EXHIBIT M

FINANCIAL CAPABILITY
OAR 345-021-0010(1) (m)

TABLE OF CONTENTS

APPENDICES

M.1 INTRODUCTION

OAR 345-021-0010(1) (m) *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.*

Response: Under Oregon Administrative Rules (OAR) 345-022-0050(2), the Energy Facility Siting Council (Council) must find that 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.

This exhibit demonstrates Perennial-WindChaser LLC's (Perennial's) financial capability.

M.2 OPINION OF LEGAL COUNSEL

OAR 345-021-0010(1)(m)(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.*

Response: Appendix M-1 presents an opinion from Perennial's legal counsel, conforming to the requirements of the rule.

M.3 TYPE AND AMOUNT OF FINANCIAL INSTRUMENT

OAR 345-021-0010(l) (m) (B) *The type and amount of the applicant's proposed bond or letter of credit to meet the requirements of OAR 345-022-0050.*

Response: Perennial hereby commits to submit, prior to the commencement of facility construction, to the State of Oregon, through the Council, a bond or letter of credit in a form satisfactory to the Council, in an amount required by the Council of up to $4.1 million (based upon the results presented in Exhibit W – Facility Retirement), which security shall ensure that sufficient funds will be available to adequately retire the facility and restore the site to a useful, nonhazardous condition.

M.4 EVIDENCE OF REASONABLE LIKELIHOOD OF OBTAINING SECURITY

OAR 345-021-0010(1)(m)(C) *Evidence that the applicant has a reasonable likelihood of obtaining the proposed bond or letter of credit in the amount proposed in OAR 345-021-0010(1)(B), before beginning construction of the facility.*

Response: Appendix M-2 presents a letter from Mr. Jonathan Lindenberg, Managing Director and Head of Structured Finance of The Bank of Tokyo-Mitsubishi UFJ, Ltd., stating the bank's willingness to furnish or arrange a letter of credit.

APPENDIX M-1

Legal Opinion on Authority to Construct

15 SW Colorado Avenue, Suite 3
Bend, Oregon 97702
balljanik.com
t 541.617.1309
f 541.617.8824

July 25, 2014

Kyle D. Wuepper
kwuepper@balljanik.com

BY E-MAIL & OVERNIGHT MAIL (rallan@martenlaw.com)

Richard H. Allan
Marten Law
1001 SW Fifth Ave. #1500
Portland, OR 97204

Re: Application of Perennial-WindChaser LLC ("Applicant") for Site Certificate

Dear Richard:

Enclosed please find the legal opinion letter with respect to the above-referenced matter.

Very truly yours,

Kyle D. Wuepper

KDW:ljk
encs

#947256\2

ball janik LLP
15 SW Colorado Avenue, Suite 3
Bend, Oregon 97702
balljanik.com
t 541.617.1309
f 541.617.8824

March 24, 2014

Kyle D. Wuepper
kwuepper@balljanik.com

Oregon Department of Energy
625 Marion Street NE
Salem, OR 97301-3737

Re: Application of Perennial-WindChaser LLC ("Applicant") for Site Certificate

Ladies and Gentlemen:

We have acted as Oregon counsel to Applicant. We are not Applicant's general counsel and we have made no investigation of Applicant's legal affairs except as expressly set forth in this letter. In this capacity, Applicant has requested that we deliver to you our opinion as to certain matters with respect to the Application for Site Certificate for the Wind Chaser Station under OAR 345-021-0010(1)(m)(A).

In rendering our opinion, we have been furnished with and have examined and relied on the following documents (collectively, the "Entity Documents"):

(1) Certificate of Formation of Applicant filed with the Delaware Secretary of State on May 24, 2013; and

(2) Limited Liability Company Operating Agreement of Applicant dated May 24, 2013.

We disclaim any responsibility for any changes that may have occurred with respect to the status of Applicant from and after dates of the Entity Documents. We also assume that the Entity Documents and the public records upon which they are based are accurate and complete.

As counsel to Applicant, we have made such investigation of law and have examined such records, documents, and agreements concerning Applicant as we deem necessary in order to render these opinions. In connection with such examination, we have assumed that all signatures on documents we have not seen executed, and all certifications by notaries public and other public officials are genuine.

Except to the extent the information constitutes a statement, directly or in practical effect, of any legal conclusion at issue, we have relied without

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investigation or analysis upon the information contained in representations by Applicant in the Entity Documents and such other documents and records, and other instruments as we have deemed appropriate for purposes of the opinions set forth herein.

We have made no independent investigation with regard to such matters or with regard to the warranties and representations made by Applicant in the Application or of any related matters. Except as specifically identified herein, we have not been retained or engaged to perform, and we have not performed, any independent review or investigation of (1) any agreement or instrument to which Applicant may be a party or by which Applicant or any property owned by Applicant may be bound, or (2) any order of any governmental or public body or authority to which Applicant may be subject.

Based on the foregoing, we are of the opinion, based upon our best knowledge, that subject to Applicant meeting all applicable federal, state and local laws (including all rules and regulations promulgated pursuant thereto), Applicant has the legal authority without violating its Entity Documents, to construct and operate the Wind Chaser Station (the "Facility") that Applicant proposes in its Application filed with the Oregon Energy Facility Siting Council, which includes this letter.

The foregoing opinion is rendered pursuant to OAR 345-021-0010(1)(m) regarding whether Applicant has the legal authority to construct and operate the Project. We express no opinion as to the applicability of any federal, state and local laws (including all rules and regulations promulgated thereto) to such construction and operation or as the effects of the foregoing laws on such construction and operation.

Whenever the phrase "knowledge", "our best knowledge" or any variation thereof is used in this opinion, the subject modified by such phrase is limited to matters within the present actual knowledge of Bradley S. Miller and Kyle D. Wuepper, the lawyers in this firm actively engaged in the representation of Applicant, shall mean only the conscious awareness of facts or other information by such lawyer(s), and shall not include any knowledge that may be imputed to such individual(s) by constructive notice or other means or imply that any inquiry has been undertaken by such individual(s) with respect to any of such matters except to the extent that facts and circumstances presented to such individual(s) would compel a prudent lawyer to make further inquiry when presented with the same facts and circumstances.

This opinion has been rendered solely for the benefit of the Oregon Department of Energy and the Oregon Energy Facility Siting Council in connection with the Application. This opinion letter is not to be quoted in whole or in part or otherwise referred to, used, delivered to, or relied upon by any person or entity for any purpose whatsoever except with respect to the Application.

Regardless of the states in which members of this firm are licensed to practice, we express no opinion as to the laws of any jurisdiction other than the laws of

Oregon in effect on the date of this opinion. We assume no obligation to update this opinion or to advise you of any changes in the circumstances, laws, or events that may occur or that might change the opinions expressed above after the date of this opinion.

Sincerely,

Ball Janik LLP

KDW:lls

APPENDIX M-2

Financial Assurance Letter

The Bank of Tokyo-Mitsubishi UFJ, Ltd.

September 3, 2013

Shigenobu Hamada
President
Perennial Power Holdings, Inc.
600 Third Avenue, New York, NY, 10016

Dear Mr. Hamada,

The Bank of Tokyo Mitsubishi UFJ, Ltd. ("BTMU") 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 \$4.1 million dollars (\$ 4,100,000) 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.

BTMU is willing to arrange the required letter of credit subject to receipt of further information, our customary due diligence and internal credit approval.

Sincerely,

The Bank of Tokyo-Mitsubishi UFJ, Ltd.,

By:______________________________
Name: Jonathan Lindenberg
Title: Managing Director & Head of Structured Finance, MUFG Project Finance

EXHIBIT N

NEED FOR THE FACILITY

OAR 345-021-0010(1)(n) *If the proposed facility is a non-generating facility for which the applicant must demonstrate need under OAR 345-023-0005, information about the need for the facility, providing evidence to support a finding by the Council as required by OAR 345-023-0005.*

Response: Perennial-WindChaser LLC is proposing a generating facility and related or supporting facilities. Therefore, a demonstration of need under Oregon Administrative Rules 345-023-0005 is not required.

EXHIBIT O

WATER USE
OAR 345-021-0010(1) (o)

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TABLES

FIGURES

APPENDICES

Appendix O-1 Port of Umatilla Letter Regarding Capacity and Support – Operation/Construction

O.1 INTRODUCTION

OAR 345-021-0010(1) (o) *Information about anticipated water use during construction and operation of the proposed facility.*

<u>Response:</u>

This exhibit provides details regarding uses of water, the source of water used, and estimates of water loss and discharge from the Perennial Wind Chaser Station (Station). Process water will be supplied by the Port of Umatilla (Port) to the Station under a subsequent user classification. Potable water up to 1 gallon per minute (gpm) will be supplied by a new onsite water well or by treating some of the process water from the Port. The exhibit provides summer and annual average water balances as well. No secondary use permit will be required for the Perennial Wind Chaser Station project (Project). Mitigation measures include reclaiming any remaining water for reuse at the Hermiston Generating Plant (HGP). Use of this water by the Project is consistent with existing permits, agreements, and any applicable Oregon Energy Facility Siting Council standards; no changes to the existing permits or additional water rights will be necessary.

The Station is dependent upon the third party permits of both HGP and the Lamb Weston Hermiston Plant with regard to managing its wastewaters. Lamb Weston's Water Pollution Control Facilities (WPCF) Permit allows Lamb Weston to manage and utilize HGP's reclaimed water, along with its 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 approved by the Oregon Department of Environmental Quality (DEQ). Lamb Weston's permit is currently being renewed by DEQ. 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 is eventually able to accept reclaimed water from the HGP that has come from the Station, then Perennial would like to have the necessary process and approvals in place to do so. Should Lamb Weston not be able to accept reclaimed water from the HGP that has come from the Station, then Perennial would install a zero liquid discharge (ZLD) system. Mitigation measures with a ZLD system include reclaiming all available waters as cooling tower makeup.

O.2 WATER USES AND SOURCES

OAR 345-021-0010(1) (o)(A) *A description of the use of water during construction and operation of the proposed facility.*

OAR 345-021-0010(1)(o)(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.*

Response:

O.2.1 Construction

During Project construction, Perennial will use water for dust abatement, washing equipment and vehicles, washing concrete trucks after delivery of concrete loads, fire suppression during construction, and water supply for testing and commissioning. Water demands during testing include pressurized piping and equipment for leak detection. Water demands during commissioning include calibrations of equipment units and processes to ensure each unit is operating as designed. Perennial anticipates using approximately 2.3 million gallons of water during the construction period, and a majority of the water will be used in the later phases of construction to support commissioning activities. Anticipated water usage is composed of:

Hydro-test (pipe & tanks)	1,500,000 gallons
Chemical cleaning/flushing dust control	550,000 gallons
Dust control	100,000 gallons
Hydro excavation/potholing	100,000 gallons
Wash out/wheel wash	50,000 gallons

All non-potable water used for construction activities will be obtained from the Port of Umatilla. Appendix O-1 contains a letter from the Port stating that it has the capacity and permits to supply the quantities of water necessary for the construction and operation of the Project.

Potable water would be obtained from a new water well located onsite or obtained from a tie-in with the process water system. Potable water demand will be less than 5,000 gallons per day (gpd). Note that a water well does not require a permit if demand is less than 5,000 gpd. Station potable water demand is predicted to be significantly below this threshold. If necessary, a water treatment system will be utilized to convert the 1 gpm process water to potable water. Potable water will be required for items such as ice machines, coolers, and sinks for construction facilities to support construction personnel.

O.2.2 Operation

The major uses of water during operation of the Station will be cooling tower makeup water and nitrogen oxide (NO_X) injection. Water will also be used for demineralized water production, potable water, and service water. Figures O-1 and O-2 provide the water mass balance for summer and annual average conditions and based upon 100% load. Summer conditions, which are the worst case for water use, are based upon the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) 1 percent warm season temperature. It is anticipated that worst case conditions will prevail for no more than 1 percent of the days per year. In this case, the 1 percent warm season temperature is 89 degrees Fahrenheit dry bulb with 27 percent relative humidity, based on ASHRAE for the Pendleton East Oregon Airport, which is the closest location to the Site for which ASHRAE data are available. Average annual conditions are based upon the average annual temperature and humidity for the Site according to the nearest recording weather station. The data set used for the annual average was collected at the nearby Hermiston 2 S station (near the Hermiston Airport) for the years 1971 through 2000 (30 years). ASHRAE data are used for extreme design conditions, but does not provide annual average conditions.

The best estimate of total water usage is based on average annual conditions without evaporative cooling. More water than indicated in the average annual case will be used when the temperature is hotter. Less water will be used when it is cooler or when the units are run at less than 100 percent load down to 50 percent to complement wind-generated energy. Units can be off line for routine scheduled maintenance, when wind-generated energy does not need to be complemented, or when demand is less than 50 percent load of a unit.

A pipe to connect the Station with the existing Port of Umatilla water system, which supplies water to the HGP, will be installed below grade with a trench under the railroad tracks. The Port of Umatilla, via the existing water-delivery system serving the HGP, will be the source of all non-potable water required to meet the Station’s needs. From the raw water interconnected at the Site Boundary, the raw water line will go through a sediment filter before entering the combined fire/raw water tank. The raw water pipeline from the Port of Umatilla water system is expected to be 12 to 14 inches in diameter. The length of the new pipeline is estimated to be approximately 208 feet. The combined fire/raw water tank provides makeup water to the cooling tower and serves as the water source for the demineralized water system and fire water system.

Cooling tower blowdown from the Station will be reclaimed and sent to the cooling tower basin of the HGP to be recycled as circulating water for the HGP. Further details and water mass balance are included in Exhibit V– Solid Waste and Wastewater. Approximately 538 feet of below grade wastewater pipeline 10 to 12 inches in diameter will be constructed from the Station to the HGP to reclaim this process blowdown. Should this option not be available to the Project, then Perennial proposes to install a ZLD system, as discussed in Section O.4.

The proposed location of the pipeline to transport water to the Station is shown on Figure B-2 in Exhibit B – Project Information.

Potable water will be obtained from a new water well located onsite or obtained from a tie-in with the process water system. Potable water demand will be less than 5,000 gpd. If necessary, a water treatment system will be utilized to convert 1 gpm of process water to potable water.

Potable water will be required for items such as ice machines, coolers, and sanitary facilities to support operating personnel.

Table O-1 shows the amount of water the Station is expected to need during operation under annual average and summer conditions. Anticipated water use was derived from Figures O-1 and O-2. The gpd usage estimate for potable water and sanitary systems is dependent on the number of permanent staff (estimated to be six to eight) and will vary from 700 to 800 gpd.

Table O-1 Anticipated Water Use during Operation of the Perennial Wind Chaser Station

Use	Source	Annual Average Condition (gpm)	Summer Condition (gpm)
Potable Water and Sanitary Systems	New Well or Port of Umatilla	1	1
Cooling Tower Water	Port of Umatilla	978	1,169
Water Production for NO_X Injection	Port of Umatilla	287	268
Evaporative Cooling of Turbine Inlet Air	Port of Umatilla	0	136
Service Water	Port of Umatilla	15	15
Filter Water	Port of Umatilla	38	48
Totals	All Sources	1,319	1,637

Note: Anticipated water use is based on 100% load during specified ambient conditions.

Key:
gpm gallons per minute
NO_x oxides of nitrogen

O.3 WATER LOSSES

OAR 345-021-0010(1)(o)(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*

Response:

Permanent water losses at the Station will occur primarily as evaporative loss from cooling tower evaporation and drift, combustion turbine evaporative cooling (seasonal), evaporation from the NO_X injection control system, and discharge of sanitary sewage.

Table O-2 provides the anticipated amount of water losses at the Station during operation under annual average and summer conditions.

Table O-2 Anticipated Water Losses during Operation of the Perennial Wind Chaser Station

Source of Loss	Annual Average Condition (gpm)	Summer Condition (gpm)
Sanitary Sewage	1	1
Cooling Tower Evaporation and Drift	880	1,052
NO_X Water System	215	201
Evaporative Coolers	0	68
Totals	1,096	1,322

Note:
Anticipated water loss is based on 100% load during specified ambient conditions.

Key:
gpm gallons per minute
NO_X oxides of nitrogen

This means that approximately 223 gpm (annual average (1,319 use-1,096 losses)) or 315 gpm (summertime (1,637 use-1,322 losses)) of wastewater from the Station can be reused. Perennial proposes to route the reclaimed water to the HGP for reuse. Reuse by the HGP is possible because of the higher quality of wastewater generated from the Station. Cooling water at the Station will be used internally in the turbine equipment, which requires high water quality specifications. Cooling water use at the HGP is used mainly for condensation of the steam turbine, which is not as sensitive to the water quality as a combustion turbine. In addition, the Station's water demand will be highly variable, as will the wastewater generation. The variability is caused by several factors: load demand by unit (which is expected to follow the variability of the wind power generated in the area), limited hours of operation and ambient conditions. Rates from zero up to those listed in the tables are expected. Water demand and wastewater generation at the HGP is more stable; for this reason it is preferable to send the variable reclaimed wastewater generation rates to this plant rather than directly to Lamb Weston.

In other words, Perennial proposes to route all its waters to the HGP for use as makeup water for the HGP's cooling towers. The HGP is currently permitted to: (1.) Send its reclaimed waters to Lamb Weston or (2.) Reclaim the waters for irrigation uses under a HGP permit issued by DEQ. Lamb Weston is also currently permitted by DEQ to accept reclaimed waters from the HGP. There may be a slight case where the HGP is down and the Station is operating, then the HGP will not be able to reclaim the water and after passing through the HGP cooling towers would go almost directly to Lamb Weston. Exhibit V – Solid Waste and Wastewater provides additional information regarding reclaimed water at the Station and at the HGP for potential reuse by Lamb Weston.

The proposed location of the pipeline to transport reclaimed water from the Station to the HGP is shown on Figure B-2in Exhibit B – Project Information. A description of the proposed wastewater supply infrastructure is also provided in Exhibit B – Project Information, Section B.4, subsection "Interconnection Water Pipelines."

O.4 ALTERNATIVE SCENARIO WITH ZERO LIQUID DISCHARGE SYSTEM

The base plan of the Station is to send its reclaimed waters to the cooling tower basin of the HGP to be reclaimed and recycled, as reflected in Tables O-1 and O-2 and Figures O-1 and O-2. The HGP in turn sends its blowdown water to the Lamb Weston facility. Lamb Weston's Water Pollution Control Facilities Permit allows Lamb Weston to manage and utilize the HGP's reclaimed water, along with their own reclaimed waters, by land application for beneficial use on the North Farm and the Madison Farm in accordance with the Oregon Department of Environmental Quality (DEQ) approved Operations, Monitoring, and Management Plan. Lamb Weston's permit is currently being renewed by DEQ. Since this permit is under review, Lamb Weston has not been able to consent to the Project potentially sending reclaimed water to the HGP. It is expected that Lamb Weston will be successful in renewing its wastewater permit and that Lamb Weston can accept reclaimed water from the HGP that has originated at the Station, once the permit is issued.

Should the Station not be able to send the reclaimed water to the HGP for reuse as make-up water for its cooling towers, Perennial proposes to use a ZLD system. A ZLD system reclaims water to the maximum extent possible with a reverse osmosis (RO) system. The RO system is identified in Figures O-3 and O-4 as "HERO," for High Efficiency Reverse Osmosis. The reclaimed water from the HERO system is used as makeup water for the cooling tower. Reject water from the HERO system is reduced to solid waste with an electric steam boiler system. The electric steam boiler system is identified as a crystallizer in Figures O-3 and O-4. Tables O-3 and O-4 show anticipated water use and anticipated water losses associated with a ZLD system which show all the available water is reused.

Table O-3 Anticipated Water Use with a ZLD System

Use	Source	Annual Average Condition (gpm)	Summer Condition (gpm)
Potable Water and Sanitary Systems	New Well or Port of Umatilla	1	1
Cooling Tower Water	Port of Umatilla	755	864
Water Production for NO_X Injection	Port of Umatilla	287	268
Evaporative Cooling of Turbine Inlet Air	Port of Umatilla	0	136
Service Water	Port of Umatilla	15	15
Filter Water	Port of Umatilla	38	38
Totals	All Sources	1,096	1,322

Note: Anticipated water use is based on 100% load during specified ambient conditions.

Key:
gpm gallons per minute
NO_X oxides of nitrogen

Table O-4 Anticipated Water Losses with a ZLD System

Source of Loss	Annual Average Condition (gpm)	Summer Condition (gpm)
Sanitary Sewage	1	1
Cooling Tower Evaporation and Drift	880	1,052
NO_X Water System	215	201
Evaporative Coolers	0	68
Totals	1,096	1,322

Key:

gpm gallons per minute
NO_X oxides of nitrogen

O.5 WATER BALANCE

OAR 345-021-0010(1)(o)(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.*

Response:

Figures O-1 and O-2 show the water mass balance for the Station under summer and annual average conditions. Figures O-3 and O-4 show the water mass balance for the Station under summer and annual average conditions with a ZLD system.

O.6 REVIEW OF PERMIT NEEDS

OAR 345-021-0010(1)(o)(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.*

OAR 345-021-0010(1) (o)(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.*

Response: The Port can supply up to 2,000 gpm of process water to the Station under a subsequent user classification. Annual average demand is expected to be about 1,300 gpm. The Port has the capacity and the permits to supply the water; specifically, the Port has an existing surface water right under Permit No. S-49497 for municipal use. A copy of the letter specifying the Port's capacity and authority to supply the water is included in Appendix O-1. Therefore, no permits are needed, nor are any permits required to be transferred or modified to supply the water needs of the Station.

Potable water demands will be supplied either by treatment before use of the process water supplied by the Port or by a new water well. Well water usage is expected to be below 5,000 gpd; thus, a groundwater permit will not be necessary. Oregon Revised Statutes Chapter 537.545(f) Exempt Uses.

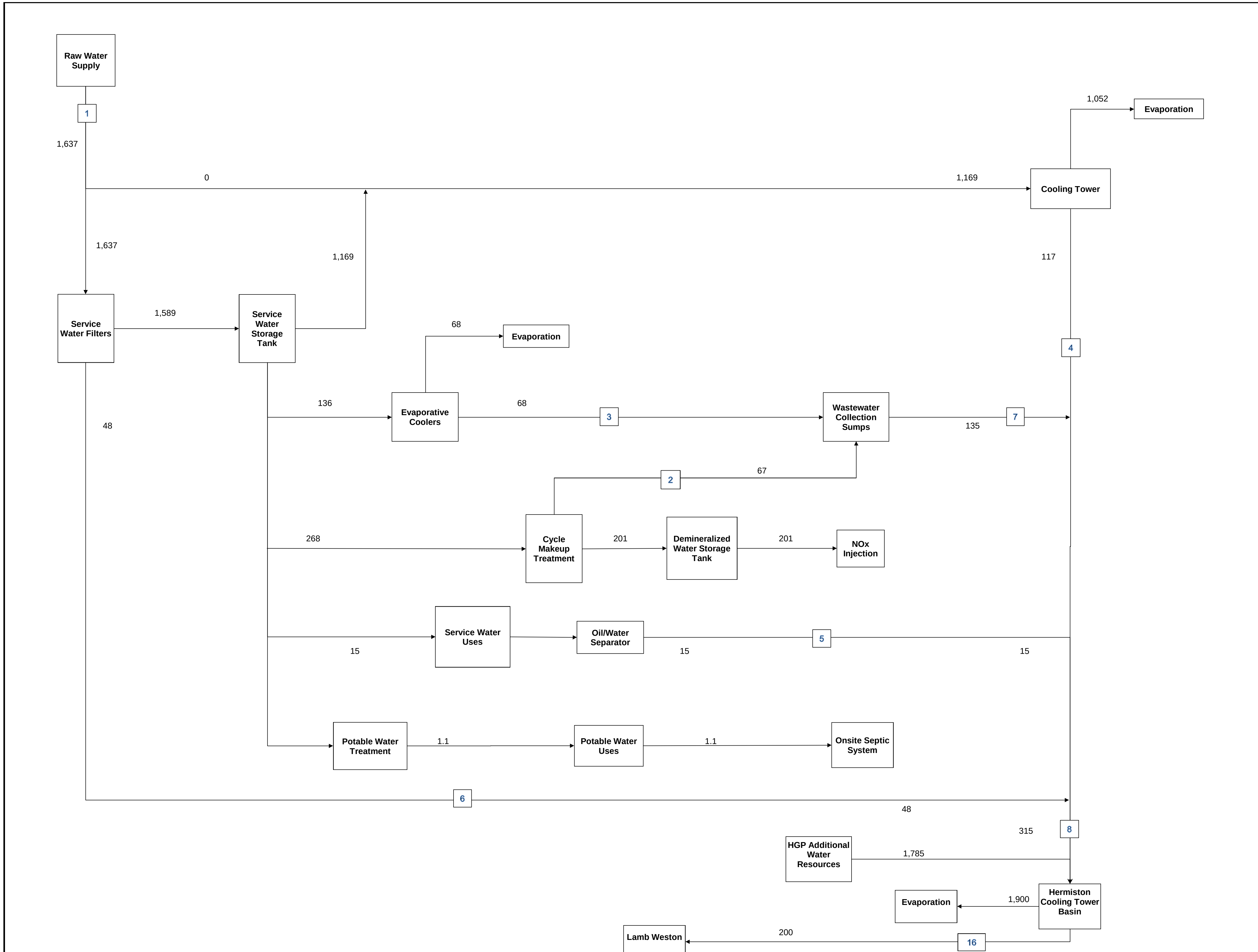
O.7 MITIGATION

OAR 345-021-0010(1) (o) (G) *A description of proposed actions to mitigate the adverse impacts of water use on affected resources.*

Response: All process water required for the Project's construction and operation will be supplied from the Port by the Oregon Water Resources Department Permit S-49497 under a reserved allocation capacity. Permit S-49497 allows the Port to appropriate up to 155 cubic feet per second (cfs) (100 million gpd) of Columbia River water. This appropriation is less than 0.2 percent of the 95 percent exceedance of the Columbia River. By 2027, the Port estimates water demand to be about 59 cfs per its Revised Water Management and Conservation Plan issued in September 2008. This is only 38 percent of its allocation to provide water to its entire service area and only 2.9 percent of its allocation if the Port needed to provide the entire 2,000 gpm reserved allocation to the Project.

Potential groundwater use for potable requirements is expected to be about 1 gpm. At this level of groundwater use, no permits are expected to be necessary and no adverse impacts on any groundwater aquifer are anticipated.

