natural gas pipeline ROW consists of industrial land, agricultural fields and crop circles interspersed with weedy grassland between the crop circles. Other than some industrial development adjacent to the WindChaser site, the habitat types have not changed since the 2013 surveys and is not suitable habitat for Washington ground squirrels. See Figures 3 and 4 in Appendix A.

3.2 Special Status Plants

No special status plants were observed in the study area. No suitable habitat was observed for Robinson's onion (*Allium robinsonii)*, which is usually found in shrub-steppe near the Columbia River high water mark; Laurence's milkvetch *(Astragalus collinus var. laurentii*), which occupies dry slopes in shrub-steppe; or Columbia cress (*Rorippa columbiae*), which requires open water (NatureServe 2013).

3.3 Wetlands and Waterbodies

The presence and character of waterbodies (and lack of wetlands) was the same as reported after the 2013 surveys (E & E 2013). Three canals and no wetlands were observed within the proposed step-up substation, generation site, and 50-foot-wide pipeline ROW, as reported in 2013. There were no wetlands or waterbodies in the transmission pulling-tensioning sites. The biologists verified the location of two waters mapped by NWI and NHD near, but not within, the pulling-tensioning sites: a man-made agricultural pond and a man-made irrigation canal. The irrigation canal is located approximately 65 feet south of pulling-tensioning site #1. This canal and the pulling-tensioning site are separated by a 35-foot-wide gravel access road; the irrigation canal will not be affected by Project activities. The agricultural pond is located approximately 150 feet northwest of pulling-tensioning site #7 (see Appendix B, Photo 12). This pond and the pulling-tension site are separated by a 25-foot wide gravel road and a levee; the pond will not be affected by Project activities. There are no additional wetlands or other waters mapped by NWI or NHD near the pulling tensioning sites.

3.4 Fish and Wildlife Resources

3.4.1 Washington Ground Squirrels

No Washington ground squirrels nor signs of them (e.g., burrows, scat, alarm calls) were detected during surveys in the study area within potential suitable habitat or observed within 1,000 feet of areas of ground disturbance. Available habitat in most parts of the study area appeared to be of low value for Washington ground squirrels. In general, the study area supported non-native grassland and shrub steppe habitats with understories that were largely dominated by dense, invasive grasses and forbs, including cheatgrass, fiddleneck, and prickly Russian thistle. Furthermore, most of the study area was in close proximity to human disturbances from residences, agricultural practices, industry, or traffic.

Washington ground squirrel protocols require surveying up to 1,000 feet from all project areas subject to potential ground disturbance to determine the presence or if suitable habitat exists. However, E & E was unable to obtain land access beyond the existing rights-of-way. Table 3 includes habitat within 1,000 feet based on field surveys and aerial surveys where access could not be obtained (based on Google Earth imagery dated 7/20/18).

Pulling-tensioning sites #4, #8, and #9 are adjacent to potential habitat for Washington ground squirrels. Site #4 is located on the intersection of a gravel and paved road. Sites #8 and #9 consisted primarily of non-native grasslands, but the ground cover was shorter and less dense than observed in other areas, and both sites are located immediately east of a buffer area and security road for the Umatilla Army Depot which has large areas of shrub-steppe habitat.

3.4.2 Raptor Nests

One active Red-tailed Hawk (*Buteo jamaicensis*) nest was observed while surveying the generation facility site. The nest was situated about 20 feet high in a black locust (*Robinia pseudoacacia*) in a row of locusts near the western edge of the generation facility site (see Appendix B, Photo 13). Two adult hawks were observed in the vicinity of the nest, one sitting on the nest. A red-tailed hawk nest was reported in the same location in 2013 (nest RN-001-002; E & E 2013).

3.4.3 Other Wildlife Observations

No special status species listed in Table 2 were observed during surveys. Two mule deer (*Odocoileus hemionus*) were observed at the substation site, and 4 to 5 dens/burrows characteristic of American badger (*Taxidea taxus*) were observed near the western side of the generation facility site. A number of common birds were observed across the study area. Detected wildlife species are reported in Table 4.

Table 4 All Wildlife Species Observed in the Study Area

Common Name	Scientific Name
Birds	
Mallard	*Anas platyrhynchos*
California Quail	*Callipepla californica*
Northern Harrier	*Circus cyaneus*
Red-tailed Hawk	*Buteo jamaicensis*
Killdeer	*Charadrius vociferus*
Rock Pigeon	*Columba livia*
Mourning Dove	*Zenaida macroura*
Western Kingbird	*Tyrannus verticalis*
Black-billed Magpie	*Pica hudsonia*

Table 4 All Wildlife Species Observed in the Study Area

Common Name	**Scientific Name**
Common Raven	*Corvus corax*
American Robin	*Turdus migratorius*
Western Meadowlark	*Sturnella neglecta*
Brewer's Blackbird	*Euphagus cyanocephalus*
House Sparrow	*Passer domesticus*
Mammals	
Mule deer	*Odocoileus hemionus*
American badger[1]	*Taxidea taxus*

Note:

[1] Burrows of the typical size and character were observed on the generation facility site; individual badgers were not observed.

4.0 References

Csuti, B., A. J. Kimerling, T. A. O'Neil, M. M. Shaughnessy, E. P. Gaines, M. M. P. Huso. 1997. *Atlas of Oregon Wildlife: Distribution, Habitat, and Natural History*. Oregon State University Press, Corvallis, Oregon.

E & E (Ecology and Environment, Inc.). 2013. Perennial Wind Chaser Station 2013 Biological Resources Survey Report.

eBird. 2019. eBird: An Online Database of Bird Distribution and Abundance [web application]. eBird, Ithaca, New York. http://www.ebird.org. Accessed May 17, 2019.

eFlora. 2019. Online species account for Robinson's Onion (*Allium robinsonnii*). http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=242101395. Accessed May 16, 2019.

Goggle Earth, Hermiston – Umatilla, Oregon, Satellite Imagery 7/20/2018. Accessed June 10, 2019

Greene, E. 1999. *Abundance and Habitat Associations of Washington Ground Squirrels in Northcentral Oregon*. M.S. thesis. Oregon State University. Corvallis, Oregon.

E & E (Ecology and Environment). 2013 Biological Resources Survey Report for the Perennial Wind Chaser Station.

Marshall, D.B., M.G. Hunter, and A.L. Contreras, Eds. 2006. *Birds of Oregon: A General Reference*. Oregon State University Press, Corvallis, Oregon.

Morgan, R.L. 2002. Unpublished Report of Oregon Department of Fish and Wildlife Status and Habitat Use of Washington Ground Squirrel on BLM-Horne Butte, Oregon.

NatureServe. 2019. NatureServe Explorer: An Online Encyclopedia of Life [web application]. Version 7.1. NatureServe, Arlington, Virginia. http://www.natureserve.org/explorer. Accessed May 15, 2019.

ODA (Oregon Department of Agriculture). 2013. Plant Programs, Plant Conservation; Oregon Listed and Candidate Plants.

OR GAP (Oregon Natural Gap Analysis Program). 1999. Oregon Natural Heritage Program. http://www.oregon.gov/DAS/CIO/GEO/pages/alphalist.aspx. Accessed April 2019.

ORBIC (Oregon Biodiversity Information Center), Institute for Natural Resources. 2019. Oregon Wildlife Explorer. http://oe.oregonexplorer.info/wildlife/wildlifeviewer. Accessed May 17, 2019.

_____. 2018. Special status species occurrence data. Data received September 2018.

Poole, A. (Editor). 2005. The Birds of North America Online. Cornell Laboratory of Ornithology, Ithaca, New York: http://bna.birds.cornell.edu/BNA/. Accessed May 150, 2019.

USFWS (United States Fish and Wildlife Service). 2013. Species Fact Sheet. Washington ground squirrel *Urocitellus washingtoni*. http://www.fws.gov/oregonfwo/Species/Data/WashingtonGroundSquirrel/. Accessed May 17, 2019.

Appendix A Figures

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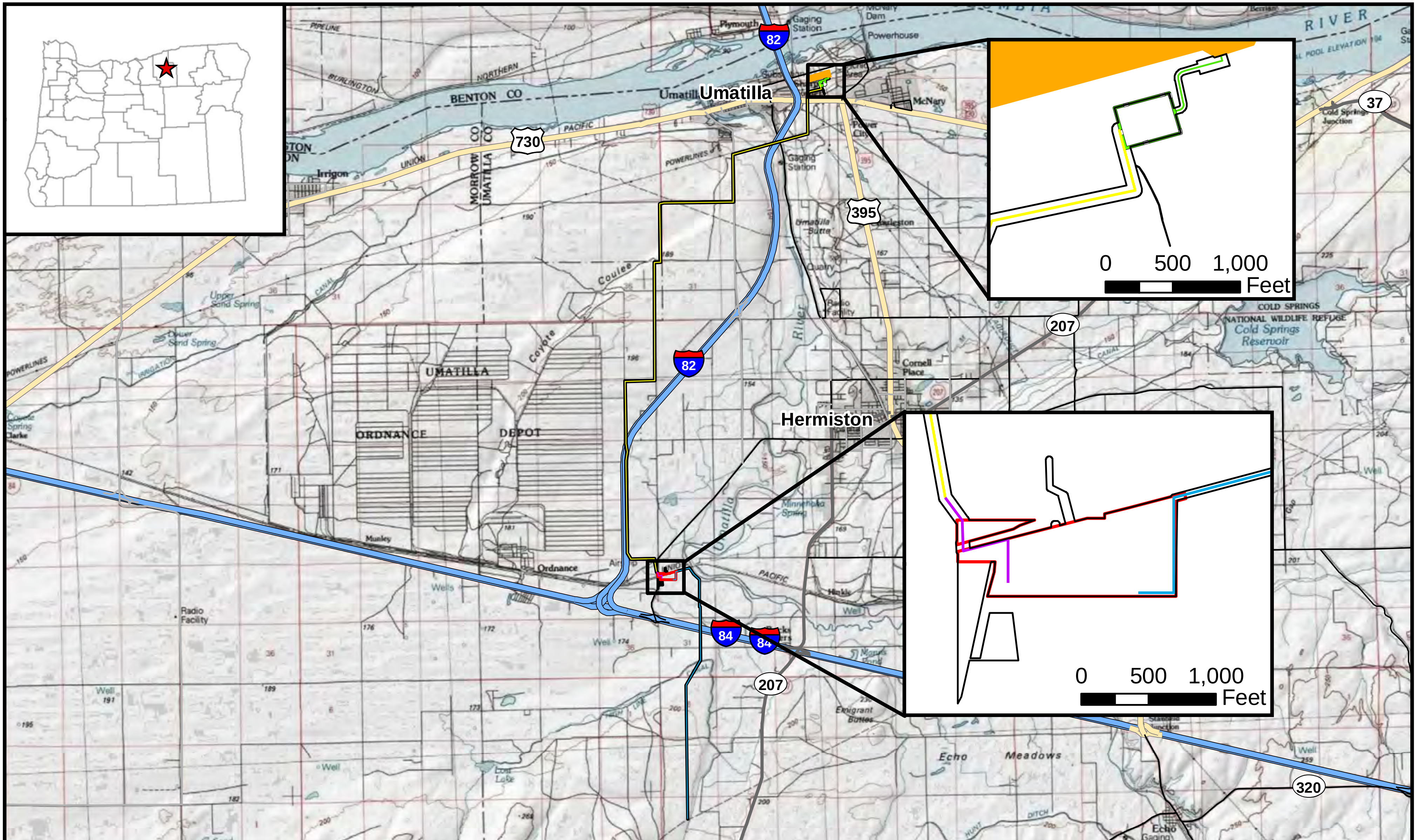

NORTH

0 6,000 12,000 Feet

Scale: 1 Inch = 12,000 Feet

Legend

- Site Boundary
- Energy Facility Site
- McNary Substation
- Step-up Substation Boundary
- Existing Transmission Line
- Proposed Transmission Line
- Prposed Underground Transmission Line
- Proposed Gas Line

Burns & McDonnell SINCE 1898

Figure 1
Project Overview
Perennial Wind Chaser Station
Umatilla County, Oregon

Source: Umatilla Co. (2011), ORMAP (2012); USDA (2012); ESRI (2013) ; and Burns & McDonnell (2014)

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NORTH

0 500 1,000
Feet

Scale: 1 Inch = 1,000 Feet

Legend

- McNary Substation
- Step-up Substation
- Transmission Line 50' ROW
- Wind Chaser Site Boundary
- Potential WGS Survey Area - 1,000' Buffer
- Stringing Site
- Existing Transmission Structure
- New Transmission Structure
- New Interconnect Line
- New Underground Construction
- Existing McNary Electrical Interconnection

BURNS McDONNELL

Figure 2a
Stringing Sites Overview
Perennial Wind Chaser Station
Umatilla County, Oregon

Source: NAIP Imagery (2017); ESRI (2018) ; and Burns & McDonnell (2018)

Issued: 1/2/2019

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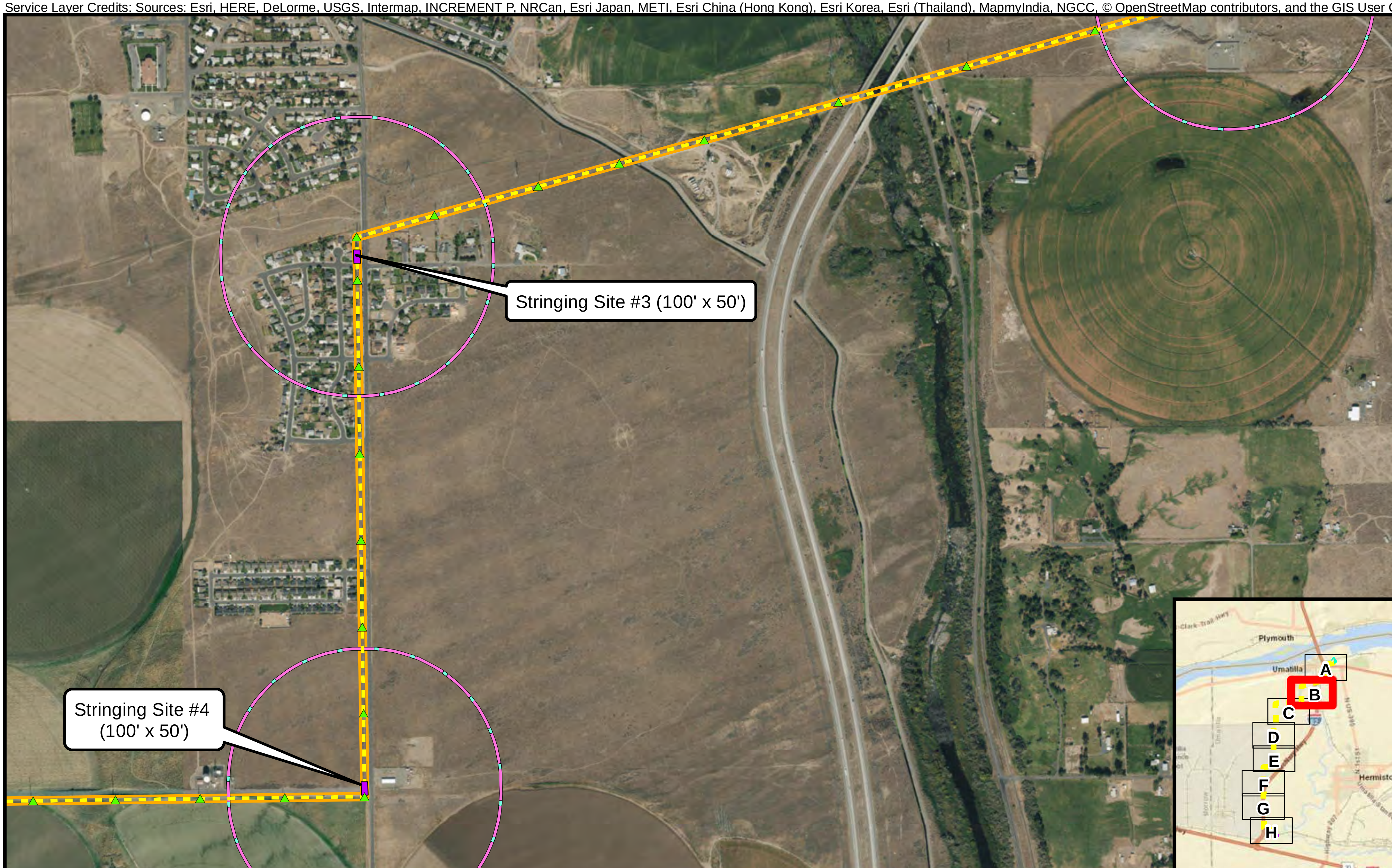

Legend

- McNary Substation
- Step-up Substation
- Transmission Line 50' ROW
- Wind Chaser Site Boundary
- Potential WGS Survey Area - 1,000' Buffer
- Stringing Site
- Existing Transmission Structure
- New Transmission Structure
- New Interconnect Line
- New Underground Construction
- Existing McNary Electrical Interconnection

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Figure 2b
Stringing Sites Overview
Perennial Wind Chaser Station
Umatilla County, Oregon

Source: NAIP Imagery (2017); ESRI (2018) ; and Burns & McDonnell (2018)

Issued: 1/2/2019

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NORTH

0 500 1,000 Feet

Scale: 1 Inch = 1,000 Feet

Legend

- McNary Substation
- Step-up Substation
- Transmission Line 50' ROW
- Wind Chaser Site Boundary
- Potential WGS Survey Area - 1,000' Buffer
- Stringing Site
- Existing Transmission Structure
- New Transmission Structure
- New Interconnect Line
- New Underground Construction
- Existing McNary Electrical Interconnection

BURNS McDONNELL

Figure 2c
Stringing Sites Overview
Perennial Wind Chaser Station
Umatilla County, Oregon

Source: NAIP Imagery (2017); ESRI (2018) ; and Burns & McDonnell (2018)

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Legend

- McNary Substation
- Step-up Substation
- Transmission Line 50' ROW
- Wind Chaser Site Boundary
- Potential WGS Survey Area - 1,000' Buffer
- Stringing Site
- Existing Transmission Structure
- New Transmission Structure
- New Interconnect Line
- New Underground Construction
- Existing McNary Electrical Interconnection

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Figure 2d
Stringing Sites Overview
Perennial Wind Chaser Station
Umatilla County, Oregon

Source: NAIP Imagery (2017); ESRI (2018) ; and Burns & McDonnell (2018)

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NORTH

0 500 1,000
Feet

Scale: 1 Inch = 1,000 Feet

Legend

- McNary Substation
- Step-up Substation
- Transmission Line 50' ROW
- Wind Chaser Site Boundary
- Potential WGS Survey Area - 1,000' Buffer
- Stringing Site
- Existing Transmission Structure
- New Transmission Structure
- New Interconnect Line
- New Underground Construction
- Existing McNary Electrical Interconnection

BURNS McDONNELL

Figure 2e
Stringing Sites Overview
Perennial Wind Chaser Station
Umatilla County, Oregon

Source: NAIP Imagery (2017); ESRI (2018) ; and Burns & McDonnell (2018)

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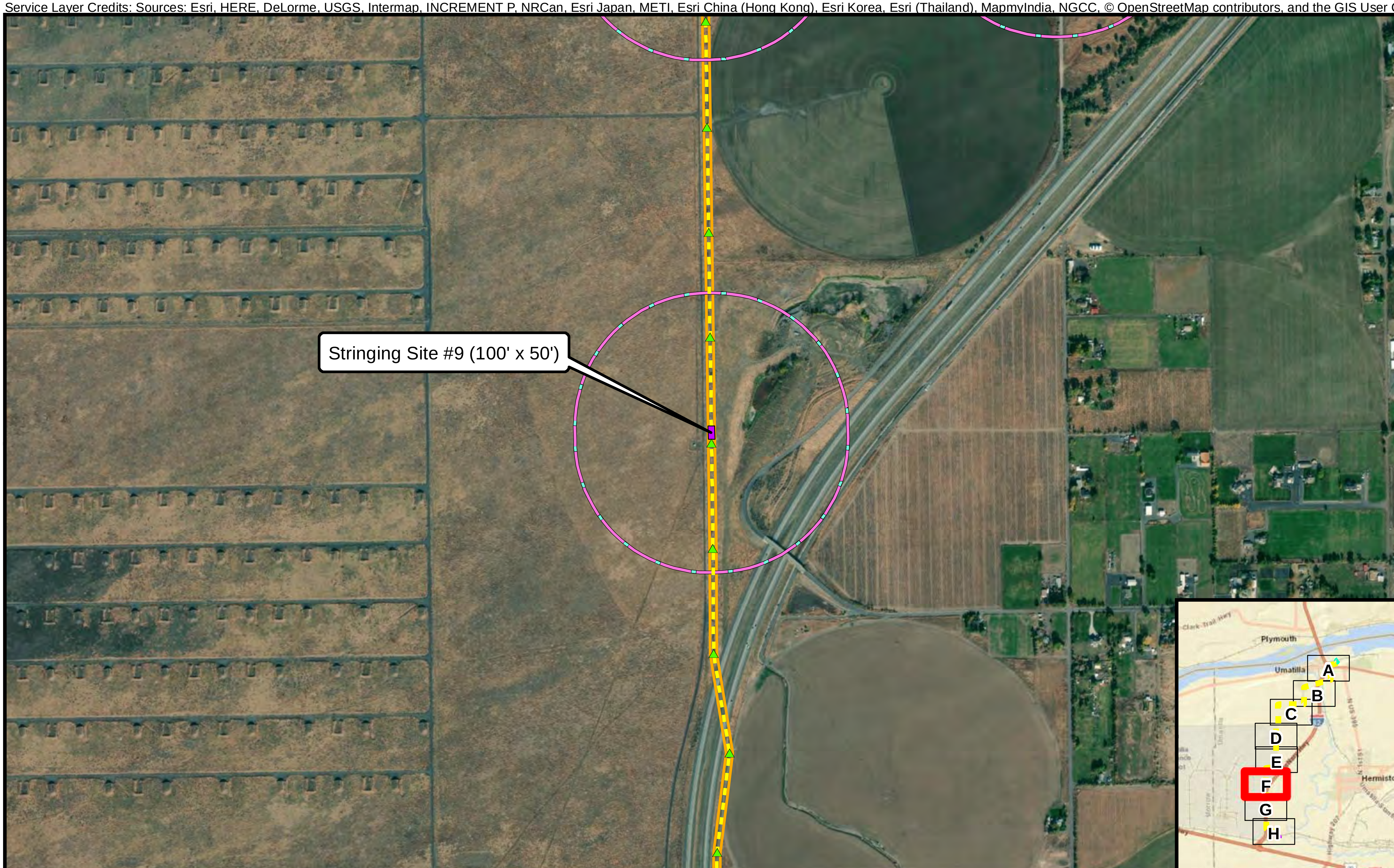