Thus, no adverse impacts of water use are expected as a result of the Station's operation. Nonetheless, the Station will reuse water internally where available and also send reclaimed water to the HGP for reuse, which would further reduce potential impacts, since the HGP will not need to obtain that water from the Port. Because no adverse impacts on affected resources have been identified, Perennial is not proposing any mitigation measures for water resources beyond those listed above.



no.	date	by	ckd	description
A	3/6/13	das	drg	Initial Issue
B	10/10/13	tms	das	ZLD
C	2/26/14	das	tms	Revised WCS Discharge

NOTES:

1. FLOWS ARE SHOWN IN GALLONS PER MINUTE ROUNDED TO THE NEAREST GPM.

DESIGN CRITERIA:

COOLING TOWER CYCLES	10

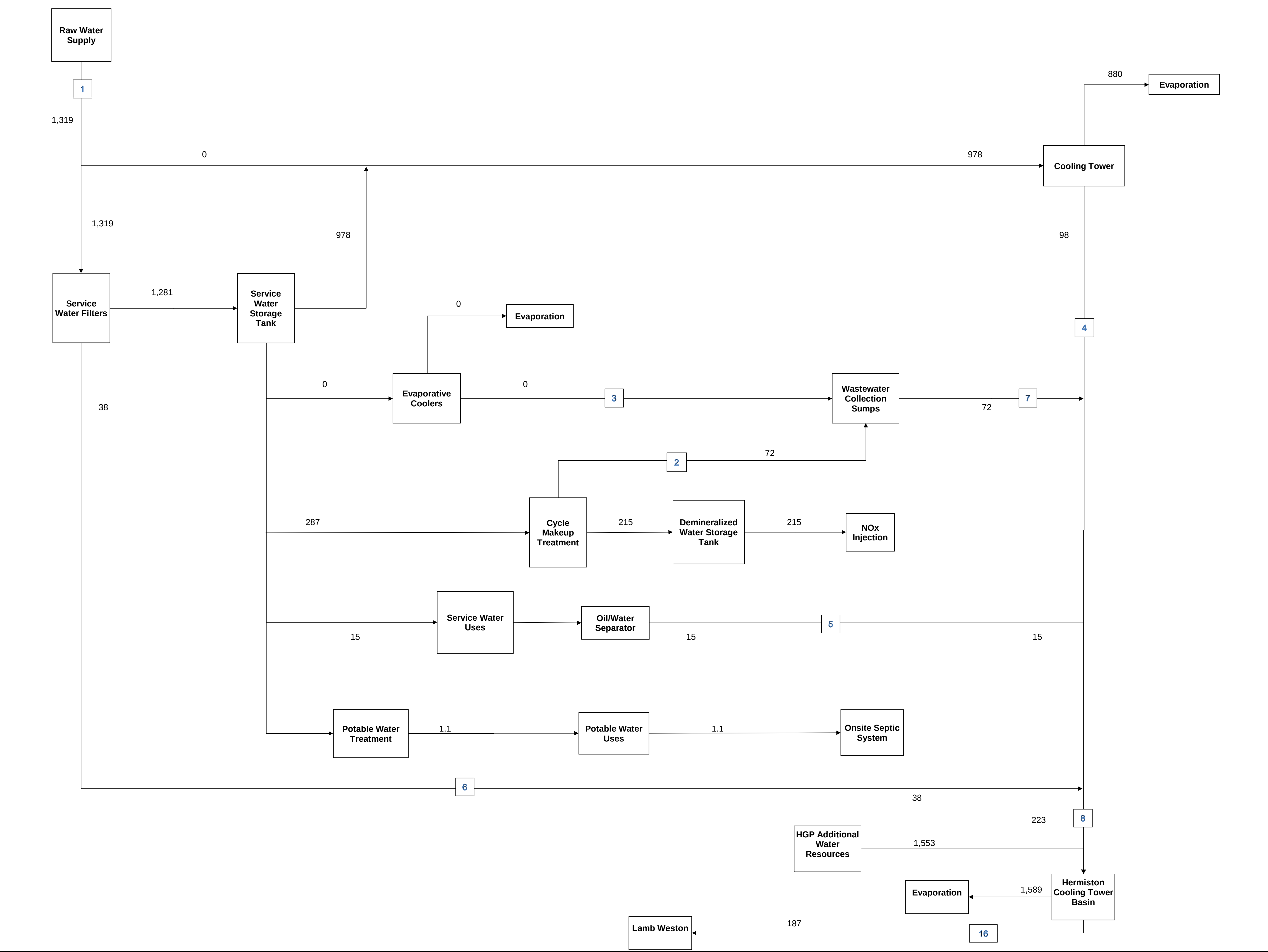
date 3/6/2013	detailed D. Schilling
designed D. Schilling	checked P. Scroggin

Perennial Wind Chaser Station

FIGURE 0-1
WATER MASS BALANCE

Summer Conditions
89 F Dry Bulb/27% RH

project 70595	contract	
drawing **WMB - 02**	---	rev. **C**
sheet	of	sheets
file		



no.	date	by	ckd	description
A	3/6/13	das	drg	Initial Issue
B	10/10/13	tms	das	ZLD
C	2/26/14	das	tms	Revised WCS Discharge

NOTES:

1. FLOWS ARE SHOWN IN GALLONS PER MINUTE ROUNDED TO THE NEAREST GPM.

DESIGN CRITERIA:

COOLING TOWER CYCLES	10

Burns & McDonnell SINCE 1898

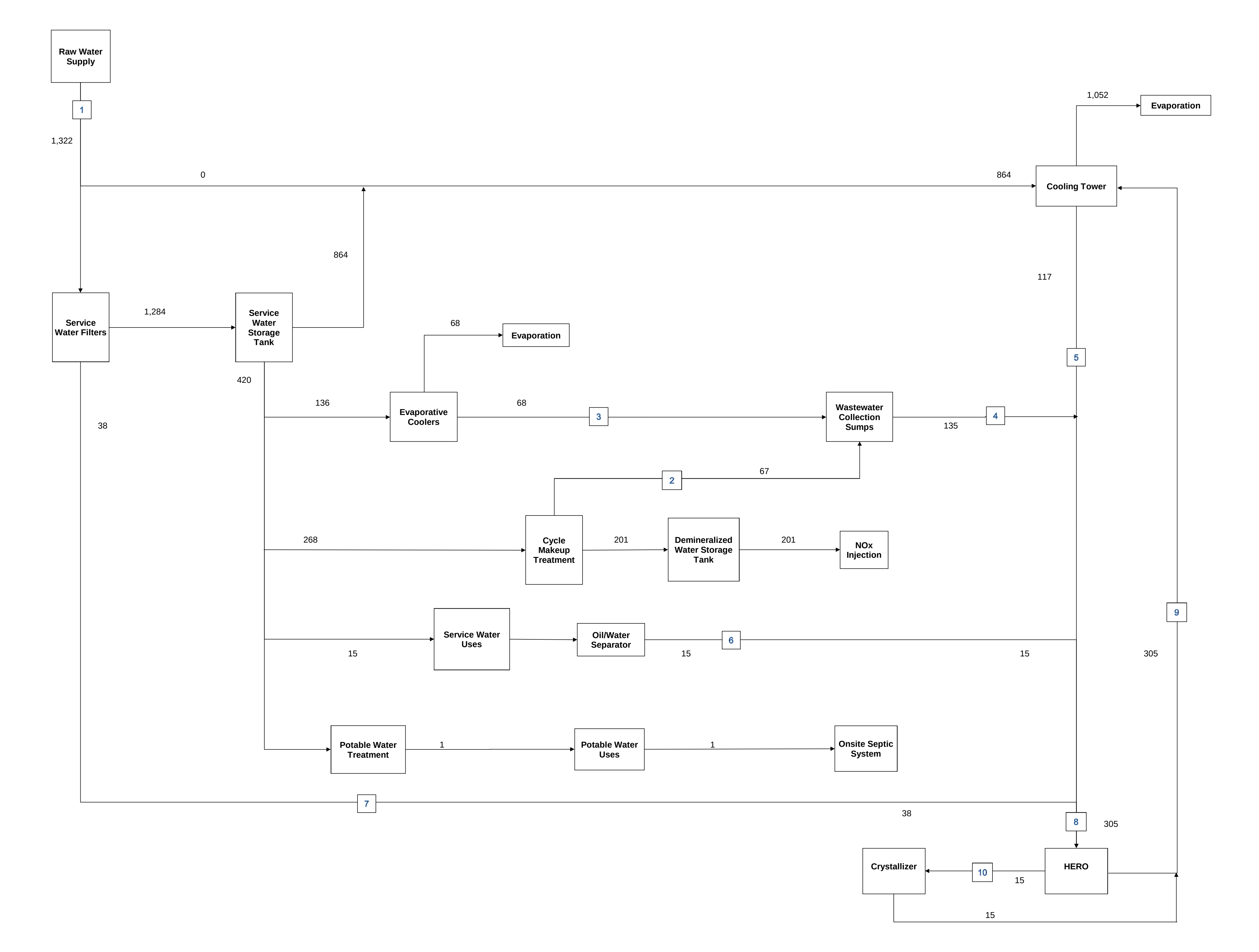
date 3/6/2013	detailed D. Schilling
designed D. Schilling	checked P. Scroggin

Perennial Wind Chaser Station

FIGURE 0-2
WATER MASS BALANCE

Annual Average Conditions
53 F Dry Bulb/65% RH

project 70595	contract	
drawing **WMB - 04**	---	rev. **C**
sheet	of	sheets
file		



no.	date	by	ckd	description
A	3/6/13	das	drg	Initial Issue
B	10/10/13	tms	das	ZLD
C	2/26/14	das	tms	Revised WCS Discharge

NOTES:

1. FLOWS ARE SHOWN IN GALLONS PER MINUTE ROUNDED TO THE NEAREST GPM.

DESIGN CRITERIA:

COOLING TOWER CYCLES 10.0

Burns & McDonnell SINCE 1898

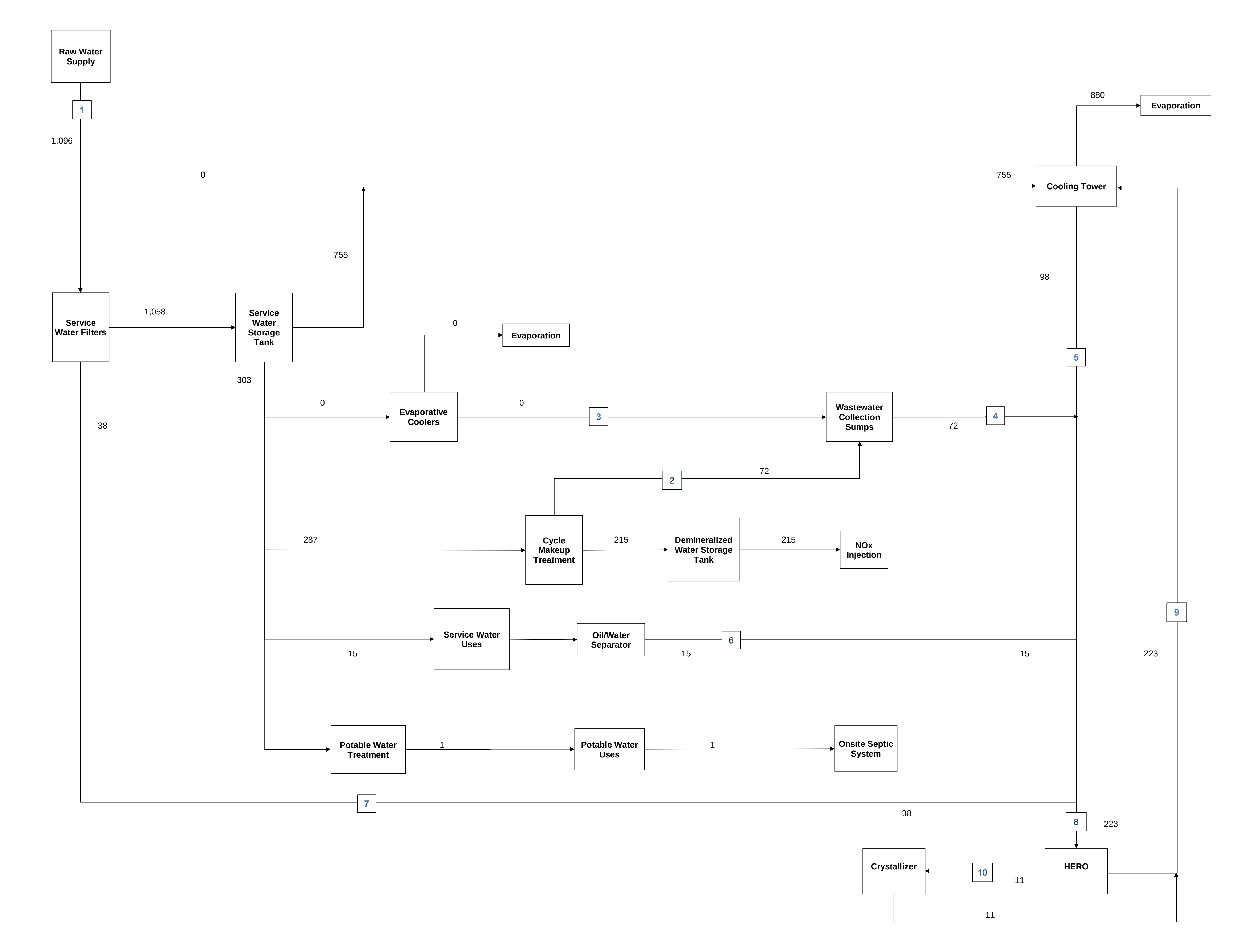
date 3/6/2013
detailed D. Schilling
designed D. Schilling
checked P. Scroggin

Perennial Wind Chaser Station

FIGURE 0-3
WATER MASS BALANCE

Summer Conditions
89 F Dry Bulb/27% RH

project 70595
contract
drawing **WMB - 02** --- rev. **C**
sheet of sheets
file



no.	date	by	ckd	description
A	3/6/13	das	drg	Initial Issue
B	10/10/13	tms	das	ZLD
C	2/26/14	das	tms	Revised WCS Discharge

NOTES:

1. FLOWS ARE SHOWN IN GALLONS PER MINUTE ROUNDED TO THE NEAREST GPM.

DESIGN CRITERIA:

COOLING TOWER CYCLES	10.0

Burns & McDonnell SINCE 1898

date 3/6/2013	detailed D. Schilling
designed D. Schilling	checked P. Scroggin

Perennial Wind Chaser Station

FIGURE 0-4
WATER MASS BALANCE

Annual Average Conditions
53 F Dry Bulb/65% RH

project 70595	contract	
drawing **WMB - 04**	---	rev. **C**
sheet	of	sheets
file		

APPENDIX O-1

Port of Umatilla Letter Regarding Capacity and Support – Operation/Construction

PORT OF UMATILLA

April 30, 2013

Mr. David Daley
Senior Vice President, Operations and Development
Perennial Power Holdings, Inc.
96 Boardwalk Blvd, Suite 202
Conroe, TX 77304

RE: PERENNIAL WIND CHASER STATION

Dear Mr. Daley,

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 Application.

Sincerely,

Kim B. Puzey

General Manager

Port of Umatilla

EXHIBIT P

FISH AND WILDLIFE HABITAT
OAR 345-021-0010(1)(p)

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P.1 INTRODUCTION

The Oregon Energy Facility Siting Council's (Council's) standards for energy facility site certificates include guidelines for fish and wildlife habitat (Oregon Administrative Rules [OAR] 345-022-0060). Fish and wildlife habitat is one of the resource areas included in these standards that may be subject to impacts from construction and operation of the Perennial Wind Chaser Station project (Project).

This exhibit provides information about the Project's anticipated impact on fish and wildlife habitat. To issue a site certificate, the Council must find that the Project's design, construction, and operation are "consistent with the fish and wildlife habitat mitigation goals and standards of OAR 635-415-0025" (ODOE 2008). The Oregon Department of Fish and Wildlife's (ODFW) Habitat Mitigation Policy applies to the Project. The Habitat Mitigation Policy identifies six habitat categories and establishes mitigation standards for each.

According to the Amended Project Order issued by the Oregon Department of Energy (ODOE) on September 30, 2013 for the Project, the "Analysis Area" for Project-related impacts on fish and wildlife habitat includes the area within the Site Boundary and 0.5 miles from the Site Boundary. Congruent with OAR 345-001-0010(55), the Site Boundary for the Project includes "the perimeter of the site of a proposed energy facility, its related or supporting facilities, all temporary laydown and staging areas and all corridors and micrositing corridors proposed by the applicant" (OAR 345-001-0010(55)).

The following sections provide responses to information requested in the guidelines for Application for a Site Certificate (ODOE 2012). Federal and state-listed species potentially occurring in the Site are addressed in Exhibit Q – Threatened and Endangered Species.

P.2 DESCRIPTION OF BIOLOGICAL AND BOTANICAL SURVEYS PERFORMED

OAR 345-21-0010(1)(p)(A) *A description of biological and botanical surveys performed that support the information in this exhibit, including a discussion of the timing and scope of each survey.*

Response: Ecology and Environment, Inc. (E & E) was hired by Perennial-WindChaser LLC (Perennial) to provide permitting support for and conduct natural resources surveys of the Project. The description of the biological and botanical surveys performed by E & E for the Project in May and August 2013 included below is excerpted from the 2013 Biological Resources Survey Report (Appendix P-1). This description includes only those methods necessary to evaluate the plant and wildlife species listed in Table P-1 and their respective habitats.

Vegetation and Habitat Mapping

Vegetation and habitat types in and around the Site were mapped using a two-step process. First, desktop analyses were conducted utilizing information from existing databases. Second, the results of these desktop analyses were verified and supplemented 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. This effort assisted with the assessment of the condition and suitability of the habitat in the Project disturbance areas for fish and wildlife addressed here and in Exhibit P.

The Oregon National Gap Analysis Program (OR GAP) maintains the most current and accurate spatial land cover dataset available for the Site (OR GAP 1999). OR GAP data were used as the foundation for vegetation and habitat mapping, along with aerial photography. The habitat classes (e.g., “Forest & Woodland” or “Semi-Desert”) mapped by OR GAP are presented as large polygons; however, these data do not provide information regarding plant species composition. Furthermore, the polygons are mapped at a large scale and often have not been field-verified.

To provide finer scale detail to the habitat and vegetation mapping, two field biologists walked the area designated for the Station (referred to herein as the “Station site”) and natural gas pipeline right-of-way (ROW) on May 9, 2013, and the step-up substation site and its associated underground transmission line ROW on August 1, 2013. The biologists mapped and labeled habitats in and adjacent to the Station site, natural gas pipeline ROW, and the step-up substation site and its associated underground transmission line ROW, and compiled lists of the dominant plant species present. They also described habitat quality, noting natural or anthropogenic disturbances and presence of non-indigenous species. All habitat transitions within the survey areas were recorded on aerial photography maps and referenced in field logbooks. The field-based maps of these habitats were then digitized using geographic information systems software. Habitat data collected were extrapolated out to 0.5 miles (equivalent to the Analysis Area for this exhibit).

E & E biologists drove along the existing transmission line to verify the OR GAP (1999) data. They did not walk the transmission line ROW because the existing transmission line is being reconductored, and this activity is not expected to result in new ground disturbance. Therefore, dominant plant species were not recorded and habitats in the transmission line ROW were not mapped at a finer scale.

Special Status Plants

E & E conducted surveys for special status plant species on May 9, and August 1, 2013. Species listed by the United States Fish and Wildlife Service and Oregon Department of Agriculture (ODA) that potentially occur in the Site were determined prior to initiating field surveys (see

Table P-1, below, and Table Q-1 in Exhibit Q – Threatened and Endangered Species). Two field biologists investigated these species during their blooming period and where suitable habitat occurred. The Station site and 50-foot-wide natural gas pipeline ROW were surveyed with complete coverage.

Noxious Weeds

E & E biologists documented all species of noxious weeds identified on the Umatilla County Noxious Weed Control list. These species are on the 2003 ODA list known to grow currently or historically in Umatilla County (Umatilla County 2013). Documented observations of noxious weeds included estimates of weed population ground cover percentage and weed population extent (i.e., diameter). Crews noted incidental observations of non-designated invasive weed species (e.g., cheatgrass [*Bromus tectorum*]) in field log books.

Wetlands and Waterbodies

E & E biologists identified all wetlands and waterbodies within the Station site and the 50-foot-wide natural gas pipeline ROW on May 9 and August 1, 2013. The crew was equipped with aerial imaging maps that included areas identified as potential wetland and stream habitat. These maps incorporated the most current data available in the National Wetland Inventory and the National Hydrography Dataset. Stream thalwegs (center or deepest point) were recorded as a line feature and the banks as point features. Additional measurements included stream width, depth, and ordinary high water mark. The ordinary high water mark was determined using the guidelines provided in *A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the United States* (Lichvar and McColley 2008). Biologists also noted flow type, direction of flow, presence of water, name of feature (if named), presence of plant or wildlife species, potential presence of fish, and presence of runs, pools, or riffles. Data collected for waterbody delineations were recorded on global positioning system (GPS) units, in field log books, and on standardized data sheets (See Exhibit J – Jurisdictional Wetlands).

Fish and Wildlife Resources

Prior to conducting field surveys, E & E biologists identified special status wildlife species with the potential to occur in the vicinity of the Project, as listed in Table P-1, below, and in Table Q-1, Exhibit Q – Threatened and Endangered Species.

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. They also documented active or inactive raptor nests. Desktop analyses, along with field-verified habitat mapping and onsite observations, should provide ample information to determine the potential presence of most special status wildlife species in the Site and its vicinity.

All detections of species listed in Table P-1 were recorded on GPS units and in field log books. Biologists maintained a daily record of all bird, mammal, reptile, and amphibian species observed.

The resource-specific methods described below are based on survey protocols established by agency personnel or approved during consultation with agency specialists.

Raptor Nests

A number of raptor species, including species of hawks, falcons, eagles, and owls, may nest in or near the Site. 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. The objective of raptor nest surveys is to identify species nesting in or in the vicinity of the Station site and 50-foot-wide natural gas pipeline ROW.

The survey area for raptor nests included all areas within 2 miles of the Station site and 50-foot-wide pipeline corridor that was visually accessible from public roads. E & E biologists searched for raptor nests while walking the Station site and 50-foot-wide natural gas pipeline ROW on May 9, 2013. They also conducted vehicle-based searches from all public roads and highways within 2 miles of the Station site and 50-foot-wide pipeline corridor on May 10, 2013. They used binoculars to scan all nesting substrate visible from the survey areas. When necessary, the biologists approached nests slowly to avoid flushing the females, although nest status and species were determined from the greatest distance possible. Visits to nest areas were kept as brief as possible.

Field surveys found one inactive raptor nest (RN-001-001) in a stand of trees near a farmhouse approximately 500 feet west of the natural gas pipeline. Two active Red-tailed Hawk (*Buteo jamaicensis*) nests were found in the survey area. Two adults were observed near one nest (RN-001-002) on the west border of the Station site, and at least one chick was present in the nest. This nest was in the line of black locust trees (*Robinia pseudoacacia*) along the west side of the Station site. Approximately 1.25 miles east of the natural gas pipeline's southern terminus was an active Red-tailed Hawk nest (RN-002-001), with one adult on the nest and another adult perched on a nearby transmission pole.

Data were recorded in field log books, on GPS units, and on standardized data sheets (see Appendix A-2 of the 2013 Biological Resources Survey Report, included here as Appendix P-1). Biologists provided descriptions of all raptor nests detected, including nest condition, substrate characteristics, and status of nest. When raptors were present, species and activity observed were also noted when possible. Photographs of the nests were taken, when possible, to help illustrate nest shape, condition, and substrate. Observations of individuals not associated with nests, and possible nesting substrates or foraging habitat, were described in field logbooks.

P.3 IDENTIFICATION AND CLASSIFICATION OF FISH AND WILDLIFE HABITATS IN THE ANALYSIS AREA

OAR 345-21-0010(1)(p)(B) *Identification of all fish and wildlife habitat in the analysis area, classified by the habitat categories as set forth in OAR 635-415-0025 and a description of the characteristics and condition of that habitat in the analysis area, including a table of the areas of permanent disturbance and temporary disturbance (in acres) in each habitat category and subtype.*

Response: This section identifies and classifies habitats located within 0.5 miles of the Station site natural gas pipeline ROW, the step-up substation, and the Project tie-in with the existing transmission line. This section does not discuss the areas along the existing transmission line ROW because the line is being reconductored, which will not result in any new ground disturbance. Refer to the 2013 Biological Resources Survey Report (Appendix P-1) for additional information regarding habitats along the existing transmission line.

Figures P-1 through P-3, at the end of this exhibit, depict the habitats that were mapped during the May 9 and August 1, 2013, field surveys along the 50-foot-wide natural gas pipeline ROW, Station site, and the step-up substation and its associated underground transmission line. Field-mapped habitats were extrapolated out to the 0.5-mile Analysis Area along the 50-foot-wide natural gas pipeline, the Station site, and the step-up substation and its associated underground transmission line. The following 11 habitat types were mapped and are described below in terms of their dominant plant species.

Weedy grassland #1 (Habitat Category 5) – Vegetation was primarily grassy with limited, scattered shrubby plants. Cheatgrass made up approximately 70 to 80 percent of this habitat, which also included mustards (*Brassica spp.*), redstem stork's bill (*Erodium cicutarium*), fiddlenecks (*Amsinckia spp.*), prickly Russian thistle (*Salsola tragus*), rubber rabbitbrush (*Ericameria nauseosa*), yellow rabbitbrush (*Chrysothamnus viscidiflorus*), and sagebrush (*Artemisia spp.*). The shrubs were present in very small, isolated patches or as single individual plants. This habitat was heavily disturbed and dominated by dense, invasive weeds, likely as a result of being located between agricultural crop circles.

"Weedy grassland #1" has been placed under "Habitat Category 5," as set forth in OAR 635-415-0025, because it "is habitat for fish and wildlife having high potential to become either essential or important habitat." This habitat was dominated by non-native plant species and consists of small patches wedged between agricultural crop circles. Field-based observations suggest that Long-billed Curlews (*Numenius americanus*) potentially nest in these grasslands (see Sections P.5 and P.6); however, this type of disturbed, weedy grassland is prevalent throughout this region of the state, where curlews have adapted to the extensive presence of cheatgrass (Dugger and Dugger 2002; Marshall et al. 2006). Therefore, clearing of vegetation in this habitat type would not substantially impact habitat availability to this species, and vegetation would likely return to a similar state within one growing season. Furthermore, the clearing of vegetation may actually improve this habitat for curlews, as they generally avoid dense shrubs and dense, tall grasses that dominate cleared fields if they are allowed to grow undisturbed (Dugger and Dugger 2002).

During field surveys, only two other wildlife species (both birds) were observed using this habitat. Chipping Sparrows (*Spizella passerina*) and Savannah Sparrows (*Passerculus sandwichensis*) were observed perched and singing from grasses and/or shrubs within "weedy grassland #1." The Chipping Sparrows were likely migrants passing through the area; however, this is suitable breeding habitat for Savannah Sparrows (Middleton 1998; Marshall et al. 2006; Wheelwright and Rising 2008; eBird 2013). Savannah Sparrows nest in a variety of open field habitats, including cultivated fields, pastures, and fallow weedy fields (Marshall et al. 2006). Other species were observed in adjacent crop fields and flying nearby, but not actively using the grasslands.

Weedy grassland #2 (Habitat Category 5) – The vegetation in this habitat was a variation on "weedy grassland #1." Cheatgrass was dominant, as were bunchgrass species, yellow rabbitbrush, and cereal rye (*Secale cereale*). Sagebrush, mustards, and fiddlenecks were also present in very small numbers. This habitat was limited to a small area near milepost 2 of the natural gas pipeline.

"Weedy grassland #2" has been placed under "Habitat Category 5" as set forth in OAR 635-415-0025, because it "is habitat for fish and wildlife having high potential to become either essential or important habitat." As this habitat type is relatively limited and very similar to "weedy grassland #1," similar reasoning was used to place it in "Habitat Category 5." No wildlife species were observed in this habitat type during the relatively brief survey; however, it is assumed that "weedy grassland #2" would attract the same species as "weedy grassland #1."

Weedy grassland #3 (Habitat Category 6) – This habitat appeared to have undergone heavy grazing and was dominated by cheatgrass, foxtail barley (*Hordeum jubatum*), and bare ground. This habitat type was relatively limited in area and appeared to be subject to regular disturbance from grazing, farm equipment, and vehicles. Long-billed Curlews were observed foraging in the adjacent agricultural field, but the high level of ground disturbance and anthropogenic disturbances (e.g., homes, interstate highway traffic) indicate that "weedy grassland #3" has low potential to become essential or important habitat for fish and wildlife. Therefore, it has been classified as "Habitat Category 6."

Weedy grassland #4 (Habitat Category 5) – The vegetation in this habitat was dominated by cheatgrass, cereal rye, mustards, and fiddlenecks. Scotch thistle also had a limited presence. This habitat was similar to “weedy grassland #1” and “weedy grassland #2” but had a larger presence of the cereal rye and Scotch thistle, which are classified as noxious weeds in Umatilla County. This is the largest contiguous patch of grassland in the Station site and natural gas pipeline ROW Analysis Area, although it is dominated by non-native plants. Although this habitat was dominated by non-native plant species, it has been classified as “Habitat Category 5” due to the presence of long-billed curlews, which may indicate high potential to become either essential or important habitat. This was the only location where a Long-billed Curlew was observed in a grassland during field surveys. In addition, a Red-tailed Hawk pair was actively nesting in the black locust trees that line the western edge of the habitat and likely use the grassland to forage (see Appendix P-1 for further details regarding the Red-tailed Hawk nest).

Weedy grassland #5 (Habitat Category 5) – Sandberg’s bluegrass (*Poa secunda*) made up more than 50 percent of this habitat. Diffuse knapweed, rubber rabbitbrush, prickly Russian thistle, and wheatgrass (Agropyron spp.) also were common. Bare soil is more prevalent here than in Weedy grasslands #1–4, and small mammal burrows are present. This habitat was classified as “Habitat Category 5” because of the high densities of non-native plants and noxious weeds, its relatively small area, and the close proximity of high level of disturbance by anthropogenic activities (i.e., McNary Substation and adjacent parks).

Weedy grassland #6 (Habitat Category 6) – This habitat consisted of fallow agriculture field dominated by mustards, fiddlenecks, cheatgrass, and prickly Russian thistle. Approximately 5–10 percent of the cover is bare ground, and small mammal burrows are present. This habitat also was classified as “Habitat Category 6” because of the high densities of non-native plants and noxious weeds, its relatively small area, and the close proximity of high level of disturbance by anthropogenic activities. In addition, this habitat showed evidence of relatively recent agricultural activities.

Agriculture (Habitat Category 6) – This habitat consisted entirely of active circular crop fields, which were prevalent in the area. While many species may forage in the crop fields, and some birds may attempt to nest in them, they are not important habitat for fish and wildlife because they are actively managed for human use. Therefore, agriculture was classified as “Habitat Category 6.”

Shrub steppe (Habitat Category 3) – The shrub steppe habitat was located north of Interstate Highway 84 and consists primarily of antelope bitterbrush (*Purshia tridentata*), rubber rabbitbrush, yellow rabbitbrush, cheatgrass, mustards, redstem stork’s bill, prickly Russian thistle, and fiddlenecks. Field surveys were limited to the Station site and 50-foot-wide natural gas pipeline ROW due to property access restrictions. As a result, only a small portion of the existing shrub steppe habitat in the Analysis Area was visited by surveyors. The remaining area of shrub steppe habitat depicted in Figures P-2 and P-3 is assumed to be of similar characteristics and condition.

Eight relatively small patches of shrub steppe habitat were identified in the Analysis Area surrounding the Station site and natural gas pipeline ROW (Figures P-2 and P-3). Although these patches are small and disconnected, and non-native species do occur in this habitat, the shrub steppe has been classified as "Habitat Category **3**." This classification is warranted by the importance of shrub steppe habitat for wildlife, and the condition of the habitat in the vicinity of the Station site is in fair condition. The precise area of shrub steppe habitat that the ROW would cross is somewhat more disturbed than the other shrub steppe areas in the analysis area; it abuts an unpaved road, crosses a second unpaved road, and contains numerous off-road vehicle two-tracks. Nonetheless, Perennial acknowledges that this habitat type is still important and has included it in the "Habitat Category 3" classification. This habitat type is not limited to the area surrounding the Project, as the nearby Umatilla Army Depot provides a large, continuous patch, and other larger patches are scattered throughout the Analysis Area along the existing transmission line; however, it is considered limited in the larger context of Columbia Plateau Ecoregion.

Sagebrush Sparrow (*Artemisiospiza nevadensis*) is an ODFW sensitive species that prefers shrub steppe habitats (Martin and Carlson 1998). A study in southeastern Washington has indicated that Sagebrush Sparrows inhabited habitat patches previously deemed marginal, with lower shrub cover and up to 65 percent cover of non-native understory species (Duberstein et al. 2008). For this reason, it is possible that Sagebrush Sparrows, and other wildlife species, may find the shrub steppe patches near the Station site to be suitable habitat despite their relatively small size and lack of connectivity.

Riparian (Habitat Category 2) – The woodland and thicket habitat running along the Umatilla River was designated as "riparian" habitat. Dominant plant species were not identified during the field surveys, as the field biologists did not have access to walk along the riparian corridor. Riparian woodland and thicket is limited in the Analysis Area to the Umatilla River corridor. In the Columbia Plateau, it is generally limited to larger watercourses. This habitat type is also important to fish and wildlife species, including populations of ODFW sensitive species like the Willow Flycatcher (*Empidonax traillii adastus*), which, in eastern Oregon, nests almost exclusively in riparian zones. Riparian woodlands and thickets also provide critical shading for rivers and streams, which is crucial for maintaining important open water habitats for fish, as in the Umatilla River. Riparian habitats have been classified as "Habitat Category 2" because they are both important to fish and wildlife species/populations and limited in the physiographic province and in the Analysis Area.

Open water (Habitat Category 2 [Umatilla River]; Habitat Category 6 [canals]) – All waterbodies in the Analysis Area were labeled as "open water." These waterbodies include the

Umatilla River and several irrigation canals managed by the Westland Irrigation District, with water supplied by the U.S. Bureau of Reclamation through the Umatilla Basin Project. The canals lack the riparian vegetation and physical structure necessary to support important fish populations and are classified as “Habitat Category 6.” The Umatilla River supports important fish populations, including the potential for all four species listed in Table P-1. Given the importance of the Umatilla River as fish and wildlife habitat and the limited availability of this habitat in the Analysis Area, it has been classified as “Habitat Category 2.”

Developed (Habitat Category 6) – This category was used to denote any area that had been completely 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 cattle yards. Developed lands have been classified as “Habitat Category 6,” as they are primarily for human use.

P.4 HABITAT MAPS

OAR-345-021-0010(1)(p)(C) *A map showing the locations of habitat identified in OAR 345-021-0010(1)(p)(B).*

Response: Figures P-1 through P-3 show the field mapped habitats within 0.5 miles of the step-up substation, Station site, and 50-foot-wide natural gas pipeline ROW. Habitat types are described and classified according to OAR 345-021-0010(1)(p)(B) in Section P.3.