NORTH

0 500 1,000 Feet

Scale: 1 Inch = 1,000 Feet

Legend

- McNary Substation
- Step-up Substation
- Transmission Line 50' ROW
- Wind Chaser Site Boundary
- Potential WGS Survey Area - 1,000' Buffer
- Stringing Site
- Existing Transmission Structure
- New Transmission Structure
- New Interconnect Line
- New Underground Construction
- Existing McNary Electrical Interconnection

BURNS McDONNELL

Figure 2f
Stringing Sites Overview
Perennial Wind Chaser Station
Umatilla County, Oregon

Source: NAIP Imagery (2017); ESRI (2018) ; and Burns & McDonnell (2018)

Issued: 1/2/2019

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NORTH

0 500 1,000 Feet

Scale: 1 Inch = 1,000 Feet

Legend

- McNary Substation
- Step-up Substation
- Transmission Line 50' ROW
- Wind Chaser Site Boundary
- Potential WGS Survey Area - 1,000' Buffer
- Stringing Site
- Existing Transmission Structure
- New Transmission Structure
- New Interconnect Line
- New Underground Construction
- Existing McNary Electrical Interconnection

BURNS McDONNELL

Figure 2g
Stringing Sites Overview
Perennial Wind Chaser Station
Umatilla County, Oregon

Source: NAIP Imagery (2017); ESRI (2018) ; and Burns & McDonnell (2018)

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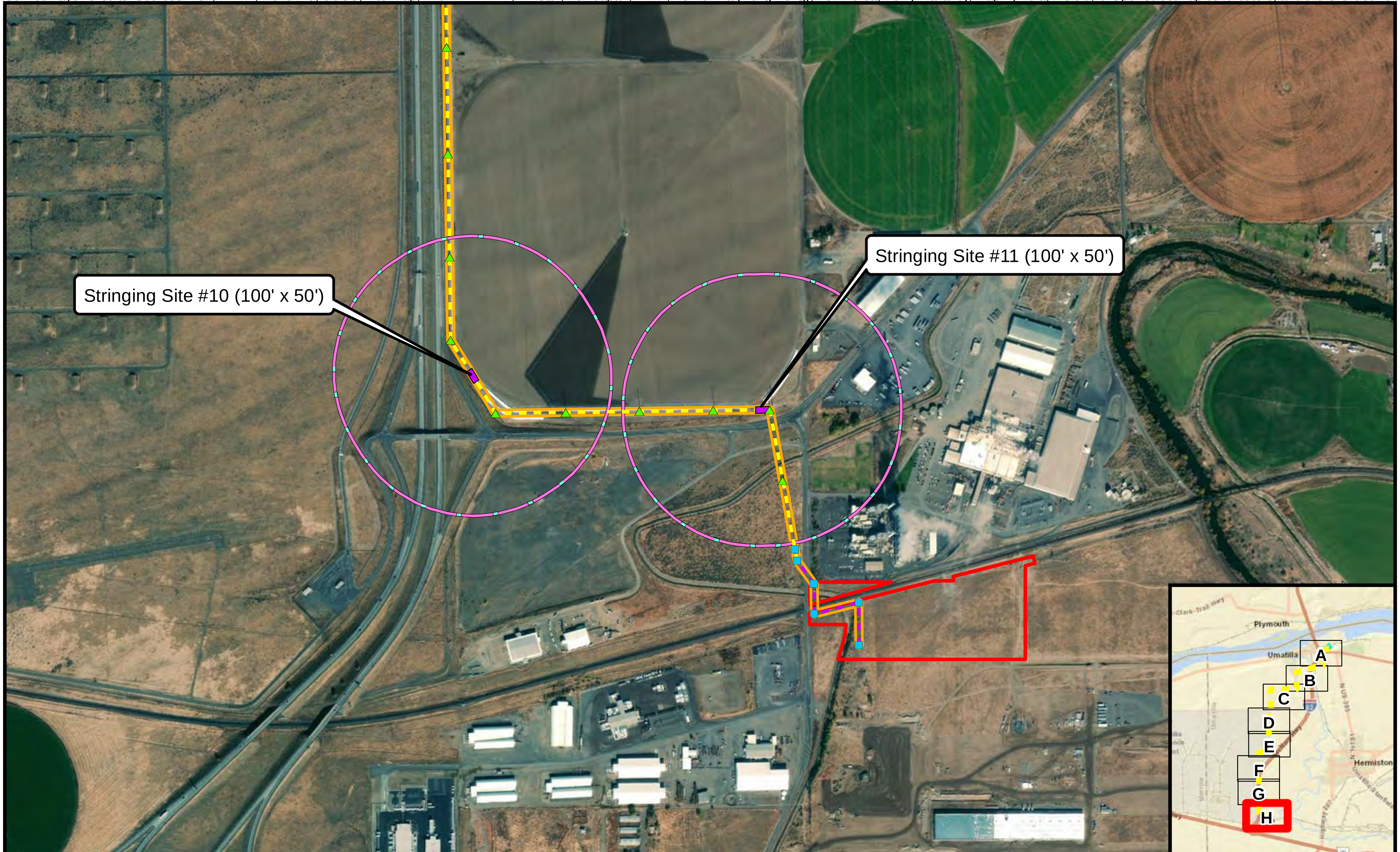
Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Commu



NORTH

0 500 1,000 Feet

Scale: 1 Inch = 1,000 Feet

Legend

- McNary Substation
- Step-up Substation
- Transmission Line 50' ROW
- Wind Chaser Site Boundary
- Potential WGS Survey Area - 1,000' Buffer
- Stringing Site
- Existing Transmission Structure
- New Transmission Structure
- New Interconnect Line
- New Underground Construction
- Existing McNary Electrical Interconnection

BURNS McDONNELL

Figure 2h
Stringing Sites Overview
Perennial Wind Chaser Station
Umatilla County, Oregon

Source: NAIP Imagery (2017); ESRI (2018) ; and Burns & McDonnell (2018)

Issued: 1/2/2019

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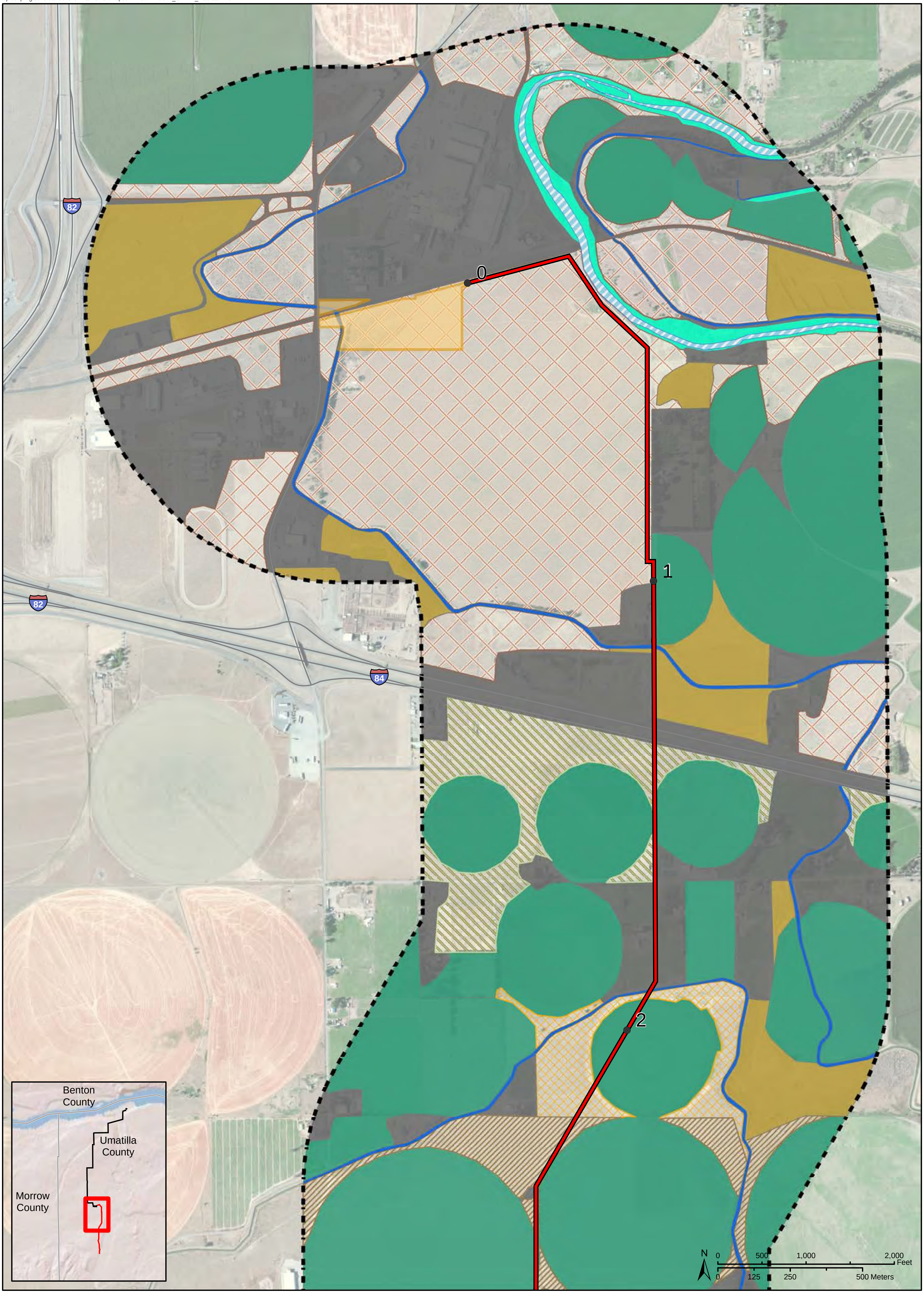

- Mileposts
- Natural Gas Pipeline
- 0.5-mile Buffer
- Station

Field Data - Habitat*

- Agriculture (6)
- Developed (6)
- Riparian (2)
- Shrub Steppe (3)
- Weedy Grassland #1 (5)
- Weedy Grassland #2 (5)
- Weedy Grassland #3 (6)
- Weedy Grassland #4 (5)
- Open Water (2)
- Open Water (6)

*Numbers in parentheses refer to ODFW Habitat Categories

Source: ESRI 2010, E&E Field Data 2013

Figure 3

Field Mapped Habitats within 0.5 Miles of the Station Site and 50-foot-wide Natural Gas Pipeline ROW

Perennial Wind Chaser Station

July 2014

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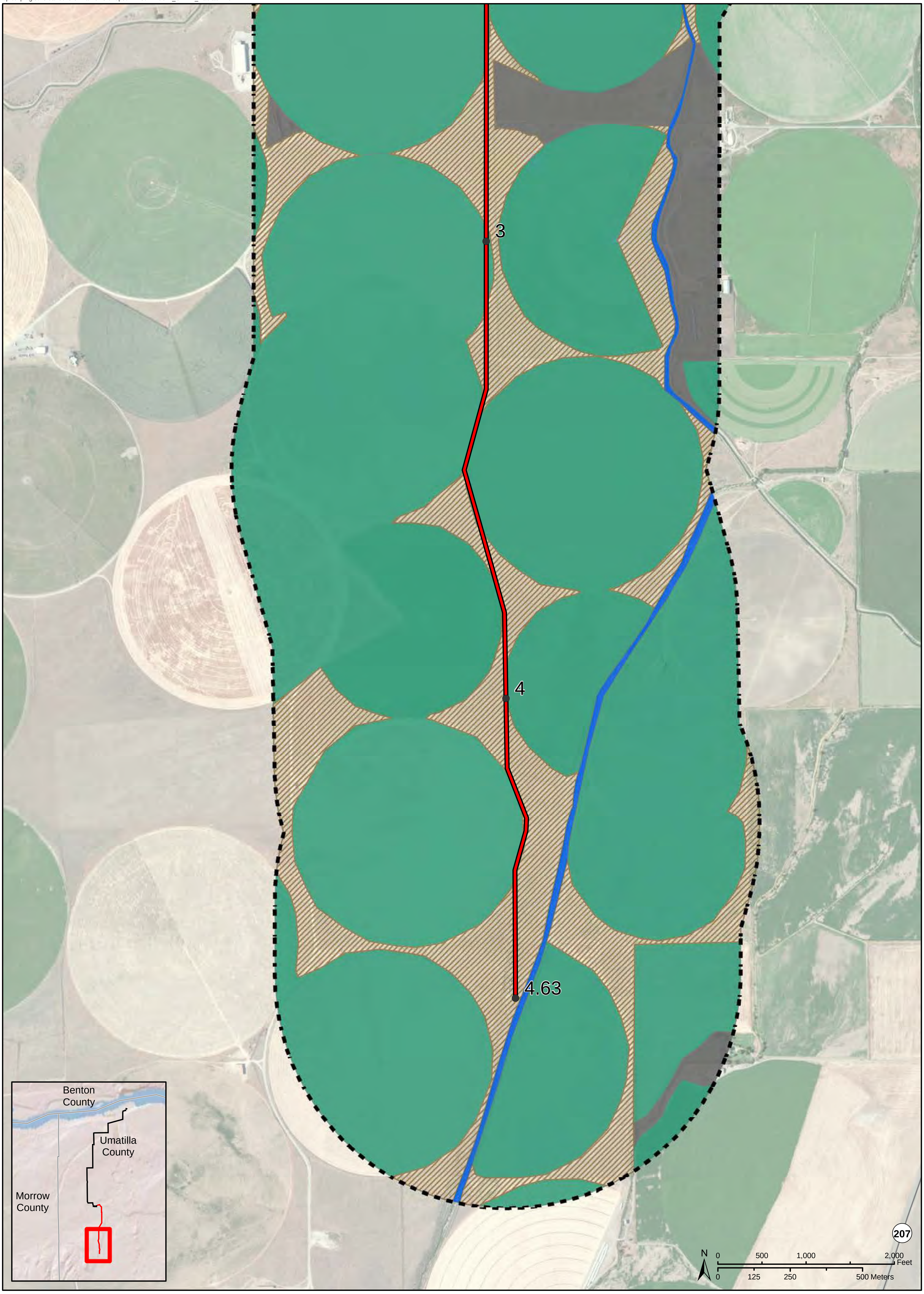


- Mileposts
- Natural Gas Pipeline
- 0.5-mile Buffer

Field Data - Habitat*
- Agriculture (6)
- Developed (6)
- Weedy Grassland #1 (5)
- Open Water (6)

*Numbers in parentheses refer to ODFW Habitat Categories

Source: ESRI 2010, E&E Field Data 2013

Figure 4

Field Mapped Habitats within 0.5 Miles of the 50-foot-wide Natural Gas Pipeline ROW

Perennial Wind Chaser Station

July 2014

Appendix B Photographs

Photo 1 Pulling-tensioning site #1, weedy grassland – facing south

Photo 2 Pulling-tensioning site # 2 – facing west

Photo 3 Pulling-tensioning site #3 – facing south

Photo 4 Pulling-tensioning site #4 – facing east

Photo 5 Pulling-tensioning site #5 – facing west

Photo 6 Pulling-tensioning site #6 – facing south

Photo 7 Pulling-tensioning site #7 – facing south

Photo 8 Pulling-tensioning site #8 – facing south

Photo 9 Pulling-tensioning site #9 – facing south

Photo 10 Pulling-tensioning site #10 – facing west

Photo 11 Pulling-tensioning site #11 – facing north

Photo 12 Agricultural pond approximately 150 feet northwest of pulling-tensioning site #7 – facing east

Photo 13 Active Red-tailed Hawk nest near western edge of generation facility site – facing south

ATTACHMENT 9

Email Consultation with the Umatilla Fire District 1 Fire Marshal

Yetter, Beth

From: Scott Goff <sgoff@ucfd1.com>
Sent: Monday, October 15, 2018 6:09 PM
To: Yetter, Beth
Subject: RE: Follow Up: Perennial Windchaser Project - Request to confirm service capability

Beth,

I see no real change in our ability to provide services for this project. But our Agency name and makeup has changed since the original application.

The project is now located within Umatilla County Fire District #1. The District has approximately 50 personnel. The District now operates out of four fire stations, with Station 23 located approximately 2 miles from the project site. We maintain a ladder truck with 75 foot delivery system, 6 engines, 5 water tenders, and the regional hazardous material response team.

Thank you,

Umatilla County Fire District #1
Scott A. Goff
Division Chief/Fire Marshal
320 South First Street
Hermiston, OR 97838
(541) 567-8822

From: Yetter, Beth <CYetter@ene.com>
Sent: Monday, October 1, 2018 8:09 PM
To: Scott Goff <sgoff@ucfd1.com>
Subject: Follow Up: Perennial Windchaser Project - Request to confirm service capability

Hi Scott,

I am following up on my email below. Please note in regard to the note in my previous email:
"Note: I will have to get back to you on the expected construction start date. I want to confirm this before I send this information."
There is no specified construction beginning date, but construction is planned to commence within the next two years.

As I mentioned on the phone call, Perennial is required to confirm that the service providers within the Project vicinity are able to provide services given the construction operations activity that will result from constructing and operating the Project.

Please don't hesitate to call if you need additional information to complete your review.

Thank you,
Beth Yetter, *Environmental Specialist*

From: Yetter, Beth
Sent: Thursday, September 13, 2018 4:36 PM
To: 'sgoff@ucfd1.com' <sgoff@ucfd1.com>
Subject: Perennial Windchaser Project - Request to confirm service capability

Hi Scott,

Thank you for taking the time to chat with me on the phone earlier today. As mentioned on the phone, this request is in regard to the Perennial Windchaser facility/project, which was permitted through the Oregon Department of Energy (ODOE) Energy Facility Siting Council (EFSC) permitting process.

A bit of background - the facility was issued a site certificate through EFSC in September 2015. A request for amendment was sent to ODOE EFSC in August 2018 for an extension of the construction deadline because construction will not commence by the date stated in the approved September 2015 application. Please note that details in regard to the site boundary, design and operation of the Facility have not changed, only the schedule (i.e., the facility description and information below is consistent with the facility description approved by ODOE EFSC in 2015). I have included some information below that should help you with your review – likely more information than you need, but please contact me if you have any questions or would like additional details.

Facility/Project Description (terms are interchangeable):

The Perennial Wind Chaser Station (Facility) is a permitted, but not yet constructed natural gas facility in Umatilla County, Oregon with a maximum capacity of 415 megawatts (MW). The Facility will consist of up to 4 combustion turbines, as well as related and supported facilities located within the permitted site boundary.

The Project includes the following components:

- 20-acre Energy Facility Site, including the Station, which is composed of four GE LMS100 combustion turbines and auxiliary systems, a four-cell cooling tower, five fuel gas compressors, a switchyard, a 2,800 square-foot control building, smaller buildings to house water, chemical and electrical equipment, a potable water system, septic system, fencing, a loop road and access roads inside the site, and a stormwater detention basin;
- Upgrades to an existing 11.59-mile-long, 230-kilovolt transmission line to the Bonneville Power Administration (BPA) McNary Substation;
- A new 3-acre step-up substation and a 477-foot-long underground transmission cable; and
- A new 4.63-mile-long natural gas pipeline lateral that will be constructed within the existing right-of-way (ROW) that services the Hermiston Generating Plant (HGP)."

I have attached two documents that include (1) an overview facility/project figure ("Overview Figure.pdf") and a figure packet with more detailed facility/project figures ("Detailed Figure Packet.pdf").