P.5 IDENTIFICATION OF STATE SENSITIVE SPECIES POTENTIALLY PRESENT IN THE ANALYSIS AREA AND ASSOCIATED SITE-SPECIFIC ISSUES

OAR-345-021-0010(1)(p)(D) *Based on consultation with Oregon Department of Fish and Wildlife (ODFW) and appropriate field study and literature review, identification of all State Sensitive Species that might be present in the analysis area and a discussion of any site-specific issues of concern to ODFW.*

Response: Literature review and queries of available databases were conducted to identify the ODFW sensitive species and ODA candidate plant species with the potential to occur in the Project’s Analysis Area. Potential presence was determined using species’ range, habitat requirements, and occurrence data in the Analysis Area. The following resources were used to identify these species:

- *Atlas of Oregon Wildlife* (Csuti et al. 1997);
- Birds of North America (Poole 2005);
- eBird (2013);

- NatureServe (2013);
- *Oregon Birds* (Marshall et al. 2006);
- Oregon Wildlife Explorer (ORBIC 2011);
- Oregon Biodiversity Information Center (ORBIC 2012); and
- United States Department of Agriculture Plants Database (USDA 2013).

The ODFW sensitive species and ODA candidate species identified from desktop analyses were verified during baseline field surveys and through consultation with ODFW (Kirsch 2014) and ODA (Currin 2013). Table P-1 lists species with the potential to occur in the Analysis Area.

Sensitive/Candidate Species Accounts

The following species accounts discuss the sensitive and candidate species identified in Table P-1 in terms of presence in the Analysis Area (observed or potential), availability of suitable habitats, and issues of concern regarding the Project's construction and operation. These factors are evaluated at two scales: the 0.5-mile buffer of the Analysis Area, and the Project's areas of temporary and permanent disturbance.

Inland Columbia redband trout

Throughout their range, Inland Columbia redband trout are found in cool streams (less than 21 degrees Celsius [°C]) east of the Cascade Mountains from desert areas to mountain habitats (IDFG 2005; NatureServe 2013). They are able to survive warmer temperatures up to 27°C for short periods of time (IDFG 2005). Within the Analysis Area, the Umatilla River provides habitat for Inland Columbia redband trout. The transmission line will span the Umatilla River; however, the line is being upgraded and no new construction is planned, which will entail no new ground disturbance that could impact the river. The natural gas pipeline will traverse several irrigation canals that connect to the Umatilla River, but these water bodies do not meet the habitat requirements (e.g., cool temperatures) to support Inland Columbia redband trout. Therefore, no Project-related issues of concern are expected regarding this species.

Western toad

Western toads live in a variety of habitats, including arid shrubby areas, suburbs, and irrigated agricultural areas (NatureServe 2013; ORBIC 2011). They breed in aquatic habitats, which in eastern Oregon may include stock ponds and reservoirs. The Analysis Area comprises fair to good habitat for this species; however, there are no ORBIC records of western toads (ORBIC 2011, 2012). This species is possible in the Analysis Area, but no issues of concern are expected, as the Project will not permanently impact water bodies or wetlands. During construction, temporary impacts are possible from increased noise and human presence, as well as disturbances to occupied streams or ditches that the Project may traverse.

Table P-1 Oregon State Sensitive Species Potentially Present in the Analysis Area

Common Name	Latin Name	Status[1]	Likelihood of Occurrence[2]
Fish			
Steelhead (Middle Columbia River Evolutionarily Significant Unit, summer run)	*Onchorhynchus mykiss*	Critical	ESA-listed (See Exhibit Q)
Inland Columbia redband trout	*Onchorhynchus mykiss gairdneri*	Vulnerable	Likely
Bull trout (Umatilla Bull Trout Significant Management Unit)	*Salvelinus confluentus*	Critical	ESA-listed (See Exhibit Q)
Pacific lamprey	*Lampetra tridentata*	Vulnerable	ESA-listed (See Exhibit Q)
Amphibians			
Western toad	*Anaxyrus boreas*	Vulnerable	Possible
Reptiles			
Northern sagebrush lizard	*Sceloporus graciosus graciosus*	Vulnerable	ESA-listed (See Exhibit Q)
Birds			
Swainson's Hawk	*Buteo swainsoni*	Vulnerable	Likely
Ferruginous Hawk	*Buteo regalis*	Critical	ESA-listed (See Exhibit Q)
Long-billed Curlew	*Numenius americanus*	Observed	Likely
Burrowing Owl	*Athene cunicularia*	Critical	ESA-listed (See Exhibit Q)
Lewis's Woodpecker	*Melanerpes lewis*	Critical	ESA-listed (See Exhibit Q)
Peregrine Falcon	*Falco peregrinus*	Vulnerable	Possible
Willow Flycatcher	*Empidonax traillii adastus*	Vulnerable	ESA-listed (See Exhibit Q)
Loggerhead Shrike	*Lanius ludovicianus*	Vulnerable	Likely
Sagebrush Sparrow	*Artemisiospiza nevadensis*	Critical	Possible
Grasshopper Sparrow	*Ammodramus savannarum*	Vulnerable	Possible
Mammals			
California myotis	*Myotis californicus*	Vulnerable	Possible
Long-legged myotis	*Myotis volans*	Vulnerable	ESA-listed (See Exhibit Q)
Pallid bat	*Antrozous pallidus*	Vulnerable	ESA-listed (See Exhibit Q)
White-tailed jackrabbit	*Lepus townsendii*	Vulnerable	Possible
Plants			
Columbia cress	*Rorippa columbiae*	Candidate	Possible

[1]The "Status" column identifies each species classification as an ODFW sensitive species or an ODA candidate plant species.
[2] "Likelihood of Occurrence" was determined based on available suitable habitat and documented observations in the analysis area.
"Likelihood of Occurrence" category definitions:

ESA (Federal Endangered Species Act)-listed (see Exhibit Q – Threatened and Endangered Species) – State Sensitive Species listed as Endangered, Threatened, or Candidate by the U.S. Fish and Wildlife Service or National Oceanic and Atmospheric Administration, National Marine Fisheries Service.
Possible – Analysis area lies within the species' range, but for whom only limited suitable habitat is available and/or no occurrence data exists.
Likely – Analysis area lies within the species' range, suitable habitat is available, and/or occurrence data exists.
Observed – Species observed during Project field surveys.

Swainson's Hawk

Swainson's Hawks migrate through and breed in eastern Oregon and are typically present from April through early October (Marshall et al. 2006; Bechard et al. 2010; eBird 2013). They prefer open habitats with rich prey populations (e.g., pocket gophers and ground squirrels) and are most common in bunchgrass prairie and irrigated farmland (Marshall et al. 2006). They primarily nest in trees but do not require large numbers to find suitable nesting substrate. There are numerous records of Swainson's Hawks in the Hermiston area (including the Umatilla Army Depot) during migration and the breeding season (eBird 2013). This species is likely to occur in the Analysis Area and the Site. The construction and operation of the Project are not expected to present issues of concern for Swainson's Hawks in the area, unless active nests are located in close proximity to construction activities. These potential impacts could be mitigated by avoiding disturbance of nests while they are active.

Long-billed Curlew

In the Columbia River Basin, Long-billed Curlews breed primarily in grasslands, particularly in those dominated by cheatgrass (Dugger and Dugger 2002; Marshall et al. 2006). They will nest in agricultural fields (i.e., short dry cereal grain, wheat stubble, and fallow) and tend to avoid areas with trees and tall, dense shrubs, and grasses. They arrive in Oregon in mid-March and remain as late as October or November (Marshall et al. 2006). They have been documented in the Hermiston area (including the Umatilla Army Depot) during migration and the breeding season (eBird 2013). No Project-related issues of concern for Long-billed Curlews are expected, unless active nests occur in or very near the construction areas. These potential impacts could be mitigated by avoiding disturbance of nests while they are active. Clearing of vegetation would likely benefit this species, as it would maintain the short, open grassy habitats it prefers (Marshall et al. 2006).

Peregrine Falcon

Peregrine Falcons occur as resident and migratory populations in Oregon (Marshall et al. 2006; eBird 2013). They nest on cliffs in close proximity to water in myriad open habitats (White et al. 2002; Marshall et al. 2006). They may also nest on bridges and building ledges in cities. Peregrine Falcons are unlikely to nest in the Analysis Area, as there are no suitable cliff ledges; however, they may hunt in the Analysis Area. There are numerous records of Peregrine Falcons in the Boardman area (23 miles east of the Project site) (eBird 2013). The construction and operation of the Project are not expected to present issues of concern for Peregrine Falcons in the area, as there are no suitable nesting substrates in the Analysis Area.

Loggerhead Shrike

Loggerhead Shrikes prefer open habitats with scattered trees or shrubs for nesting and elevated substrates for perching (Yosef 1996; Marshall et al. 2006). These habitats may include pastures, mowed roadsides, golf courses, agricultural lands, riparian areas, and open woodlands (Yosef 1996). They breed in eastern Oregon and are rare but regular in the winter (Marshall et al. 2006). Loggerhead Shrikes have been observed in the Hermiston area, but there are no known records in the Analysis Area (eBird 2013). The Analysis Area is composed primarily of fair to good quality habitat for this species (ORBIC 2011). No issues of concern are expected for this species unless active nests are documented in close proximity to construction activities. These potential impacts could be mitigated by avoiding disturbance of nests while they are active.

Sagebrush Sparrow

Sagebrush Sparrows are migrants and breeders in Oregon and are associated with sagebrush and other high desert shrub habitats (Martin and Carlson 1998; Marshall et al. 2006). The Umatilla Army Depot largely contains good quality Sagebrush Sparrow habitat, and other small, isolated patches occur throughout the Analysis Area (ORBIC 2011). The nearest documented observations were recorded in the Umatilla National Wildlife Refuge and the Boardman Bombing Range (eBird 2013). Loss of habitat may impact local breeding populations if sagebrush and other shrub habitats are cleared for the Project; however, sagebrush habitat is non-existent in areas of construction (i.e., Station site and natural gas pipeline ROW). Sagebrush plants do occur in a few very small, isolated patches, but these patches are located amidst agriculture and weedy grassland vegetation and would not be able to support breeding Sagebrush Sparrows. Therefore, no suitable Sagebrush Sparrow habitat is expected to cleared, and no Project-related impacts are expected for this species.

Grasshopper Sparrow

In eastern Oregon, Grasshopper Sparrows breed in grasslands, often native bunchgrass remnants, with an absence of woody shrubs (Vickery 1996; Marshall et al. 2006). Fair or good habitat is available in small, scattered patches in the vicinity of the Analysis Area (ORBIC 2011). ORBIC (2012) has identified potential habitat for the species near the southern terminus of the natural gas pipeline and along the transmission line near the mouth of the Umatilla River. Field verification of the ORBIC mapped habitat near the southern terminus of the natural gas pipeline determined that this area is highly unlikely to support Grasshopper Sparrows. This area is dominated by active agriculture and grassy areas of dense, invasive weeds.

Several Grasshopper Sparrows have been documented in recent years in the Boardman area, along with two observations in the Umatilla Army Depot in 2012 (eBird 2013). Loss of habitat may impact local breeding populations if grassland habitats are cleared for the Project; however, the grassland habitats expected to be cleared are already disturbed and dominated by invasive weeds and are therefore unlikely to support breeding Grasshopper Sparrows. In the unlikely event that breeding Grasshopper Sparrows do occur in the Analysis Area, active nests in close proximity to construction activities may be disturbed. These potential impacts could be mitigated by avoiding disturbance of nests while they are active.

California myotis

California myotis forage along clumps of trees, on woodland edges, and over open water (Csuti et al. 1997; ORBIC 2011). They roost in both natural and man-made structures, including buildings, mines, rock crevices, cliff faces, and hollow trees. The Analysis Area is primarily composed of fair habitat, with small patches of good habitat (ORBIC 2011). However, there are no documented records of the species in the Analysis Area (ORBIC 2012). California myotis would most likely occur in the riparian woodlands along the Umatilla River (located as close as 175 feet from the pipeline ROW) or along other small clumps of trees in the Analysis Area (as close as 50 feet from the ROW in residential yards). They may also roost in buildings and other man-made structures in the Analysis Area. Residences, farm buildings, and other structures are present as close as 50 to 75 feet from the ROW; however, Perennial does not have permission to access adjacent parcels to conduct surveys for roosts.

The Project is not expected to clear any valuable habitat for this species, but bats could be disturbed by construction-related activities if active roosts occur in close proximity. This is also not expected to occur, as anthropogenic disturbance is already common in the Analysis Area and construction is not planned to occur in close proximity to suitable man-made structures. Some of the existing sources of anthropogenic disturbance are the Hermiston Generating Plant (HGP), immediately north of the Station site; River Point Farms yard and structures, 800 feet southwest of the Station site; United Parcel Service and FedEx distribution centers, 1,300 feet and 3,200 feet west of the Station sites, respectively; McNary Dam substation, 257 feet north of the Project substation site; and Interstate 84, crossed by the pipeline ROW. Approximately 10 residences and active farm buildings are located within 250 feet of the pipeline ROW, the Station site, and the substation site.

White-tailed jackrabbit

White-tailed jackrabbits occupy open habitats like sagebrush deserts and grasslands (Csuti et al. 1997; ORBIC 2011). In areas where black-tailed jackrabbits (*Lepus californicus*) also occur, they prefer open fields and ryegrass habitats (Csuti et al. 1997). The Analysis Area is composed primarily of fair habitat, with isolated patches of high quality habitat (ORBIC 2011). There are no documented records of the species in the Analysis Area (ORBIC 2012). Loss of habitat may impact local populations if open desert vegetation is cleared for the Project; however, the open habitats created by clearing vegetation may also be suitable for the species. White-tailed jackrabbits could be disturbed by construction-related activities if they occur in close proximity to the Project. This is also not expected to occur, as anthropogenic disturbance is already common in the Analysis Area.

Columbia cress

Columbia cress grows near many types of water bodies and in a variety of soils (NatureServe 2013). The most likely locations for its occurrence in the Analysis Area are along the Columbia and Umatilla Rivers and their tributaries, as well as irrigation ditches and roadside ditches. There are no known occurrences of this species in the Analysis Area (ORBIC 2012; NatureServe 2013). No issues of concern are expected for this species, as no individuals were observed in the Site.

P.6 DESCRIPTION OF BASELINE SURVEYS OF STATE SENSITIVE SPECIES

OAR-345-021-0010(1)(p)(E) *A baseline survey of the use of habitat in the analysis area by species identified in OAR-345-021-0010(1)(p)(D) performed according to a protocol approved by the Department and ODFW.*

Response: The baseline surveys conducted in support of this exhibit are described in Section P.2 and in further detail in the 2013 Biological Resources Survey Report (Appendix P-1). Habitats in the Analysis Area are described in Section P.3 and shown in Figures P-1 through P-3. The 2013 Biological Resources Survey Report describes the habitat analysis results in further detail as well.

Long-billed Curlew is the only species listed in Table P-1 that was observed during the May 9 and August 1, 2013, field surveys of the Station site and natural gas pipeline ROW. Seventy Long-billed Curlews were recorded, 60 of which were observed in a single flock that flew into an agricultural field to forage. It is not uncommon for curlews to forage in large groups for invertebrates, even during the breeding season (Dugger and Dugger 2002). In Oregon, Long-billed Curlews favor nesting in cheatgrass-dominated grasslands. The high densities of cheatgrass in the area and the number of curlews recorded indicate that the species is likely nesting in the grasslands in the Analysis Area. It is also known to nest in agricultural fields in the Great Basin.

While Long-billed Curlews are the only species listed in Table P-1 that were observed during surveys, suitable habitat was present in close proximity to the Station site and natural gas pipeline ROW for other ODFW sensitive species and ODA candidate species. Nesting and foraging habitat is available in the Analysis Area for the sensitive raptor species, although Ferruginous Hawks are less likely to occur in cultivated areas (Bechard and Schmutz 1995; Marshall et al. 2006). Moreover, Loggerhead Shrikes prefer open habitats with scattered trees or shrubs for nesting and elevated substrates for perching, and they have been recorded in the Hermiston area (Yosef 1996; Marshall et al. 2006; eBird 2013). Likewise, western toads live in a variety of habitats, including arid shrubby areas, suburbs, and irrigated agricultural areas (ORBIC 2011; NatureServe 2013). Several bat species may also occur in the area, given available man-made roosting opportunities (e.g., buildings and bridges) and foraging opportunities in the open areas and riparian woodlands along the Umatilla River (Csuti et al. 1997; NatureServe 2013). All of the fish species listed in Table 2-3 have the potential to occur in the Columbia and Umatilla Rivers and their tributaries, which may include the canals that traverse the Project. Finally, suitable habitat for Columbia cress occurs where open water exists, as this species is known to grow near a variety of waterbody types (NatureServe 2013).

P.7 DESCRIPTION OF POTENTIAL ADVERSE IMPACTS

OAR-345-021-0010(1)(p)(F) *A description of the nature, extent and duration of potential adverse impacts on the habitat identified in OAR-345-021-0010(1)(p)(B) and species identified in OAR-345-021-0010(1)(p)(D) that could result from construction, operation, and retirement of the proposed facility.*

Response: Some direct impacts are expected to the habitats identified in Section P.3 (OAR-345-021-0010[1][p][B]). Table P-2 highlights the acreages of the different habitat types and categories that will be permanently and temporarily disturbed by the Project. Approximately 81 percent of areas of permanent disturbance consist of weedy grasslands that are classified as "Habitat Category 5," which is on the lower end of the range for habitat quality but has a high potential to become either essential or important habitat. The remaining permanent disturbance areas include highly disturbed weedy grasslands, developed areas, and open water (irrigation canal) that are classified as "Habitat Category 6," which has low potential to be essential or important habitat for fish and wildlife. Approximately 57 percent of areas of temporary disturbance consist of weedy grasslands that are classified as "Habitat Category 5." Approximately 37 percent of temporary disturbance areas consist of highly disturbed weedy grasslands, active agriculture, developed areas, and open water (irrigation canal) that are classified as "Habitat Category 6." The remaining 6 percent of areas of temporary disturbance is shrub steppe that is classified as "Habitat Category 3." Combined, almost 97 percent of all the permanent and temporary disturbances are proposed to occur on either "Habitat Category 5" or "Habitat Category 6" lands. These habitat types in the ROW are typically disturbed and dominated by non-native plants or are actively managed agricultural lands or developed areas. None of these habitat types are limited in the region. Considering this, the overall impacts on the habitats identified in Section P.3 are expected to be minimal.

Indirect impacts on the species identified in Table P-1 due to permanent and temporary habitat loss also are expected to be minimal. The disturbances will occur almost exclusively on "Habitat Category 5" and "Habitat Category 6" lands (almost 97 percent of disturbance areas), and these habitats are common in and around the Analysis Area. Sensitive species that use these primarily non-native grassland habitats (i.e., Long-billed Curlews) would still have similar habitat for nesting, foraging, and roosting in close proximity to the Project and across the region.

Direct impacts on individual animals that may nest, roost, or den in areas of the ROW where vegetation is cleared are possible as a result of mortality or injury by Project equipment and vehicles, or even foot traffic. The same would be true if any plant species listed in Table P-1 are present in areas to be cleared during construction. Mitigation measures, including pre-construction surveys and onsite monitoring by a biologist when sensitive resources are detected, would reduce the likelihood that mortality of any species listed in Table P-1 would result from vegetation clearing (see Section P.8). The increases in traffic (including construction equipment) during all phases of the Project increases the likelihood of vehicle-related mortalities of species listed in Table P-1. Mitigation measures, including enforced speed limits, will reduce the likelihood of mortalities (see Section P.8). The probability of fuel and other hazardous fluid leaks or spills also is increased. To avoid or minimize impacts on fish and wildlife and their habitats resulting from spills, all construction crews will carry emergency spill response equipment to be used if inadvertent releases occur. After implementation of the mitigation measures in Section P.8, vehicle-related accidents and pollutant spills are not expected to have measurable impacts on sensitive species.

Direct impacts on wildlife from sensory disturbances also are possible during construction, operation, and retirement of the Project. Noise, vibrations, and human presence could cause displacement or avoidance of areas, or nest abandonment by breeding birds. Sensory disturbances can cause stress, displacement, or avoidance behavior, resulting in disruptions in essential activities such as foraging, reproduction, and parental care. Project-related sensory disturbance impacts are expected to be intermittent and short term, occurring during work hours and ceasing after construction activities have moved from the vicinity of nesting, roosting, denning, and foraging areas. Fish or wildlife that currently use the Analysis Area, including any species listed in Table P-1, would have some tolerance of the high level of existing anthropogenic disturbances. Some of the existing sources of anthropogenic disturbance are the HGP, located immediately north of the Station site; River Point Farms yard and structures, located 800 feet southwest of the Station site; United Parcel Service and FedEx distribution centers, located 1,300 feet and 3,200 feet west of the Station sites, respectively; McNary Dam substation, located 257 feet north of the Project substation site; and Interstate 84, crossed by the pipeline ROW. Approximately 10 residences and active farm buildings are located within 250 feet of the pipeline ROW, the Station site, and the substation site. The Project's addition of noise and human activity to the Analysis Area would be relatively small compared to the existing level of disturbances created by the human population, traffic, agriculture, and industry noise sources noted above. Therefore, the additional impacts on sensitive fish and wildlife in the Analysis Area associated with disturbances by the Project activities would be small relative to the impacts from existing anthropogenic activities. However, Project-related human presence and noise impacts on sensitive species could be heightened if the disturbances occurred in close proximity to individuals. For example, Long-billed Curlews nesting in close proximity to construction or Project retirement activities could result in nest abandonment or disruption of critical parental behaviors (Dugger and Dugger 2002). This would not be likely during operations, as the disturbances are consistent and long term. Individuals would avoid any areas of intolerable disturbances. Mitigation measures, such as pre-construction and avoidance of nesting birds during construction and retirement, will reduce the likelihood that any species listed in Table P-1 will adversely impacted by noise and other anthropogenic disturbances (see Section P.8).

Total construction duration for the Station is expected to be 22 months, from mobilization to commencement of commercial operation. The first construction contractor is expected to be mobilized onsite in the third quarter of 2015. The first two months of construction activities will comprise site preparation and grading work. Then, construction for Unit 1 through Unit 4 will continue for the next 16 months until the units are ready to be commissioned in first quarter 2017. At peak construction, it is estimated that 200 to 225 construction workers will be employed at the Project site. Therefore, the majority of the impact from construction activities, such as traffic, noise, and demand for public service from nearby communities, will occur during this 16-month period when construction is at its peak. Startup, testing, and commissioning will occur for another four months before the Station is ready to be placed into commercial operation.

The transmission line will be reconductored, which may result in limited new ground disturbances from activities such as driving on vegetation, however, no excavation or grading would occur. According to Institute of Electrical and Electronics Engineers standard 524, "Guide to the Installation of Overhead Transmission Line Conductors," major equipment required for reconductoring may include reel stands, tensioner, puller, reel winder, pilot line winder, splicing cart, and pulling vehicle. It is estimated that 12 stringing locations will be required for the reconductoring effort. Each stringing location will be contained within the existing transmission ROW and will measure approximately 50 x 100 feet, for a total of 60,000 square feet, or approximately 1.38 acres of temporary disturbance. Exact stringing locations and equipment requirements will be determined during the advanced Project planning stage. Activities at these sites will be low-impact, consisting primarily of vehicles driving on low-lying vegetation. No excavation, grading, or other soil disturbance will occur at these sites. Crews will be restricted to existing unpaved access roads, including two-track roads in some cases, to access work sites along this corridor. To avoid or minimize impacts on special-status natural resources along the transmission line, including nesting birds (during nesting season) and Washington ground squirrels, a biologist will conduct preconstruction surveys at all sites where vegetation will be disturbed in suitable habitat and will remain onsite to monitor for impacts during stringing or other construction activities. If the biologist observes active bird nests or signs of Washington ground squirrels, then Perennial will contact the United States Fish and Wildlife Service (USFWS) to determine which avoidance and minimization measures to implement, if appropriate. Transmission lines have the potential for collision and electrocution risks to birds and bats; however, these risks are not likely to be increased by the reconductoring of the lines and with the implementation of mitigation measures (see Section P.8).

Project personnel, equipment, and vehicles will have a substantially reduced presence during the operation and maintenance phases compared to the construction phase. Project operations and maintenance will also result in some noise and traffic increases, due to the employment of six to eight full time employees, primarily at the Station site. The Analysis Area currently has an elevated level of human activity and noise, as it includes the City of Umatilla, as well as several interstate routes and highways. Agriculture, industry, and energy development also are common in the Analysis Area. Impacts during operations and maintenance are anticipated to be similar to those describe above for the construction phase but to a much lesser degree. No new ground-disturbing activities would typically occur during operations and maintenance without Perennial obtaining additional permits and implementing appropriate impacts avoidance measures for the Project. Impacts resulting from decommissioning activities are expected to be the same as those described above for construction, and the same conservation measures will be implemented as during the construction phase.

Table P-2 Permanent and Temporary Disturbances (in acres) to Each Habitat Type and Habitat Mitigation Category

Habitat Type	Mitigation Category	Disturbance Acres
Permanent Disturbances		
Weedy Grassland #1	6	0.00
Weedy Grassland #2	5	0.00
Weedy Grassland #3	6	0.00
Weedy Grassland #4	5	18.52
Weedy Grassland #5	5	0.51
Weedy Grassland #6	6	3.00
Agriculture	6	0.00
Shrub Steppe	3	0.00
Riparian	2	0.00
Open Water	6	0.29
Developed	6	1.16
	Total	**23.48**
Temporary Disturbances		
Habitat Type	**Mitigation Category**	**Disturbance Acres**
Weedy Grassland #1	5	9.71
Weedy Grassland #2	5	0.59

Table P-2 Permanent and Temporary Disturbances (in acres) to Each Habitat Type and Habitat Mitigation Category

Habitat Type	Mitigation Category	Disturbance Acres
Weedy Grassland #3	6	0.68
Weedy Grassland #4	5	10.10
Weedy Grassland #5	5	0.57
Weedy Grassland #6	6	0.71
Agriculture	6	6.77
Shrub Steppe	3	2.03
Riparian	2	0.00
Open Water	6	0.12
Developed	6	5.38
	Total	**36.67**

*Acreage is subject to change as Project plans continue to be refined.

P.8 MITIGATION MEASURES

OAR-345-021-0010(1)(p)(G) *A description of any measures proposed by the applicant to avoid, reduce, or mitigate the potential adverse impacts described in OAR-345-021-0010(1)(p)(F) in accordance with the ODFW mitigation goals described in OAR 635-415-0025 and a discussion of how the proposed measures would achieve those goals.*

Response: The Project site is located in an agricultural field that is surrounded on three sides by roads, railroads, industrial property (HGP and Lamb-Weston agricultural processing plant) light industrial property (FedEx package distribution facility), and a large cattle stock yard. The natural gas pipeline is to be constructed within an existing 50-foot ROW, also primarily on agricultural land. An existing transmission line will be upgraded (reconductored) to accommodate the Project, and a new step-up substation will be constructed on agricultural land adjacent to the existing Bonneville Power Administration McNary Substation.

The following measures will be implemented by Perennial to avoid and/or minimize impacts on fish, wildlife, and their habitats:

- All Project personnel will attend an environmental training session prior to entering the Project ROW. The training will cover topics related to the Project's environmental compliance, including, but not limited to: approved Project boundaries and access roads; sensitive wetland and waterbody resources; special-status plant and wildlife species; basic avoidance and minimization measures that Perennial will implement for the Project; the role of onsite biologist or monitors; the notification process to be followed if workers identify new sensitive resources; the major environmental laws and regulations that apply to the Project; and the penalty for not complying with laws or regulations.

- The Project will be designed, constructed, maintained, and operated following current Avian Power Line Interaction Committee guidelines to minimize risk of avian mortality.
- Vegetation removed during clearing will be disposed of according to federal, state, and local regulations.
- Any herbicides used during construction and operations and maintenance will be applied according to label instructions and any federal, state, and local regulations.
- Perennial will restrict vehicular travel to the ROW and other established areas within the construction, access, or maintenance easement(s).
- Roads not otherwise needed for maintenance and operations will be restored to pre-construction conditions, to the extent practicable. Roads needed for maintenance and operations will be retained.
- Every construction crew will carry appropriate emergency spill response equipment, including, but not limited to: spill kits with sorbent pads, diatomaceous earth, shovels and appropriate hand tools, curtain booms if working near open water, personal protection equipment, and appropriate temporary waste disposal containers. If a spill occurs, the crew will temporarily halt work to contain and clean up the material and eliminate the source of the spill before resuming work.
- Perennial will restrict the refueling and maintenance of vehicles and the storage of fuels and hazardous chemicals within at least 100 feet of wetlands, surface waterbodies, and groundwater wells, or as otherwise required by federal, state, or local regulations.
- Perennial will conduct construction and scheduled maintenance activities during daylight hours, to the extent practicable.
- Perennial will impose speed limits during construction for access roads to reduce dust emissions, maintain safety, and protect wildlife.
- Perennial will restore all temporary construction-related areas to pre-construction conditions or better after work has been completed.
- Perennial will minimize compaction of soils and rutting through appropriate use of construction equipment (e.g., low ground-pressure equipment and temporary equipment mats).
- Perennial will minimize the amount of time that any excavations remain open.
- Perennial will identify, control, and minimize the spread of non-native invasive species and noxious weeds, to the extent practicable.

- Perennial will clearly demarcate boundaries of environmentally sensitive areas during construction to increase visibility to construction crews.
- If construction-related activities occur during the raptor breeding season (February 1 through August 31), pre-construction surveys will be conducted within 0.5 miles of all proposed Project features for Ferruginous Hawk nests, and within 0.25 miles for all other raptor species nests. If active nests are located, construction-related activities would be restricted within 0.5 miles of Ferruginous Hawk nests, and 0.25 miles of all other raptor nests until the nests have failed or chicks have fledged. A biologist will monitor the status of the active nests daily during nearby active construction and document potential adverse interactions with the Project. Spatial restrictions around active raptor nests may be reduced through consultation with ODFW and USFWS when considering factors such as the visibility of the Project from the nest, topography, existing human disturbances, and the presence of nest monitors.
- If construction-related activities occur during the migratory bird breeding season (March 15 through August 15), pre-construction surveys will be conducted within 20 feet of all proposed Project features for nests of all native, non-raptor species. Given the diversity of species potentially occurring in the vicinity of the Project, their varying nest initiation dates, and the possibility of multiple clutches by some species, pre-construction nest surveys for non-raptors will be valid for two weeks. If active nests are located, the Project will consult ODFW and USFWS to determine appropriate measures to take, which may include limiting construction-related activities within 20 feet of the nests until the nests have failed or chicks have fledged, and/or continuing proposed activities with the presence of a biological monitor. A biologist will monitor the status of active nests daily during nearby active construction and document potential adverse interactions with the Project.
- If a California myotis roost is observed incidentally during other biological surveys of the ROW, the Project will consult ODFW and USFWS to determine appropriate measures to take, if any. Potential measures include implementing a spatial disturbance buffer and/or continuing proposed activities with the presence of a biological monitor.
- If construction occurs during important time periods (e.g., breeding, migration, etc.) or at close distances to environmentally sensitive areas, Perennial will consult with the USFWS, ODFW, and ODA for guidance on seasonal and/or spatial restrictions designed to avoid and/or minimize adverse effects.
- Perennial will establish streamside management zones within 50 feet of both sides of intermittent and perennial streams and along margins of bodies of open water where removal of low-lying vegetation is minimized.
- Perennial will selectively apply herbicides, if used, within streamside management zones.

Perennial has developed a Revegetation and Noxious Weed Control Plan (Appendix P-3) that outlines the goals, methods, and standards for soil restoration and revegetation of areas disturbed during the construction, operation, and maintenance of the Project. This plan provides additional details on the measures listed above, including noxious and invasive weed control measures that will be implemented in all areas of the Project. If the Project description changes or when schedule determinations are made available, Perennial will consult with the USFWS and ODFW to determine whether conditions have changed in a way that would warrant additional measures. Perennial has consulted ODFW regarding the measures described above (Kirsch 2014).

P.9 MONITORING PROGRAM

OAR-345-021-0010(1)(p)(H) *A description of the applicant's proposed monitoring plans to evaluate the success of the measures described in OAR-345-021-0010(1)(p)(G).*

Response: Perennial has developed two monitoring plans to evaluate and track the success of the mitigation measure described in this exhibit: the Project Restoration Monitoring Plan (Appendix P-3) and the Project Biological Monitoring Plan (Appendix P-4). The Project Restoration Monitoring Plan outlines the goals, methods, and criteria to be used by Perennial monitor restoration efforts during and after construction of the Perennial Wind Chaser Station project (Project). These efforts include measures to help ensure proper topsoil management, soil stabilization, and erosion control; noxious weed control; and site revegetation. The Project Biological Monitoring Plan outlines the goals, methods, and criteria that Perennial will use to monitor the success of mitigation measures designed to avoid or minimize impacts on plants and wildlife and their habitats resulting from the Perennial Wind Chaser Station project (Project).

Perennial has initiated consultations with the USFWS, ODFW, and the Umatilla County Weed Control Board regarding the development of these plans. Additional details of the measures provided in Section P.8, including potential nest buffer distances, acceptable levels of construction activity, and the potential need for onsite monitors, will be determined in consultations with USFWS and ODFW and will be included in the monitoring plans. Perennial will provide these plans to the ODOE, USFWS, ODFW, and the Umatilla County Weed Control Board for review and approval before they are finalized and implemented.

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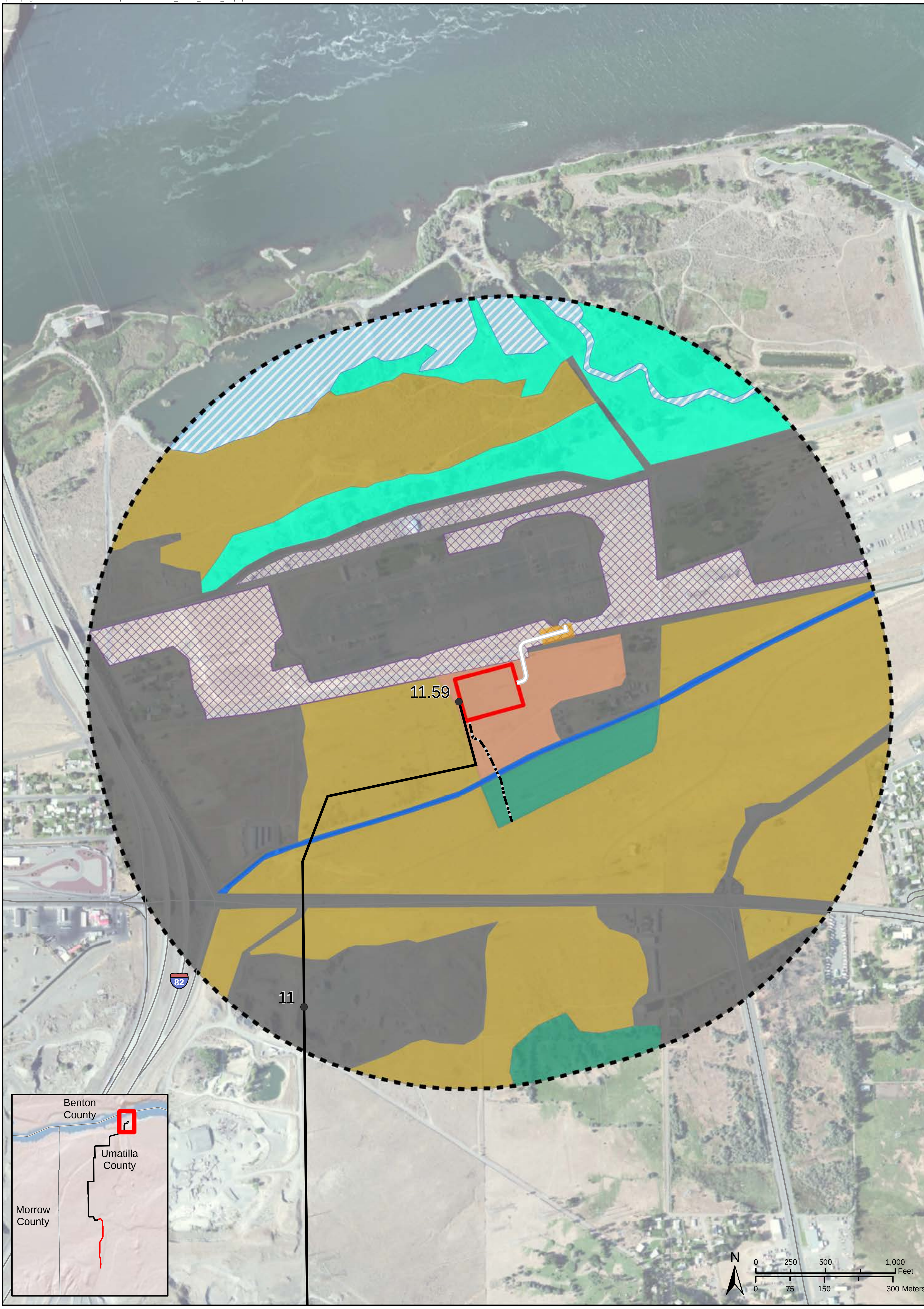

- Mileposts
- Existing Transmission Line
- Underground Trasnmission Line
- Step-up Substation
- Riser Structure
- 0.5-mile Buffer

*Numbers in parentheses refer to ODFW Habitat Categories

Source: ESRI 2010, E&E Field Data 2013

- Upgraded Gravel Road

Field Data - Habitat*

- Agriculture (6)
- Developed (6)
- Riparian (2)
- Shrub Steppe (3)
- Weedy Grassland #5 (5)
- Weedy Grassland #6 (6)
- Open Water (2)
- Open Water (6)

Figure P-1

Field Mapped Habitats within 0.5 Miles of the Step-up Substation Site and Underground Transmission Line ROW

Perennial Wind Chaser Station

July 2014

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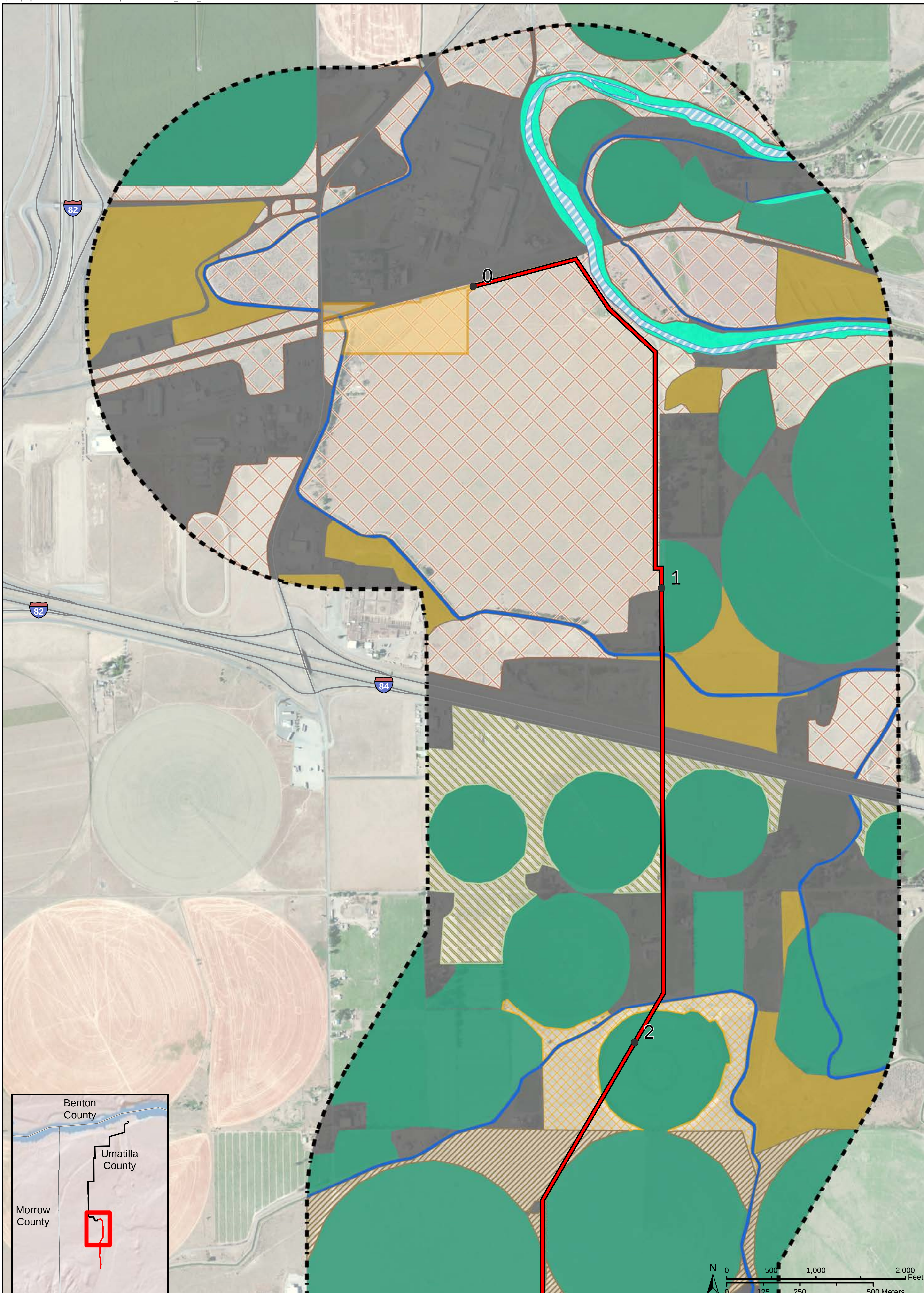

- Mileposts
- Natural Gas Pipeline
- 0.5-mile Buffer
- Station

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 P-2

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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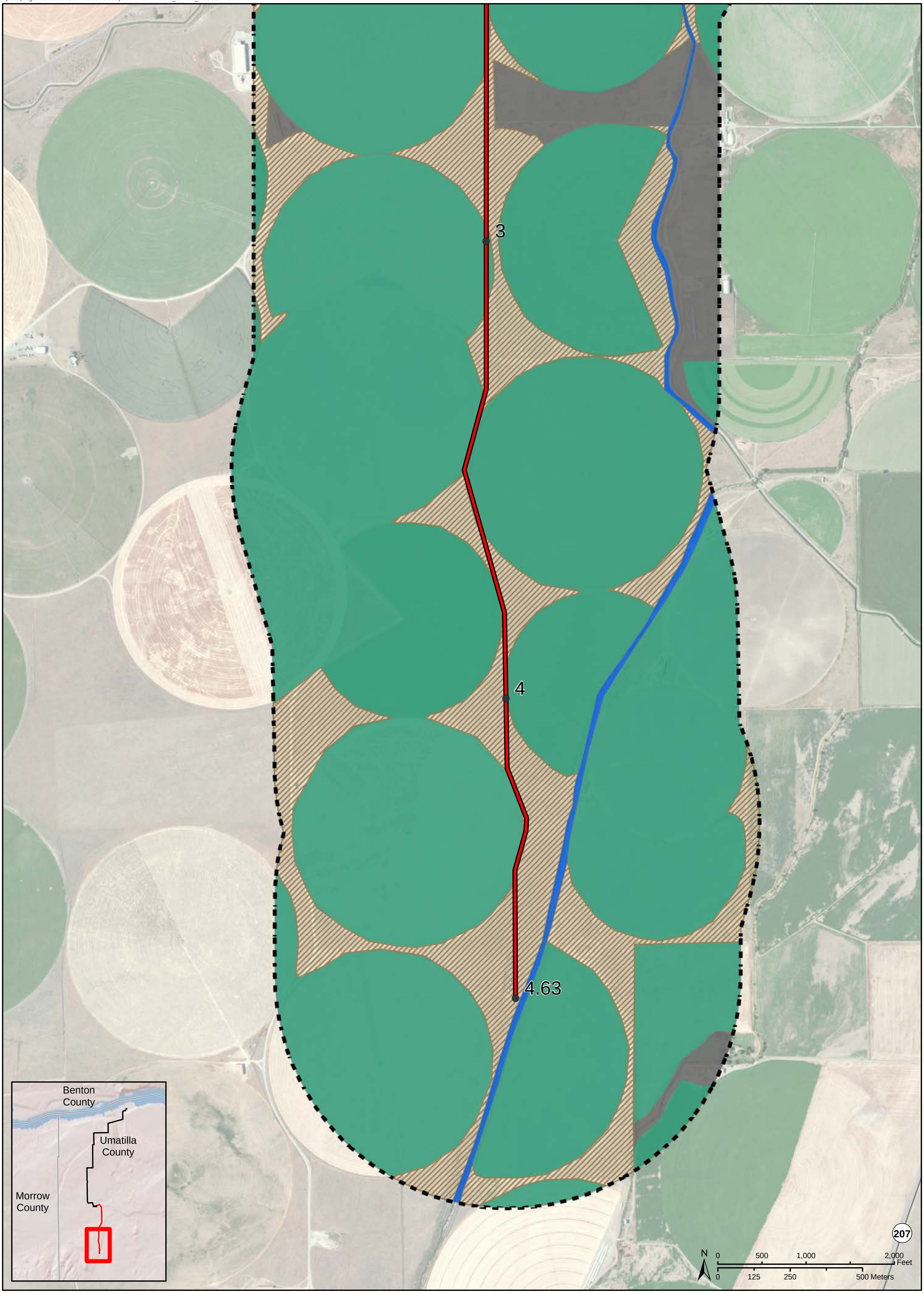

- Mileposts
- Natural Gas Pipeline
- 0.5-mile Buffer

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 P-3

Field Mapped Habitats within 0.5 Miles of the 50-foot-wide Natural Gas Pipeline ROW

Perennial Wind Chaser Station

July 2014

APPENDIX P-1

2013 Biological Resources Survey Report

Perennial Wind Chaser Station

2013 Biological Resources Survey Report

September 2013

Prepared for:

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A DATASHEETS

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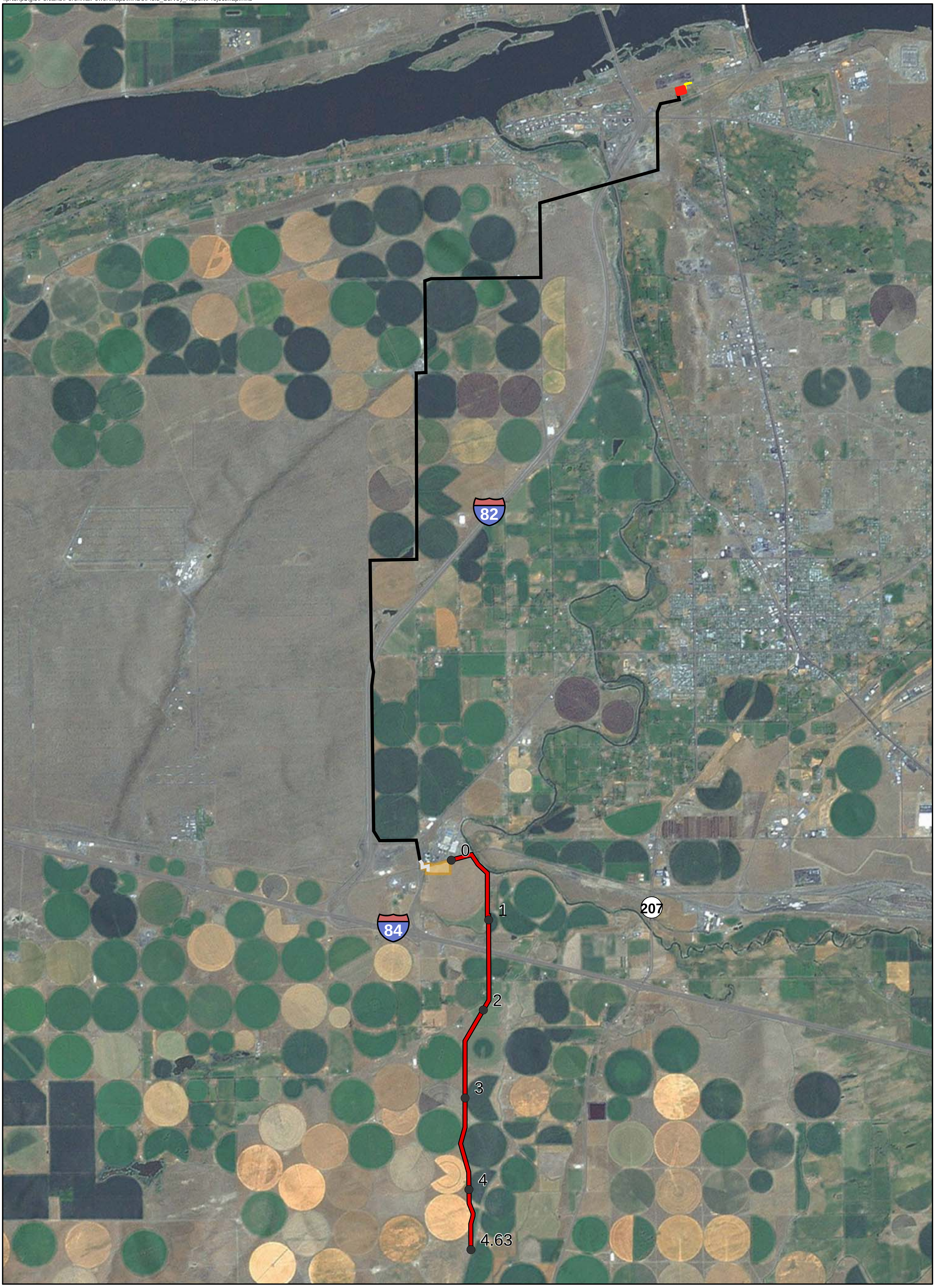
1.0 PURPOSE AND SCOPE

Perennial-WindChaser LLC (Perennial) proposes to construct a natural gas combustion turbine electrical generating plant and an associated transmission line and natural gas pipeline (Perennial Wind Chaser Station project, referred to herein as the Project) in western Umatilla County, near Hermiston, Oregon (Figure 1-1). The approximately 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 Perennial Wind Chaser Station (Station) 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.

After considering and evaluating several transmission line alternatives, Perennial proposes to use the existing 12-mile, 230-kilovolt (kV) transmission line that connects the HGP to the Bonneville Power Administration McNary Substation. This will require replacing the 115-kV conductors on one side of the transmission with 230-kV conductors for almost the entire route. The Project route will separate from the existing line near the McNary Substation and connect to a new 3-acre step-up substation, then interconnect to the McNary Substation by a 477-foot underground transmission cable. Perennial also proposes to construct a new 4.63-mile natural gas pipeline lateral within the existing 50-foot natural gas line right-of-way (ROW) that serves the HGP. The new lateral would interconnect with the Gas Transmission Northwest interstate natural gas system.

Prior to filing an Application for Site Certificate (ASC) with the Oregon Department of Energy (ODOE), Perennial submitted a Notice of Intent (NOI) in May 2012 and has subsequently filed an amended NOI in September 2012 and a Second Amended NOI in August 2013 describing the Project. This Biological Resources Survey Report has been prepared to support the ASC.

This report describes the pre-Project surveys that were conducted on May 9 and August 1, 2013, by Ecology and Environment, Inc. (E & E) to evaluate the existing or potentially occurring biological resources in the proposed Project area. 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, and the entire length of the 50-foot-wide proposed gas pipeline ROW. The proposed re-conductoring of the transmission line is not expected to result in any ground disturbance, and ODOE has indicated that surveys are not necessary for areas where re-conductoring will occur. E & E limited survey efforts along the existing transmission line to simple verification of mapped habitat types gleaned from desktop analyses (see Section 2.1 for survey methods).



Mileposts
Natural Gas Pipeline
Existing Transmission Line
New Overhead Transmission Line
New Underground Transmission
Station
Step-Up Substation

Source: ESRI 2010, E&E Field Data 2013

N

0 1 2
Miles

Figure 1-1

Perennial Wind Chaser Station
and Its Associated Facilities

Perennial Wind Chaser Station

A tie-in length to connect the Project with the existing HGP line (estimated to be approximately 600 feet, possibly with two new poles) has not yet been finalized and will be surveyed at a later date.

The primary focus of these baseline biological surveys was to identify and map habitats and vegetation within the proposed facility site and along the pipeline ROW. Surveyors also documented the presence of special status plant and animal species, breeding raptors, wetlands and waterbodies, and designated noxious weeds. The data collected during these surveys will be used to complete Exhibit J “Jurisdictional Waters,” Exhibit P “Fish and Wildlife Habitat,” and Exhibit Q “Threatened and Endangered Species” of the Project’s ASC, to be submitted to the Energy Facility Siting Council. The Oregon Department of Fish and Wildlife (ODFW) was consulted on April 26, 2013, to discuss and receive approval of survey methods, timeframes, locations, and level of effort.

2.0 SURVEY METHODS

2.1 Vegetation and Habitat Mapping

Vegetation and habitat types in and around the Project area were mapped using a two-step process. First, desktop analyses were conducted utilizing information from existing databases. Second, the results of these desktop analyses were verified and supplemented 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. This effort assisted with the assessment of the condition and suitability of the habitat in the Project disturbance areas for fish and wildlife addressed in Exhibits P and Q of the Project's ASC.

The Oregon National Gap Analysis Program (OR GAP) maintains the most current and accurate spatial land cover dataset available for the Project area (OR GAP 1999). OR GAP data were used as the foundation for vegetation and habitat mapping, along with aerial photography. The OR GAP data map polygonal designations of habitat classes (e.g., "Forest & Woodland" or "Semi-Desert"); however, these data do not provide information regarding plant species composition. Furthermore, the polygons are mapped at coarser scales and often have not been field-verified.

To provide finer scale detail to the habitat and vegetation mapping, two field biologists walked the proposed facility site and pipeline ROW on May 9, 2013. The proposed step-up substation and its associated underground transmission line (100-foot corridor) were surveyed on August 1, 2013. The biologists mapped and labeled habitats in and adjacent to these proposed Project features and compiled lists of the dominant plant species present. They also described habitat quality, noting natural or anthropogenic disturbances and presence of non-indigenous species. All habitat transitions within the survey areas were recorded on aerial photography maps and referenced in field logbooks. The field-based maps of these Project area habitats were then digitized using geographic information systems software. Habitat data collected within the proposed facility site and pipeline ROW were extrapolated out to 0.5 miles (equivalent to the analysis area for Exhibit P "Fish and Wildlife Habitat"). Habitat data collected at the step-up substation were not extrapolated.

E & E biologists drove along the existing transmission line to verify the OR GAP (1999) data. The transmission line ROW was not walked, as this area's transmission line is being reconductored and is not expected to be subject to ground disturbance during construction. Therefore, dominant plant species were not recorded, and habitats were not remapped at a finer scale.

2.2 Special Status Plants

E & E conducted surveys for special status plant species on May 9 and August 1, 2013. A table of species listed by the United States Fish and Wildlife Service (USFWS) and Oregon Department of Agriculture (ODA) that potentially occur in the Project area was created prior to initiating field surveys (Table 2-1). Two field biologists investigated the species listed in Table 2-1 during the blooming period and where suitable habitat occurred. The proposed facility site and 50-foot-wide pipeline ROW were surveyed with complete coverage.

Table 2-1 Special Status Plant Species Listed by the USFWS and ODA that Potentially Occur in the Vicinity of the Project

Common Name	Latin Name	Status	Phenology	Habitat
Robinson's onion	*Allium robinsonii*	SC	April–May	Shrub-steppe, proximity to high water mark in Columbia River (BMNHC 2013; NatureServe 2013)
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 2013)

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 Noxious Weeds

E & E biologists documented all species of noxious weeds identified in the Umatilla County Noxious Weed Control list (Table 2-2). These species are those on the 2003 ODA list known to grow currently or historically in Umatilla County (Umatilla County 2013). Documented observations of noxious weeds included estimates of weed population ground cover percentage and weed population extent (i.e., diameter). Crews noted incidental observations of non-designated invasive weed species (e.g., cheatgrass [*Bromus tectorum*]) in field log books and included these species in the vegetation and habitat mapping results (Section 3.1).

2.4 Wetlands and Waterbodies

E & E biologists surveyed for all wetlands and waterbodies within the proposed facility site and the 50-foot-wide pipeline ROW on May 9, 2013. The crews were equipped with aerial imaging maps that include areas identified as potential wetland and stream habitat.

Table 2-2 Noxious Weeds Identified by the Umatilla County Weed Control Board as Currently or Historically Growing in Umatilla County

Common Name	Latin Name
Camelthorn	*Alhagi pseudalhagi*
Creeping yellow cress	*Rorippa sylvestris*
Leafy spurge	*Euphorbia esula*
Marijuana	*Cannabis sativa*
Meadow knapweed	*Centaurea jacea XC. Nigra*
Purple loosestrife	*Lythrum salicaria*
Purple starthistle	*Centaurea calcitrapa*
Rush skeletonweed	*Chondrilla juncea*
Spotted knapweed	*Centaurea maculosa*
Tansy ragwort	*Senecio jacobaea*
Viper's bulgoss	*Echium vulgare*
Perennial pepperweed	*Lepidium latifolium L.*
Austrian peaweed	*Sphaerophysa salsula*
Canada thistle	*Circium arvense*
Cereal rye	*Secale cereal*
Dalmation toadflax	*Linaria dalmatica*
Dodder	*Cuscuta pentagona*
Diffuse knapweed	*Centaurea diffusa*
Hoary cress	*Cardaria draba*
Johnsongrass	*Sorghum halepense*
Jointed goatgrass	*Aegilops cylindrical*
Kochia	*Kochia scoparia*
Musk thistle	*Carduus nutans*
Puncturevine	*Tribulus terrestris*
Quackgrass	*Agropyron repens*
Ragweed	*Ambrosia artemisiifolia*
Russian knapweed	*Acroptilion repens*
Scotch thistle	*Onopordum acanthium*
St. Johnswort	*Hypercium perforatum*
Yellow starthistle	*Centaurea solstitialis*

These maps incorporated the most current data available in the National Wetland Inventory and the National Hydrography Dataset. If streams were present, stream thalwegs (center or deepest point) were recorded as a line feature and the banks as point features. Additional measurements included stream width, depth, and ordinary high water mark. The ordinary high water mark was determined using the guidelines provided in *A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the United States* (Lichvar and McColley 2008). Biologists also noted flow type, direction of flow, presence of water, name of feature (if named), presence of plant or wildlife species, potential presence of fish, and presence of runs, pools, or riffles. Data collected for waterbody delineations were recorded on global positioning system (GPS) units, in field log books, and on standardized data sheets (Attachment A-1).

2.5 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. Potential presence of these species 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 (2013);
- NatureServe (2013);
- *Oregon Birds* (Marshall et al. 2006);
- Oregon Biodiversity Information Center (ORBIC 2012); and
- Oregon Wildlife Explorer (ORBIC 2011).

2.5.1 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. Active or inactive raptor nests were documented, but protocol-level surveys for these resources were not conducted. The primary goal of conducting surveys for raptor nests, or any other special status wildlife species, at this juncture, would be to determine the presence or likelihood of presence for the environmental review in the ASC. Desktop analyses, along with field-verified habitat mapping and on-site observations, should provide ample information to determine the potential presence of most special status wildlife species in the Project area and its vicinity. Protocol-level, species-specific Washington ground squirrel ([*Urocitellus washingtoni*]) surveys were conducted in locations where E & E identified suitable habitat within the proposed facility site and 50-foot-wide pipeline ROW.

All detections of species listed in Table 2-3 were recorded on GPS units and in field log books. Biologists maintained a daily record of all bird, mammal, reptile, and amphibian species observed.

Table 2-3 Special Status Species Potentially Present in the Vicinity of the Project

Common Name	Latin Name	Status[1]
Fish		
Steelhead (Middle Columbia River)	*Onchorhynchus mykiss*	FT, SS
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 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

Table 2-3 Special Status Species Potentially Present in the Vicinity of the Project

Common Name	Latin Name	Status[1]
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

[1]The “Status” column identifies each species designation by the USFWS and/or ODFW.
Status Acronyms:
FC = U.S. Fish and Wildlife Service listed as Candidate
FT = U.S. Fish and Wildlife Service listed as Threatened
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

The resource-specific methods described below are based on survey protocols established by agency personnel or approved during consultation with agency specialists.

2.5.2 Washington Ground Squirrel

The Washington ground squirrel is currently considered a candidate species for listing under the Endangered Species Act and 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.

Washington ground squirrel surveys for the Project were conducted during the species’ peak activity period (April–May), in compliance with ODFW survey recommendations. The surveys were designed to record all signs within 1,000 feet of all Project areas subject to potential ground disturbance where suitable habitat or historic records of burrows exist. This 1,000-foot buffer was derived by E & E biologists by using a minimum 785-foot disturbance buffer recommended by ODFW for construction activities, adding the construction corridor width of 50 feet and rounding up to 1,000 feet. The surveys conducted on May 9, 2013, were limited by landowner access issues; therefore, E & E focused on all areas within the proposed facility site and 50-foot-wide pipeline ROW that primarily contain native grasslands or shrublands (i.e., not active agricultural lands or other disturbed areas). According to survey protocol, if any Washington ground squirrels, their sign, or suitable habitat were observed during the surveys, they would be documented, and full surveys would be conducted within 1,000 feet when landowner access issues were resolved. Washington ground squirrel surveys were conducted on August 1, 2013, to determine if potential habitat occurred at the proposed step-up substation location. Protocol-level surveys were not completed at this location, as August is not in the appropriate survey window.

Surveys were conducted in the morning and early afternoon hours. E & E biologists surveyed the proposed facility site and 50-foot-wide pipeline corridor 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 surveyors 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.