Facility Construction and Operation – Expected Workforce and Construction Detail Information

- At peak construction, it is estimated that 200 to 225 construction workers will be employed at the Project site. Operation of the Project will require approximately six to eight permanent employees.
- During Construction: The general contractor for the Project is expected to temporarily relocate supervisory personnel and some skilled workers to the local area. Due to the location of the Project, it is estimated that up to 65 percent of craft may come from outside of the analysis area (the analysis area is defined as the site

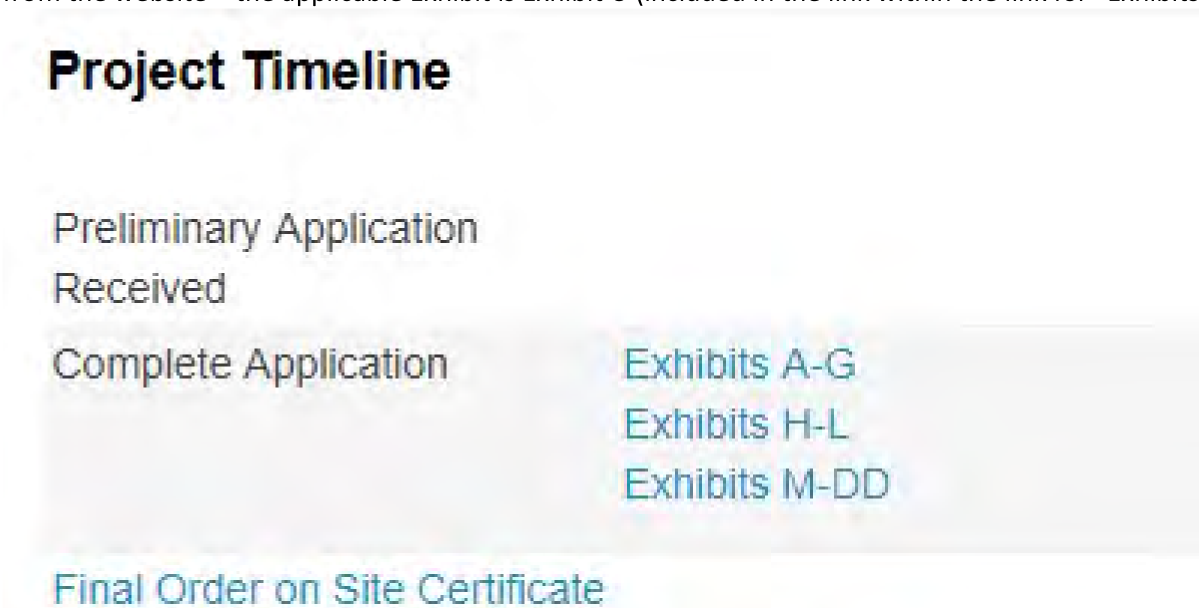
boundary and 10 miles from the Site boundary). Wherever possible, construction and service providers are expected to be local Oregon communities, primarily Hermiston, Umatilla, Stanfield, Irrigon, and Boardman.

- Construction is expected to take 22 months – Note: I will have to get back to you on the expected construction start date. I want to confirm this before I send this information.
- The upgrades to the existing transmission line and construction of the step-up substation will be managed by the Umatilla Electric Cooperative. No permanent employees will be required to operate the transmission line or step-up substation. The new step-up substation and underground transmission line to the BPA McNary Substation will be constructed on federal land managed by BPA.

<u>Text from the Original Application in regard to Fire Services</u>

"The Project site is located within Hermiston Fire and Emergency Services District. The District has a total of 43 paid and volunteer fire and rescue personnel (IFA 2013; Hermiston Fire & Emergency Services 2013). The District operates out of three fire stations, with the #3 station located approximately 2 miles from the Project site. It maintains a ladder truck with a 75-foot delivery system capable of dispensing water or foam, plus additional fire trucks, pumper trucks, water tenders, and two hazardous material teams with support vehicles (Phillips 2013)."

FYI – if you would like to view the original Sept. 2015 approved application, it can be found [here.](#) Below is screenshot from the website – the applicable Exhibit is Exhibit U (included in the link within the link for "Exhibits M-DD," below).



Please don't hesitate to give me a call or shoot me an email if you have questions, need clarifications, or need additional information. Thank you!

Beth Yetter, *Environmental Specialist*
7440 S. Creek Road, Suite 400, Salt Lake City, Utah 84093
Phone: 801-561-1036 ext. 6262 • Cell: 423-667-9062
CYetter@ene.com • www.ene.com

ATTACHMENT 10

Figure C-1.A through C-1.H – Stringing Sites Overview

Path: Z:\Clients\ENS\Perennial\107891_WindChaser\Studies\Geospatial\DataFiles\ArcDocs\Figure_C_1_Staging_WGS_Buffers.mxd tbeemer 1/2/2019

NORTH

0 500 1,000 Feet

Scale: 1 Inch = 1,000 Feet

Legend

- McNary Substation
- Step-up Substation
- Transmission Line 50' ROW
- Wind Chaser Site Boundary
- Potential WGS Survey Area - 1,000' Buffer
- Stringing Site
- Existing Transmission Structure
- New Transmission Structure
- New Interconnect Line
- New Underground Construction
- Existing McNary Electrical Interconnection

BURNS McDONNELL

Figure C-1.A
Stringing Sites Overview
Perennial Wind Chaser Station
Umatilla County, Oregon

Source: NAIP Imagery (2017); ESRI (2018) ; and Burns & McDonnell (2018)

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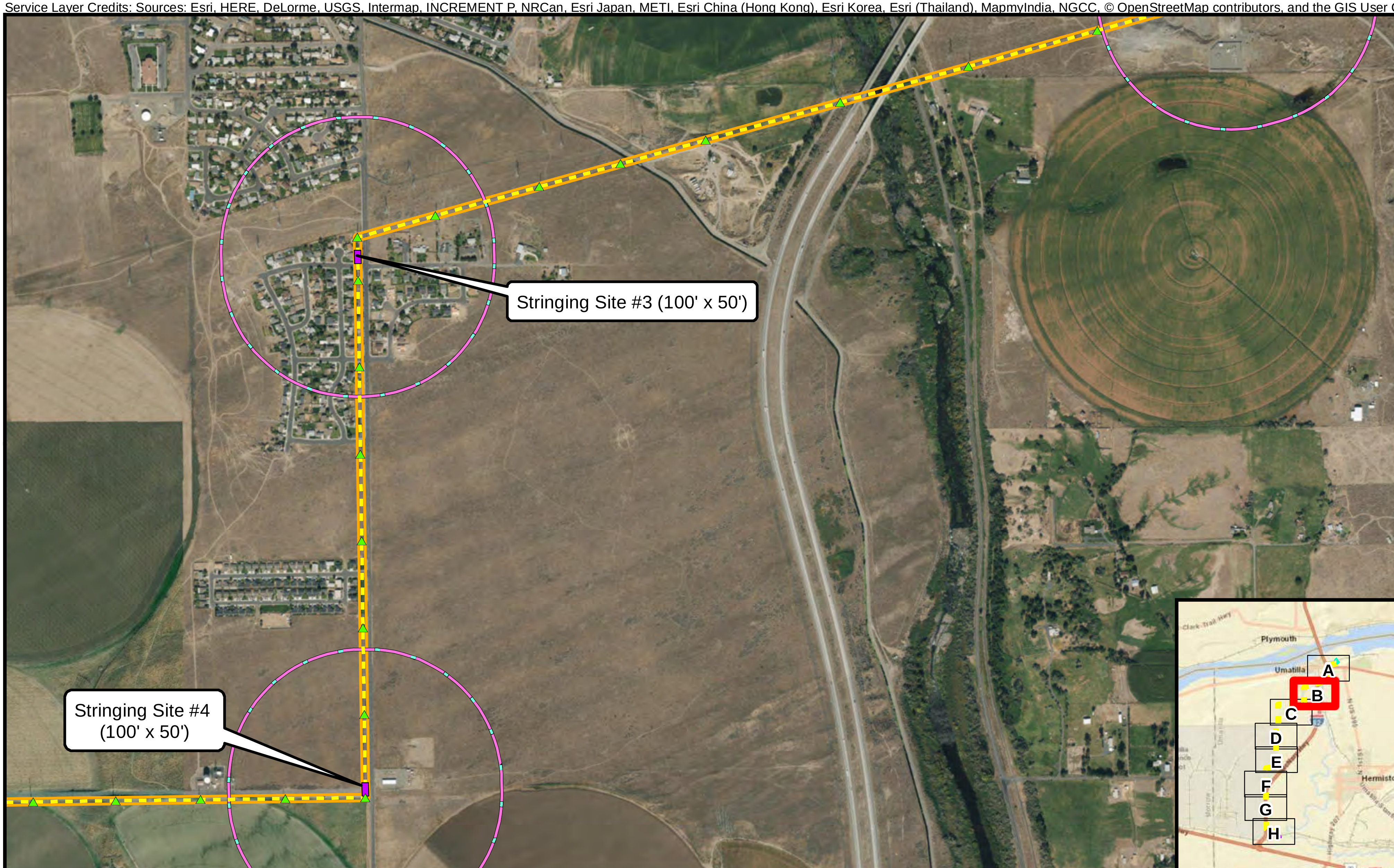

NORTH

0 500 1,000 Feet

Scale: 1 Inch = 1,000 Feet

Legend

- McNary Substation
- Step-up Substation
- Transmission Line 50' ROW
- Wind Chaser Site Boundary
- Potential WGS Survey Area - 1,000' Buffer
- Stringing Site
- Existing Transmission Structure
- New Transmission Structure
- New Interconnect Line
- New Underground Construction
- Existing McNary Electrical Interconnection

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Figure C-1.B
Stringing Sites Overview
Perennial Wind Chaser Station
Umatilla County, Oregon

Source: NAIP Imagery (2017); ESRI (2018) ; and Burns & McDonnell (2018)

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NORTH

0 500 1,000
Feet

Scale: 1 Inch = 1,000 Feet

Legend

- McNary Substation
- Step-up Substation
- Transmission Line 50' ROW
- Wind Chaser Site Boundary
- Potential WGS Survey Area - 1,000' Buffer
- Stringing Site
- Existing Transmission Structure
- New Transmission Structure
- New Interconnect Line
- New Underground Construction
- Existing McNary Electrical Interconnection

BURNS McDONNELL

Figure C-1.C
Stringing Sites Overview
Perennial Wind Chaser Station
Umatilla County, Oregon

Source: NAIP Imagery (2017); ESRI (2018) ; and Burns & McDonnell (2018)

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NORTH

0 500 1,000 Feet

Scale: 1 Inch = 1,000 Feet

Legend

- McNary Substation
- Step-up Substation
- Transmission Line 50' ROW
- Wind Chaser Site Boundary
- Potential WGS Survey Area - 1,000' Buffer
- Stringing Site
- Existing Transmission Structure
- New Transmission Structure
- New Interconnect Line
- New Underground Construction
- Existing McNary Electrical Interconnection

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Figure C-1.D
Stringing Sites Overview
Perennial Wind Chaser Station
Umatilla County, Oregon

Source: NAIP Imagery (2017); ESRI (2018) ; and Burns & McDonnell (2018)

Issued: 1/2/2019

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NORTH

0 500 1,000
Feet

Scale: 1 Inch = 1,000 Feet

Legend

McNary Substation
Step-up Substation
Transmission Line 50' ROW
Wind Chaser Site Boundary
Potential WGS Survey Area - 1,000' Buffer
Stringing Site
Existing Transmission Structure
New Transmission Structure
New Interconnect Line
New Underground Construction
Existing McNary Electrical Interconnection

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Figure C-1.E
Stringing Sites Overview
Perennial Wind Chaser Station
Umatilla County, Oregon

Source: NAIP Imagery (2017); ESRI (2018) ; and Burns & McDonnell (2018)

Issued: 1/2/2019

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NORTH

0 500 1,000 Feet

Scale: 1 Inch = 1,000 Feet

Legend

- McNary Substation
- Step-up Substation
- Transmission Line 50' ROW
- Wind Chaser Site Boundary
- Potential WGS Survey Area - 1,000' Buffer
- Stringing Site
- Existing Transmission Structure
- New Transmission Structure
- New Interconnect Line
- New Underground Construction
- Existing McNary Electrical Interconnection

BURNS McDONNELL

Figure C-1.F
Stringing Sites Overview
Perennial Wind Chaser Station
Umatilla County, Oregon

Source: NAIP Imagery (2017); ESRI (2018) ; and Burns & McDonnell (2018)

Issued: 1/2/2019

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NORTH

0 500 1,000 Feet

Scale: 1 Inch = 1,000 Feet

Legend

- McNary Substation
- Step-up Substation
- Transmission Line 50' ROW
- Wind Chaser Site Boundary
- Potential WGS Survey Area - 1,000' Buffer
- Stringing Site
- Existing Transmission Structure
- New Transmission Structure
- New Interconnect Line
- New Underground Construction
- Existing McNary Electrical Interconnection

BURNS McDONNELL

Figure C-1.G
Stringing Sites Overview
Perennial Wind Chaser Station
Umatilla County, Oregon

Source: NAIP Imagery (2017); ESRI (2018) ; and Burns & McDonnell (2018)

Issued: 1/2/2019

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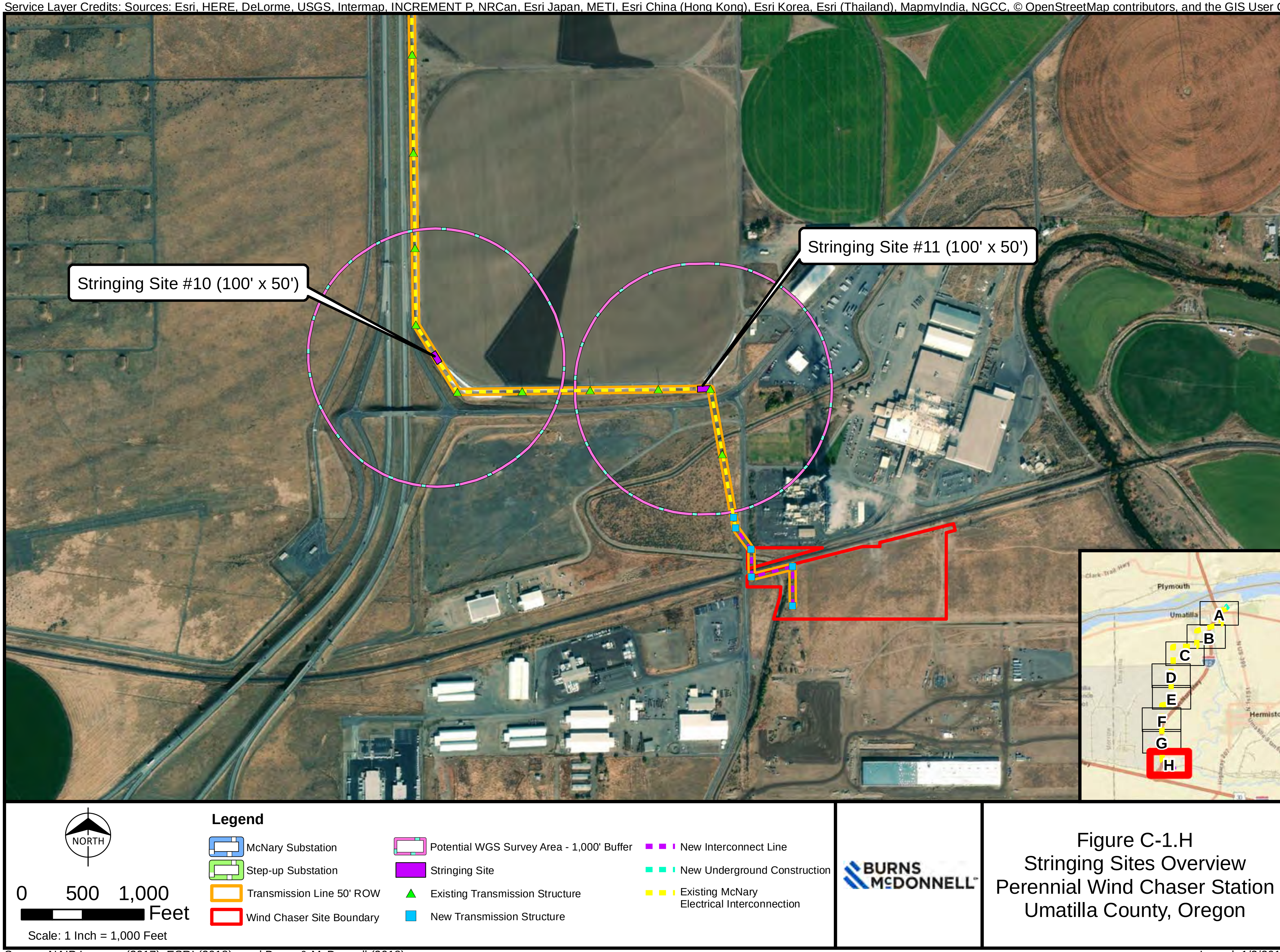

BURNS McDONNELL

Figure C-1.H
Stringing Sites Overview
Perennial Wind Chaser Station
Umatilla County, Oregon

Source: NAIP Imagery (2017); ESRI (2018) ; and Burns & McDonnell (2018)

Issued: 1/2/2019

ATTACHMENT 11

Exhibit Y – Carbon Dioxide Emissions and Support Calculations

EXHIBIT Y

CARBON DIOXIDE EMISSIONS

OAR 345-021-0010(1)(y)

TABLE OF CONTENTS

TABLES

APPENDIX

Y.1 INTRODUCTION

OAR 345-021-0010(1)(y) *If the facility is a base load gas plant, a non-base load power plant, or a nongenerating energy facility that emits carbon dioxide, a statement of the means by which applicant elects to comply with the applicable carbon dioxide emissions standard under OAR 345-024- 0560, OAR 345-024-0600, or OAR 345-024-0630 and information, showing detailed calculations, about the carbon dioxide emissions of the energy facility.*

Response: To issue a site certificate, the Energy Facility Siting Council (Council) must find that "the energy facility complies with any applicable carbon dioxide [CO_2] emissions standard adopted by the Council or enacted by statute" (Oregon Administrative Rule [OAR] 345- 024-0500.) The Perennial Wind Chaser Station project (Project) would be a classified as a "non-base load power plant" as defined in OAR 345- 001-0010(40) because the Project would be limited by the site certificate to an average number of hours of operation per year of not more than 6,600 hours. Under this definition, for a plant designed to operate at variable loads, the facility's annual hours of operation are determined by dividing the actual annual electric output of the facility in megawatt-hours by the facility's nominal electric generating capacity in megawatts (MW). Thus, for a non-base load power plant, the Council must find that the net CO_2 emissions rate of the proposed facility does not exceed 0.614 pounds of carbon dioxide per kilowatt hour (lbs CO_2/kWh) of net electric power output, with CO_2 emissions and net electric power output measured on a new and clean basis, according to OAR 345-024-0590.

The Project is heavily dependent upon the third party permits of both the Hermiston Generating Plant (HGP) and the Lamb Weston Hermiston Plant with regard to managing its wastewaters. Lamb Weston's Water Pollution Control Facilities Permit allows Lamb Weston to manage and dispose of the HGP's wastewater, along with their own reclaimed waters, by land application for beneficial use on the North Farm and the Madison Farm in accordance with the Operations, Monitoring, and Management Plan that has been approved by the Oregon Department of Environmental Quality. Lamb Weston's permit is currently being renewed. Because this permit is under review, Lamb Weston has not been able to consent to the Project potentially sending reclaimed water to the HGP. If Lamb Weston becomes able to accept reclaimed water from the HGP that has comes from the Station, then Perennial would like to have all the necessary process and approvals in place to do so. This exhibit details how the Project will comply with any applicable Council standards with this option. Should Lamb Weston not be able to accept reclaimed water from HGP that has come from the Station, then Perennial would install a zero liquid discharge (ZLD) system. Because this option is a potential alternative that would have a significant effect upon the auxiliary electrical load demand, compliance with the CO_2 standard under this alternative is reviewed separately in Appendix Y-1.

Y.2 SUMMARY

This exhibit provides information regarding compliance with the CO_2 emissions standard, as required by OAR 345-021-0010(1)(y). Perennial WindChaser LLC (Perennial) will comply with the CO_2 emissions standard of OAR 345-024-0590 for the Project by providing offset funds to The Climate Trust (formerly the Oregon Climate Trust), as allowed by OAR 345-024-0600(3). Perennial's payments will be made in compliance with the monetary path payment requirement of OAR 345-024-0710. The gross CO_2 emissions rates are estimated to be 1.055 lbs CO_2/kWh for the non-base load element, resulting in an excess CO_2 emission of 0.441 lbs CO_2/kWh for the non-base load element. The Project will not include power enhancement or augmentation.

Y.3 FUEL CYCLE AND USAGE

OAR 345-021-0010(1)(y)(A) *Exhibit Y shall include information about the fuel cycle and usage including the maximum hourly fuel use at net electrical power output at average annual conditions for a base load gas plant and the maximum hourly fuel use at nominal electric generating capacity for a non-base load power plant or a base load gas plant with power augmentation technologies, as applicable.*

Response: The Project will be fueled by natural gas only and will be an open/simple cycle electrical generating facility. Natural gas will be fired only in the combustion turbine generators. Electricity will be produced by the motive force of the combustion turbine generators. Under average annual operating conditions, the Project is expected to produce a net electrical output of approximately 415 MW, with actual output dependent upon the technology selected. Assuming 415 MW output at average annual conditions, the Project would use approximately 3,740 million British thermal units (Btu)/hour (higher heating value [HHV]) or 3.68 million standard cubic feet of natural gas per hour.

Y.4 GROSS CAPACITY FOR EACH GENERATING UNIT

OAR 345-021-0010(1)(y)(B) *Exhibit Y shall include the gross capacity as estimated at the generator output terminals for each generating unit. For a base load gas plant, gross capacity is based on the average annual ambient conditions for temperature, barometric pressure and relative humidity. For a non-base load plant, gross capacity is based on the average temperature, barometric pressure and relative humidity at the site during the times of year when the facility is intended to operate. For a baseload gas plant with power augmentation, gross capacity in that mode is based on the average temperature, barometric pressure and relative humidity at the site during the times of year when the facility is intended to operate with power augmentation.*

Response: The gross capacity of each generating unit will depend on the final technology selected. Based upon the General Electric LMS100 technology, the gross capacity of each generating unit will be approximately 106.5 MW for each of the four identical units.

Y.5 ONSITE ELECTRICAL LOADS AND LOSSES

OAR 345-021-0010(1)(y)(C) *Exhibit Y shall include a table showing a reasonable estimate of all on-site electrical loads and losses greater than 50 kilowatts, including losses from on-site transformers, plus a factor for incidental loads, that are required for the normal operation of the plant when the plant is at its designed full power operation.*

Response: A list of all expected electrical loads and losses greater than 50 kilowatts is shown in Table Y-1. This list is based on a typical technology and will vary with the final technology selected.

Table Y-1 Loads and Losses

Unit	Electrical Loads (kW)	Electrical Losses (kW)
CTG-1	106,483	
CTG-2	106,483	
CTG-3	106,483	
CTG-4	106,483	
Air Compressors		450
Circulating Water Pumps		1,050
Fuel/Gas Compressors		1,900
Demineralizer Water Forwarding Pumps		150
Close Cooling Water Pumps		750
Cooling Tower Fans		600
Water Treatment and Chemical Feed		100
Gas Turbine Auxiliaries		2,400
SCR System		1,300
DC Power Supply and UPS		100
Lighting		70
Miscellaneous Controls & Small Loads		750
Main Transformer Losses		700
Auxiliary Transformer Losses		300
Electrical Balance	425,932	10,620

Key:
CTG combustion turbine generator
DC direct current
kW kilowatt
SCR selective catalytic reduction
UPS uninterruptible power supply

Y.6 ALTERNATE FUEL USE

OAR 345-021-0010(1)(y)(D) *Exhibit Y shall include maximum number of hours per year and energy content (Btu per year, higher heating value) of alternate fuel use.*

Response: OAR 345-021-0010(1)(y)(D) is not applicable because Perennial proposes to use only natural gas as fuel for this energy facility.

Y.7 CALCULATIONS OF CARBON DIOXIDE EMISSIONS

This section describes the detailed calculations of the CO_2 emissions for the Project, as required by OAR 345-021-0010(1)(y)(E)-(H). A spreadsheet of expected emissions calculations is provided as Table Y-2, presented at the end of the exhibit. This table also provides information regarding how the emission factors used in the non-base load were calculated. The emissions calculations provided herein are estimates only. As described in Section Y.4, after technology selection and prior to construction of the energy facility, actual final emissions calculations will be submitted to the Oregon Department of Energy to determine the amount of the monetary path offset funds.

Y.7.1 Gross Carbon Dioxide Emissions

OAR 345-021-0010(1)(y)(E) *Exhibit Y shall include the total gross carbon dioxide emissions for 30 years, unless an applicant for a non-base load power plant or nongenerating energy facility proposes to limit operation to a shorter time.*

Response: Gross CO_2 emissions are defined in Oregon Revised Statute (ORS) 469.502(2)(e) as the predicted CO_2 emissions of the Project measured on a new and clean basis. Gross CO_2 emissions for 30 years' operation at non-base load, at average site conditions, and for 3,000 hours per year were estimated to be approximately 39,434 million pounds of CO_2, as shown in Table Y-2. Note that Perennial is requesting a peak of 4,400 hours per year of 100% load in other Exhibits and permit applications. Because the electrical demand will be variable, and Exhibit Y reviews a 30-year span of time, a 3,000 hours per year average over 30 years seems more realistic of actual operation. Also there are no refunds of offset CO_2 costs if there are any over estimations of operating time.

OAR 345-021-0010(1)(y)(F) *Exhibit Y shall include the gross carbon dioxide emissions rate expressed as:*

(i) Pounds of carbon dioxide per kilowatt-hour of net electric power output for a base load gas plant, including operation with or without power augmentation, as appropriate, or for a non-base load power plant;

(ii) Pounds of carbon dioxide per horsepower hour for nongenerating facilities for which the output is ordinarily measured in horsepower; or

(iii) A rate comparable to pounds of carbon dioxide per kilowatt-hour of net electric power output for nongenerating facilities other than those measured in horsepower;

Response: Items (ii) and (iii) do not apply, the following text is in response to item (i). Net electric power output is defined under OAR 345-001-0010(35) as "the electric power produced or capacity made available for use. Calculation of net electric power output subtracts losses from on-site transformers and power used for any on-site electrical loads from gross capacity as measured or estimated at the generator terminals for each generating unit." Based on the onsite electrical loads and losses in Section Y.5, the net electric power for non-base load condition is approximately 415 MW. The net CO_2 emissions rate was estimated to be 1.055 lbs CO_2/kWh for non-base load element, as shown in Table Y-2.

Y.7.2 Excess Carbon Dioxide Emissions and Rate

OAR 345-021-0010(1)(y)(G) *Exhibit Y shall include the total excess carbon dioxide emissions for 30 years, unless an applicant for a non-base load power plant or a nongenerating energy facility proposes to limit operation to a shorter time.*

OAR 345-021-0010(1)(y)(H) *The excess carbon dioxide emissions rate, using the same measure as required for paragraph (F).*

Response: The total excess CO_2 emissions for 30 years, at average site conditions, and 3,000 hours per year are estimated to be approximately 7.10 million tons of CO_2, as shown in Table Y-2. The excess CO_2 emission rate is estimated to be 0.441 lbs CO_2/kWh, also as shown in Table Y-2.

Y.8 SITE CONDITIONS

OAR 345-021-0010(1)(y)(I) *Exhibit Y shall contain the average annual site conditions, including temperature, barometric pressure and relative humidity, together with a citation of the source and location of the data collection devices.*

Response: The annual average site conditions were calculated based on the Hermiston 2S National Climatic Data Center metrological station (1971 to 2000)[1] and are as follows:

Temperature	53.0 °F
Barometric Pressure	14.399 pounds per square inch
Relative Humidity	64.8 percent

OAR 345-021-0010(1)(y)(J) *For a non-base load power plant (or when using power augmentation), the average temperature, barometric pressure and relative humidity at the site during the times of the year when the facility is intended to operate, together with a citation of the source and location of the data collection devices.*

Response: No power augmentation will be proposed for the project. Refer to the text above for site conditions.

Y.9 FUEL INPUT

OAR 345-021-0010(1)(y)(K) *Exhibit Y shall contain the annual fuel input in British thermal units, higher heating value, to the facility for each type of fuel the facility will use, assuming:*

(i) For a base load gas plant, a 100-percent capacity factor on a new and clean basis and the maximum number of hours annually that the applicant proposes to use alternative fuels;

(ii) For a non-base load power plant, the applicant's proposed annual hours of operation on a new and clean basis, the maximum number of hours annually that the applicant proposes to use alternative fuels and, if the calculation is based on an operational life of fewer than 30 years, the proposed operational life of the facility;

(iii) For a nongenerating energy facility, the reasonably likely operation of the facility based on one year, 5-year, 15-year, and 30-year averages, unless an applicant proposes to limit operation to a shorter time.

Response: Perennial proposes to use only natural gas as fuel for the Station. It is expected that the Station will operate 3,000 hours per year. The expected total annual fuel input is 11.2×10^6 million Btu per year.

OAR 345-021-0010(1)(y)(L) *For each type of fuel a base load gas plant or a non-base load power plant will use, the estimated heat rate and capacity of the facility measured on a new and*

[1] *See* Western Regional Climate Center. HERMISTON 2 S, OREGON (353847) 1971-2000 Monthly Climate Summary. Available at: http://www.wrcc.dri.edu/cgi-bin/cliNORM2000tM.pl?orherm.

clean basis with no thermal energy to cogeneration, consistent with the data supplied in Exhibit B shall be provided in Exhibit Y.

Response: Perennial proposes to use only natural gas as fuel for the proposed energy facility. As shown in Table Y-2, the estimated load net power output is 415 MW, with a capacity of approximately 34 percent and an estimated gross heat rate of 8,781 Btu/kWh, HHV.

Y.10 NON GENERATING FACILITY EFFICIENCY AND CAPACITY

OAR 345-021-0010(1)(y)(M) *For each type of fuel a nongenerating energy facility will use, the estimated efficiency and capacity of the facility with no thermal energy to cogeneration.*

Response: OAR 345-021-0010(1)(y)(M) is not applicable.

Y.11 COGENERATION TO LOWER CARBON DIOXIDE EMISSIONS

OAR 345-021-0010(1)(y)(N)(i) through (xii) *If the facility provides thermal energy for cogeneration to lower its net carbon dioxide emissions rate, the applicant shall include:[information outlined in subsection (i) through (xii)].*

Response: The Project will not include cogeneration; therefore, OAR 345- 021-0010(1)(y)(N) is not applicable.

OAR 345-021-0010(1)(y)(O)(i) through (xxi) *If the applicant proposes to offset carbon dioxide emissions as described in OAR 345-024-0550(3), 345-024-0560(2), 345-024-0590(3), 345-024-0600(2), 345-024-0620(3) or 345-024-0630(1), the applicant shall include:[information outlined in subsection (i) through (xxi)].*

Response: OAR 345-021-0010(1)(y)(O) is not applicable since all required offsets will be provided through the monetary path.

Y.12 MONETARY PATH

OAR 345-021-0010(1)(y)(P) *If the applicant elects to comply with the applicable carbon dioxide emissions standard by using the monetary path under OAR 345-024-0560(3), 345-024-0600(3) or 345-024-0630(2), the applicant shall include:*

(i) A statement of the applicant's election to use the monetary path;

Response: Perennial will comply with the CO_2 standard of OAR 345-024-0590 for the Project solely by providing offset funds to The Climate Trust, as allowed by OAR 345-024-0600(3) and in compliance with the monetary path payment requirement of OAR 345-024-0710.

(ii) The amount of carbon dioxide reduction, in tons, for which the applicant is taking credit by using the monetary path;

Response: Perennial will use the monetary path for the full amount of the CO_2 emission reduction required to comply with the CO_2 emission standard. Section Y.7 provides an initial calculation of CO2 emissions. The actual monetary path payment requirement will be determined in accordance with site certificate conditions.

(iii) The qualified organization to whom the applicant will provide offset funds and funds for the cost of selecting and contracting for offsets. The applicant shall include evidence that the organization meets the definition of a qualified organization under OAR 345-001- 0010. The applicant may identify an organization that has applied for, but has not received, an exemption from federal income taxation, but the Council shall not find that the organization is a qualified organization unless the organization is exempt from federal taxation under section 501(c)(3) of the Internal Revenue Code as amended and in effect on December 31, 1996; and

Response: Perennial will provide offset funds, and funds for the cost of selecting and contracting for offsets, to The Climate Trust. For the following reasons, The Climate Trust is a "qualified organization" as defined by OAR 345-001-0010(48):

- The Climate Trust is exempt from federal taxation under section 501(c)(3) of the Internal Revenue Code. By a letter dated November 19, 1997, the Internal Revenue Service determined that The Climate Trust (then the Oregon Climate Trust) is exempt from taxation under section 501(c)(3).
- The Climate Trust is incorporated in the State of Oregon. The Articles of Incorporation are filed with the Oregon Secretary of State.
- The Articles of Incorporation of The Climate Trust require that offset funds received under OAR 345-024-0710(3) (ORS 469.503(2)) are to be used for offsets projects that would result in direct reduction, elimination, sequestration, or avoidance of CO_2 emissions. The Articles of Incorporation of The Climate Trust require that decisions regarding the use of such funds be made by a body composed of seven voting members, of which three are appointed by the Council, three are Oregon residents appointed by the Bullitt Foundation, and one is appointed by applicants for site certificates that are subject to ORS 469.503(2)(d) and the holders of such site certificates.
- The Climate Trust has made available on an annual basis, beginning after the first year of operation, a signed opinion of an independent certified public accountant stating that the qualified organization's use of funds pursuant to ORS 469.503 conforms with generally accepted accounting principles.
- The Climate Trust has provided DOE with documentation that the Climate Trust has complied with OAR 345-001-0010(1)(48)(e) (ORS 469.503(2)(e)(K)(v)).

(iv) A statement of whether the applicant intends to provide a bond or letter of credit to secure the funds it must provide to the qualified organization or whether it requests the option of providing either a bond or a letter of credit.

Response: Perennial is requesting the option of providing either a letter of credit or bond to ensure the payment of funds to The Climate Trust.

Table Y-2 Carbon Dioxide Emission Factor Calculations

A. CO_2 Standard	**415 MW of Combustion Turbines**
CO_2 Standard (lbs CO_2/kWh)	0.614

B. Parameters for Non-Base Load Gas Plant

Net Power Output (kW)	415,312
New and Clean Gross Heat Rate (Btu/kWh) HHV	8,781
Annual Hours of Operation	3,000

C. Parameters for Power Augmentations

Net Power Output (kW)	NA
New and Clean Heat Rate (Btu/kWh) HHV	
Annual Hours of Operation	

D. Calculations

New Power Output (kW)	415,312
Annual Hours of Operation	3,000
Percent Time on Non-Base Load	34.2%
Net Annual Generation (million kWh/yr)	1,245.9
Deemed Life of Plant (years) by Statute or Rule	30
Total Gross Plant Output (million kWh for 30 years)	38,334
Total Net Plant Output (million kWh for 30 years)	37,378
Gross Heat Rate (Btu/kWh) HHV	8,781
CO_2 Emissions Rate (lbs CO_2/Btu)	0.00011715
Total Gross CO_2 Emissions (million lbs)	39,434

E. Total Operations

Table Y-2 Carbon Dioxide Emission Factor Calculations

Combined Net Output (million kWh for 30 years)	37,378
Combined CO_2 Emissions (million lbs for 30 years)	39,434
Net CO_2 Emissions Rate (lbs CO_2/kWh)	1.055
CO_2 Standard (lbs CO_2/kWh)	0.614
Excess CO_2 Emissions Rate (lbs CO_2/kWh)	0.441
Excess Tons CO_2 (million tons over 30 years)	8.24

F. Monetary Path

Offset Fund Rate ($/ton CO_2)	$1.90
Offset Funds Required ($ million)	$15.66
Contracting and Selection Funds ($ million)	$0.70
Monetary Path Requirement ($ million)	$16.36

Key:

Btu/kWh	British thermal units per kilowatt hour
CO_2	carbon dioxide
HHV	higher heating value
kW	kilowatt
kWh/yr	kilowatts per year
lbs	pounds
lbs/CO_2/kWh	pounds of carbon dioxide per kilowatt hour
NA	not applicable

APPENDIX Y-1

Project Review with a Zero Liquid Discharge System

1 INTRODUCTION

This section demonstrates compliance of the Energy Facility Siting Council's (Council) carbon dioxide emissions (CO_2) standard to not exceed 0.614 pounds of carbon dioxide per kilowatt hour (lbs CO_2/kWh) of net electric power output, should a zero liquid discharge (ZLD) system be installed by Perennial-WindChaser LLC (Perennial) as part of the Perennial Wind Chaser Station project (Project).

2 SUMMARY

This appendix to Exhibit Y provides information on compliance with the CO_2 standard, as required by Oregon Administrative Rules (OAR) 345-021-0010(1)(y). Perennial will comply with the CO_2emissions standard of OAR 345-024-0590 for the Project by providing offset funds to The Climate Trust (formerly the Oregon Climate Trust), as allowed by OAR 345-024-0600(3). Perennial's payments will be made in compliance with the monetary path payment requirement of OAR 345-024-0710. The gross CO_2 emissions rates are estimated to be 1.064lbs CO_2/kWh for the non-base load element, resulting in an excess CO_2emission of 0.450 lbs CO_2/kWh for the non-base load element. The Project will not include power enhancement or augmentation.

3 FUEL CYCLE AND USAGE

The Perennial Wind Chaser Station (Station) will be fueled by natural gas only and will be an open/simple cycle electrical generating facility. Natural gas will be fired only in the combustion turbine generators. Electricity will be produced by the motive force of the combustion turbine generators. Under average annual operating conditions, the Station is expected to produce a net electrical output of approximately 411.9 megawatts (MW), with actual output dependent upon the technology selected. Note that without a ZLD system the electrical output would be approximately 415.3 MW, the decrease is due entirely to the ZLD system as shown in Table 1 below. Assuming 411.9 MW output at average annual conditions, the Station will use approximately 3,740 million British thermal units (Btu)/hour (higher heating value [HHV]) or 3.68 million standard cubic feet of natural gas per hour.

4 GROSS CAPACITY FOR EACH GENERATING UNIT

The gross capacity of each generating unit will depend on the final technology selected. Based upon the General Electric LMS100 technology, the gross capacity of each generating unit will be approximately 106.5 MW for each of the four identical units.

5 ONSITE ELECTRICAL LOADS AND LOSSES

A list of all expected electrical loads and losses greater than 50 kilowatts is shown in Table 1. This list is based on a typical technology and will vary with the final technology selected.

Table 1 Loads and Losses

Unit	Electrical Loads (kW)	Electrical Losses (kW)
CTG-1	106,483	
CTG-2	106,483	
CTG-3	106,483	
CTG-4	106,483	
Air Compressors		450
Circulating Water Pumps		1,050
Fuel/Gas Compressors		1,900
Demineralizer Water Forwarding Pumps		150
Close Cooling Water Pumps		750
Cooling Tower Fans		600
Water Treatment and Chemical Feed		100
Gas Turbine Auxiliaries		2,400
SCR System		1,300
DC Power Supply and UPS		100
Lighting		70
Miscellaneous Controls & Small Loads		750
Main Transformer Losses		700
Auxiliary Transformer Losses		300
Zero Liquid Discharge System		3430
Electrical Balance	**425,932**	**14,050**

Key:
CTG combustion turbine generator
DC direct current
SCR selective catalytic reduction
UPS uninterruptible power supply

6 ALTERNATE FUEL USE

Perennial proposes to use only natural gas as fuel for the Project.

7 CALCULATIONS OF CARBON DIOXIDE EMISSIONS

This section describes the detailed calculations of the CO_2 emissions of the Project, as required by OAR 345-021-0010(1)(y)(E)-(H). A spreadsheet of expected emissions calculations is provided as Table 2, presented at the end of this appendix. This table also provides information regarding how the emission factors used in the non-base load were calculated. The emissions calculations provided herein are estimates only. As described in Section 4, after technology selection and prior to construction of the Station, actual final emissions calculations will be submitted to the Oregon Department of Energy to determine the amount of the monetary path offset funds.

7.1 Gross Carbon Dioxide Emissions

Gross CO_2 emissions for 30 years' operation at non-base load, at average site conditions, and for 3,000 hours per year, were estimated to be approximately 39,434 million pounds of CO_2, as shown in Table 2.

Based on the onsite electrical loads and losses in Section 5, the net electric power for non-base load condition is approximately 411.9 MW. The net CO_2 emissions rate was estimated to be 1.064 lbs CO_2/kWh for non-base load element, as shown in Table 2.

7.2 Excess Carbon Dioxide Emissions

The total excess CO_2 emissions for 30 years, at average site conditions, and 3,000 hours per year are estimated to be approximately 7.21 million tons of CO_2, as shown in Table 2. The excess CO_2 emission rate is estimated to be 0.450 lbs CO_2/kWh, also shown in Table 2.

8 SITE CONDITIONS

The annual average site conditions were calculated based on the Hermiston 2S National Climatic Data Center; metrological station (1971 to 2000)[2] and are as follows:

Temperature	53.0 °F
Barometric Pressure	14.399 pounds per square inch
Relative Humidity	64.8 percent

No power augmentation would be proposed for the Project.

[2] *See* Western Regional Climate Center. HERMISTON 2 S, OREGON (353847) 1971-2000 Monthly Climate Summary. Available at: http://www.wrcc.dri.edu/cgi-bin/cliNORM2000tM.pl?orherm.

9 FUEL INPUT

Perennial proposes to use only natural gas as fuel for the Station. It is expected that the Station will operate 3,000 hours per year. The expected total annual fuel input would be 11.2 x 10^6 million Btu per year. As shown in Table 2, the estimated load net power output is 411.9 MW, with a capacity of about 34 percent and an estimated gross heat rate of 8,781 Btu/kWh, HHV.