2.5.3 Raptor Nests

A number of raptor species, which include 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. The objective of raptor nest surveys was to identify species nesting in or in the vicinity of the proposed facility site and 50-foot-wide pipeline ROW.

E & E biologists searched for raptor nests while walking the proposed facility site, 50-foot-wide pipeline ROW, and proposed step-up substation on May 9 and August 1, 2013. They also conducted vehicle-based searches from all public roads and highways within 2 miles of the proposed facility site and 50-foot-wide pipeline corridor on May 10, 2013. Binoculars were used to scan all nesting substrate visible from the aforementioned survey areas. When necessary, nests were approached slowly to avoid flushing the females, although nest status and species were determined from the greatest distance possible. Visits to nest areas were kept as brief as possible.

Detecting nests at a distance can be more difficult for some species than others. For example, Ferruginous Hawks may nest on lower shrubs and ground outcrops, and Northern Harriers (*Circus cyaneus*) often nest on the ground in riparian grasslands (Bechard and Schmutz 1995; Smith et al. 2011). Burrowing Owls nest in underground dens, often abandoned mammal dens (Poulin et al. 2011). Cavity-nesters, like the American Kestrel (*Falco sparverius*), also may be difficult to locate (Smallwood and Bird 2002).

Data were recorded in field log books, on GPS units, and on standardized data sheets (Attachment A-2). Biologists provided descriptions of all raptor nests detected, including nest condition, substrate characteristics, and status of nest. When raptors were present, species and activity observed were also noted when possible. Photographs of the nests were taken, when possible, to help illustrate nest shape, condition, and substrate. Observations of individuals not associated with nests, and possible nesting substrates or foraging habitat, were described in field logbooks.

3.0 RESULTS AND DISCUSSION

3.1 Vegetation and Habitat Mapping

Figure 3-1 depicts the habitats that were mapped during the May 9, 2013, field surveys along the 50-foot-wide pipeline ROW and proposed facility site (extrapolated out to 0.5 mile). Figure 3-2 illustrates the habitats that were mapped during the August 1, 2013, survey of the proposed step-up substation. The following nine habitat categories were mapped and described with dominant plant species:

Weedy grassland #1 – Vegetation was primarily grassy with limited, scattered shrubby plants (Figure 3-3). Cheatgrass made up approximately 70 to 80 percent of this habitat, which also included mustards (*Brassica spp.*), redstem stork's bill (*Erodium cicutarium*), fiddlenecks (*Amsinckia spp.*), prickly Russian thistle (*Salsola tragus*), rubber rabbitbrush (*Ericameria nauseosa*), yellow rabbitbrush (*Chrysothamnus viscidiflorus*), and sagebrush (*Artemisia spp.*).

Weedy grassland #2 – The vegetation in this habitat was a variation on "Weedy grassland #1." Cheatgrass was dominant, as were bunchgrass species, yellow rabbitbrush, and cereal rye (*Secale cereale*). Sagebrush, mustards, and fiddlenecks were also present in small numbers.

Weedy grassland #3 – This habitat had been subject to heavy grazing and was dominated by cheatgrass, foxtail barley (*Hordeum jubatum*), and bare ground (Figure 3-4).

Weedy grassland #4 – The vegetation was dominated by cheatgrass, cereal rye, mustards, and fiddlenecks (Figure 3-5). Scotch thistle also had a limited presence.

Weedy grassland #5 – Sandberg's bluegrass (*Poa secunda*) made up more than 50 percent of this habitat (Figure 3-6). Diffuse knapweed), rubber rabbitbrush, prickly Russian thistle, and wheatgrass (*Agropyron spp.*) also were common. Bare soil is more prevalent here than in Weedy grasslands #1–4, and small mammal burrows are present.

Weedy grassland #6 – Fallow agriculture field dominated by mustards, fiddlenecks, cheatgrass, and prickly Russian thistle. Approximately 5–10 percent of the cover is bare ground, and small mammal burrows are present (Figure 3-7).

Agriculture – This habitat consists entirely of active circular crop fields, which are prevalent in the area.

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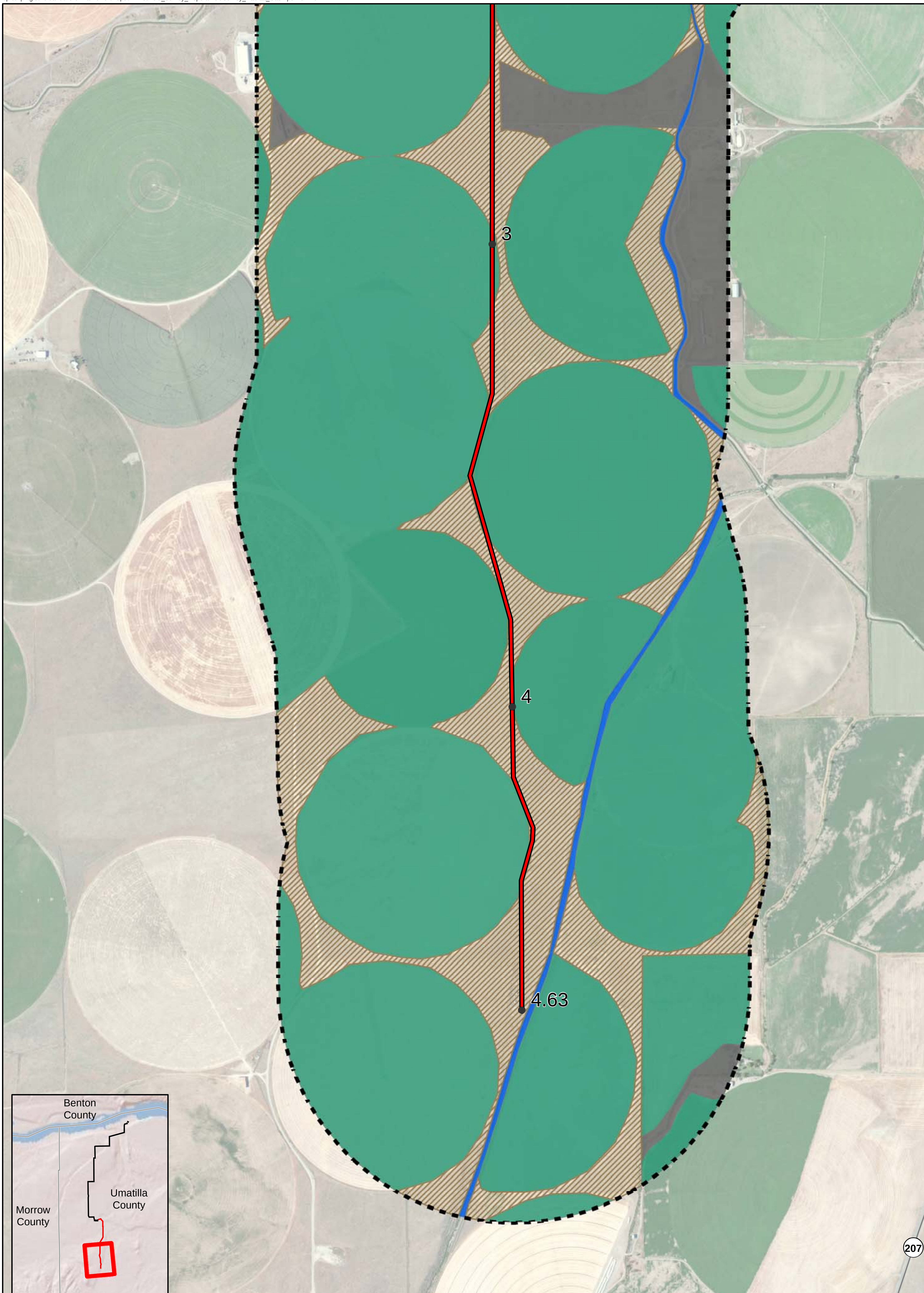


- Mileposts
- Natural Gas Pipeline
- 0.5-mile Buffer
- Station

Field Data - Habitat

- Agriculture
- Developed
- Open Water
- Weedy Grassland #1

N

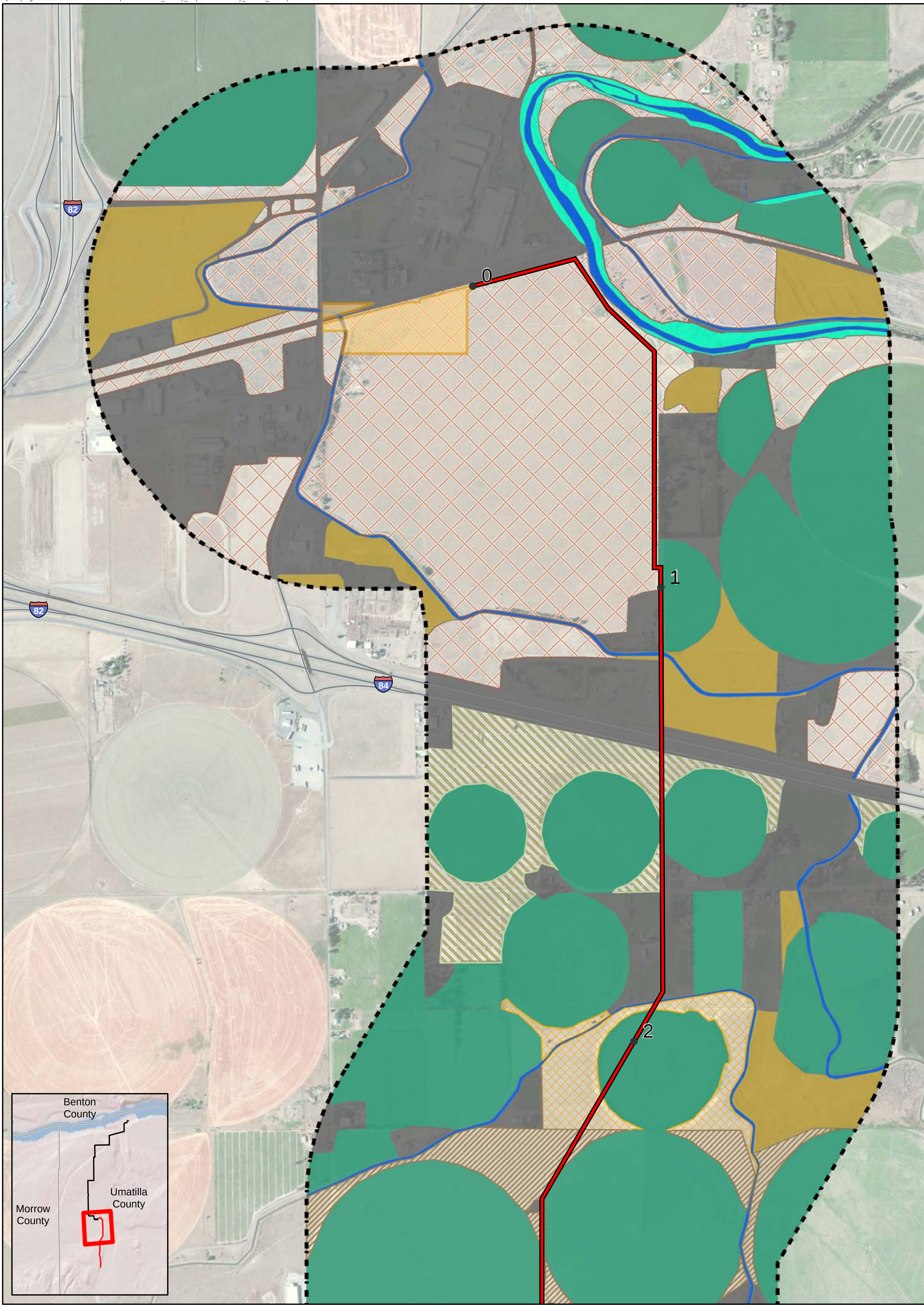
0 1,000 2,000
Feet

Figure 3-1a

Field Mapped Habitats within 0.5 Mile of the Proposed Facility Site and 50-foot-wide Pipeline ROW

Perennial Wind Chaser Station

Source: ESRI 2010, E&E Field Data 2013



- Mileposts
- Natural Gas Pipeline
- 0.5-mile Buffer
- Station

Field Data - Habitat
- Agriculture
- Developed
- Open Water
- Riparian
- Shrub Steppe
- Weedy Grassland #1
- Weedy Grassland #2
- Weedy Grassland #3
- Weedy Grassland #4

N

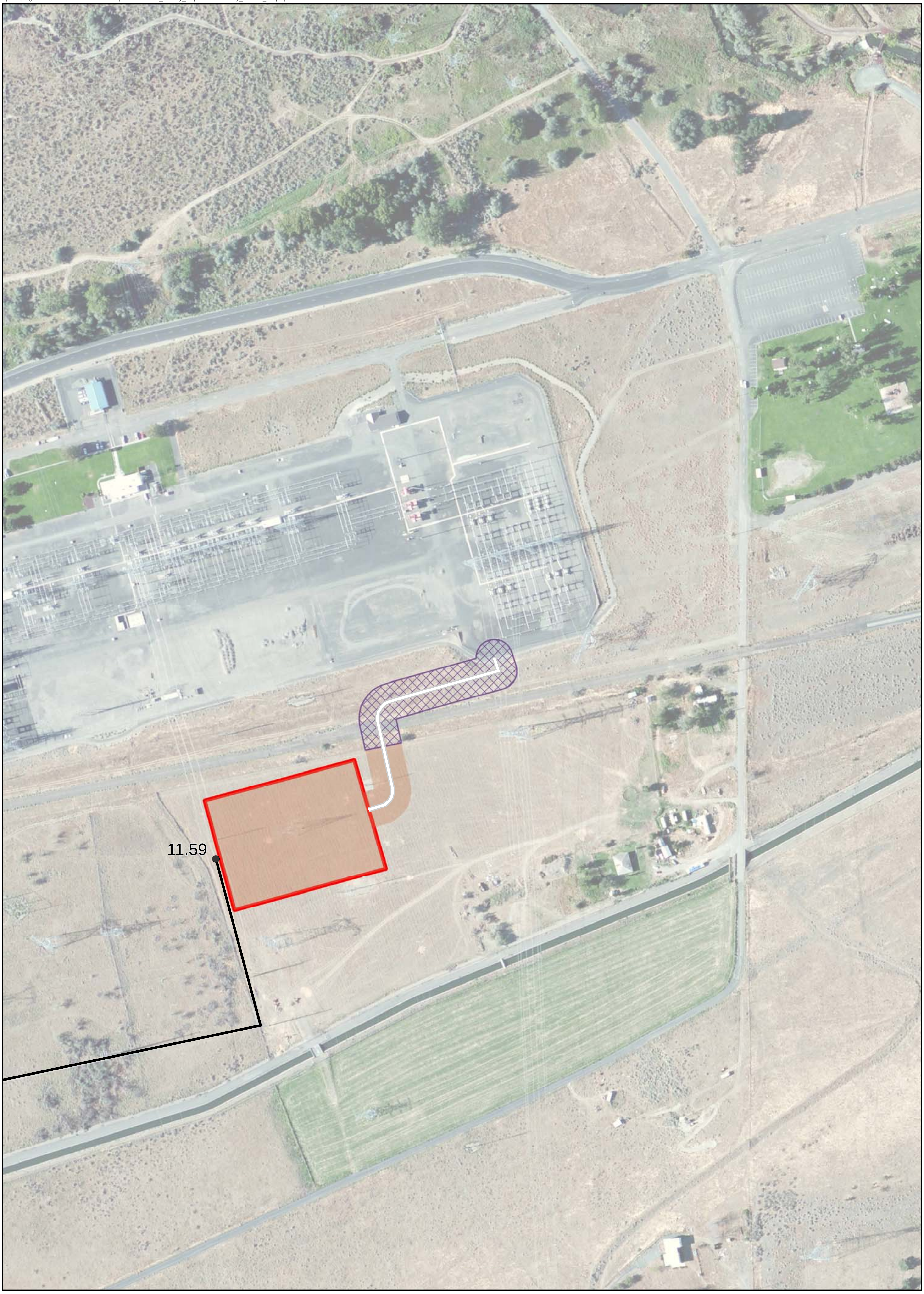
0 1,000 2,000
Feet

Source: ESRI 2010, E&E Field Data 2013

Figure 3-1b

Field Mapped Habitats within 0.5 Mile of the Proposed Facility Site and 50-foot-wide Pipeline ROW

Perennial Wind Chaser Station



Mileposts
Existing Transmission Line
Underground Transmission Line
Step-up Substation

Field Data - Habitat
Weedy Grassland #5
Weedy Grassland #6

N
0 150 300
Feet

Source: ESRI 2010, E&E Field Data 2013

Figure 3-2

Field Mapped Habitats of the Proposed Step-up Substation and Its Associated Underground Transmission Line

Perennial Wind Chaser Station


Figure 3-3 Weedy Grassland #1


Figure 3-4 Weedy Grassland #3

Figure 3-5 Weedy Grassland #4

Figure 3-6 Weedy Grassland #5

Figure 3-7 Weedy Grassland #6

Shrub steppe – The shrub steppe habitat is located north of Interstate Highway 84 and consists primarily of antelope bitterbrush (*Purshia tridentata*), rubber rabbitbrush, yellow rabbitbrush, cheatgrass, mustards, redstem stork's bill, prickly Russian thistle, and fiddlenecks.

Riparian – The woodland and thicket habitat running along the Umatilla River was designated as "riparian" habitat. Dominants were not identified during the field surveys, as the field biologists did not have access to walk along the riparian corridor.

Open water – All waterbodies were labeled with this category.

Developed – This category was used to denote any area that had been completely 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 cattle yards.

All areas within 0.5 miles of the proposed transmission line were mapped with the OR GAP (1999) data (Figure 3-8). The coarse detail of the mapping of these data was largely found to be accurate when verified during the May 9, 2013, field visit. One notable inaccuracy was observed during the field verification.

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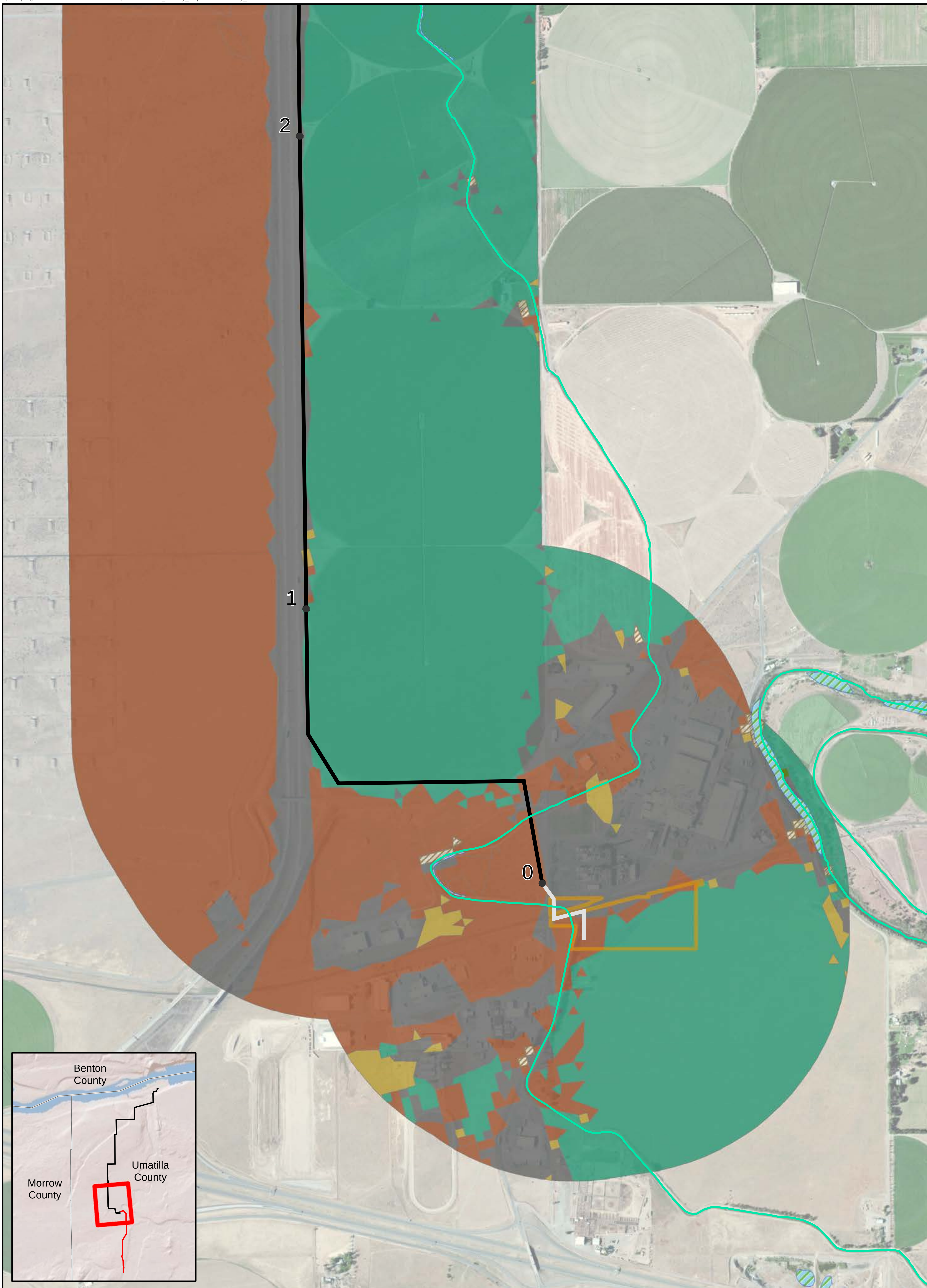


Milepeposts
Transmission Line
New Overhead Transmission Line
Station
Step-up Substation

NHD
NWI

Oregon GAP Data
Agricultural Vegetation
Developed & Other Human Use
Forest & Woodland
Introduced & Semi-natural vegetation
Semi-Desert
Shrubland & Grassland

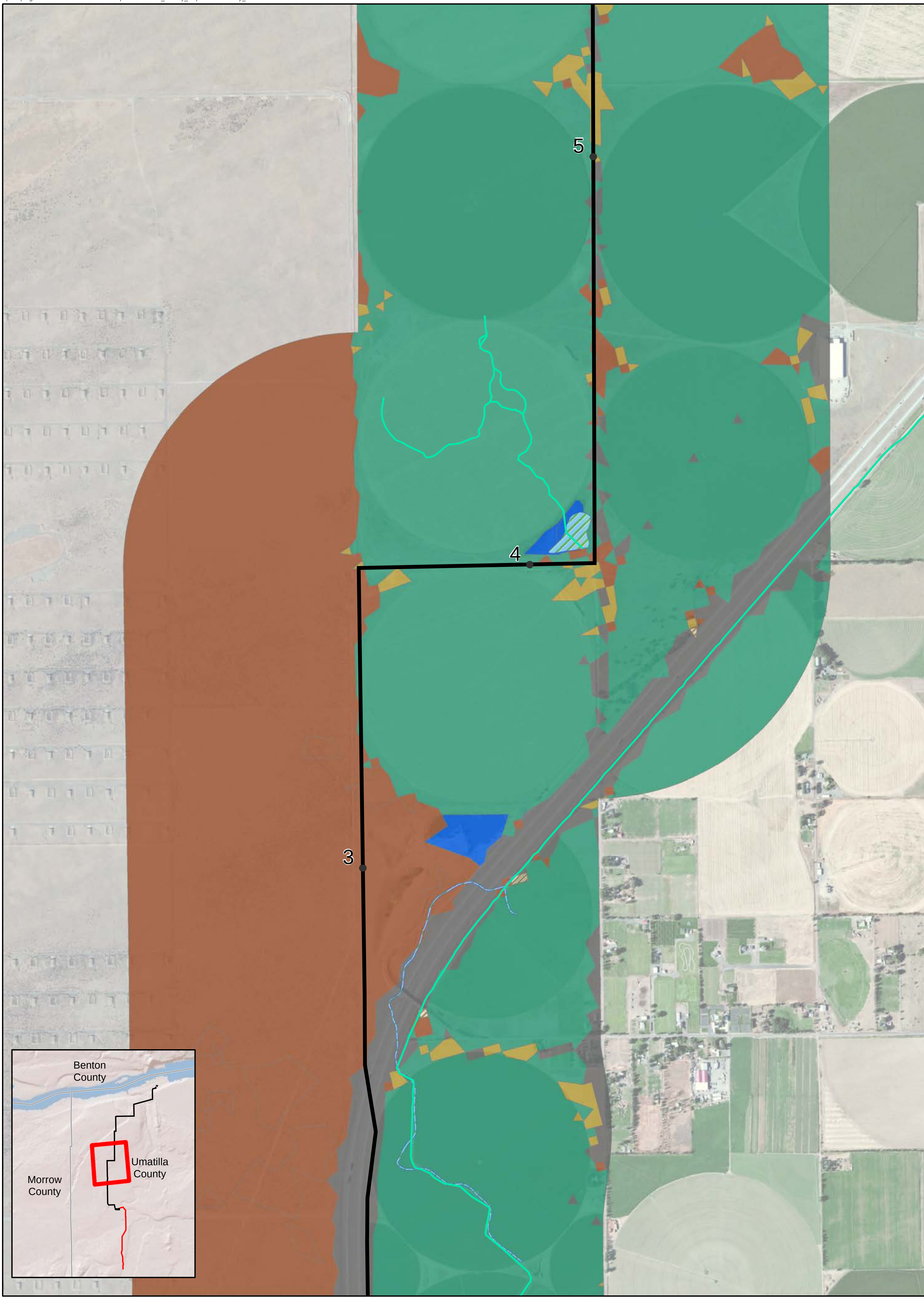
N
0 1,000 2,000
Feet

*Open Water has been edited based on field verification of data
Source: ESRI 2010, Oregon GAP 1999

Figure 3-8a

Habitats within 0.5 Mile of the Transmission Line as Mapped by OR GAP (1999)

Perennial Wind Chaser Station



- Milpeposts
- Transmission Line
- New Overhead Transmission Line
- Station
- Step-up Substation
- NHD
- NWI

Oregon GAP Data

- Agricultural Vegetation
- Developed & Other Human Use
- Introduced & Semi-natural vegetation
- *Open Water
- Semi-Desert
- Shrubland & Grassland

*Open Water has been edited based on field verification of data

Source: ESRI 2010, Oregon GAP 1999

N

0 1,000 2,000

Feet

Figure 3-8b

Habitats within 0.5 Mile of the Transmission Line as Mapped by OR GAP (1999)

Perennial Wind Chaser Station

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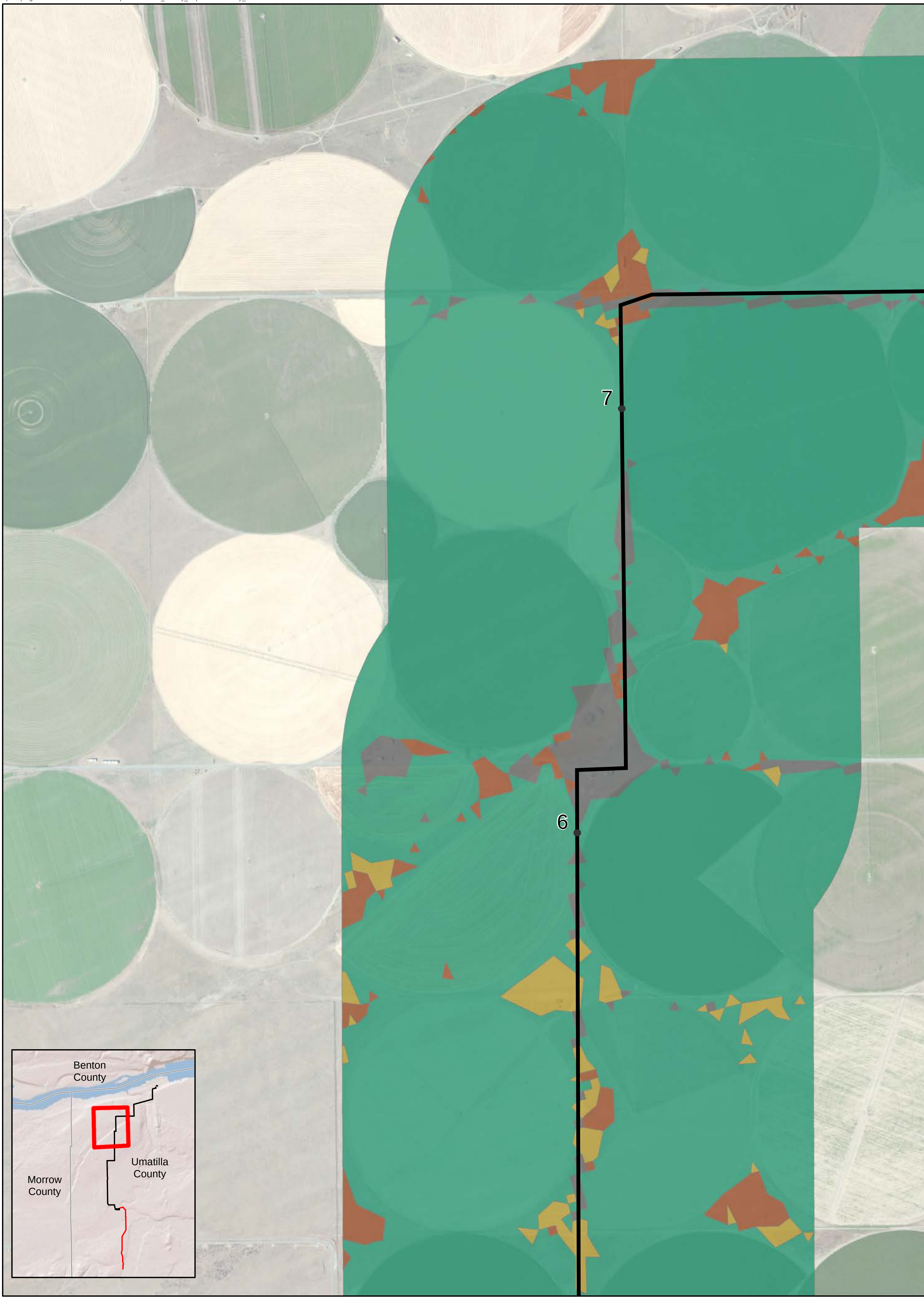

- Milepoststs
- Transmission Line
- New Overhead Transmission Line
- Station
- Step-up Substation
- NHD
- NWI

Oregon GAP Data
- Agricultural Vegetation
- Developed & Other Human Use
- Introduced & Semi-natural vegetation
- Semi-Desert

N

0 1,000 2,000

Feet

*Open Water has been edited based on field verification of data

Source: ESRI 2010, Oregon GAP 1999

Figure 3-8c

Habitats within 0.5 Mile of the Transmission Line as Mapped by OR GAP (1999)