10 NON GENERATING FACILITY EFFICIENCY AND CAPACITY

The Station will an electrical generating facility.

11 COGENERATION TO LOWER CARBON DIOXIDE EMISSIONS

The Project would not include cogeneration

12 MONETARY PATH

Perennial will comply with the CO_2 standard of OAR 345-024-0590 for the Station solely by providing offset funds to The Climate Trust, as allowed by OAR 345-024-0600(3) and in compliance with the monetary path payment requirement of OAR 345-024-0710.

Perennial will use the monetary path for the full amount of the CO_2 emission reduction required to comply with the CO_2 emission standard. Section 7 provides an initial calculation of CO_2 emissions. The actual monetary path payment requirement will be determined in accordance with site certificate conditions.

Perennial will provide offset funds, and funds for the cost of selecting and contracting for offsets, to The Climate Trust and is requesting the option of providing either a letter of credit or bond to ensure the payment of funds to The Climate Trust.

Table 2 Carbon Dioxide Emission Factor Calculations

A. CO_2 Standard	411.9 MW of Combustion Turbines
CO_2 Standard (lbs CO_2/kWh)	0.614

B. Parameters for Non-Base Load Gas Plant

Net Power Output (kW)	411,882
New and Clean Gross Heat Rate (Btu/kWh) HHV	8,781
Annual Hours of Operation	3,000

C. Parameters for Power Augmentations

Net Power Output (kW)	NA
New and Clean Heat Rate (Btu/kWh) HHV	
Annual Hours of Operation	

D. Calculations

New Power Output (kW)	411,882
Annual Hours of Operation	3,000
Percent Time on Non-Base Load	34.2%
Net Annual Generation (million kWh/year)	1235.6
Deemed Life of Plant (years) by Statute or Rule	30
Total Gross Plant Output (million kWh for 30 years)	38,334
Total Net Plant Output (million kWh for 30 years)	37,069
Gross Heat Rate (Btu/kWh) HHV	8,781
CO_2 Emissions Rate (lbs CO_2/Btu)	0.00011715
Total Gross CO_2 Emissions (million lbs)	39,434

E. Total Operations

Combined Net Output (million kWh for 30 years)	37,069
Combined CO_2 Emissions (million lbs for 30 years.)	39,434
Net CO_2 Emissions Rate (lbs CO_2/kWh)	1.064
CO_2 Standard (lbs CO_2/kWh)	0.614
Excess CO_2 Emissions Rate (lbs CO_2/kWh)	0.450
Excess Tons CO_2 (million tons over 30 years)	8.34

F. Monetary Path

Offset Fund Rate ($/ton CO_2)	$1.90
Offset Funds Required ($ million)	$15.85
Contracting and Selection Funds ($ million)	$0.71
Monetary Path Requirement ($ million)	$16.55

Key:
Btu British thermal units
CO_2 carbon dioxide
HHV higher heating value
kW kilowatt
kWh kilowatt hour
lbs pounds

Support Calculations

Performance By:	**Vu, Christopher**		
Project Info:	**Wind Chaser**		
Engine:	**LMS100 PA**		
Deck Info:	**G0179E - 8k1.scp**	Date:	**04/04/2013**
Generator:	**BDAX 82-445ER 60Hz, 13.8kV, 0.85PF (35404)**	Time:	**8:57:07 AM**
Fuel:	**Site Gas Fuel#900-3694, 20828 Btu/lb,LHV**	Version:	**3.9.6b**

Case #	**106**
Ambient Conditions	
Dry Bulb, °F	53.0
Wet Bulb, °F	47.1
RH, %	64.8
Altitude, ft	564.0
Ambient Pressure, psia	14.399
Engine Inlet	
Comp Inlet Temp, °F	53.0
RH, %	64.8
Conditioning	NONE
Tons(Chilling) or kBtu/hr(Heating)	0
Pressure Losses	
Inlet Loss, inH20	4.50
Exhaust Loss, inH20	12.00
Partload %	**100**
kW, Gen Terms	**106483**
Est. Btu/kW-hr, LHV	**7919**
Guar. Btu/kW-hr, LHV	**8122**
	1.02563
Fuel Flow	
MMBtu/hr, LHV	843.2
lb/hr	40484
NOx Control	**Water**
Water Injection	
lb/hr	24516
Temperature, °F	100.0
Intercooler	**Wet Cooling**
Humidification	OFF
IC Heat Extraction, btu/s	29698
KOD Water Extraction, lb/s	0.0

Exhaust Parameters	1711351
Temperature, °F	779.1
lb/sec	493.4
lb/hr	1776351
Energy, Btu/s- Ref 0 °R	157257
Cp, Btu/lb-R	0.2739

Exh Wght % Wet	
AR	1.2340
N2	72.3767
O2	13.3811
CO2	6.1662
H20	6.8373
SO2	0.0000
CO	0.0013
HC	0.0001
NOX	0.0033

Exh Mole % Dry	
AR	0.9735
N2	81.4258
O2	13.1798
CO2	4.4158
H20	0.0000
SO2	0.0000
CO	0.0015
HC	0.0003
NOX	0.0033

Exh Mole % Wet	
AR	0.8695
N2	72.7265
O2	11.7717
CO2	3.9441
H20	10.6837
SO2	0.0000
CO	0.0013
HC	0.0003
NOX	0.0029

Aero Energy Fuel Number	900-3694 (Wind Chaser)	
	Volume %	**Weight %**
Hydrogen	0.0000	0.0000
Methane	96.4758	92.9618
Ethane	1.9940	3.6013
Ethylene	0.0000	0.0000
Propane	0.1159	0.3070
Propylene	0.0000	0.0000
Butane	0.0209	0.0730
Butylene	0.0000	0.0000
Butadiene	0.0000	0.0000
Pentane	0.0013	0.0056
Cyclopentane	0.0000	0.0000
Hexane	0.0000	0.0000
Heptane	0.0000	0.0000
Carbon Monoxide	0.0000	0.0000
Carbon Dioxide	0.7385	1.9522
Nitrogen	0.6532	1.0991
Water Vapor	0.0000	0.0000
Oxygen	0.0000	0.0000
Hydrogen Sulfide	0.0000	0.0000
Ammonia	0.0000	0.0000

Btu/lb, LHV	20828	
Btu/scf, LHV	916.1	
Btu/scf, HHV	1015.8	
Btu/lb, HHV	23096	1.10889
Fuel Temp, °F	76.9	
NOx Scalar	0.989	
Specific Gravity	0.57	

Engine Exhaust

Exhaust Avg. Mol. Wt., Wet Basis	28.1
Exhaust Flow, ACFM	942007
Exhaust Flow, SCFM	382822
Exhaust Flow, Btu/lb	319
Exhaust Flow, Calories/s	39628839
Inlet Flow Wet, pps	478.3
Inlet Flow Dry, pps	475.6
Shaft HP	144823

Generator Information

Capacity kW	166060
Efficiency	0.9860
Inlet Temp, °F	53.0

Gear Box Loss, HP	N/A
Exhaust Flow, lbmoles per hour	63215
Exhaust Flow, lbmoles per hour (Dry)	52672

Gross GT Output, kW	106,483
Gross Estimated GT Heat Rate, HHV	8,781

Fuel Input, MMBtu/hr (HHV)	935.0
Fuel Heating Value, Btu/lb (HHV)	23096

CO2	109,533

Annual Operating Hours	3000
Plant Capacity	34.25%

	No ZLD	With ZLD
Auxiliary Load	2.50%	3.30%
NPO, mW	415.312	411.882
lb/kWh CO2	1.029	1.029
total heat input (mmBtu/hr)	3740.07052	3740.07052
total heat input (mmscf/hr)	3.681896555	3.681896555
lb per 30 year CO2	39,432.01	39,432.01
lb per 30 year excess CO2	13,556.64	13,556.64
ton per 30 year excess CO2	6.78	6.78
total heat input per year	11220211.56	11,220,211.56
gross heat rate, hhv	8781.3148	8,781.31
Net annual generation	1245.936	1235.646
Net 30-yr generatio	37378.08	37069.38
CO2 lb/btu	0.00011715	0.00011715
Gross annual generation	1277.796	1277.796
Gross 30-yr generatio	38333.9	38333.9
Net CO2 lb/kWh	1.0550	1.0637
Gross CO2 lb/kWh	1.0286	1.0286
CO2 standard, lb/kWh	0.614	0.614
CO2 excess, lb/kWh	0.441	0.450
Excess tons, 30 years	8.24	8.34
$/ton CO2	1.9	1.9
Funds Required	15.66	15.84

Contracting Funds	0.70	0.71
Total Funds required ($ M)	16.36	16.55

ATTACHMENT 12

Exhibit F - Property Owners

EXHIBIT F

PROPERTY OWNERS

OAR 345-021-0010(1)(f)

TABLE OF CONTENTS

TABLES

FIGURES

F.1 INTRODUCTION

OAR 345-021-0010(1)(f) *A list of names and mailing addresses of all owners of record, as shown on the most recent property tax assessment roll, of property located within or adjacent to the site boundary as defined in OAR 345-001-0010. The applicant shall submit an updated list of property owners as requested by the Department before the Department issues notice of any public hearing on the application for a site certificate as described in OAR 345-015-0220. In addition to incorporating the list in the application for a site certificate, the applicant shall submit the list to the Department in electronic format acceptable to the Department for the production of mailing labels. Property adjacent to the site boundary means property that is:*

A) Within 100 feet of the site boundary where the site, corridor or micrositing corridor is within an urban growth boundary;
B) Within 250 feet of the site boundary where the site, corridor or micrositing corridor is outside an urban growth boundary and not within a farm or forest zone; and
C) Within 500 feet of the site boundary where the site, corridor or micrositing corridor is within a farm or forest zone.

Response: Within this Application for Site Certificate (ASC), the term "Site" includes the proposed location of the energy facility and its related or supporting facilities. "Site Boundary" is the perimeter of the Site including the right of ways of the laterals and the temporary laydown area. Within the Site, there are five areas: 1) The "Energy Facility Site, or Station" refers to an area adjacent to the Hermiston Generating Plant (HGP), the boundary for which is defined as laid out in Figure F-8. 2) A temporary laydown area adjacent to the Station, process pipelines to HGP, and any utility lines to the Station. 3) The transmission line right-of-way (ROW) includes a 50-foot buffer around the existing HGP transmission line, along with additional tie-ins with the onsite switchyard and with a small transformer yard. The transmission line extends northward to the Bonneville Power Administration (BPA) McNary Substation, located about 11.59 miles from the Station. 4) The "step-up substation" is a new 500-kV step-up substation to be located south of the BPA McNary Substation to increase voltage of the line from 230 kV to 500 kV. An underground high voltage cable and aboveground transition structure will connect the step-up substation with the BPA McNary Substation. 5) The "natural gas pipeline" is a new pipeline lateral to be built within the existing 50-foot natural gas ROW that serves HGP. The natural gas pipeline extends southward from the energy facility site to an existing pipeline operated by Gas Transmission Northwest (GTN), located approximately 4.63 miles south of the proposed Station.

Portions of the Site are mostly within or adjacent to a farm zone; therefore, "adjacent" properties include those located within 500 feet of the notice distance of the Site Boundary until the transmission line corridor enters the city of Umatilla, where the notice distance becomes 100 feet.

F.2 IDENTIFICATION OF PROPERTY OWNERS

Perennial-WindChaser LLC (Perennial) obtained electronic data from Umatilla County on August 5, 2013, that included the names and mailing addresses of all owners of record of property located within the notice distance of the Site Boundary as shown on the most recent property tax assessment roll. Perennial will submit the list to the Oregon Department of Energy in electronic format acceptable to the Department for the production of mailing labels. Table F-1 provides the mailing address and name of property owners, each property's proximity to the Site Boundary, and the tax lot and map numbers for each property, along with a map identification number. Figures F-1 through F-11 show the property locations and their proximity to the Site Boundary.

The current owner of the energy facility site property (M003) is Perennial Power Holding Inc.

Table F-1 Property Owners Within Notice Distance of the Site Boundary

Map ID Number	Mailing Address and Name	Relationship to Site Boundary	Tax Map	Lot Number
M003	Perennial Power Holding Inc 300 Madison Ave New York, NY 10017	Energy Facility Site	4N2830	1200
M001	Vadata Inc Attn: Tax Dept PO Box 80416 Seattle, WA 98108	Gas Line and Within 500 feet of Transmission Line and Power Plant	4N2830	1100 & 1100A1
M002	Hermiston Generating Co & PacifiCorp 78145 Westland Rd Hermiston, OR 97838	Temporary Construction Area	4N2830	1500
M004	Farmland Reserve Inc Attn: Tax Admin PO Box 511196 Salt Lake City, UT 84151	Within 500 feet of Power Plant	4N2725A	500
M005	Bounds Roger S PO Box 148 Hermiston, OR 97838	Within 500 feet of Power Plant and Transmission Line	4N2725A	700
M006	BT Property LLC 55 Glenlake PKWY Atlanta, GA 30328	Within 500 feet of Power Plant and Transmission Line	4N2725A	600
M009	Flying J Inc. c/o Pilot Travel Centers LLC PO Box 54470 Lexington, KY 40555	Transmission Line and within 500 feet of the Power Plant	4N2725A	200
M008	Hermiston Generating Co & PacifiCorp 825 NE Multnomah St Ste 1900 Portland, OR 97239	Within 500 feet of Power Plant and Transmission Line and Process Lines	4N28C	2220
M007	ConAgra Foods Lamb Weston Inc. Karima Tomasino PO Box 1900 Pasco, WA 99302	Within 500 feet of Power Plant and Transmission Line and Process Lines	4N2830	300
M010	ConAgra Foods Lamb Weston Inc. PO Box 1900 Pasco, WA 99302	Within 500 feet of Power Plant and Transmission Line and Gas line	4N28C	2206
M012	Umatilla Electric Co-Op Assn. PO Box 1148 Hermiston, OR 97838	Within 500 feet of Power Plant and Gas Line	4N2830	400
M011	Umatilla Electric Co-Op Assn. PO Box 1148 Hermiston, OR 97838	Within 500 feet of Power Plant and Gas Line	4N2830	500

Table F-1 Property Owners Within Notice Distance of the Site Boundary

Map ID Number	Mailing Address and Name	Relationship to Site Boundary	Tax Map	Lot Number
M013	Art Mortgage Borrower Propco 2006-3 L Marvin F Poer & Co. 18818 Teller Ave #Ste. 277 Irvine, CA 92612	Within 500 feet of Power Plant and Gas Line	4N2830	100
M176	Petro Stopping Centers LP Travelcenters of America 24601 Center Ridge Rd #200 Westlake, OH 44145	Within 500 feet of Temporary Construction Area	4N2725	500
M177	Vadata Inc Attn: Tax Dept PO BOX 80416 Seattle, WA 98108	Within 500 feet of Temporary Construction Area	4N2725	600
M018	Umatilla Electric Co-Op Assn. PO Box 1148 Hermiston, OR 97838	Transmission Line	4N2725A	100
M020	Pedro Land Comapany LLC 78710 Westland Rd Hermiston, OR 97838	Transmission Line	4N27	1200
M022	7S Farming LLC 78638 Walker Rd Hermiston, OR 97838	Transmission Line	4N27	1100
M025	Umatilla Electric Co-op Assn. PO Box 1148 Hermiston, OR 97838	Transmission Line	4N27	3800
M026	Westland Irrigation District Attn. Stacey Wells PO Box 944 Hermiston, OR 97838	Transmission Line	4N27	401
M027	ConAgra Foods Lamb Weston Inc. Karima Tomasino PO Box 1900 Pasco, WA 99302	Transmission Line	4N27	206
M030	ConAgra Foods Lamb Weston Inc. Karima Tomasino PO Box 1900 Pasco, WA 99302	Transmission Line	4N27	100
M031	Cleaver Land, LLC PO Box 1191 Hermiston, OR 97838	Transmission Line	5N27	600
M032	Amstad Farms Land Company LLC 16300 SW 192ND Ave Sherwood, OR 97140	Transmission Line	5N27	601

Table F-1 Property Owners Within Notice Distance of the Site Boundary

Map ID Number	Mailing Address and Name	Relationship to Site Boundary	Tax Map	Lot Number
M034	Amstad Farms Land Company LLC 16300 SW 192ND Ave Sherwood, OR 97140	Transmission Line	5N27	602
M035	Amstad Farms Land Company LLC 16300 SW 192ND Ave Sherwood, OR 97140	Transmission Line	5N28C	1300
M038	Amstad Farms Land Co LLC PO BOX 890 Hermiston, OR 97838 And Umatilla Broadcasting 80898 Powerline Rd Umatilla, OR 97882	Transmission Line	5N28C	1401&1401A1
M042	Woodward Diana Betts PO Box 63 Hermiston, OR 97838	Transmission Line	5N2820CC	200
M044	Columbia Basin Development LLC 7010 Indiana St Vancouver, OR 98664	Transmission Line	5N2820CC	100
M046	Te Amo Despacio LLC 963 SW Simpson Ave #Ste 110 Bend, OR 97702	Transmission Line	5N2820CB	7700
M047	Madrigal Mendoza Gerardo PO Box 1071 Hermiston, OR 97838	Transmission Line	5N2820CB	4200
M048	Ambriz Jose Sanchez 3045 Blue Jay St Umatilla, OR 97882	Transmission Line	5N2820CB	4100
M049	Collins Steven H & Jeanna M &Collins Barbara 3025 Blue Jay St Umatilla, OR 97882	Transmission Line	5N2820CB	4000
M050	Mendoza Rosa Elena Campos 49 Rio Senda St. Umatilla, OR 97882	Transmission Line	5N2820CB	300
M051	Columbia Basin Development LLC 7010 Indiana St Vancouver, OR 98664	Transmission Line	5N2820CB	200
M052	Columbia Basin Development LLC 7010 Indiana St Vancouver, WA 98664	Transmission Line	5N2820CB	100

Table F-1 Property Owners Within Notice Distance of the Site Boundary

Map ID Number	Mailing Address and Name	Relationship to Site Boundary	Tax Map	Lot Number
M055	Sanguino Gerardo Jr & Mendoza Guadalupe 2733 Blue Jay St Umatilla, OR 97882	Transmission Line	5N2820BC	6400
M056	Meza Garcia Jorge A & Meza Alejandra 2677 Blue Jay St Umatilla, OR 97882	Transmission Line	5N2820BC	6300
M057	Fullerton Timothy 2655 Blue Jay St Umatilla, OR 97882	Transmission Line	5N2820BC	6200
M058	Campos Isidro Navarrete ET AL 2633 Blue Jay St Umatilla, OR 97882	Transmission Line	5N2820BC	6100
M059	Catherine M. Christopher PO Box 2197 Fallbrook, CA 92028	Transmission Line	5N2820BC	6000
M060	Alberta R. & John D. Nichols, Jr. (TDD) PO Box 338 Umatilla, OR 97882	Transmission Line	5N2820BC	5800
M061	Jeffrey Clements 2589 Blue Jay St. Umatilla, OR 97882	Transmission Line	5N2820BC	5100
M063	Jaquelin Espain 2533 Blue Jay St. Umatilla, OR 97882	Transmission Line	5N2820BC	5000
M065	Sandy J. Muniz 130 S Conway Pl. #17 Kennewick, WA 99336	Transmission Line	5N2820BC	4900
M067	Renato Ceniceros 326 NW Butte Dr. Hermiston, OR 97838	Transmission Line	5N2820BC	4800
M069	Garcia Marco Antonio & Armenta Maria D R 2433 Blue Jay St Umatilla, OR 97882	Transmission Line	5N2820BC	4700
M071	Fernando Vargas 2399 Blue Jay St. Umatilla, OR 97882	Transmission Line	5N2820BC	4600
M073	Miguel & Flora Radillo 2377 Blue Jay St Umatilla, OR 97882	Transmission Line	5N2820BC	4500
M075	Donn A. & Alana J. McWilliams 2355 Blue Jay St. Umatilla, OR 97882	Transmission Line	5N2820BC	4400

Table F-1 Property Owners Within Notice Distance of the Site Boundary

Map ID Number	Mailing Address and Name	Relationship to Site Boundary	Tax Map	Lot Number
M076	Martinez Pedro V & Hilda 266 Pine Tree Ave Umatilla, OR 97882	Transmission Line	5N2820BC	4300
M077	Horacio & Isidora Villarreal 277 Chukar Cir. Umatilla, OR 97882	Transmission Line	5N2820BB	9800
M078	Bruce A & Carla B McLane 170 Van Buren Dr Umatilla, OR 97882	Transmission Line	5N2820BB	8900
M081	Soria Mauricio 2 Pomono Dr McNary, OR 97801	Transmission Line	5N2820	700
M082	Hinsley Richey James & Jodi Ladeanne 333 Pine Tree Ave Umatilla, OR 97882	Transmission Line	5N2820	702
M083	Garcia Guadalupe P & Margarita G PO Box 1582 Umatilla, OR 97882	Transmission Line	5N2820	800
M084	Anderson June PO Box 1234 Umatilla, OR 97882	Transmission Line	5N2820	900
M085	Umatilla-Morrow Co Headstart Inc 721 SE 3rd #Ste 107 Pendleton, OR 97801	Transmission Line	5N2820	1000
M086	Leathers Lloyd L PO Box 1708 Umatilla, OR 97882	Transmission Line	5N2820	1100
M087	Scott Bruce A PO Box 8313 Black Butte Ranch, OR 97759	Transmission Line	5N2820	400
M088	Anderson June PO Box 1234 Umatilla, OR 97882	Transmission Line	5N2820	500
M089	Reffett Sandra E PO Box 65 Plymouth, WA 99346	Transmission Line	5N2820	300
M091	Reffett Wayne S PO Box 65 Plymouth, WA 99346	Transmission Line	5N2820	100

Table F-1 Property Owners Within Notice Distance of the Site Boundary

Map ID Number	Mailing Address and Name	Relationship to Site Boundary	Tax Map	Lot Number
M095	State Of Oregon ODOT Tech Cntr Prop Mgmt #42500 4040 Fairview Industrial Dr SE #MS2 Salem, OR 97302	Transmission Line	5N2821	600
M102	Morrison John K ET AL 1020 Boyer Ave Walla Walla, WA 99362 and Jones-Scott Co PO Box 775 Hermiston, OR 97838	Transmission Line	5N2816	2200
M103	Bonney Ken ET AL C/O Barnett & Moro 495 E Main St Hermiston, OR 97838	Transmission Line	5N2816	2300
M105	USA-BLM PO Box 2965 Portland, OR 97208	Transmission Line	5N2816	2000
M108	State Of Oregon ODOT Tech Cntr Prop Mgmt #42500 4040 Fairview Industrial Dr SE #MS2 Salem, OR 97302	Transmission Line	5N2816A	1700
M109	USA-BLM PO Box 2965 Portland, OR 97208	Transmission Line	5N2816A	1600
M113	USA-BLM PO Box 2965 Portland, OR 97208	Transmission Line	5N2816A	400
M116	USA-BLM PO Box 2965 Portland, OR 97208	Transmission Line	5N2816A	300
M117	USA BPA PO Box 3621 Portland, OR 97208	Transmission Line and Step-up Substation	5N2816A	200
M127	USA BPA PO Box 3621 Portland, OR 97208	Transmission Line	5N2816A	100
M128	USA-BLM PO Box 2965 Portland, OR 97208	Transmission Line	5N2809	100
M014	Hermiston Generating Co & Pacificorp 78145 Westland Rd Hermiston, OR 97838	Within 500 feet of Transmission Line	4N2830	200

Table F-1 Property Owners Within Notice Distance of the Site Boundary

Map ID Number	Mailing Address and Name	Relationship to Site Boundary	Tax Map	Lot Number
M015	Hibler LLC 2405 S Janeen St Boise, ID 83709	Within 500 feet of Transmission Line	4N28C	3000
M016	Bishop Karen 382 NW 10th St Hermiston, OR 97838	Within 500 feet of Transmission Line	4N28C	2903
M017	Hermiston Generating Co LP 78145 Westland Rd Hermiston, OR 97838	Within 500 feet of Transmission Line	4N28C	2900
M138	Flying J Inc C/O Pilot Travel Centers LLC PO Box 54470 Lexington, KY 40555	Within 500 feet of Transmission Line	4N2725A	202
M019	USA Dept Of Army Umatilla Army Depot	Within 500 feet of Transmission Line	4N2725	100
M021	USA Dept Of Army Umatilla Army Depot	Within 500 feet of Transmission Line	4N27	200
M023	7s Farming LLC 78638 Walker Rd Hermiston, OR 97838	Within 500 feet of Transmission Line	4N27	900
M024	Bellinger Robert D & Lou A 29760 Bellinger Rd Hermiston, OR 97838	Within 500 feet of Transmission Line	4N27	600
M028	Conagra Foods Lamb Weston Inc Karima Tomasino PO Box 1900 Pasco, WA 99302	Within 500 feet of Transmission Line	4N2807B	200
M029	Conagra Foods Lamb Weston Inc Karima Tomasino PO Box 1900 Pasco, WA 99302	Within 500 feet of Transmission Line	4N28B	4300
M033	Amstad Farms Land Company LLC 16300 SW 192nd Ave Sherwood, OR 97140	Within 500 feet of Transmission Line	5N28C	6701
M036	Amstad Farms Land Company LLC 16300 SW 192nd Ave Sherwood, OR 97140 And N & C Land LLC 71062 Perkins Rd Echo, OR 97826	Within 500 feet of Transmission Line	5N27	501 & 501A1
M037	Amstad Farms Land Company LLC 16300 SW 192nd Ave Sherwood, OR	Within 500 feet of Transmission Line	5N28C	1200

Table F-1 Property Owners Within Notice Distance of the Site Boundary

Map ID Number	Mailing Address and Name	Relationship to Site Boundary	Tax Map	Lot Number
M040	Umatilla, City of, Property Tax Dept PO Box 7467 Charlotte, NC 28241	Within 500 feet of Transmission Line	5N2820CC	400
M041	Umatilla, City Of PO Box 130 Umatilla, OR 97882	Within 500 feet of Transmission Line	5N2820CC	300
M039	Cleaver Land, LLC P O Box 1191 Hermiston, OR 97838	Within 500 feet of Transmission Line	5N28C	1400
M043	Guisti James 2644 Blue Jay St Umatilla, OR 97882	Within 100 feet of Transmission Line	5N2820	2203
M043A	C C P D Inc PO Box 203 Pendleton, OR 97801	Within 100 feet of Transmission Line	5N2820	2207
M045	C C P D Inc PO Box 203 Pendleton, OR 97801 And Cleaver Alan PO Box 1192 Hermiston, OR 97838	Within 100 feet of Transmission Line	5N2820	2200&2290A1
M178	CCPD Inc PO Box 203 Pendleton, OR 97801	Within 100 feet of Transmission Line	5N2820	2204
M182	Coria Erik G & Solis Kimberly 489 Dark Canyon Ave Umatilla, OR 97882	Within 100 feet of Transmission Line	5N2820CB	400
M181	Madgril Ubaldo 3030 Blue Jay St Umatilla, OR 97882	Within 100 feet of Transmission Line	5N2820CB	3900
M180	Bowman Jackie Malven 78756 Ternes Ln Hermiston, OR 97882	Within 100 feet of Transmission Line	5N2820CB	4300
M179	Macias Laura Rivera & Armenta Armando M 492 Bridgeport Ave Umatilla, OR 97882	Within 100 feet of Transmission Line	5N2820CB	7600
M053	Fastrack Inc 4803 Cataonia Dr Pasco, WA 99301	Within 100 feet of Transmission Line	5N2820	1700
M054	Fastrack Inc DBA Monogram of Pasco 4803 Cataonia Dr Pasco, WA 99301	Within 100 feet of Transmission Line	5N2820	2300

Table F-1 Property Owners Within Notice Distance of the Site Boundary

Map ID Number	Mailing Address and Name	Relationship to Site Boundary	Tax Map	Lot Number
M062	Deacon James E & Sirena D 2522 Curlew St Umatilla, OR 97882	Within 100 feet of Transmission Line	5N2820BD	2400
M064	Ortiz Mendoza Rosa M 233 Sparrow Ave Umatilla, OR 97882	Within 100 feet of Transmission Line	5N2820BD	2300
M066	Privett H John & Frances J 2466 Curlew St Umatilla, OR 97882	Within 100 feet of Transmission Line	5N2820BD	2200
M068	Karen Salesh Shalendra & Tabitha 2444 Curlew St Umatilla, OR 97882	Within 100 feet of Transmission Line	5N2820BD	2100
M070	Picker Stacey L & Monique 285 Hawk Circle Umatilla, OR 97882	Within 100 feet of Transmission Line	5N2820BD	2000
M072	Ebker Phillip S 297 Hawk Circle Umatilla, OR 97882	Within 100 feet of Transmission Line	5N2820BD	1900
M074	Leon Jorgr & Maria B 288 Pine Tree Ave Umatilla, OR 97882	Within 100 feet of Transmission Line	5N2820BD	100
M079	Espain Jaquelin 255 Chukar Circle Umatilla, OR 97882	Within 100 feet of Transmission Line	5N2820BB	10000
M080	Hayden Enterprises Inc 2464 SW Glacier Pl Ste 110 Redmond, WA 97756	Within 100 feet of Transmission Line	5N2820BB	9700
M090	Nobles Clyde C & Betty L 650 Monroe St Umatilla, OR 97882	Within 100 feet of Transmission Line	5N2820	200
M092	Nobles Clyde C & Betty L 650 Monroe St Umatilla, OR 97882	Within 500 feet of Transmission Line	5N2817D	1600
M183	Nobles Clyde C & Betty L 650 Monroe St Umatilla, OR 97882	Within 500 feet of Transmission Line	5N2817D	1500
M184	Simplot Industries Inc PO Box 27 Boise, ID 83707	Within 500 feet of Transmission Line	5N2817D	600
M185	State of Oregon ODOT Tech Cntr Prop Mgmt #42500 4040 Fairview Industrial Dr SE #MS2 Salem,OR 97302	Within 500 feet of Transmission Line	5N2821	800

Table F-1 Property Owners Within Notice Distance of the Site Boundary

Map ID Number	Mailing Address and Name	Relationship to Site Boundary	Tax Map	Lot Number
M093	Umatilla County Of 216 SE 4th Pendleton, OR 97801	Within 500 feet of Transmission Line	5N2817D	800
M094	Umatilla County Of 216 SE 4th Pendleton, OR 97801	Within 500 feet of Transmission Line	5N2817D	1100
M096	Wadekamper Lon G 29899 Country Ln Hermiston, OR 97838	Within 500 feet of Transmission Line	5N2821	1000
M097	Hampton Flora L Cruz Marcelino Valle & Alicia (Agt) 1360 6th St #3 Umatilla, OR 97882	Within 500 feet of Transmission Line	5N2821	700
M098	White Debra A 1/3 Et Al 2/3 77311 Colonel Jordan Rd Hermiston, OR 97838	Within 500 feet of Transmission Line	5N2821	300
M099	White Debra A 1/3 Et Al 2/3 77311 Colonel Jordan Rd Hermiston, OR 97838	Within 500 feet of Transmission Line	5N2821	400
M100	Vadata Inc PO Box 80416 Seattle, WA 97108	Within 500 feet of Transmission Line	5N2821	200 & 200A1
M104	Umatilla Electric COOP Assoc PO Box 1148 Hermiston, OR 97838	Within 500 feet of Transmission Line	5N2816	2400
M106	Morrison John K & ET AL 1020 Boyer Ave Walla Walla, WA 99362 And Jones-Scott Co PO Box 775 Hermiston, OR 97838	Within 500 feet of Transmission Line	5N2816	2100&2100A1
M107	Umatilla County Of 216 SE 4th Pendleton, OR 97801	Within 500 feet of Transmission Line	5N2816	1700
M110	The William Morgan Reuter Family Limited 79786 Agnew Rd Hermiston, OR 97838	Within 500 feet of Transmission Line	5N2816	700
M140	Oregon Department Of Transportation Right Of Way Section Ms#2 4040 Fairview Industrial Dr SE Salem, OR 97302	Within 500 feet of Transmission Line	5N2816	900
M111	USA-BR 550 W Fort St Boise, ID 83724	Within 500 feet of Transmission Line	5N2816	1000

Table F-1 Property Owners Within Notice Distance of the Site Boundary

Map ID Number	Mailing Address and Name	Relationship to Site Boundary	Tax Map	Lot Number
M112	Timpy Anna L 401 6th St Umatilla, OR 97882 and J R ZUKIN CORP PO BOX 331 The Dalles, OR 97058	Within 500 feet of Transmission Line	5N2816	1100
M139	USA-BR 550 W Fort St Boise, ID 83724	Within 500 feet of Transmission Line	5N2816	800
M119	USA-BR 550 W Fort St Boise, ID 83724	Within 500 feet of Transmission Line	5N2816	600
M114	Jenks Duane O & Jenks Vard B (Trs) PO Box D Moses Lake, WA 98837	Within 500 feet of Transmission Line	5N2816A	600
M115	USA-BR 550 W Fort St Boise, ID 83724	Within 500 feet of Transmission Line	5N2816A	500
M118	USA-BR 550 W Fort St Boise, ID 83724	Within 500 feet of Transmission Line	5N2816A	700
M120	USA-BLM PO Box 2965 Portland, OR 97208	Within 500 feet of Transmission Line	5N2816A	1000
M121	MO MO INC PO BOX 1290 Umatilla, OR 97882	Within 500 feet of Transmission Line	5N2816A	900
M122	MO MO INC PO BOX 1290 Umatilla, OR 97882	Within 500 feet of Transmission Line	5N2816A	800
M123	MO MO INC PO BOX 1290 Umatilla, OR 97882	Within 500 feet of Transmission Line	5N2816A	1100
M124	MO MO INC 1890 7th ST Umatilla, OR 97882	Within 500 feet of Transmission Line	5N2816A	1300
M125	MO MO INC 1890 7th ST Umatilla, OR 97882	Within 500 feet of Transmission Line	5N2816A	1200
M126	USA-BLM PO BOX 2965 Portland, OR 97208	Within 500 feet of Transmission Line	5N28A	400
M174	Liberated L & E LLC 2229 E Avenue Q Palmdale, CA 93550	Gas Line	4N2830	600

Table F-1 Property Owners Within Notice Distance of the Site Boundary

Map ID Number	Mailing Address and Name	Relationship to Site Boundary	Tax Map	Lot Number
M150	Liberated L & E LLC 2229 E Avenue Q Palmdale, CA 93550	Gas Line	4N2830	2100
M149	Snakcorp Inc. c/o Shearers Foods Inc. 100 Lincoln Way E Massilon, OH 44646	Gas Line	4N28C	3800
M152	Westland Irrig Dist Attn Stacey Wells PO Box 944 Hermiston, OR 97838	Gas Line	4N2831	100
M157	Sharkey Philip E & Lora L 29689 Noble Rd Hermiston, OR 97838	Gas Line	4N2831	800
M160	Johnston Andrew Dean 29616 Noble Rd Hermiston, OR 97838	Gas Line	4N2831	1000
M162	Pedro Mark Anthony & Maorgan Alexis 29592 Noble Rd Hermiston, OR 97838	Gas Line	4N2831	1200
M164	Boettcher Trust 29957 Noble Rd Hermiston, OR 97838	Gas Line	4N2831	2300
M167	ELH LLC 76855 Highway 207 Echo, OR 97826	Gas Line	3N28	2401
M166	Madison Ranches Inc. 29299 Madison Rd Echo, OR 97826	Gas Line	3N28	2501
M168	Madison Ranches Inc. 29299 Madison Rd Echo, OR 97826	Gas Line	3N28	2600
M170	Madison Ranches Inc. 29299 Madison Rd Echo, OR 97826	Gas Line	3N28	2700
M171	JR Simplot Company PO Box 27 Boise, ID 83707	Gas Line	3N28	2300
M173	JR Simplot Company PO Box 27 Boise, ID 83707	Gas Line	3N28	2307
M172	Madison Ranches Inc. 29299 Madison Rd Echo, OR 97826	Gas Line	3N28	6100

Table F-1 **Property Owners Within Notice Distance of the Site Boundary**

Map ID Number	Mailing Address and Name	Relationship to Site Boundary	Tax Map	Lot Number
M141	Britt Sidney & Randy Rae 78540 Big Butter Creek Rd Echo, OR 97826	Within 500 feet of Gas Line	4N28C	2802
M142	Craft Rick A 1118 N Michigan Ave Caldwell ID, 83605	Within 500 feet of Gas Line	4N2830	800
M143	Craft Thomas D PO Box 4532 Portland OR, 97208	Within 500 feet of Gas Line	4N2830	900
M144	Driftwood Meacham LLC Burnam Norma (Agt) 78001 Cottonwood Bend Rd Hermiston, OR 97838	Within 500 feet of Gas Line	4N2830	1000
M145	Strand Mary E & Paul J 77941 Cottonwood Bend Rd Hermiston, OR 97838	Within 500 feet of Gas Line	4N2830	1600
M146	Coria Eva P c/o Tammy Angel Ornelas 77935 Cottonwood Bend Rd Hermiston, OR 97838	Within 500 feet of Gas Line	4N2830	1700
M147	Bell Merry Susan PO Box 754 Hermiston, OR 97838	Within 500 feet of Gas Line	4N2830	1800
M148	Buckallew Cregg A & M Mary 77867 Cottonwood Bend Rd Hermiston, OR 97838	Within 500 feet of Gas Line	4N2830	1900
M151	Liberated L & E LLC Colmenero Fred (Agt) 80261 S Edwards Rd Hermiston, OR 97838	Within 500 feet of Gas Line	4N2830	2000
M153	McDaniels Eldon 111003 E Windward Ln Kennewick, WA 99338	Within 500 feet of Gas Line	4N2831	301
M156	Wood Daniel J & Debora L 33256 E Walls Rd Hermiston, OR 97838	Within 500 feet of Gas Line	4N2831	700
M155	Wood Daniel J & Debora L 33256 E Walls Rd Hermiston, OR 97838	Within 500 feet of Gas Line	4N2831	600
M154	Barton George H 1390 SW 11th St Hermiston, OR 97838 And JR Zukin Corp DBA Meadow Outdoor Adv PO Box 331 The Dalles, OR 97058	Within 500 feet of Gas Line	4N2831	400 & 400A1

Table F-1 Property Owners Within Notice Distance of the Site Boundary

Map ID Number	Mailing Address and Name	Relationship to Site Boundary	Tax Map	Lot Number
M158	Boettcher Trust 29957 Noble Rd Hermiston, OR 97838	Within 500 feet of Gas Line	4N28C	5800
M159	Smith Raymon J & Leah Joy 29704 Noble Rd Hermiston, OR 97838	Within 500 feet of Gas Line	4N2831	900
M161	Smith Raymon J & Leah Joy 29704 Noble Rd Hermiston, OR 97838	Within 500 feet of Gas Line	4N2831	1100
M163	Pedro Mark Anthony & Morgan Alexis 29592 Noble Rd Hermiston, OR 97838	Within 500 feet of Gas Line	4N2831	2200
M165	Curtis Bert W 29416 Noble Rd Hermiston, OR 97838	Within 500 feet of Gas Line	4N2831	2100
M169	JR Simplot Company PO Box 27 Boise, ID 83707	Within 500 feet of Gas Line	3N28	2601
M175	JR Simplot Company PO Box 27 Boise, ID 83707	Within 500 feet of Gas Line	3N28	6101

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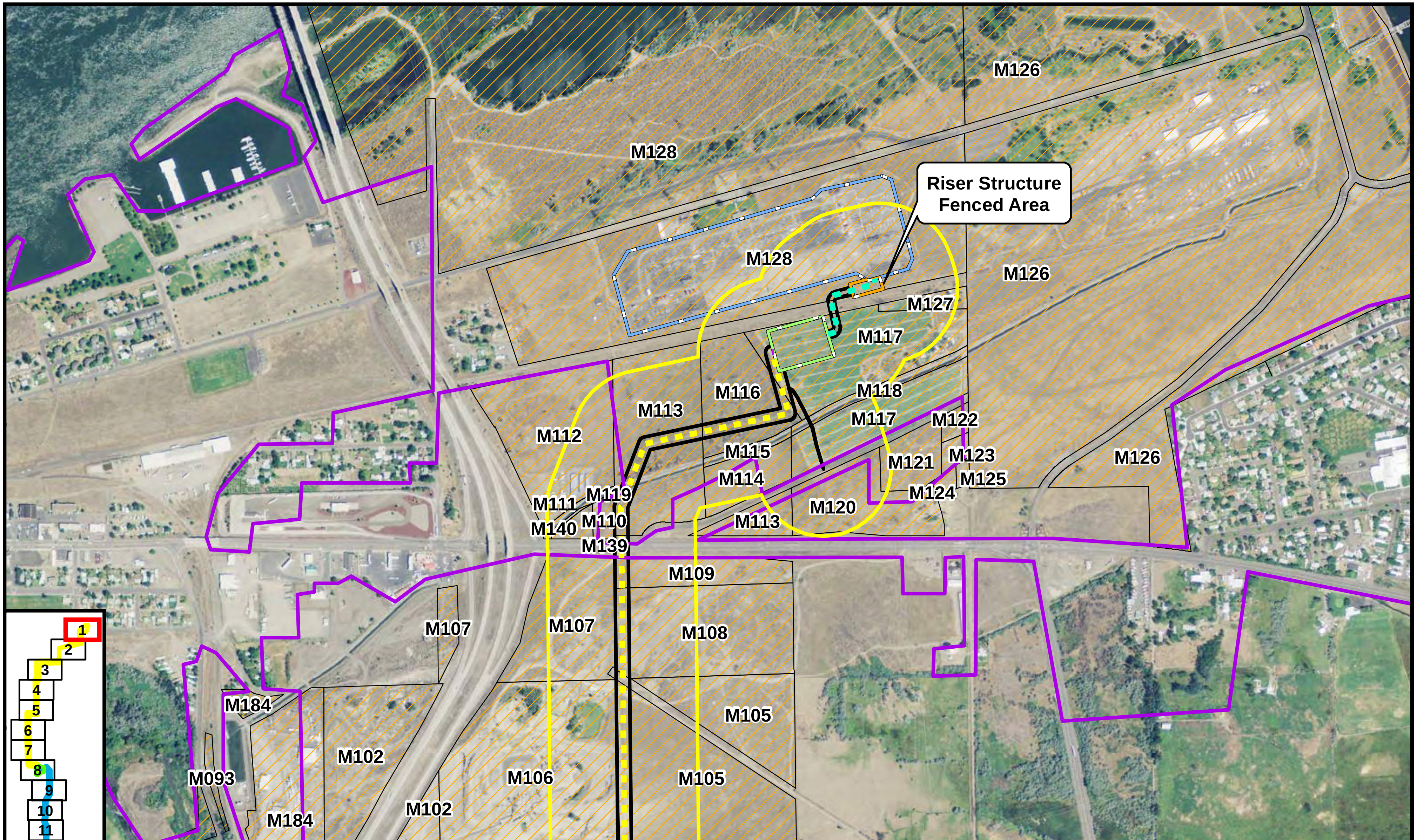