Perennial Wind Chaser Station

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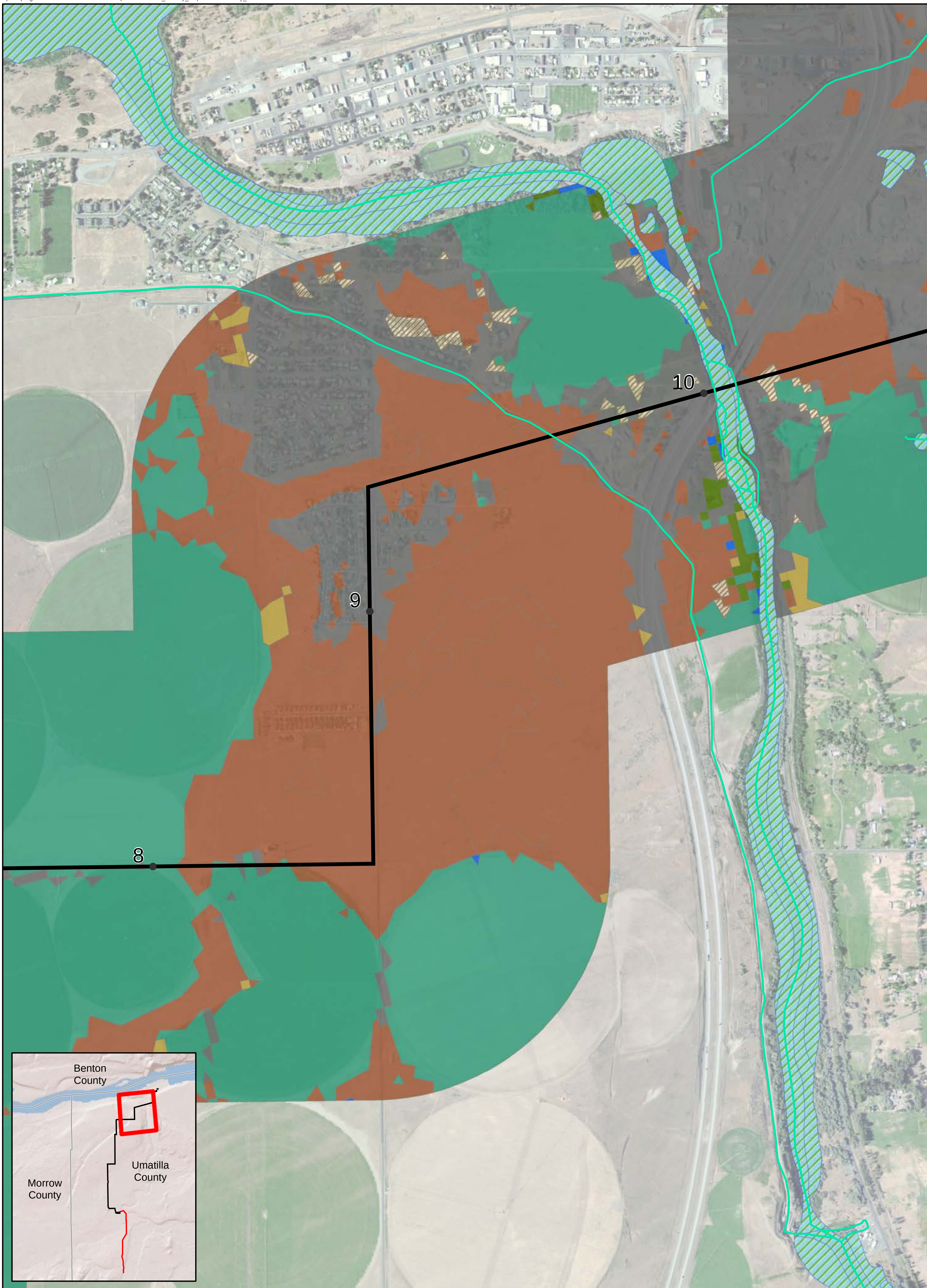

- Milpeposts
- Transmission Line
- New Overhead Transmission Line
- Station
- Step-up Substation
- NHD
- NWI

Oregon GAP Data

- Agricultural Vegetation
- Developed & Other Human Use
- Forest & Woodland
- Introduced & Semi-natural vegetation
- *Open Water
- Semi-Desert
- Shrubland & Grassland

*Open Water has been edited based on field verification of data

Source: ESRI 2010, Oregon GAP 1999

N

0 1,000 2,000
Feet

Figure 3-8d

Habitats within 0.5 Mile of the Transmission Line as Mapped by OR GAP (1999)

Perennial Wind Chaser Station

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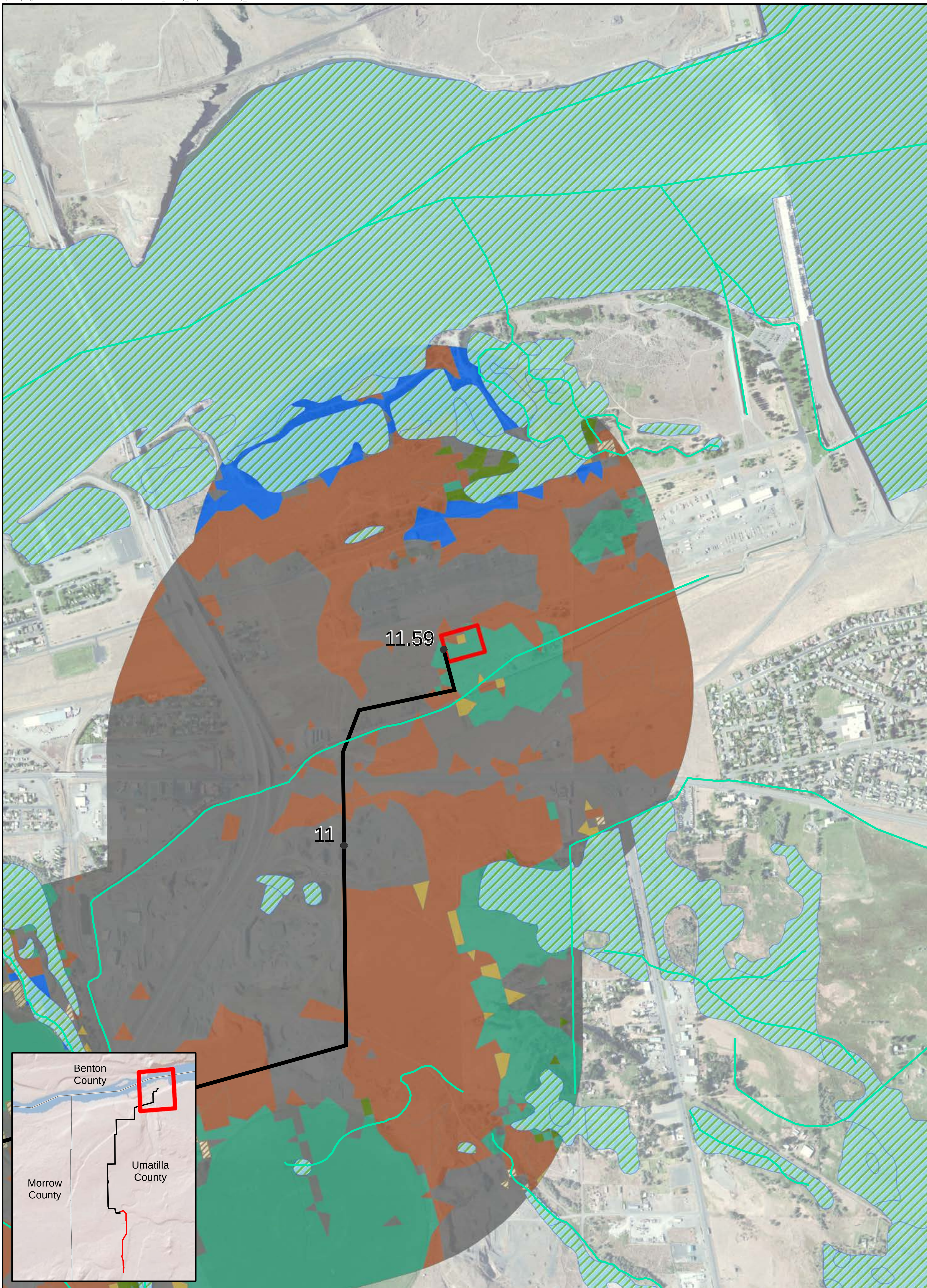

Milepeosts
Transmission Line
New Overhead Transmission Line
Station
Step-up Substation
NHD
NWI
Oregon GAP Data
Agricultural Vegetation
Developed & Other Human Use
Forest & Woodland
Introduced & Semi-natural vegetation
*Open Water
Semi-Desert
Shrubland & Grassland

N
0 1,000 2,000
Feet

*Open Water has been edited based on field verification of data
Source: ESRI 2010, Oregon GAP 1999

Figure 3-8e

Habitats within 0.5 Mile of the Transmission Line as Mapped by OR GAP (1999)

Perennial Wind Chaser Station

"Open Water" was mapped in a number of locations where open water did not exist. In actuality, open water existed only along the Umatilla and Columbia Rivers, as well as small lakes and ponds near the McNary Substation and two small ponds in the southern half of the transmission line. Figure 3-8 includes "Open Water" habitat that has been edited based on field verifications. This figure also includes National Wetland Inventory and National Hydrographic Dataset data.

3.2 Special Status Plants

No special status plants were observed in the proposed facility site, the 50-foot-wide pipeline ROW, or the proposed step-up substation. Suitable habitat was not observed for Robinson's onion or Laurence's milkvetch, as the Project is not located near the Columbia River high water mark or on dry slopes. Suitable habitat for Columbia cress does occur where open water exists, as this species is known to grow near a variety of waterbody types (NatureServe 2013).

3.3 Noxious Weeds

Six species of noxious weeds included on the Umatilla County Noxious Weed Control list (Umatilla County 2013) were identified during field surveys of the proposed step-up substation, facility site, and the 50-foot-wide pipeline ROW (Table 3-1; Figure 3-9). Quackgrass was documented between mileposts 2 and 3.5 of the pipeline ROW, while cereal rye was recorded at the proposed facility site and approximately between milepost 0 and milepost 2.1 of the 50-foot-wide pipeline ROW. Scotch thistle was documented at several locations between the proposed facility site and the pipeline's southern terminus.

Many of the Scotch thistle specimens were dead; however, living individuals were more common in the vicinity of the proposed facility site and sporadic elsewhere. Kochia (Kochia spocaria), diffuse knapweed, and puncturevine (Tribulus terrestris) were documented along the pipeline ROW north of Interstate Highway 84 during the August survey. Diffuse knapweed was also recorded near the proposed step-up substation.

Table 3-1 Noxious Weeds Observed in the Proposed Facility Site and 50-foot-wide ROW

ID	Species	Location (milepost)	Cover	Diameter
NW-001-001	Scotch thistle	4.68	<1%	300+ feet
NW-001-002	Quackgrass	3.34	<1%	300+ feet
NW-001-003	Quackgrass	3.05	<1%	300+ feet
NW-001-004	Quackgrass	2.93	<1%	300+ feet

Table 3-1 Noxious Weeds Observed in the Proposed Facility Site and 50-foot-wide ROW

ID	Species	Location (milepost)	Cover	Diameter
NW-001-005	Quackgrass	2.51	<1%	100 feet
NW-001-006	Cereal Rye	2.32	26–50%	300+ feet
NW-001-007	Scotch thistle	2.06	<1%	50 feet
NW-001-008	Cereal rye	2.06	<1%	50 feet
NW-001-009	Cereal rye	1.55	1–5%	300+ feet
NW-001-010	Cereal rye	1.35	<1%	300+ feet
NW-001-011	Scotch thistle	1.35	<1%	single plant
NW-003-001	Diffuse knapweed	1.29	<1%	10 feet
NW-003-002	Kochia	1.29	<1%	single plant
NW-001-012	Cereal rye	1.28	<1%	300+ feet
NW-001-013	Cereal rye	0.59	<1%	300+ feet
NW-003-003	Diffuse knapweed	0.50	<1%	100 feet
NW-003-004	Scotch thistle	0.50	<1%	100 feet
NW-003-005	Kochia	0.50	26–50%	50 feet
NW-003-012	Puncturevine	0.50	1–5%	300+ feet
NW-003-006	Scotch thistle	0.32	<1%	150 feet
NW-003-007	Scotch thistle	0.24	<1%	150 feet
NW-003-008	Diffuse knapweed	0.23	6–25%	300+ feet
NW-003-009	Diffuse knapweed	0.23	<1%	100 feet
NW-001-014	Scotch thistle	Facility Site	<1%	300+ feet
NW-001-015	Scotch thistle	Facility Site	<1%	150 feet
NW-001-016	Scotch thistle	Facility Site	<1%	150 feet
NW-001-017	Cereal rye	Facility Site	<1%	150 feet
NW-003-010	Kochia	Facility Site	<1%	10 feet
NW-003-011	Diffuse knapweed	Facility Site	6–25%	300+ feet
NW-003-014	Diffuse knapweed	Interconnect	1–5%	50 feet

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Existing Transmission Line
Underground Transmission Line
Step-up Substation

Noxious Weeds*
- Cereal Rye
- Quackgrass
- Scotch Thistle
- Diffuse Knapweed
- Kochia
- Puncturevine

- Cereal Rye Extent
- Quackgrass Extent
- Scotch Thistle Extent
- Kochia
- Diffuse Knapweed
- Puncturevine

*The approximate extent of each observed population and its associated GPS points is mapped within Project ROWs

N

0 500 1,000
Feet

Source: ESRI 2010, E&E Field Data 2013

Figure 3-9a

Noxious Weeds Observed in the Proposed Facility Site, Step-up Substation, and 50-foot-wide ROW

Perennial Wind Chaser Station

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Existing Transmission Line
New Overhead Transmission Line
Natural Gas Pipeline
Natural Gas Pipeline 50-foot Buffer
Station

Noxious Weeds*
Cereal Rye
Quackgrass
Scotch Thistle
Diffuse Knapweed
Kochia
Puncturevine

Cereal Rye Extent
Quackgrass Extent
Scotch Thistle Extent
Kochia
Diffuse Knapweed
Puncturevine

*The approximate extent of each observed population and its associated GPS points is mapped within Project ROWs
Source: ESRI 2010, E&E Field Data 2013

N
0 500 1,000
Feet

Figure 3-9b

Noxious Weeds Observed in the Proposed Facility Site and 50-foot-wide ROW

Perennial Wind Chaser Station

\\prtbhp1\gis\Portland\PerennialPower\Maps\MXDs\Field_Survey_Report\FieldSurvey_NoxiousWeeds_buffers.mxd

Natural Gas Pipeline

Natural Gas Pipeline 50-foot Buffer

Noxious Weeds*

- Cereal Rye
- Quackgrass
- Scotch Thistle
- Diffuse Knapweed
- Kochia
- Puncturevine

- Cereal Rye Extent
- Quackgrass Extent
- Scotch Thistle Extent
- Kochia
- Diffuse Knapweed
- Puncturevine

*The approximate extent of each observed population and its associated GPS points is mapped within Project ROWs

Source: ESRI 2010, E&E Field Data 2013

N

0 500 1,000

Feet

Figure 3-9c

Noxious Weeds Observed in the Proposed Facility Site and 50-foot-wide ROW

Perennial Wind Chaser Station

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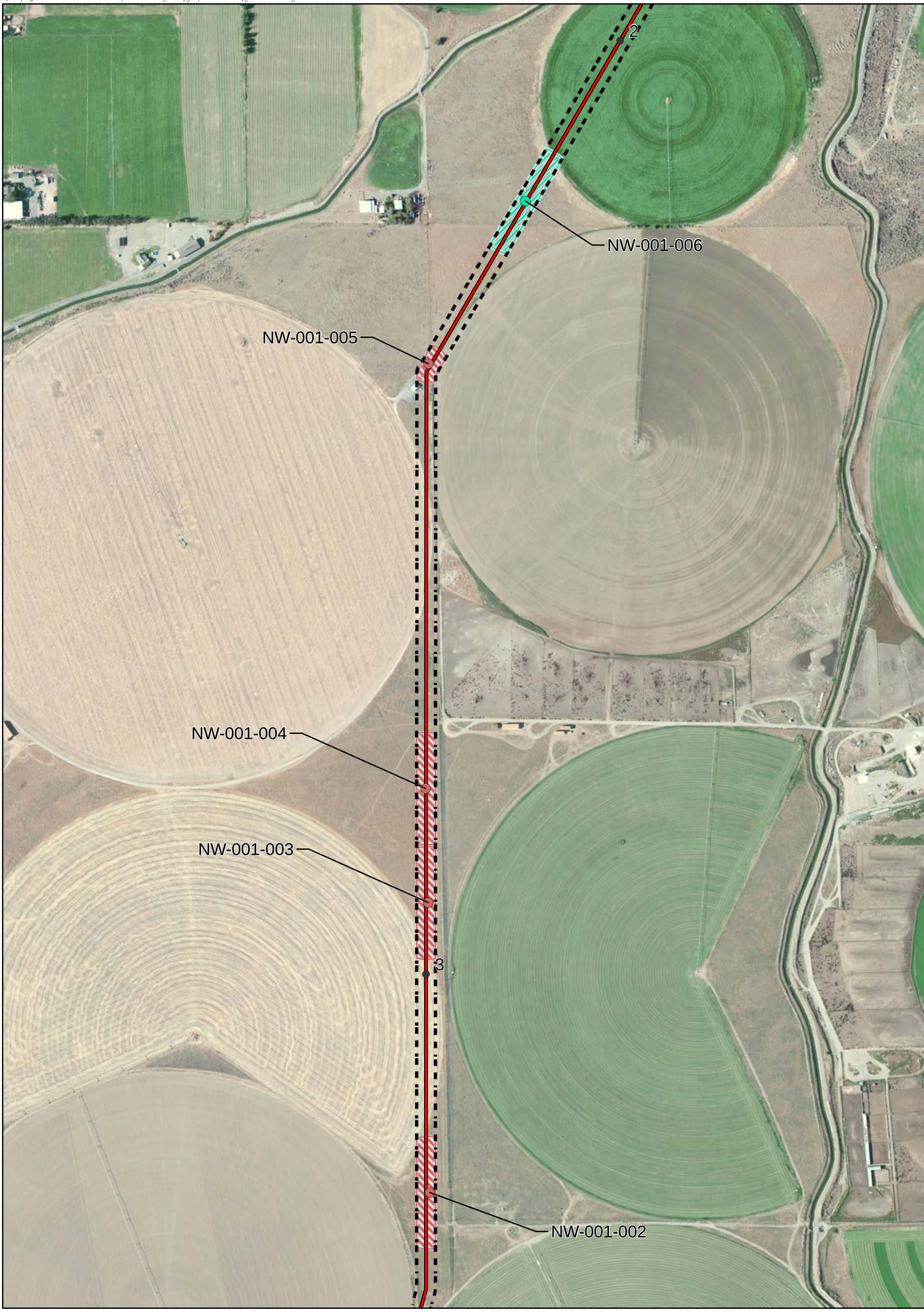

Natural Gas Pipeline
Natural Gas Pipeline 50-foot Buffer

Noxious Weeds*
- Cereal Rye
- Quackgrass
- Scotch Thistle
- Diffuse Knapweed
- Kochia
- Puncturevine

- Cereal Rye Extent
- Quackgrass Extent
- Scotch Thistle Extent
- Kochia
- Diffuse Knapweed
- Puncturevine

*The approximate extent of each observed population and its associated GPS points is mapped within Project ROWs

Source: ESRI 2010, E&E Field Data 2013

N

0 500 1,000
Feet

Figure 3-9d

Noxious Weeds Observed in the Proposed Facility Site and 50-foot-wide ROW

Perennial Wind Chaser Station

\\prtbhp1\gis\Portland\PerennialPower\Maps\MXDs\Field_Survey_Report\FieldSurvey_NoxiousWeeds_buffers.mxd

Natural Gas Pipeline

Natural Gas Pipeline 50-foot Buffer

Noxious Weeds*

- Cereal Rye
- Quackgrass
- Scotch Thistle
- Diffuse Knapweed
- Kochia
- Puncturevine

- Cereal Rye Extent
- Quackgrass Extent
- Scotch Thistle Extent
- Kochia
- Diffuse Knapweed
- Puncturevine

*The approximate extent of each observed population and its associated GPS points is mapped within Project ROWs

Source: ESRI 2010, E&E Field Data 2013

N

0 500 1,000

Feet

Figure 3-9e

Noxious Weeds Observed in the Proposed Facility Site and 50-foot-wide ROW

Perennial Wind Chaser Station

3.4 Wetlands and Waterbodies

Three canals and zero wetlands were identified within the proposed step-up substation, facility site, and 50-foot-wide pipeline ROW during the May 9 and August 1, 2013, field surveys (Table 3-2). Figure 3-10 depicts the locations of the three canals observed. The completed data sheets for these three canals are included in Attachment A-1. Information regarding wetlands and waterbodies within 0.5 miles of the proposed transmission line is presented with the OR GAP data (1999) in Figure 3-8.

Table 3-2 Waterbodies Observed in the Proposed Facility Site and 50-foot-wide ROW

ID	Type	Name	Location (milepost)
SS-001-001	Canal/ditch	High Line Canal	1.9
SS-001-002	Canal/ditch	Westland A Canal	1.15
SS-001-003	Canal/ditch	Westland A Canal	0.00

3.5 Fish and Wildlife Resources

3.5.1 Washington Ground Squirrel

No Washington ground squirrels or their sign were observed during surveys of the proposed facility site and the 50-foot-wide pipeline ROW. Available habitat within these areas also did not appear to be suitable. Grassland and shrub steppe habitats were largely dominated by dense, invasive plants, including cheatgrass and prickly Russian thistle. Furthermore, the entire survey area was in close proximity to human disturbances from residences, agricultural practices, industry, and traffic. No evidence of wildlife burrowing activity of any type was observed. Based on the conditions observed within the proposed facility site and 50-foot-wide pipeline ROW, and the experience and knowledge of the field biologists that conducted the survey, Washington ground squirrels are not expected to occur in close proximity to the surveyed area.

Potential Washington ground squirrel habitat was observed at the proposed step-up substation site and its associated underground transmission line (100-foot corridor). The habitats present at these locations were weedy grasslands similar to those located at the proposed facility site and the 50-foot-wide pipeline ROW; however, the vegetation was less dense, and small mammal burrows were present throughout. The step-up substation site and associated transmission line were surveyed during August, a period when Washington ground squirrels are inactive. The heavy human presence and notable ground disturbance and weed presence in this area suggest a low likelihood that Washington ground squirrels are using the area.

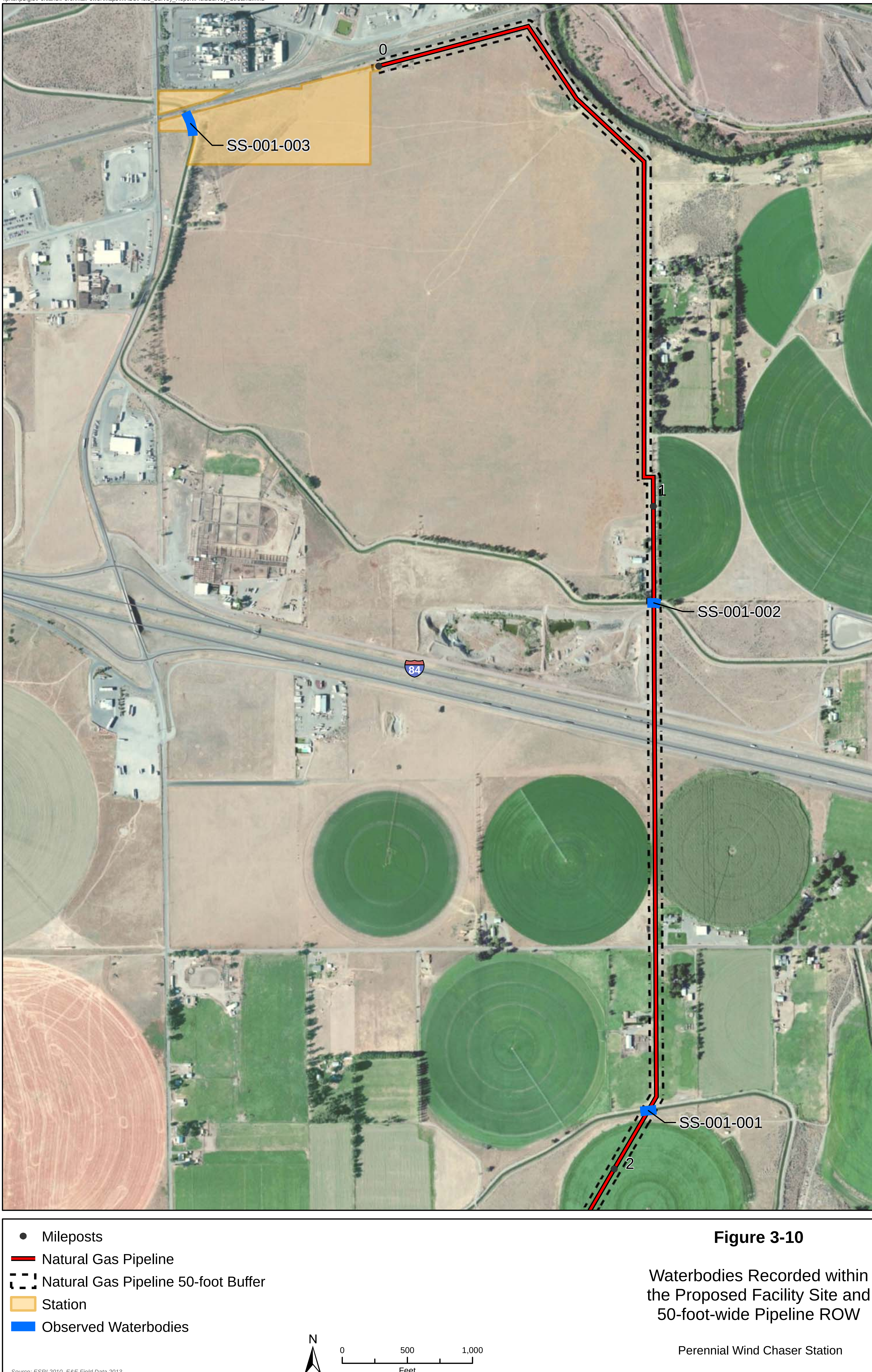

Figure 3-10

Waterbodies Recorded within the Proposed Facility Site and 50-foot-wide Pipeline ROW

Perennial Wind Chaser Station

3.5.2 Raptor Nests

One inactive raptor nest and two active Red-tailed Hawk (*Buteo jamaicensis*) nests were observed while surveying the proposed step-up substation, facility site, and the 50-foot-wide pipeline ROW, and driving nearby roads (Table 3-3; Figure 3-11). The two Red-tailed Hawk nests were situated in black locust trees (*Robinia pseudoacacia*). Nest RN-001-002 was located along the western edge of the proposed facility site parallel to County Road 1325 (Figure 3-12). RN-002-001 is located more than a mile east of the southern terminus of the pipeline ROW, adjacent to Hermiston Highway (Figure 3-13). The inactive nest was in a line of trees at a homestead along the pipeline ROW. Completed raptor nest data sheets are presented in Attachment A-2.

Table 3-3 Raptor Nests Observed in the Proposed Facility Site and 50-foot-wide ROW

ID	Species	Location (milepost)	Status	Notes
RN-001-001	Unidentified	2.33	Inactive	N/A
RN-001-002	Red-tailed Hawk	Facility site	Active	At least one chick, both adults near nest
RN-002-001	Red-tailed Hawk	N/A*	Active	Adult on nest, another nearby

*Nest is located along Hermiston Highway, more than a mile east of the proposed pipeline ROW.
Key:
N/A not applicable

The search for raptor nests was limited by access, as surveyors were restricted to Project ROWs and public roads. Other raptors, including special status species, may be nesting in the vicinity of the proposed Project. Swainson's Hawks nest in trees in open habitats, including irrigated agricultural lands (Marshall et al. 2006). The Project area provides ample nesting opportunities for this species. Ferruginous Hawks also prefer open areas, but are less common in cultivated areas than are Swainson's Hawks (Bechard and Schmutz 1995; Marshall et al. 2006). Burrowing Owls are common breeders in the nearby Umatilla Army Depot (65 pairs in 2012) and may also be nesting in other areas in the Project vicinity (Cary 2012).

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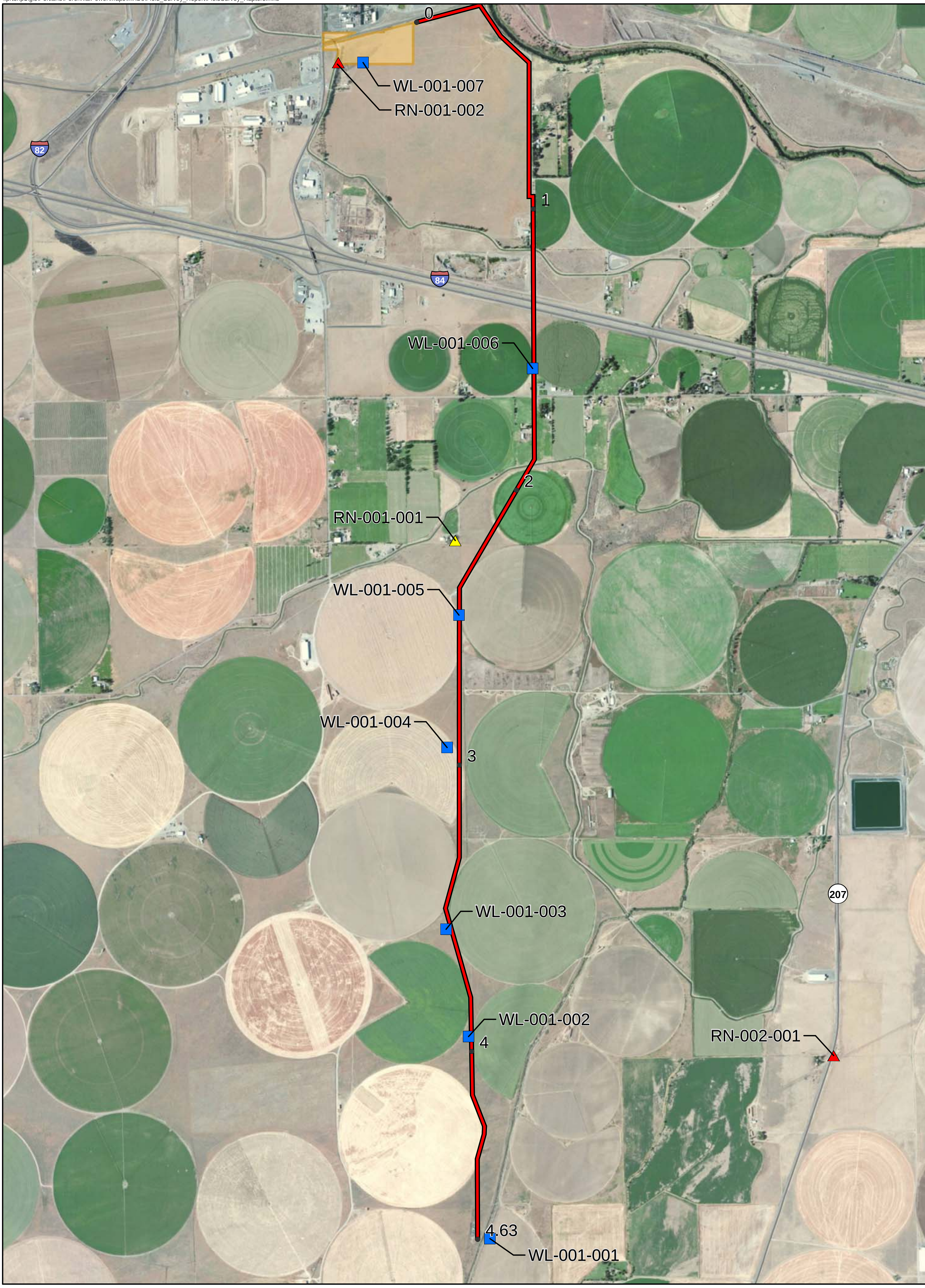

Natural Gas Pipeline
Station
Field Data
Red-tailed Hawk
Unidentified Raptor
Long-billed Curlew

N
0 0.5 1
Miles

Source: ESRI 2010, E&E Field Data 2013

Figure 3-11

Raptor Nests and Long-billed Curlew Observations in the Vicinity of the Proposed Facility Site and 50-foot-wide Pipeline ROW

Perennial Wind Chaser Station

Figure 3-12 View of RN-001-002 from the Northeast

Figure 3-13 View of RN-002-001 from Below (facing northeast)

3.5.3 Other Wildlife Observations

Long-billed Curlew was the only special status species listed in Table 2-3 to be observed during the May 9 and August 1, 2013, field surveys of the proposed step-up substation, site facility, and 50-foot-wide pipeline ROW (Table 3-4; Figure 3-8). Seventy Long-billed Curlews were recorded, with 60 being observed in a single flock (WL-001-004) that flew into an agricultural field to forage. It is not uncommon for curlews to forage in large groups for invertebrates, even during the breeding season (Dugger and Dugger 2002). In Oregon, Long-billed Curlews favor nesting in cheatgrass-dominated grasslands. The high densities of cheatgrass in the area and the number of curlews recorded indicate that the species is likely nesting in those grasslands. They are also known to nest in agricultural fields in the Great Basin.