NORTH

0 500 1,000 Feet

Scale: 1 Inch = 1,000 Feet

Legend

- Energy Facility Site
- Site Boundary
- McNary Substation
- Step-up Substation Boundary
- New Interconnect Line
- New Underground Construction
- Existing McNary Electrical Interconnection
- New Gas Interconnection
- Digitized Umatilla City Limits
- Wind Chaser Site 500' Owner Notice
- McNary Electrical Interconnection Owner Notice Area*
- Gas Interconnection 500' Owner Notice
- Tax Lot

*Owner Notice Area is 500' Outside of City Limits and 100' Within City Limits

Burns & McDonnell SINCE 1898

Figure F-1
Project Property Parcels
Perennial Wind Chaser Station
Umatilla County, Oregon

Source: Umatilla Co. (2011), ORMAP (2012); USDA (2012); ESRI (2013) ; and Burns & McDonnell (2013)

Issued: 11/4/2013

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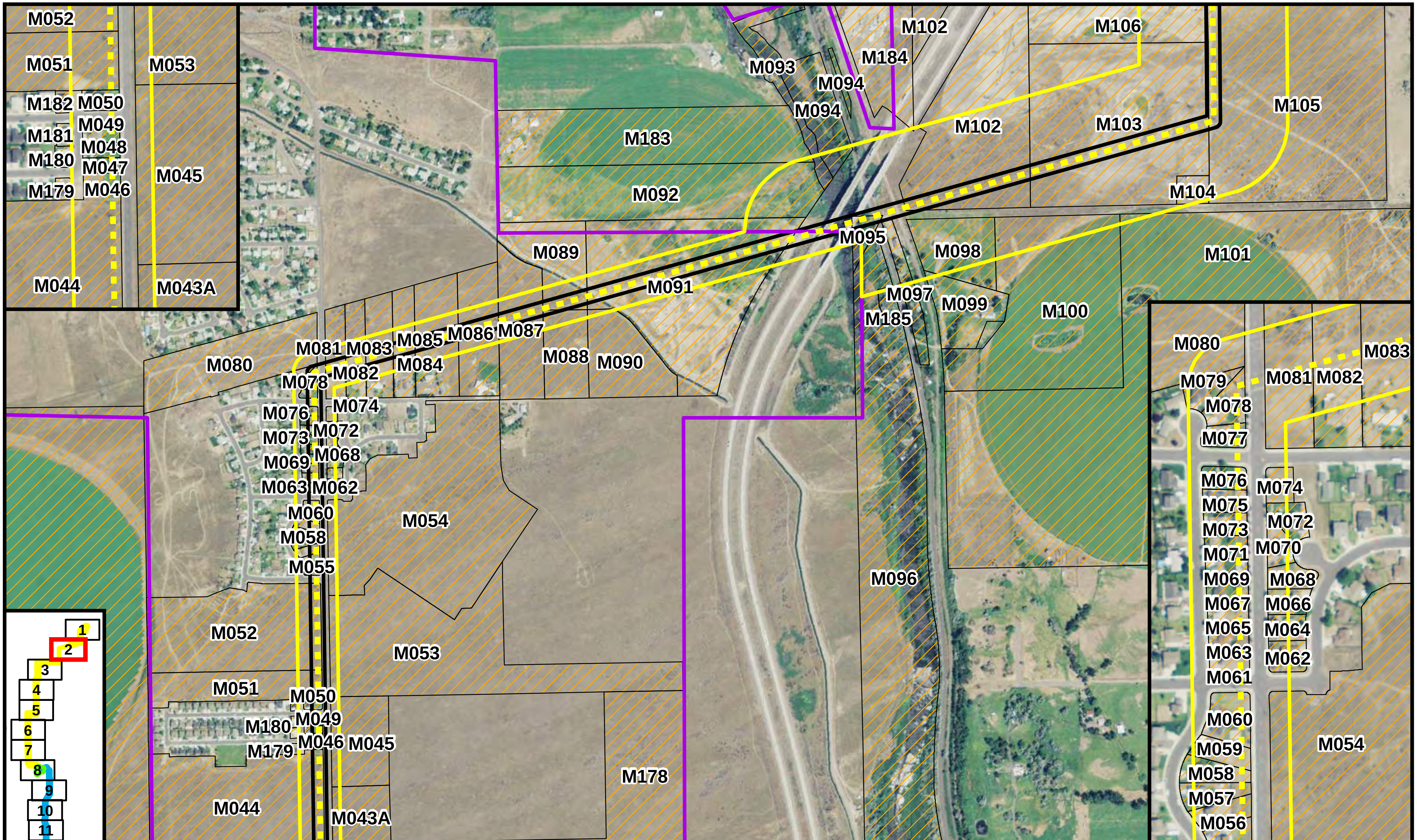

NORTH

0 500 1,000 Feet

Scale: 1 Inch = 1,000 Feet

Legend

- Energy Facility Site
- Site Boundary
- McNary Substation
- Step-up Substation Boundary
- New Interconnect Line
- New Underground Construction
- Existing McNary Electrical Interconnection
- New Gas Interconnection
- Digitized Umatilla City Limits
- Wind Chaser Site 500' Owner Notice
- McNary Electrical Interconnection Owner Notice Area*
- Gas Interconnection 500' Owner Notice
- Tax Lot

*Owner Notice Area is 500' Outside of City Limits and 100' Within City Limits

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Figure F-2
Project Property Parcels
Perennial Wind Chaser Station
Umatilla County, Oregon

Source: Umatilla Co. (2011), ORMAP (2012); USDA (2012); ESRI (2013) ; and Burns & McDonnell (2013)

Issued: 11/4/2013

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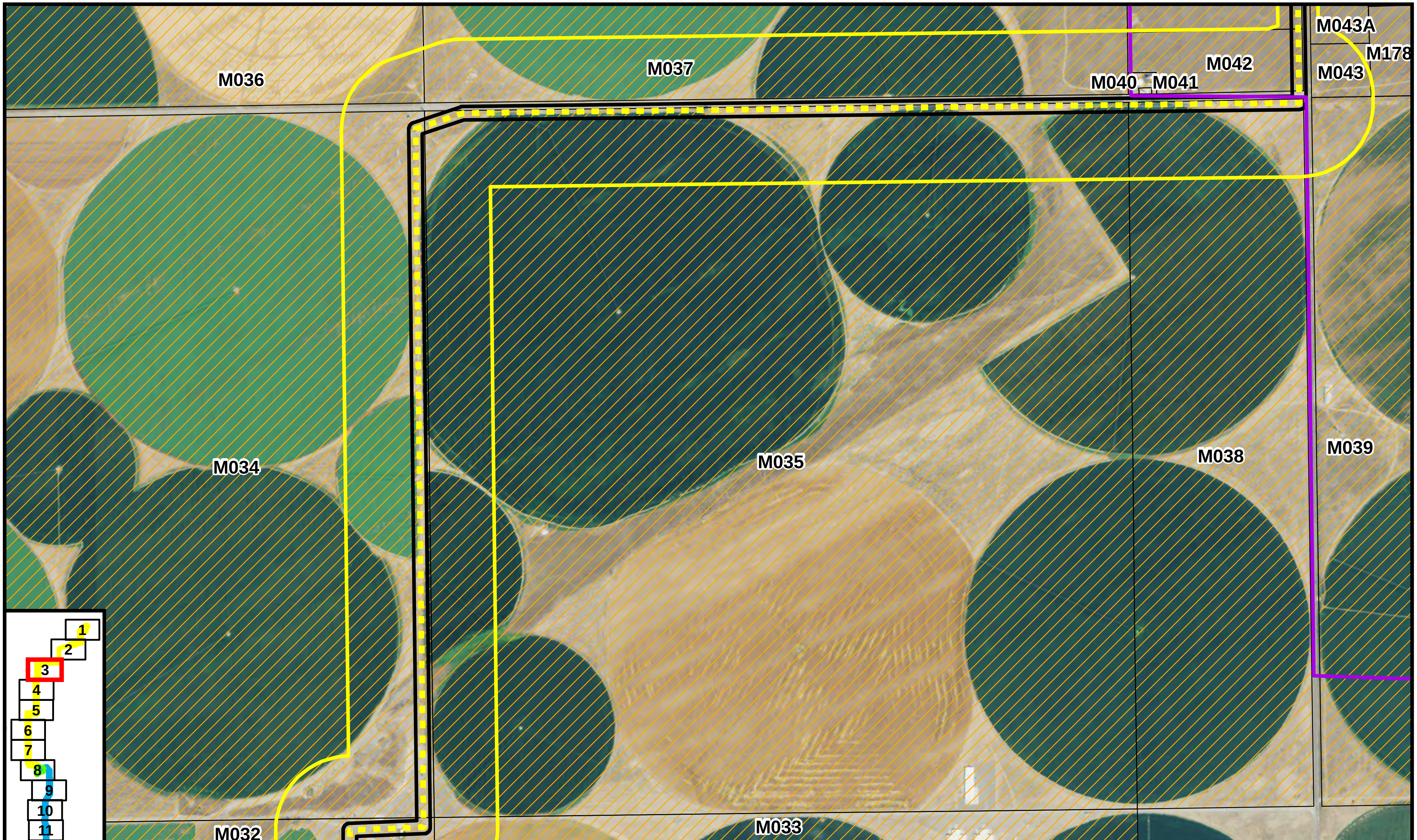

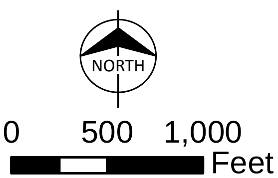

Scale: 1 Inch = 1,000 Feet

Legend

- Energy Facility Site
- Site Boundary
- McNary Substation
- Step-up Substation Boundary
- New Interconnect Line
- New Underground Construction
- Existing McNary Electrical Interconnection
- New Gas Interconnection
- Digitized Umatilla City Limits
- Wind Chaser Site 500' Owner Notice
- McNary Electrical Interconnection Owner Notice Area*
- Gas Interconnection 500' Owner Notice
- Tax Lot

*Owner Notice Area is 500' Outside of City Limits and 100' Within City Limits

Burns & McDonnell SINCE 1898

Figure F-3
Project Property Parcels
Perennial Wind Chaser Station
Umatilla County, Oregon

Source: Umatilla Co. (2011), ORMAP (2012); USDA (2012); ESRI (2013) ; and Burns & McDonnell (2013)

Issued: 11/1/2013

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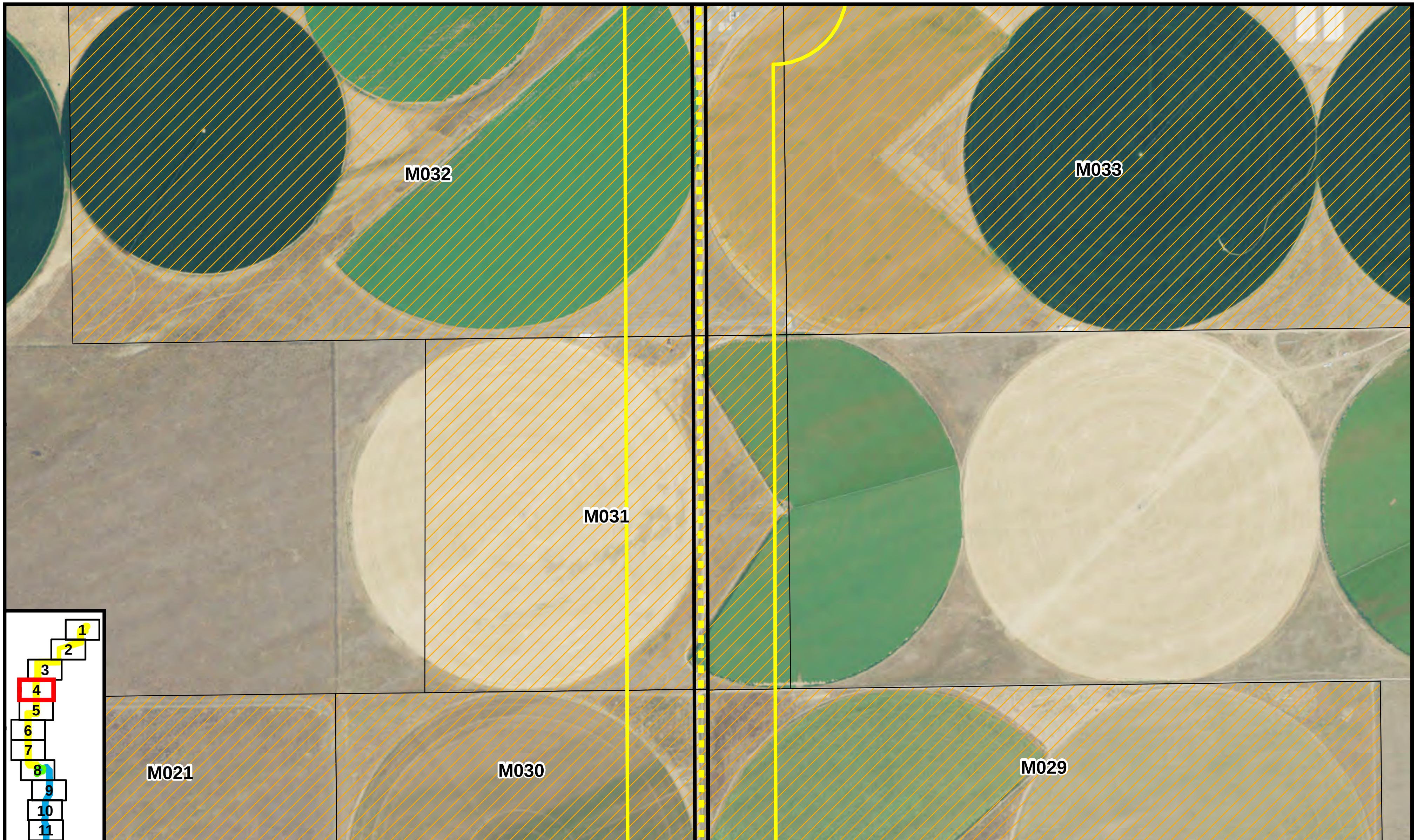

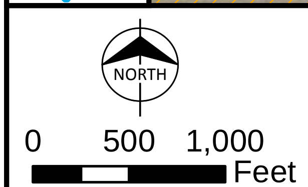

Scale: 1 Inch = 1,000 Feet

Legend

- Energy Facility Site
- Site Boundary
- McNary Substation
- Step-up Substation Boundary
- New Interconnect Line
- New Underground Construction
- Existing McNary Electrical Interconnection
- New Gas Interconnection
- Digitized Umatilla City Limits
- Wind Chaser Site 500' Owner Notice
- McNary Electrical Interconnection Owner Notice Area*
- Gas Interconnection 500' Owner Notice
- Tax Lot

*Owner Notice Area is 500' Outside of City Limits and 100' Within City Limits

Burns & McDonnell SINCE 1898

Figure F-4
Project Property Parcels
Perennial Wind Chaser Station
Umatilla County, Oregon

Source: Umatilla Co. (2011), ORMAP (2012); USDA (2012); ESRI (2013) ; and Burns & McDonnell (2013)

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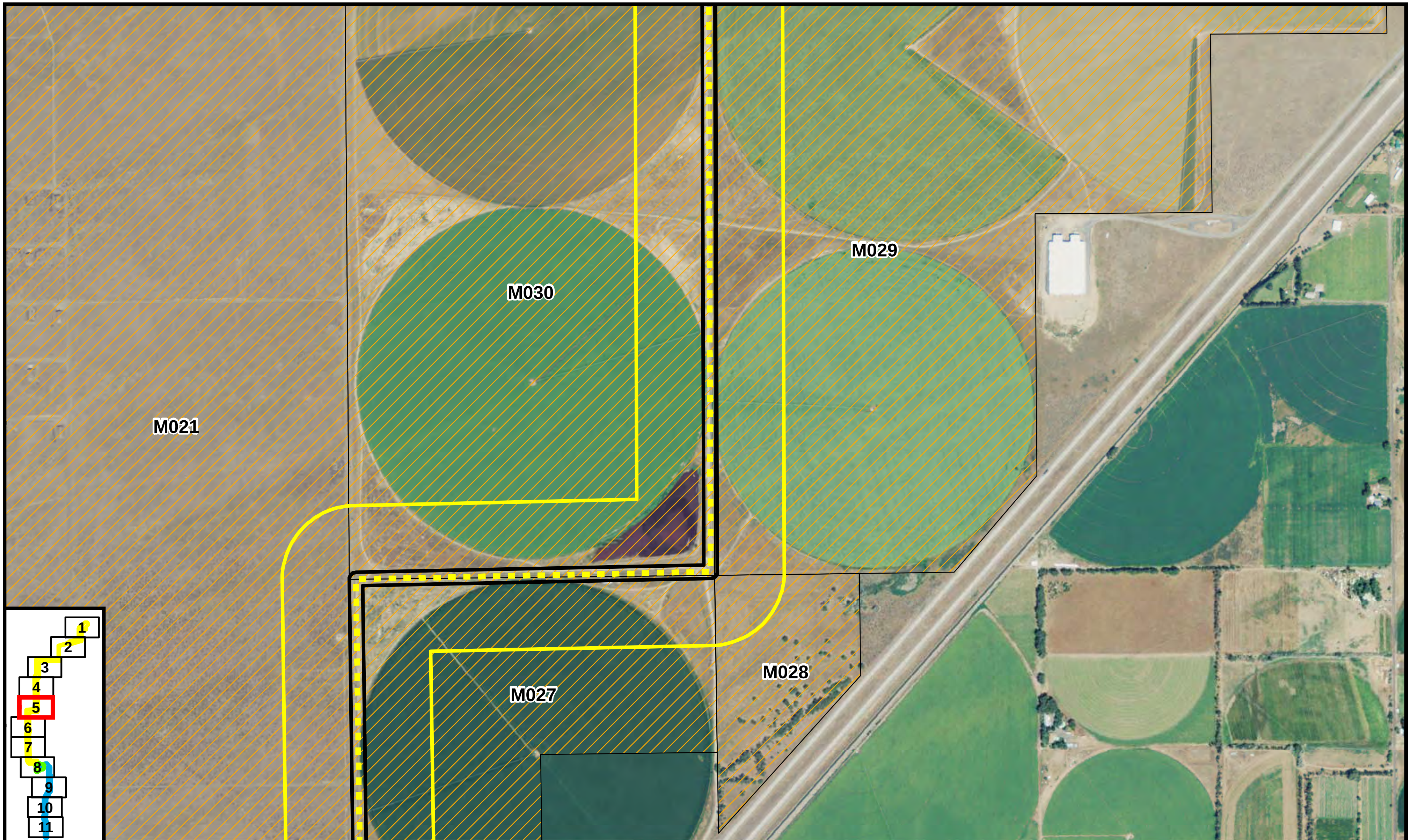

Legend

- Energy Facility Site
- Site Boundary
- McNary Substation
- Step-up Substation Boundary
- New Interconnect Line
- New Underground Construction
- Existing McNary Electrical Interconnection
- New Gas Interconnection
- Digitized Umatilla City Limits
- Wind Chaser Site 500' Owner Notice
- McNary Electrical Interconnection Owner Notice Area*
- Gas Interconnection 500' Owner Notice
- Tax Lot

*Owner Notice Area is 500' Outside of City Limits and 100' Within City Limits

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Figure F-5
Project Property Parcels
Perennial Wind Chaser Station
Umatilla County, Oregon

Source: Umatilla Co. (2011), ORMAP (2012); USDA (2012); ESRI (2013) ; and Burns & McDonnell (2013)