Table 3-4 Long-billed Curlews Observed in the Proposed Facility Site and 50-foot-wide ROW

ID	Location (milepost)	Number of individuals	Behavior
WL-001-001	4.74	1	Singing
WL-001-002	4.08	1	Flyover
WL-001-003	3.70	2	Singing
WL-001-004	3.06	60	Foraging
WL-001-005	2.60	2	Flyover
WL-001-006	1.69	3	Foraging
WL-001-007	Facility Site	1	Foraging

While Long-billed Curlews were the only special status species observed during surveys, suitable habitat was present in close proximity to surveyed Project areas for other species listed in Table 2-3. As previously mentioned, nesting and foraging habitat is available for the special status raptor species, although Ferruginous Hawks are less likely to occur in cultivated areas (Bechard and Schmutz 1995; Marshall et al. 2006). Moreover, Loggerhead Shrikes prefer open habitats with scattered trees or shrubs for nesting and elevated substrates for perching, and they have been recorded in the Hermiston area (Yosef 1996; Marshall et al. 2006; eBird 2013). Likewise, western toads live in a variety of habitats, including arid shrubby areas, suburbs, and irrigated agricultural areas (ORBIC 2011; NatureServe 2013). Several bat species may also occur in the area, given available manmade roosting opportunities (e.g., buildings, bridges) and foraging opportunities in the open areas and riparian woodlands along the Umatilla River (Csuti et al. 1997; NatureServe 2013). Finally, all of the fish species listed in Table 2-3 have the potential to occur in the Columbia and Umatilla Rivers and their tributaries, which may include the canals that traverse the Project.

Table 3-5 lists all of the wildlife species observed incidentally during the May 9 and August 1, 2013, field surveys of the proposed step-up substation, facility site, and 50-foot-wide pipeline ROW. In total, 29 species of birds and one mammal were observed. No amphibians or reptiles were recorded.

Table 3-5 All Wildlife Species Observed in the Proposed Facility Site and 50-foot-wide ROW on May 9, 2013

Common Name	Latin Name
Birds	
Mallard	*Anas platyrhynchos*
Northern Shoveler	*Anas clypeata*
California Quail	*Callipepla californica*
Ring-necked Pheasant	*Phasianus colchicus*
American White Pelican	*Pelecanus erythrorhynchos*
Great Blue Heron	*Ardea herodias*
Northern Harrier	*Circus cyaneus*
Osprey	*Pandion haliaetus*
Red-tailed Hawk	*Buteo jamaicensis*
Killdeer	*Charadrius vociferus*
Long-billed Curlew	*Numenius americanus*
Rock Pigeon	*Columba livia*
Eurasian Collared-Dove	*Streptopelia decaocto*
Mourning Dove	*Zenaida macroura*
Western Kingbird	*Tyrannus verticalis*
Black-billed Magpie	*Pica hudsonia*
American Crow	*Corvus brachyrhynchos*
Common Raven	*Corvus corax*
Horned Lark	*Eremophila alpestris*
Violet-green Swallow	*Tachycineta thalassina*
Barn Swallow	*Hirundo rustica*
Cliff Swallow	*Petrochelidon pyrrhonota*
American Robin	*Turdus migratorius*
European Starling	*Sturnus vulgaris*
Chipping Sparrow	*Spizella passerina*

Table 3-5 All Wildlife Species Observed in the Proposed Facility Site and 50-foot-wide ROW on May 9, 2013

Common Name	Latin Name
Savannah Sparrow	*Passerculus sandwichensis*
Red-winged Blackbird	*Agelaius phoeniceus*
Western Meadowlark	*Sturnella neglecta*
Brewer's Blackbird	*Euphagus cyanocephalus*
Brown-headed Cowbird	*Molothrus ater*
House Sparrow	*Passer domesticus*
Mammals	
Mountain cottontail	*Sylvilagus nuttallii*

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APPENDIX A

DATASHEETS

A-1 Stream Field Data Sheets

STREAM ID: SS -001-03

STREAM DATA

☐ ROW ☒ Project Facility STATE OR
☐ Access Road ☐ Staging/Storage Area PROJECT Perennial

County: Umatilla

Date: 5/9/13

Stream Name: ☐ UNNAMED ☐ NAMED:

Stream Type: ☐ STREAM ☒ DITCH/CANAL

Observers: D. Wardwell, M. Alexander

CHARACTERISTICS

Water Present: ☒ yes ☐ no

Flow Type: ☒ Perennial ☐ Intermittent ☐ Ephemeral

Stream Flow Direction: North

Width (ft) (water's edge to water's edge): 25

Width (ft) (bank to bank): 30
(above OHWM; use OHWM Criteria below)

CHARACTERISTICS

Substrate Type	Probed Stream Depth	Water Clarity
☐ Bedrock	☐ N/A	☐ Clear
☐ Gravel	☐ 0 – 6"	☒ Discolored
☒ Sand	☐ 7 – 12"	☐ Oily Film
☐ Silt	☐ 13 – 24"	☐ Other
☐ Cobbles	☐ 25 – 36"	
☐ Clay	☒ 37"+	
☐ Concrete		
☐ Other		

STREAM BANK HEIGHT AND SLOPE

Left Bank*	Right Bank*
Height (ft): 3	Height (ft): 4
Slope: ☐ 0-30º (4:1)	Slope: ☐ 0-30º (4:1)
☐ 31-45º (3:1)	☐ 31-45º (3:1)
☐ 46-60º (2:1)	☐ 46-60º (2:1)
☒ 61-90º (1:1)	☒ 61-90º (1:1)

Height (ft) (OHWM from stream bed): 7+
*Direction when facing downstream

Evidence of Erosion: ☐ yes ☒ no

☐ Sloughing ☐ Undercutting ☐ Impact from Cattle

☐ Other:

Top of Bank Characteristics
Width (ft) Highest Bank to Highest Bank: 30'

Highest Left Bank Height*: 3'
Highest Left Bank Slope*: 75°
Highest Right Bank Height*: 4'
Highest Right Bank Slope*: 75°
*Direction when facing downstream

ASSOCIATED HABITAT

Riparian Vegetation
☐ yes
☒ no
If yes, list:

Width of riparian corridor (ft): 35' total

Stream Fringe (5' or less including both banks)

☐ yes, width (ft):
☒ no
If yes, list :

Aquatic Vegetation
☒ yes
~~☒ no~~ DW
If yes, list:
Rush spp.

ASSOCIATED SPECIES

Aquatic Organisms
☐ yes
☒ no
If yes, list:

Riparian/Terrestrial Organisms
☐ yes
☒ no
If yes, list:

Stream has potential for fish presence
☒ yes
☐ no

T&E Species
☐ yes, list ID:
☒ no

OHWM Criteria – Ordinary High Water Mark
☐ clear, natural line impressed on bank
☐ changes in character of soil
☐ shelving
☐ vegetation matted down, bent or absent
☐ leaf litter disturbed or washed away
☐ sediment deposition
☐ water staining
☐ presence of litter and debris
☐ destruction of terrestrial vegetation
☐ presence of wrack line
☐ sediment sorting
☐ scour
☐ abrupt change in plant community
☐ other (list):
Discontinuous OHWM: ☐ yes ☒ no

Geometry: ☐ Meandering ☒ Relatively Straight

Presence of: ☐ run ☐ pools ☐ riffles

Is the stream/tributary:
☐ natural
☒ manmade – Explain: canal
☐ man-altered – Explain:

NOTES:
RPDW 0560 – center to east (across
0561 – downstream to north
0562 – upstream to south
from left bank

14:AW5907_T0714-03/16/09-D1

RP-001-008 (left) X:
RP-001-009 (right) X:
RP-001-010 (center) X: 315718.19, Y: 5074818.28

STREAM ID: SS-001-002

STREAM DATA

[X] ROW [ ] Project Facility STATE
[ ] Access Road [ ] Staging/Storage Area PROJECT

County: Umatilla

Date: 5/9/13

Stream Name: [ ] UNNAMED [ ] NAMED:

Stream Type: [ ] STREAM [X] DITCH/CANAL

Observers: D. Wardwell, M. Alexandor

CHARACTERISTICS

Water Present: [X] yes [ ] no

Flow Type: [X] Perennial [ ] Intermittent [ ] Ephemeral

Stream Flow Direction: W

Width (ft) (water's edge to water's edge): 24'

Width (ft) (bank to bank): 31'
(above OHWM; use OHWM Criteria below)

CHARACTERISTICS

Substrate Type
[ ] Bedrock
[ ] Gravel
[X] Sand
[ ] Silt
[ ] Cobbles
[ ] Clay
[ ] Concrete
[ ] Other

Probed Stream Depth
[ ] N/A
[ ] 0 – 6"
[ ] 7 – 12"
[ ] 13 – 24"
[ ] 25 – 36"
[X] 37"+

Water Clarity
[ ] Clear
[X] Discolored
[ ] Oily Film
[ ] Other

STREAM BANK HEIGHT AND SLOPE

Left Bank* Height (ft): 3
Slope: [ ] 0-30º (4:1) [ ] 31-45º (3:1) [X] 46-60º (2:1) [✓] 61-90º (1:1)

Right Bank* Height (ft): 3
Slope: [ ] 0-30º (4:1) [ ] 31-45º (3:1) [X] 46-60º (2:1) [ ] 61-90º (1:1)

Height (ft) (OHWM from stream bed): 6+
*Direction when facing downstream

Evidence of Erosion: [ ] yes [X] no

[ ] Sloughing [ ] Undercutting [ ] Impact from Cattle

[ ] Other:

Top of Bank Characteristics
Width (ft) Highest Bank to Highest Bank: 31
Highest Left Bank Height*: 3
Highest Left Bank Slope*: 45°
Highest Right Bank Height*: 3
Highest Right Bank Slope*: 60°
*Direction when facing downstream

ASSOCIATED HABITAT

Riparian Vegetation
[ ] yes
[X] no
If yes, list:

Width of riparian corridor (ft): 35' total

Stream Fringe (5' or less including both banks)
[ ] yes, width (ft):
[X] no
If yes, list :

Aquatic Vegetation
[ ] yes
[X] no
If yes, list:

ASSOCIATED SPECIES

Aquatic Organisms
[ ] yes
[X] no
If yes, list:

Riparian/Terrestrial Organisms
[ ] yes
[X] no
If yes, list:

Stream has potential for fish presence
[X] yes
[ ] no

T&E Species
[ ] yes, list ID:
[X] no

OHWM Criteria – Ordinary High Water Mark

[ ] clear, natural line impressed on bank
[ ] changes in character of soil
[ ] shelving
[ ] vegetation matted down, bent or absent
[ ] leaf litter disturbed or washed away
[ ] sediment deposition
[ ] water staining
[ ] presence of litter and debris
[ ] destruction of terrestrial vegetation
[ ] presence of wrack line
[ ] sediment sorting
[ ] scour
[ ] abrupt change in plant community
[ ] other (list):

Discontinuous OHWM: [ ] yes [X] no

Geometry: [ ] Meandering [X] Relatively Straight

Presence of: [ ] run [ ] pools [ ] riffles

Is the stream/tributary:
[ ] natural
[X] manmade – Explain: irrigation ditch/canal
[ ] man-altered – Explain:

NOTES:

photo N – 0554.jpg
photo W – downstream 0555.jpg from
Photo E upstream 0556.jpg left bank

14:AW5907_T0714-03/16/09-D1

RP-001-005 South bank
RP-001-006 Center X: 316 755.04, y: 5073641.22
RP-001-007 North bank

STREAM ID: SS- 001-001

STREAM DATA

☒ ROW	☐ Project Facility	STATE OR
☐ Access Road	☐ Staging/Storage Area	PROJECT Perennial Wind Chaser

County: Umatilla

Date: 5-9-13

Stream Name: ☐ UNNAMED ☐ NAMED:

Stream Type: ☐ STREAM ☒ DITCH/CANAL

Observers: D. Wardwell, M. Alexander

CHARACTERISTICS

Water Present: ☒ yes ☐ no

Flow Type: ☒ Perennial ☐ Intermittent ☐ Ephemeral

Stream Flow Direction: West

Width (ft) (water's edge to water's edge): ~~7 mm~~ 20

Width (ft) (bank to bank): ~~9 mm~~ 25
(above OHWM; use OHWM Criteria below)

CHARACTERISTICS

Substrate Type
- ☐ Bedrock
- ☐ Gravel
- ☒ Sand
- ☐ Silt
- ☐ Cobbles
- ☐ Clay
- ☐ Concrete
- ☐ Other

Probed Stream Depth
- ☐ N/A
- ☐ 0 – 6"
- ☐ 7 – 12"
- ☐ 13 – 24"
- ☐ 25 – 36"
- ☒ 37"+

Water Clarity
- ☐ Clear
- ☒ Discolored
- ☐ Oily Film
- ☐ Other

STREAM BANK HEIGHT AND SLOPE

Left Bank* Height (ft): 3'

Right Bank* Height (ft): 2'

Left Bank Slope:
- ☐ 0-30º (4:1)
- ☐ 31-45º (3:1)
- ☒ 46-60º (2:1)
- ☑ 61-90º (1:1)

Right Bank Slope:
- ☐ 0-30º (4:1)
- ☐ 31-45º (3:1)
- ☒ 46-60º (2:1)
- ☐ 61-90º (1:1)

Height (ft) (OHWM from stream bed): 1

*Direction when facing downstream

Evidence of Erosion: ☐ yes ☒ no

☐ Sloughing ☐ Undercutting ☐ Impact from Cattle

☐ Other:

Top of Bank Characteristics

Width (ft) Highest Bank to Highest Bank: 25

Highest Left Bank Height*: 2

Highest Left Bank Slope*: 60

Highest Right Bank Height*: 2

Highest Right Bank Slope*: 60

*Direction when facing downstream

ASSOCIATED HABITAT

Riparian Vegetation
- ☐ yes
- ☒ no

If yes, list:

Width of riparian corridor (ft): 35' total

Stream Fringe (5' or less including both banks)
- ☐ yes, width (ft):
- ☒ no

If yes, list :

Aquatic Vegetation
- ☐ yes
- ☒ no

If yes, list:

ASSOCIATED SPECIES

Aquatic Organisms
- ~~☒ yes~~ MW
- ☒ no

If yes, list:

Riparian/Terrestrial Organisms
- ☒ yes
- ☐ no

If yes, list: Red-winged Blackbird, Great Blue Heron

Stream has potential for fish presence
- ☒ yes
- ☐ no

T&E Species
- ☐ yes, list ID:
- ☒ no

OHWM Criteria – Ordinary High Water Mark

- ☐ clear, natural line impressed on bank
- ☐ changes in character of soil
- ☐ shelving
- ☐ vegetation matted down, bent or absent
- ☐ leaf litter disturbed or washed away
- ☐ sediment deposition
- ☐ water staining
- ☐ presence of litter and debris
- ☐ destruction of terrestrial vegetation
- ☐ presence of wrack line
- ☐ sediment sorting
- ☐ scour
- ☐ abrupt change in plant community
- ☐ other (list):

Discontinuous OHWM: ☐ yes ☒ no

Geometry: ☐ Meandering ☒ Relatively Straight

Presence of: ☐ run ☐ pools ☐ riffles

Is the stream/tributary:
- ☐ natural
- ☒ manmade – Explain:
- ☐ man-altered – Explain:

NOTES: from left bank

Photo 0550.jpg cross stream to North
0551.jpg downstream to west
0552.jpg upstream to east

RP- 001-002 South Bank
RP- 001-003 Center Stream X: 316687.83, Y: 507245.24
RP- 001-004 North Bank

A-2 Raptor Nest Field Data Sheets

STREAM ID: SS-001-03

STREAM DATA

☐ ROW ☒ Project Facility ☐ Access Road ☐ Staging/Storage Area	STATE OR PROJECT Perennial
County: Umatilla	Stream Name: ☐ UNNAMED ☐ NAMED:
Date: 5/9/13	Stream Type: ☐ STREAM ☒ DITCH/CANAL
	Observers: D. Wardwell, M. Alexander

CHARACTERISTICS

Water Present: ☒ yes ☐ no

Flow Type: ☒ Perennial ☐ Intermittent ☐ Ephemeral

Stream Flow Direction: North

Width (ft) (water's edge to water's edge): 25

Width (ft) (bank to bank): 30
(above OHWM; use OHWM Criteria below)

CHARACTERISTICS

Substrate Type	Probed Stream Depth	Water Clarity
☐ Bedrock	☐ N/A	☐ Clear
☐ Gravel	☐ 0 – 6"	☒ Discolored
☒ Sand	☐ 7 – 12"	☐ Oily Film
☐ Silt	☐ 13 – 24"	☐ Other
☐ Cobbles	☐ 25 – 36"	
☐ Clay	☒ 37"+	
☐ Concrete		
☐ Other		

STREAM BANK HEIGHT AND SLOPE

Left Bank*	Right Bank*
Height (ft): 3	Height (ft): 4
Slope: ☐ 0-30º (4:1)	Slope: ☐ 0-30º (4:1)
☐ 31-45º (3:1)	☐ 31-45º (3:1)
☐ 46-60º (2:1)	☐ 46-60º (2:1)
☒ 61-90º (1:1)	☒ 61-90º (1:1)

Height (ft) (OHWM from stream bed): 7+
*Direction when facing downstream

Evidence of Erosion: ☐ yes ☒ no

☐ Sloughing ☐ Undercutting ☐ Impact from Cattle

☐ Other:

Top of Bank Characteristics

Width (ft) Highest Bank to Highest Bank: 30'

Highest Left Bank Height*: 3'
Highest Left Bank Slope*: 75°
Highest Right Bank Height*: 4'
Highest Right Bank Slope*: 75°
*Direction when facing downstream

ASSOCIATED HABITAT

Riparian Vegetation
☐ yes
☒ no
If yes, list:

Width of riparian corridor (ft): 35' total

Stream Fringe (5' or less including both banks)
☐ yes, width (ft):
☒ no
If yes, list :

Aquatic Vegetation
☒ yes
☒ ~~no~~ DW
If yes, list:
Rush spp.

ASSOCIATED SPECIES

Aquatic Organisms
☐ yes
☒ no
If yes, list:

Riparian/Terrestrial Organisms
☐ yes
☒ no
If yes, list:

Stream has potential for fish presence
☒ yes
☐ no

T&E Species
☐ yes, list ID:
☒ no

OHWM Criteria – Ordinary High Water Mark

☐ clear, natural line impressed on bank
☐ changes in character of soil
☐ shelving
☐ vegetation matted down, bent or absent
☐ leaf litter disturbed or washed away
☐ sediment deposition
☐ water staining
☐ presence of litter and debris
☐ destruction of terrestrial vegetation
☐ presence of wrack line
☐ sediment sorting
☐ scour
☐ abrupt change in plant community
☐ other (list):
Discontinuous OHWM: ☐ yes ☒ no

Geometry: ☐ Meandering ☒ Relatively Straight

Presence of: ☐ run ☐ pools ☐ riffles

Is the stream/tributary:
☐ natural
☒ manmade – Explain: canal
☐ man-altered – Explain:

NOTES:

RPDW 0560 – center to east (across
0561 – downstream to north
0562 – upstream to south
from left bank

14:AW5907_T0714-03/16/09-D1

RP-001-008 (left) X:
RP-001-009 (right) X:
RP-001-010 (center) X: 315718.19, Y: 5074818.28

STREAM ID: SS-001-002

STREAM DATA

[x] ROW [ ] Project Facility STATE____
[ ] Access Road [ ] Staging/Storage Area PROJECT

County: Umatilla

Date: 5/9/13

Stream Name: [ ] UNNAMED [ ] NAMED:

Stream Type: [ ] STREAM [x] DITCH/CANAL

Observers: D. Wardwell, M. Alexander

CHARACTERISTICS

Water Present: [x] yes [ ] no

Flow Type: [x] Perennial [ ] Intermittent [ ] Ephemeral

Stream Flow Direction: W

Width (ft) (water's edge to water's edge): 24'

Width (ft) (bank to bank): 31'
(above OHWM; use OHWM Criteria below)

CHARACTERISTICS

Substrate Type
- [ ] Bedrock
- [ ] Gravel
- [x] Sand
- [ ] Silt
- [ ] Cobbles
- [ ] Clay
- [ ] Concrete
- [ ] Other ____

Probed Stream Depth
- [ ] N/A
- [ ] 0 – 6"
- [ ] 7 – 12"
- [ ] 13 – 24"
- [ ] 25 – 36"
- [x] 37"+

Water Clarity
- [ ] Clear
- [x] Discolored
- [ ] Oily Film
- [ ] Other____

STREAM BANK HEIGHT AND SLOPE

Left Bank* Height (ft): 3
Slope: [ ] 0-30º (4:1) [ ] 31-45º (3:1) [x] 46-60º (2:1) [x] 61-90º (1:1)

Right Bank* Height (ft): 3
Slope: [ ] 0-30º (4:1) [ ] 31-45º (3:1) [x] 46-60º (2:1) [ ] 61-90º (1:1)

Height (ft) (OHWM from stream bed): 6+
*Direction when facing downstream

Evidence of Erosion: [ ] yes [x] no

[ ] Sloughing [ ] Undercutting [ ] Impact from Cattle

[ ] Other:____

Top of Bank Characteristics
Width (ft) Highest Bank to Highest Bank: 31

Highest Left Bank Height*: 3
Highest Left Bank Slope*: 45°
Highest Right Bank Height*: 3
Highest Right Bank Slope*: 60°
*Direction when facing downstream

ASSOCIATED HABITAT

Riparian Vegetation
[ ] yes
[x] no
If yes, list:

Width of riparian corridor (ft): 35' total

Stream Fringe (5' or less including both banks)

[ ] yes, width (ft):____
[x] no
If yes, list :

Aquatic Vegetation
[ ] yes
[x] no
If yes, list:

ASSOCIATED SPECIES

Aquatic Organisms
[ ] yes
[x] no
If yes, list:

Riparian/Terrestrial Organisms
[ ] yes
[x] no
If yes, list:

Stream has potential for fish presence
[x] yes
[ ] no

T&E Species
[ ] yes, list ID: ____
[x] no

OHWM Criteria – Ordinary High Water Mark

- [ ] clear, natural line impressed on bank
- [ ] changes in character of soil
- [ ] shelving
- [ ] vegetation matted down, bent or absent
- [ ] leaf litter disturbed or washed away
- [ ] sediment deposition
- [ ] water staining
- [ ] presence of litter and debris
- [ ] destruction of terrestrial vegetation
- [ ] presence of wrack line
- [ ] sediment sorting
- [ ] scour
- [ ] abrupt change in plant community
- [ ] other (list):____

Discontinuous OHWM: [ ] yes [x] no

Geometry: [ ] Meandering [x] Relatively Straight

Presence of: [ ] run [ ] pools [ ] riffles

Is the stream/tributary:
[ ] natural
[x] manmade – Explain: irrigation ditch/canal
[ ] man-altered – Explain:____

NOTES:

photo N – 0554.jpg
photo W - downstream 0555.jpg from
Photo E upstream 0556.jpg left bank

14:AW5907_T0714-03/16/09-D1

RP-001-005 South bank
RP-001-006 Center X: 316 755.04, y: 5073641.22
RP-001-007 North bank

STREAM ID: SS- 001-001

STREAM DATA

☒ ROW ☐ Project Facility ☐ Access Road ☐ Staging/Storage Area	STATE OR PROJECT Perennial Wind Chaser
County: Umatilla	Stream Name: ☐ UNNAMED ☐ NAMED:
Date: 5-9-13	Stream Type: ☐ STREAM ☒ DITCH/CANAL
	Observers: D. Wardwell, M. Alexander

CHARACTERISTICS

Water Present: ☒ yes ☐ no

Flow Type: ☒ Perennial ☐ Intermittent ☐ Ephemeral

Stream Flow Direction: West

Width (ft) (water's edge to water's edge): ~~7~~ 20

Width (ft) (bank to bank): ~~9~~ 25
(above OHWM; use OHWM Criteria below)

CHARACTERISTICS

Substrate Type	Probed Stream Depth	Water Clarity
☐ Bedrock	☐ N/A	☐ Clear
☐ Gravel	☐ 0 – 6"	☒ Discolored
☒ Sand	☐ 7 – 12"	☐ Oily Film
☐ Silt	☐ 13 – 24"	☐ Other
☐ Cobbles	☐ 25 – 36"	
☐ Clay	☒ 37"+	
☐ Concrete		
☐ Other		

STREAM BANK HEIGHT AND SLOPE

Left Bank*	Right Bank*
Height (ft): 3'	Height (ft): 2'
Slope: ☐ 0-30º (4:1)	Slope: ☐ 0-30º (4:1)
☐ 31-45º (3:1)	☐ 31-45º (3:1)
☒ 46-60º (2:1)	☒ 46-60º (2:1)
☑ 61-90º (1:1)	☐ 61-90º (1:1)

Height (ft) (OHWM from stream bed): 1
*Direction when facing downstream

Evidence of Erosion: ☐ yes ☒ no

☐ Sloughing ☐ Undercutting ☐ Impact from Cattle

☐ Other:

Top of Bank Characteristics
Width (ft) Highest Bank to Highest Bank: 25

Highest Left Bank Height*: 2
Highest Left Bank Slope*: 60
Highest Right Bank Height*: 2
Highest Right Bank Slope*: 60
*Direction when facing downstream

ASSOCIATED HABITAT

Riparian Vegetation
☐ yes
☒ no
If yes, list:

Width of riparian corridor (ft): 35' total

Stream Fringe (5' or less including both banks)

☐ yes, width (ft):
☒ no
If yes, list :

Aquatic Vegetation
☐ yes
☒ no
If yes, list:

ASSOCIATED SPECIES

Aquatic Organisms
~~☒ yes~~ MW
☒ no
If yes, list: Red-winged Blackbird
Great Blue Heron

Riparian/Terrestrial Organisms
☒ yes
☐ no
If yes, list:

Stream has potential for fish presence
☒ yes
☐ no

T&E Species
☐ yes, list ID:
☒ no

OHWM Criteria – Ordinary High Water Mark

☐ clear, natural line impressed on bank
☐ changes in character of soil
☐ shelving
☐ vegetation matted down, bent or absent
☐ leaf litter disturbed or washed away
☐ sediment deposition
☐ water staining
☐ presence of litter and debris
☐ destruction of terrestrial vegetation
☐ presence of wrack line
☐ sediment sorting
☐ scour
☐ abrupt change in plant community
☐ other (list):

Discontinuous OHWM: ☐ yes ☒ no

Geometry: ☐ Meandering ☒ Relatively Straight

Presence of: ☐ run ☐ pools ☐ riffles

Is the stream/tributary:
☐ natural
☒ manmade – Explain:
☐ man-altered – Explain:

NOTES: from left bank

Photo 0550.jpg cross stream to North
0551.jpg downstream to west
0552.jpg upstream to east

14:AW5907_T0714-03/16/09-D1

RP- 001-002 South Bank
RP- 001-003 center stream X: 316687.83, Y: 507245.24
RP- 001-004 North Bank

APPENDIX P-2

Revegetation and Noxious Weed Control Plan

Perennial Wind Chaser Station

Revegetation and Noxious Weed Control Plan

October 2014

Prepared for:

Perennial-WindChaser LLC
300 Madison Avenue
New York, NY 10017

Prepared by:

Ecology and Environment, Inc.
333 SW Fifth Avenue, Suite 600
Portland, Oregon 97204

TABLE OF CONTENTS

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1 INTRODUCTION

This Revegetation and Noxious Weed Control Plan outlines the goals, methods, and standards for soil restoration and revegetation of areas expected to be temporarily disturbed during the construction, operation, and maintenance of the Perennial Wind Chaser Station project (Project).[1] In addition, this plan describes noxious and invasive weed control measures that will be implemented in all areas of the Project during and after construction, including both temporary disturbance areas and permanent aboveground facilities. Perennial-WindChaser LLC (Perennial) is not required to revegetate areas with permanent Project facilities, such as the power generating facility (Station) site, step-up substation, or any other permanent aboveground Project components; however, noxious weed control and erosion control will be implemented in all areas of the Project including within the transmission pipeline and natural gas pipeline rights-of-way ([ROW] Project area). The purpose of these efforts is to restore the soil and vegetation in temporarily disturbed Project areas to pre-disturbance condition or better.

The goal of this plan is to provide the methods and standards to:

1. Avoid or minimize impacts on the native habitats and vegetation communities present in the Project area;
2. Avoid or minimize impacts on native soils through erosion and loss or degradation of topsoil;
3. Avoid or control the introduction or spread of noxious weeds in or immediately adjacent to the Project area (including along Project access roads);
4. Re-establish native plant communities in non-agricultural areas of the Project within five years of completion of the construction of the Project; and
5. Re-establish the conditions for pre-Project farming practices in agricultural areas of the Project within one year of completion of the construction of the Project.