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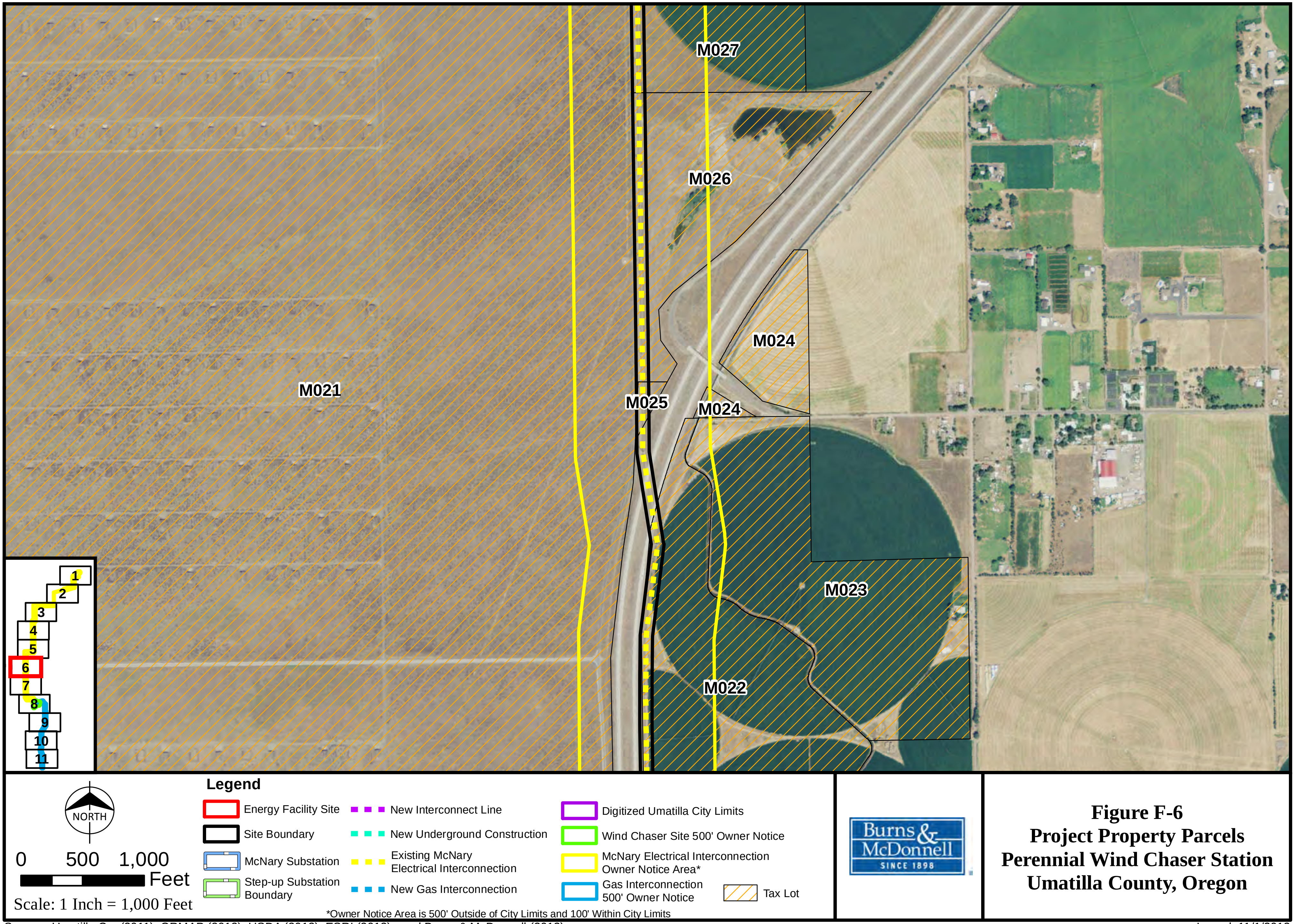

Figure F-6
Project Property Parcels
Perennial Wind Chaser Station
Umatilla County, Oregon

Source: Umatilla Co. (2011), ORMAP (2012); USDA (2012); ESRI (2013) ; and Burns & McDonnell (2013)

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NORTH

0 500 1,000 Feet

Scale: 1 Inch = 1,000 Feet

Legend

- Energy Facility Site
- Site Boundary
- McNary Substation
- Step-up Substation Boundary
- New Interconnect Line
- New Underground Construction
- Existing McNary Electrical Interconnection
- New Gas Interconnection
- Digitized Umatilla City Limits
- Wind Chaser Site 500' Owner Notice
- McNary Electrical Interconnection Owner Notice Area*
- Gas Interconnection 500' Owner Notice
- Tax Lot

*Owner Notice Area is 500' Outside of City Limits and 100' Within City Limits

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Figure F-7
Project Property Parcels
Perennial Wind Chaser Station
Umatilla County, Oregon

Source: Umatilla Co. (2011), ORMAP (2012); USDA (2012); ESRI (2013) ; and Burns & McDonnell (2013)

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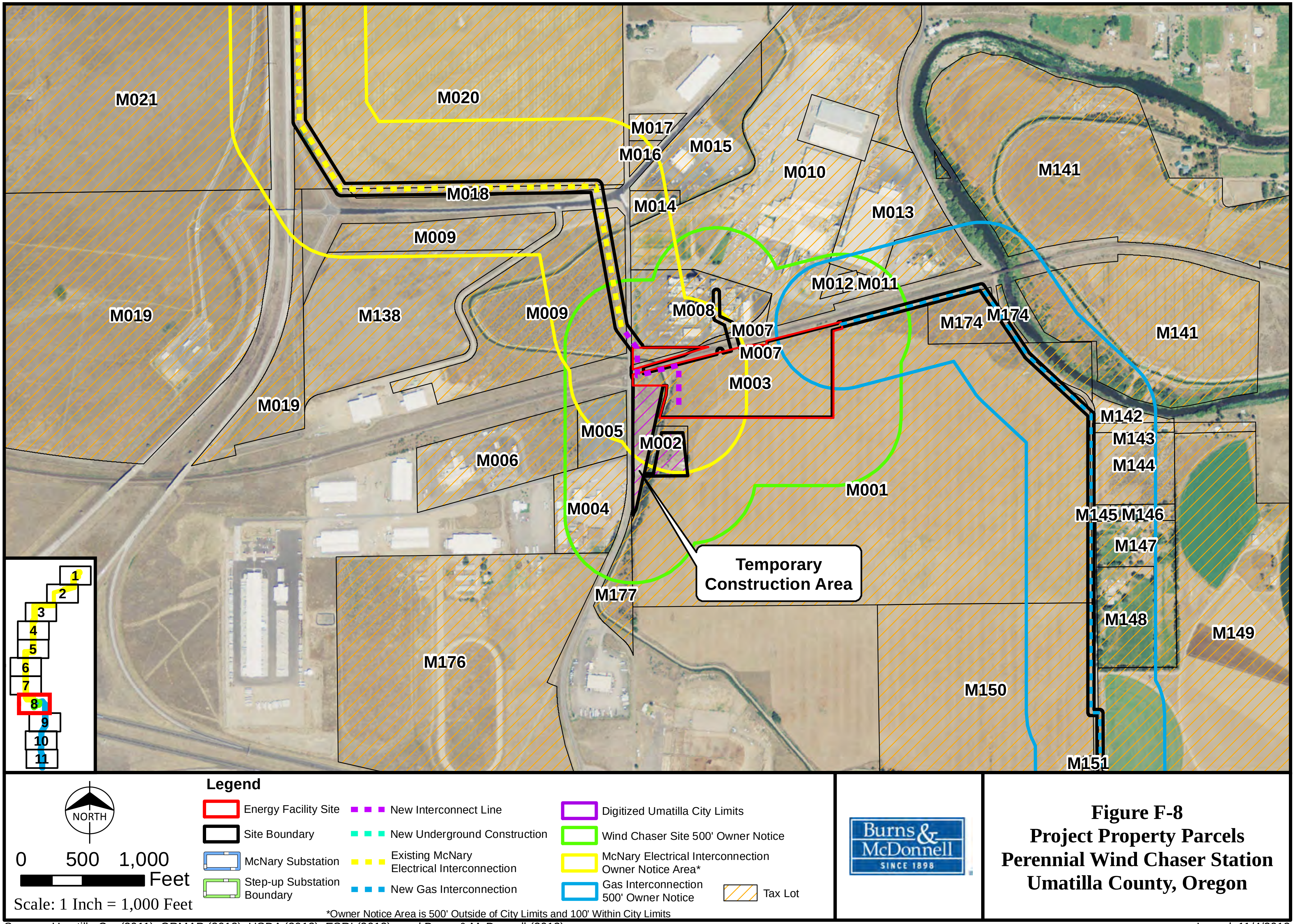

Figure F-8
Project Property Parcels
Perennial Wind Chaser Station
Umatilla County, Oregon

Source: Umatilla Co. (2011), ORMAP (2012); USDA (2012); ESRI (2013) ; and Burns & McDonnell (2013)

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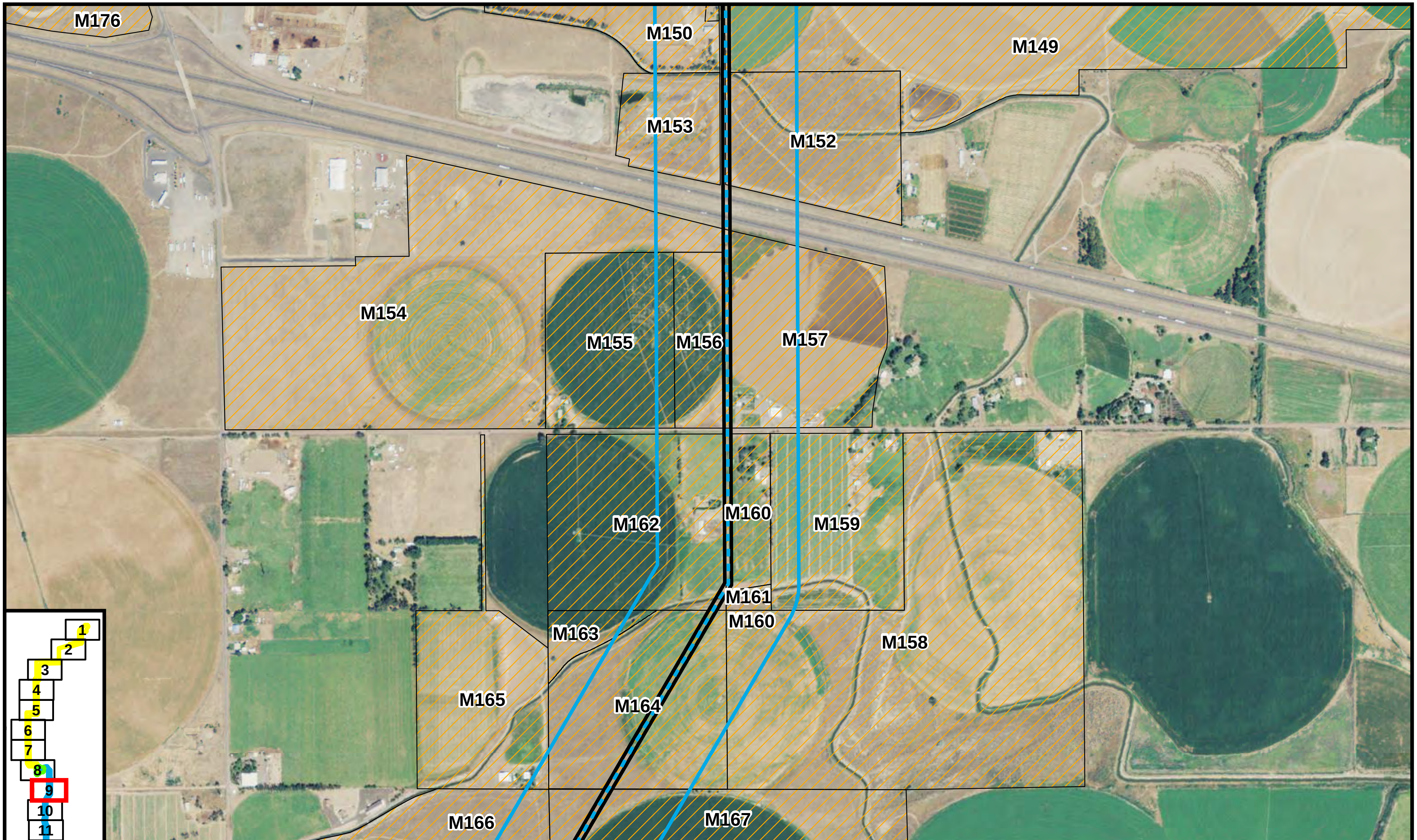

NORTH

0 500 1,000 Feet

Scale: 1 Inch = 1,000 Feet

Legend

- Energy Facility Site
- Site Boundary
- McNary Substation
- Step-up Substation Boundary
- New Interconnect Line
- New Underground Construction
- Existing McNary Electrical Interconnection
- New Gas Interconnection
- Digitized Umatilla City Limits
- Wind Chaser Site 500' Owner Notice
- McNary Electrical Interconnection Owner Notice Area*
- Gas Interconnection 500' Owner Notice
- Tax Lot

*Owner Notice Area is 500' Outside of City Limits and 100' Within City Limits

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Figure F-9
Project Property Parcels
Perennial Wind Chaser Station
Umatilla County, Oregon

Source: Umatilla Co. (2011), ORMAP (2012); USDA (2012); ESRI (2013) ; and Burns & McDonnell (2013)

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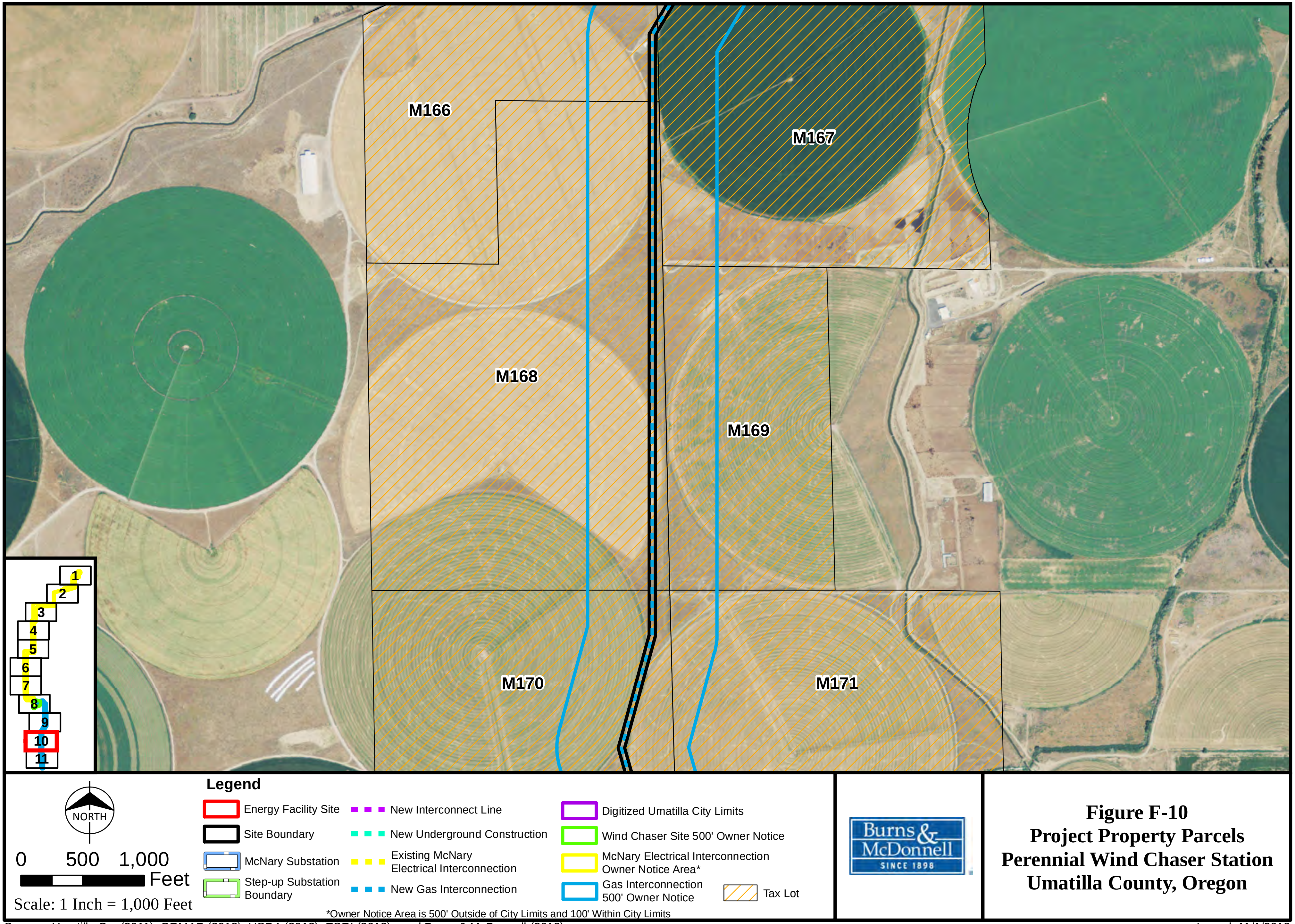

Figure F-10
Project Property Parcels
Perennial Wind Chaser Station
Umatilla County, Oregon

Source: Umatilla Co. (2011), ORMAP (2012); USDA (2012); ESRI (2013) ; and Burns & McDonnell (2013)

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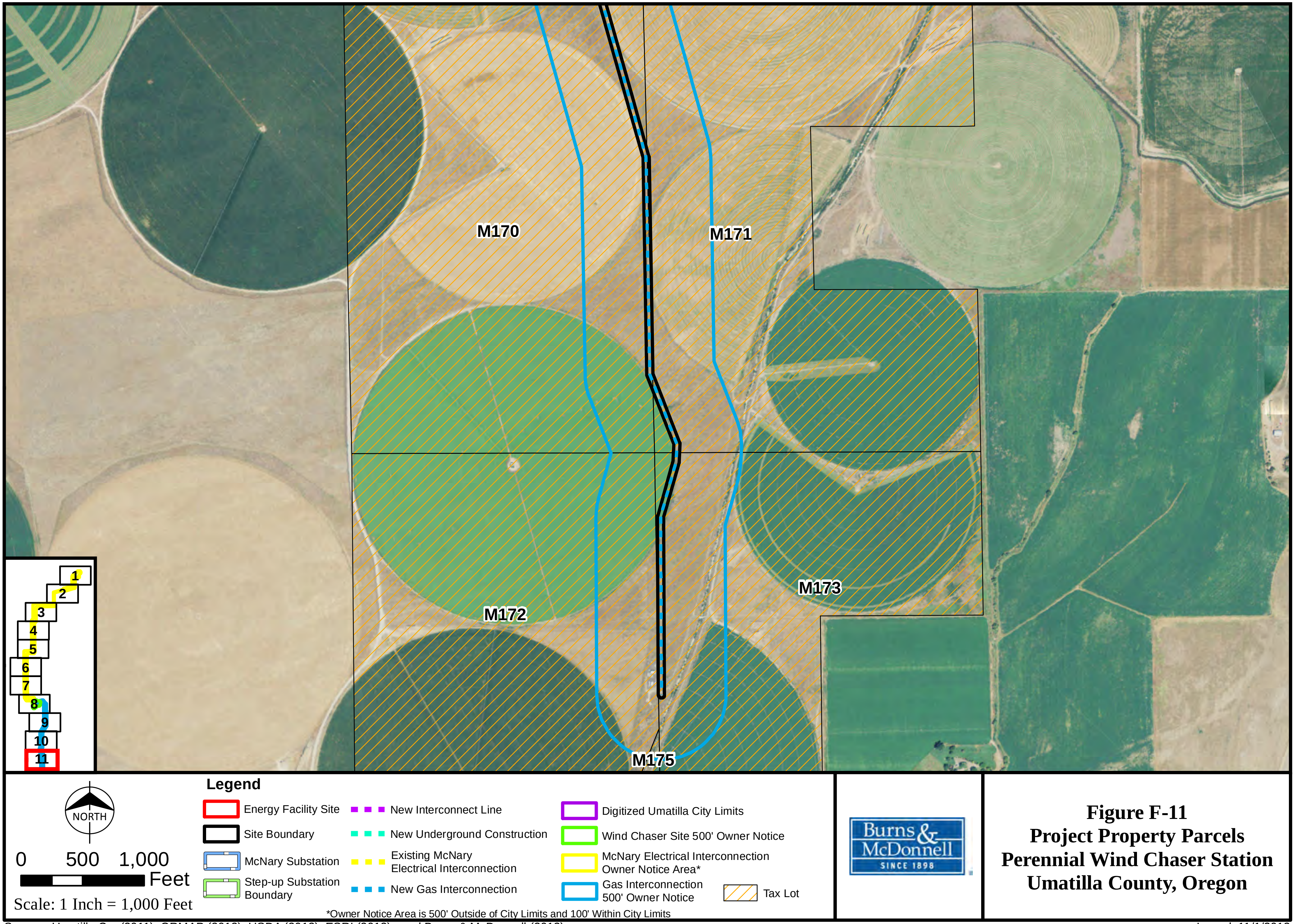

Figure F-11
Project Property Parcels
Perennial Wind Chaser Station
Umatilla County, Oregon

Source: Umatilla Co. (2011), ORMAP (2012); USDA (2012); ESRI (2013) ; and Burns & McDonnell (2013)

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