This plan has been developed in consultation with the Oregon Department of Fish and Wildlife (ODFW) and the Umatilla County Weed Control Board. Additionally, this plan utilizes restoration and revegetation methods and standards developed by other energy projects in this region of Oregon that have been approved by the Oregon Energy Facility Siting Council (EFSC 2006, 2011). All seed mixes, planting methods, noxious weed control treatments, topsoil conservation methods, and erosion control measures will only be

1 This plan is incorporated by reference in the Project's site certificate application and is not intended to be a "stand-alone" document. This plan does not contain all mitigation measures required of Perennial.

implemented with the approval of the ODFW and the individual landowners. Perennial will implement and maintain sediment and erosion control measures during construction and after construction until the risk of erosion has been eliminated and areas of disturbance are successfully restored. This plan also provides a brief summary of post-construction monitoring procedures to evaluate the success of the measures described in this plan. For a complete discussion of Perennial's monitoring procedures, refer to the Project Restoration Monitoring Plan (Exhibit P, Appendix P-3).

The Project area is composed primarily of active agriculture cropland, disturbed or weedy agricultural areas, and limited areas of shrub-steppe rangelands of varying quality (>2 percent in the natural gas pipeline ROW). Direct and indirect impacts on vegetation and wildlife habitat at aboveground facilities will be permanent in nature and will result from the removal of vegetation and wildlife habitat through excavation and grading activities. Other than noxious weed control measures and erosion and sediment control measures, revegetation will not be conducted at these sites.

In general, the intensity of construction impacts on vegetation and habitat in temporary disturbance areas will be low and will often be limited to the flattening of vegetation by rubber-tired vehicles. In some instances, the intensity of impacts in temporary disturbance areas will be higher and will require the removal of topsoil and vegetation through grading, excavation, or drilling activities. Perennial will implement revegetation measures in all temporary construction disturbance areas where soil is disturbed. Such soil disturbance sites will require active measures to restore vegetation cover in a timely manner, control erosion, and prevent the establishment and spread of noxious weeds. Construction crews will segregate topsoil from subsoil for pipeline trenching in agricultural areas and replace this topsoil during the restoration phase of the Project.

Perennial will implement a number of best management practices designed to control sediment and minimize erosion, particularly in the vicinity of Project drainages and waterbodies. These erosion and sediment control practices will be maintained for the duration of the construction restoration phases of the Project, but may be maintained longer if a high risk of erosion still exists. Erosion and sediment control measures are described in the Erosion and Sediment Control Plan, located in Exhibit I, Appendix I-2.

2 SITE DESCRIPTION

The Station will be located on private land in Umatilla County, Oregon, approximately 4 miles southwest of the city of Hermiston, Oregon, near the intersection of Interstate Highways 82 and 84. In addition to the Station, the Project includes a 50-foot-wide natural gas pipeline ROW that will extend 4.63 miles south of the Station to the existing Gas Transmission Northwest pipeline and the construction of a new metering facility adjacent to the existing metering facility. The natural gas pipeline ROW will be located almost entirely within the existing ROW of the lateral that services the Hermiston Generating Plant. In addition, the Project includes reconductoring an existing12-mile transmission line that will terminate at a new 3-acre step-up substation, as well installing an approximately 477-foot-long underground transmission cable into the existing Bonneville Power Administration McNary Substation. The transmission line reconductoring will not result in permanent ground disturbance.

Permanent ground disturbance will primarily occur at 1) the Station site, 2) the step-up substation, 3) the natural gas pipeline metering facility, and 4) the fenced riser area. Approximately 23.48 acres of category 5 and 6 habitat (developed areas and weedy grasslands at the Station site and the step-up substation) will be permanently removed as a result of the Project. These areas will not be revegetated after construction, although appropriate noxious weed control measures will be implemented in areas that have non-impervious surfaces.

Temporary ground disturbance will primarily occur at 1) the 50-foot-wide natural gas pipeline ROW, 2) the two new transmission line poles, 3) the underground electrical ROW connecting the step-up substation to the McNary Substation, and 4) the contractor's construction yard facilities adjacent to the Station. Approximately 2.03 acres of category 3 habitat (rabbitbrush-dominated shrub-steppe) and 34.64 acres of category 5 and 6 habitats (including weedy grassland, irrigated agriculture, and developed areas) will be temporarily disturbed. All temporarily disturbed Project areas will be seeded per ODFW requirements or returned back to agricultural use (at landowner request) after construction is complete.

Table 1 Permanent and Temporary Disturbances (in acres) to Each Habitat Type and Habitat Mitigation Category

Habitat Type	Mitigation Category	Disturbance Acres
Permanent Disturbances		
Weedy Grassland #1	5	0.00
Weedy Grassland #2	5	0.00
Weedy Grassland #3	6	0.00
Weedy Grassland #4	5	18.52
Weedy Grassland #5	5	0.51
Weedy Grassland #6	6	3.00
Agriculture	6	0.00
Shrub Steppe	3	0.00
Riparian	2	0.00
Open Water	6	0.29
Developed	6	1.16

Table 1 Permanent and Temporary Disturbances (in acres) to Each Habitat Type and Habitat Mitigation Category

Habitat Type	Mitigation Category	Disturbance Acres
Permanent Disturbances		
	Total	**23.48**
Temporary Disturbances		
Habitat Type	**Mitigation Category**	**Disturbance Acres**
Weedy Grassland #1	5	9.71
Weedy Grassland #2	5	0.59
Weedy Grassland #3	6	0.68
Weedy Grassland #4	5	10.10
Weedy Grassland #5	5	0.57
Weedy Grassland #6	6	0.71
Agriculture	6	6.77
Shrub Steppe	3	2.03
Riparian	2	0.00
Open Water	6	0.12
Developed	6	5.38
	Total	**36.67**

*Acreage is subject to change as Project plans continue to be refined.

3 SCHEDULE

In general, implementation of the measures described in this plan will begin at the start of construction activities, although it may be appropriate to implement some measures prior to the commencement of ground-disturbing activities. In particular, it may be advantageous to pre-treat selected noxious weed populations before construction activities start if treatment will prevent plants from going to seed. Erosion control and noxious weed control measures should be implemented and maintained throughout the construction phase of the Project. Restoration and revegetation of temporary disturbance areas should occur as soon as possible after construction has been completed in any given area of the Project. In instances where this is not possible due to construction requirements, temporary erosion control measures (e.g., temporary slope breakers, erosion control fabric, planting of winter wheat, etc.) should be implemented instead until final restoration efforts can be started. After construction of the Project, erosion control, noxious weed control, and replanting and seeding will continue for up to five years or until Perennial, the ODFW, and the Oregon Department of Energy (ODOE) have deemed restoration and revegetation to be successful. If the Project has not achieved successful restoration and revegetation after five years, Perennial will consult the ODFW and ODOE regarding additional measures or an alternative course forward. Refer to the Project Restoration Monitoring Plan (Exhibit P, Appendix P-3) for more details on post-construction monitoring procedures and schedule.

4 RESTORATION AND REVEGETATION METHODS

Restoration and revegetation of temporarily disturbed Project areas will include: 1) erosion control and topsoil management, 2) noxious and invasive weed control, 3) seed mix selection and planting techniques, and 4) post-construction monitoring and contingency measures.

Monitoring of restoration efforts should be initiated during construction as work in individual areas of the Projects is completed, but most monitoring of revegetation will occur one to five years after construction has been completed.

Perennial anticipates following the restoration and re-seeding guidelines provided in this plan; however, the methods and timing could be altered at the request of landowners, the ODFW, and ODOE.

4.1 Erosion Control and Topsoil Management

Soil preservation and preparation techniques, including erosion control and topsoil management measures, shall be implemented immediately prior to, or at the start of, construction. Erosion and sediment control measures are provided in more detail in the Project's Erosion and Sediment Control Plan (Exhibit I, Appendix I-2), and will include measures similar to those described below.

The Project shall implement the following erosion control and topsoil management measures:

- Minimize construction impacts in the Project area by, where practical and safe, limiting grading and clearing to avoid impacts on native soils and vegetation;
- Use proper soil management techniques, including topsoil stripping, stockpiling, and reapplying to establish surface conditions that would enhance development of diverse, stable, and self-generating plant communities. Topsoil management will apply to the transmission pipeline ROW where excavation, grading, or other construction activities could result in mixing of soil layers;
- Establish stable surface and drainage conditions and use standard erosion control devices and techniques to minimize soil erosion and sedimentation, including the installation of silt fencing, straw bales, mulch, straw wattle, erosion control fabric, slope breakers, and trench breakers, as appropriate;

- Establish terrain compatible with the surrounding landscape (recontouring) that emphasizes restoration of existing drainage and landform patterns, to the extent practical; and
- Weed control methods, including treatment approach and use of specific herbicides, shall be finalized prior to construction in coordination with individual landowners, the ODFW, and Umatilla County.

4.2 Noxious and Invasive Weed Control

Noxious and invasive weed control should begin prior to ground disturbance through pre-treatment, if appropriate, and should continue through construction and during the operation and maintenance phases of the Project. Perennial shall implement measures to prevent or control introduction or spread of weed seeds and plant parts during construction or operations and maintenance phases of the Project. Efforts should focus on species that are designated as noxious weeds by the Oregon Department of Agriculture (ODA 2013) and by Umatilla County (Umatilla County Noxious Weed Control 2012). Table 2 shows the noxious and invasive weed species that were identified on the ROW during 2013 field surveys. In addition, Perennial shall attempt to prevent the introduction and spread of other invasive species not officially designated as noxious that could affect revegetation success, such as cheatgrass, Russian thistle, and tumble mustard.

The Project shall implement the following noxious and invasive weed control measures:

- Prevent introduction or spread of seeds and plant parts during construction or operations and maintenance from species that are designated as noxious weeds by the Oregon Department of Agriculture (ODA), and attempt to prevent the introduction and spread of other invasive species not officially designated as noxious, such as cheatgrass and Russian thistle;
- Include a discussion of the risks of noxious weeds and the Project control methods in the Project's environmental awareness training that Project personnel will undergo prior to entering the ROW;
- Qualified biological monitors or contract weed control personnel approved by the ODA, ODOE, and Umatilla County, as appropriate, shall conduct onsite biological monitoring in areas of noxious weed concern or presence before and after construction;
- Pre-treat all state-designated noxious weed populations identified in Project disturbance areas prior to construction, as practical;

- Wash all Project vehicles and equipment before they enter the Project Site for first time. Typically, this is done by constructing a contained wash structure at the contractor's construction yard and washing vehicles immediately upon arrival at the Project;
- Use regular site assessments and suitable herbicide application to keep off-ROW areas related to the Project, such as contractor construction yards, in weed free condition;
- Use certified weed-free straw bales and straw mulch for soil erosion and sedimentation control measures;
- Use certified weed-free seed during re-vegetation efforts obtained from a supplier approved by the State of Oregon; and
- Use manual, mechanical (mowing, clipping), or chemical (herbicides) techniques to control weed populations. Perennial may utilize any of these methods on a site-specific basis. If herbicide applications are used to treat weed populations, a licensed contractor should be used to prescribe specific treatments and to apply chemicals.

Table 2 Designated Noxious Weeds and Other Invasive Species Observed During 2013 Field Surveys

Latin Name	Common Name	ODA Classification[1]	Umatilla County Classification[2]	Number of Sites
State-designated noxious weeds				
Agropyronrepens	Quackgrass	None[3]	B	4
Centaureadiffusa	Diffuse knapweed	B	B[4]	6
Kochiascoparia	Kochia	B	B	3
Onopordumacanthium	Scotch thistle	B	B[4]	9
Secale cereal	Cereal rye	None	B	7
Tribulusterrestris	Puncturevine	B	B	1

Table 2 Designated Noxious Weeds and Other Invasive Species Observed During 2013 Field Surveys

Latin Name	Common Name	ODA Classification[1]	Umatilla County Classification[2]	Number of Sites
Invasive Species Not Designated as Noxious				
Bromustectorum	Cheatgrass	none	none	throughout
Salsola tragus	Russian thistle	none	none	throughout
Sisymbriumaltissimum	Tumble mustard	none	none	throughout

Source: ODA 2013, Umatilla County Noxious Weed Control 2012

Notes:

[1] ODA Class B definition: a weed of known economic importance which occurs in the state in small enough infestations to make eradication or containment possible; or is not known to occur, but its presence in neighboring states makes future occurrence in Oregon seem imminent. Limited to intensive control at the state, county or regional level as determined on a site specific, case-by-case basis. Where implementation of a fully integrated statewide management plan is not feasible, biological control (when available) shall be the primary control method.

[2] Umatilla County Class B definition: a weed of known economic importance which is regionally abundant, but which may have limited distribution in some countries. Where implementation of a fully integrated statewide management plan is feasible, biological control shall be the main control approach for species for which biological agents are available. Limited to intensive control at state or county level as determined on a case-by-case basis.

[3] This species was included on the ODA's 2010 designated noxious weed list.

[4] This species has been targeted by Umatilla County for additional enforcement throughout the county in dryland annual cropping areas, irrigated crops and pastures, and dryland/range/timber.

4.3 Re-seeding Methods

Areas of temporary disturbance will be restored to original grade and soil condition as soon as possible after the final construction ground disturbance and will generally be re-contoured and de-compacted, if necessary. These areas will then be evaluated to determine whether re-seeding or other revegetation techniques are required to return the area to preconstruction vegetation conditions. Re-seeding may not be necessary or appropriate in some areas, including places where vegetation has been flattened but not crushed and those where little or no vegetation was present prior to construction. If appropriate, re-seeding will be initiated immediately after construction in any completed part of the Project. Re-seeding activities may need to be delayed, depending on the season or on weather conditions, but should always occur as soon as appropriate after construction. Preliminary seed mixes are provided in Table 3; however, the final seed mixes used may change as a result of further consultations with the ODA and ODFW or at the request of individual landowners.

Agricultural Croplands

Perennial shall coordinate with landowners and, as necessary, restore croplands to original grade and contour and repair any agricultural drainage systems that are impacted by construction. Individual landowners will be consulted when determining the proper seed mix to be used during re-seeding activities on agricultural lands. The primary goal of cropland revegetation is to return croplands to a condition consistent with typical pre-construction conditions. If necessary, in coordination with the landowner, an appropriate cover crop will be planted to hold the site until the next crop planting rotation. Cultivated agricultural areas are successfully revegetated if the replanted areas achieve crop production comparable to adjacent non-disturbed cultivated areas. Perennial shall consult with the landowner to determine whether these areas have been successfully revegetated and shall report to the ODFW and ODOE on the success of revegetation in these areas as part of its annual Restoration Monitoring Report (see Restoration Monitoring Plan, Appendix P-3).

Disturbed Grasslands and Shrub-Steppe Rangeland

Weedy, disturbed grasslands constitute the primary non-agricultural vegetation type in the Project area (approximately 61 percent of temporary disturbance areas). Shrub-steppe rangeland constitutes a very small portion of the non-agricultural vegetation type in the Project area (less than 6 percent of temporary disturbance areas). Seed mixtures for disturbed grasslands and shrub-steppe rangeland (Table 3: Seed Mixes 2 and 3, respectively) have been developed consisting of native species and desirable non-native species known to provide erosion control and wildlife forage benefits in Eastern Oregon. The current seed mix recommendations provided in Table 3 may be altered prior to construction and revegetation efforts in consultation with landowners and the ODFW.

Perennial shall use the following guidelines during re-seeding efforts:

- Re-seed disturbed areas as soon as possible after final construction disturbance in each area.
- Re-seed construction soil disturbance areas to restore vegetation as soon as possible after construction in any part of the Project where construction has been completed.
- Re-seed temporary disturbance areas during the appropriate season and as weather conditions allow.
- Crews will attempt to conduct all re-seeding during the period from February through early April for construction disturbances that occurred during the winter and early spring. For areas where construction is completed outside of the winter or spring periods, re-seeding maybe delayed until the months of October or November (when dry season has passed). If final construction and soil restoration are not completed at a

time that allows immediate re-seeding during one of the two periods listed above (winter/spring or fall), the areas will be mulched or otherwise treated to minimize erosion until seeding can be conducted.

- Seeds will be applied using either manual or mechanical methods, depending on factors such as the size of the area to be re-seeded and risk for further disturbance due to the use of planting equipment (e.g., tractor or all-terrain vehicle).
- In addition, Perennial may employ either broadcasting or drilling techniques as appropriate and feasible. Broadcasting or seed drilling methods will be used according to which method is most appropriate for the disturbance area.
- Straw mulch may be applied as needed immediately after seeding.

Table 3 Seed Mix for Temporarily Disturbed Project Areas

Vegetation Type	Common Name	Scientific Name	PLS (pounds per acre[1,2]	Description/ Purpose
Seed Mix 1: Agricultural (irrigated, dryland, and pastures)	Wheat or other crop seed, at the request of landowner.		At landowner request	(EC)
Seed Mix 2: Disturbed native grasslands	Secarbluebunch wheatgrass	*Pseudoregneriaspicata*	6	(N) (EC) (F)
	Sherman big bluegrass	*Poaampla*	1.5	(N) (F)
	Sandberg's bluegrass	*Poasecunda*	2.0	(N) (F)
	Small burnet	*Sanguisorba minor*	2.0	(I) (F)
	Great Basin wildrye *	*Elymuscinereus*	1.0	(N) (EC) (F)
	Needle and thread grass*	*Hesperostipacomata*	1.0	(N) (EC) (F)
	Western yarrow *	*Achilleamillefolium var. occidentalis*	1.0	(N) (F)
Seed Mix 3: Shrub-steppe	Secarbluebunch wheatgrass	*Pseudoregneriaspicata*	6	(N) (EC) (F)
	Sherman big bluegrass	*Poaampla*	1.5	(N) (F)
	Sandberg's bluegrass	*Poasecunda*	2.0	(N) (F)

Table 3 Seed Mix for Temporarily Disturbed Project Areas

Vegetation Type	Common Name	Scientific Name	PLS (pounds per acre[1,2]	Description/ Purpose
	Ladak alfalfa	*Medicago sativa*	1.0	(I) (F)
	Small burnet	*Sanguisorba minor*	2.0	(I) (F)
	Great Basin wildrye *	*Elymuscinereus*	1.0	(N) (EC) (F)
	Needle and thread grass*	*Hesperostipacomata*	1.0	(N) (EC) (F)
	Western yarrow *	*Achilleamillefolium var. occidentalis*	1.0	(N) (F)
	Big sagebrush *	*Artemisia tridentata*	1.0	(N) (F)

Key:
(N) = Native, (I) = Introduced, (EC) = Erosion Control, (F) = Forage
* Optional species depending on site and availability
[1] PLS = pure live seed
[2] Final pounds/acre may change at the request of the landowners or the ODFW

5 MONITORING PROGRAM

The Restoration Monitoring Plan (Exhibit P, Appendix P-3) outlines the goals, methods, and criteria to be used by Perennial to evaluate and track the success of restoration efforts during and after construction of the Project. The discussion below provides a brief summary of the monitoring procedures provided in Appendix P-3; however, Appendix P-3 is the primary document for all monitoring procedures.

Perennial will conduct annual monitoring of restoration efforts in all Project areas. The purpose of monitoring is to evaluate the effectiveness of long-term soil stability, noxious weed control, and vegetation condition within areas disturbed during construction and to identify appropriate remedial actions that will help Perennial attain successful restoration of disturbed areas.

Perennial will provide biologists and/or inspectors qualified to conduct these evaluations. Restored cultivated lands will be monitored primarily by the landowner and/or farmer for production ability after Perennial has completed final construction restoration. Landowners may report any subsequent concerns to Perennial. In many cases, the restored croplands will be replanted during the next growing season. Perennial's monitoring teams will provide general descriptions of the conditions of cultivated agricultural areas during monitoring efforts; however, these will mainly be used to verify information provided by the landowner and/or farmer. Therefore, most monitoring effort will occur at non-cultivated areas. However, Perennial's monitors will note substantial restoration issues observed on cultivated lands during the course of monitoring in other Project areas. Although monitoring of some restoration measures will be applicable to all project areas (e.g., erosion control and noxious weed control), monitoring of other measures will only apply to areas that are not developed or used for agricultural farming (e.g., topsoil segregation, re-seeding). Where possible, all annual monitoring efforts will be conducted in single site visits and by the same team.

Restoration monitoring will begin in the first growing season (fall or spring) following the completion of construction and initial restoration and continue annually for up to five years. When it is determined that an area of the Project has been successfully restored at any point during years 1 to 5, by satisfying all success criteria, Perennial will request concurrence from ODOE and ODFW. If ODOE and ODFW concur, Perennial will conclude that it has no further obligation to perform revegetation activities in that area of the Project. Where this is the case, the monitoring effort may require fewer than five years. If after five years of monitoring (and remedial actions) some sites have not attained restoration success, Perennial will coordinate with ODOE and ODFW regarding appropriate steps forward. At this point Perennial may suggest additional restoration techniques or strategies be implemented, or Perennial may request a waiver from further restoration obligations at these sites.

For a complete discussion of Perennial's monitoring procedures, refer to the Project Restoration Monitoring Plan (Appendix P-3).

6 AMENDMENT OF PLAN

This Revegetation Plan may be amended by agreement of Perennial and the ODOE. Amendments will be prepared in consultation with the ODFW and ODOE and may be made without altering the site certificate.

7 REFERENCES

EFSC (Energy Facility Siting Council). 2011. Summit Ridge Wind Farm: Revegetation and Weed Control Plan. January 14, 2011. Available at: http://www.oregon.gov/energy/Siting/docs/SRW/SRW_final_order_exhibits_081911.pdf.

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ODA (Oregon Department of Agriculture). 2013. Noxious Weed Policy and Classification System 2013. Oregon Department of Agriculture Noxious Weed Control Program. Salem, Oregon, 2013.

Umatilla County Noxious Weed Control. 2012. Umatilla County 2011 Noxious Weed List. Pendleton, Oregon.

APPENDIX P-3

Restoration Monitoring Plan

Perennial Wind Chaser Station

Restoration Monitoring Plan

October 2014

Prepared for:

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1 INTRODUCTION

This Restoration Monitoring Plan outlines the goals, methods, and criteria to be used by Perennial-WindChaser LLC (Perennial) to evaluate and track the success of restoration efforts during and after construction of the Perennial Wind Chaser Station project (Project). These efforts include measures to help ensure proper topsoil management, soil stabilization, and erosion control; noxious weed control; and site revegetation. This plan focuses primarily on post-construction monitoring procedures; however, some measures implemented during earlier phases of construction, such as pre-treatment of noxious weeds and temporary erosion control techniques, may require monitoring during the construction phase.

The goals of the Project restoration measures and monitoring procedures are to:

1. Avoid or minimize impacts on native soils and habitats caused by erosion and loss or degradation of topsoil;
2. Avoid or control the introduction or spread of noxious weeds in or immediately adjacent to the Project area (including along Project access roads);
3. Re-establish native plant communities in non-cultivated temporary disturbance areas within five years of completion of the construction of the Project; and
4. Re-establish the conditions for pre-Project farming practices in cultivated agricultural areas of the Project within one year of completion of the construction of the Project;

This plan provides summaries only of the restoration measures that will be implemented during and after construction of the Project. These measures are discussed in more detail in the Project Erosion and Sediment Control Plan (Exhibit I, Appendix I-2) and in the Project Revegetation and Noxious Weed Control Plan (Exhibit P, Appendix P-2). Although these other plans also discuss monitoring procedures, this plan is the primary document for Project monitoring procedures. The monitoring procedures described in this plan supersede any monitoring procedures discussed in those plans.

The procedures described in this plan have been reviewed and approved by the Oregon Department of Energy (ODOE), the Oregon Department of Fish and Wildlife (ODFW), and the Umatilla County Weed Control Board. The procedures described in this plan utilize some of the restoration and revegetation methods and standards approved by ODOE for other energy projects in this region of Oregon (ODOE 2006, 2011).

2 SITE DESCRIPTION AND NATURE OF IMPACTS

The Project will be located on private lands in Umatilla County, Oregon. The project components relevant to this monitoring plan, including impacts types and acreages, are provided in Table 1 and described below.

Permanent ground disturbance related to construction will occur at 1) the Energy Facility Site (Station), 2) the step-up substation, and 3) and the riser structures at the Bonneville Power Administration's McNary Substation. At these sites, approximately 23.48 acres that consist of developed areas and weedy grasslands will be permanently altered. These areas will not be revegetated after construction, although appropriate soil stabilization, erosion control, and noxious weed control measures will be implemented in areas that have non-impervious surfaces.

Temporary ground disturbances related to construction will occur at all other Project sites, including 1) the natural gas pipeline right-of-way (ROW), 2) the construction laydown and parking area, 3) the underground electrical ROW connecting the step-up substation to the McNary Substation, 4) the contractor's construction yard facilities adjacent to the Station, and several other small project features. At these sites, an estimated 36.67 acres of land will be temporarily impacted as a result of the Project: approximately 22.5 acres composed of weedy grasslands; 12.2 acres of developed or agricultural lands; and 2 acres of shrub-steppe habitat.

Often, the intensity of construction impacts on vegetation and habitat in temporary disturbance areas will be low and will often be limited to the flattening of vegetation by rubber-tired vehicles. In some instances, the intensity of impacts in temporary disturbance areas will be higher and will require the removal of topsoil and vegetation through grading, excavation, or drilling activities.

Table 1 Project Disturbance Areas

Project Feature	Notes	Acres Impacted	
		Temporary	Permanent
Permanent disturbance areas			
Station site	Power station and switchyard	--	19.97
Step-up Substation	Step-up voltage to the BPA's McNary Substation	--	3.0
Risers structure	within McNary Substation/USACE lands	--	0.51
Temporary disturbance areas			
Construction Laydown and Parking (located outside of Energy Facility Site boundary)	During construction	5.11	--
Natural Gas Pipeline	4.63 miles long, 50-feet-wide ROW	28.06	--
Initial tie-in Transmission Poles (two new towers)	2 towers, 0.23 acres each	0.46	--
Underground 500-kV Transmission Cable	Step-up substation to risers	0.55	--
Underground Process Water Line	208 feet by 50 feet	0.24	--
Underground Reclaimed Water Line	538 feet by 50 feet	0.62	--

Table 1 Project Disturbance Areas

Project Feature	Notes	Acres Impacted	
		Temporary	Permanent
T-Line Tie-in to Substation	100 x 11 feet	0.03	--
Step-up Substation Road Upgrade	Gravel on existing access road (12 feet by 800 feet long)	0.22	--
Transmission Line Reconductoring[1]	12 stringing sites (50 feet by 100 feet)	1.38[1]	--
Subtotal		36.67	23.48
TOTAL		**60.15**	

Notes:
[1] Locations of up to 12 stringing sites (50 X 100 feet each) associated with the transmission line reconductoring have not been determined. No excavating, grading, or other soil disturbance will occur at these sites; potential disturbances will primarily result from vehicles driving on grass, shrubs, and other vegetation.

Key:

BPA	Bonneville Power Administration
kV	kilovolt
ROW	right-of-way
USACE	United States Army Corps of Engineers

3 SUMMARY OF RESTORATION MEASURES

Successful restoration of Project disturbance areas will be accomplished by implementing measures during construction that are designed to help ensure success in three main areas:

- Erosion control, topsoil management, and soil stabilization;
- Noxious weed control; and
- Revegetation.

Soil stabilization, erosion control, and noxious weed control measures will generally be implemented in all Project areas, including both temporary disturbance areas and permanent aboveground facilities. However, topsoil management and revegetation measures will generally only be implemented in temporary disturbance areas, including the pipeline ROW and contractor yards and parking areas. The Project is not required to restore vegetation or original soil conditions in areas with permanent aboveground Project facilities, such as the power generating facility (Station) site and the step-up substation. For cultivated agricultural lands, the Project will determine appropriate revegetation, soil stabilization, and topsoil restoration methods in coordination with the individual landowner and/or farmer.

The sections below summarize the restoration measures that will be implemented during construction of the Project that may be relevant to monitoring procedures. These measures are discussed in more detail in the Project Erosion and Sediment Control Plan, located in Exhibit I, Appendix I-2 and in the Project Revegetation and Noxious Weed Control Plan in Exhibit P,

Appendix P-2. The sections below are intended for use as a reference by field monitoring personnel after the measures have already been implemented.

3.1 Erosion Control, Topsoil Management, and Soil Stabilization Measures

The goal of these soil preservation measures is to avoid or minimize construction-related impacts on native soils and on the environment that may result from erosion or mixing of topsoil with subsoil layers. Perennial will implement erosion control, topsoil management, and soil stabilization measures according to the following general guidelines:

- Erosion control measures will be implemented immediately prior to ground disturbances in Project areas. These measures will be maintained for the duration of the construction and restoration phases, as necessary, and may be maintained into the operations and maintenance phase until the risk of erosion has been eliminated and areas of disturbance are successfully restored.
- Standard erosion control techniques will be used, including the use of silt fencing, straw bales, mulch, straw wattle, erosion control fabric, water bars, temporary and permanent slope breakers, trench breakers, and other techniques, as appropriate.
- At the discretion of Perennial's environmental inspectors and the pertinent landowners, some permanent erosion control measures may be appropriate (e.g., permanent slope breakers).
- Topsoil management techniques will be implemented at the start of ground-disturbing activities and maintained throughout construction, as needed.
- At a minimum, trench line and spoils side topsoil stripping and segregation will be performed in temporary disturbance areas, unless the pertinent landowner and/or farmer has requested otherwise.
- At the discretion of Perennial's environmental inspectors and the pertinent landowner and/or farmer, the contractor may conduct topsoil segregation in other Project areas where topsoil and subsoil might mix, such as the pipeline ROW during muddy conditions, or other areas where excavation or grading are needed.
- Soil stabilization measures will be implemented as soon as construction in any Project area is complete and, if needed, again during the final restoration and clean-up phase. These measures typically include restoring the site to original grade and contour and compacting soils as necessary.

3.2 Noxious and Invasive Weed Control Measures

Perennial will implement measures to prevent or control introduction or spread of designated noxious weed seeds and plant parts prior to and during construction and during the operations and maintenance phases of the Project. Noxious weed control efforts will focus on species that are designated as noxious weeds by the Oregon Department of Agriculture (ODA 2013) and by

Umatilla County (Umatilla County Noxious Weed Control 2012). The goal of noxious weed control is to prevent the introduction or spread of noxious weeds in or immediately adjacent to the Project area, but not to eradicate all noxious weed populations in Project areas.

Six designated noxious weed species were observed during field surveys in 2013: quackgrass (*Agropyron repens*), diffuse knapweed (*Centaurea diffusa*), kochia (*Kochia scoparia*), Scotch thistle (*Onopordum acanthium*), cereal rye (*Secale cereal*), and puncturevine (*Tribulus terrestris*). Locations of noxious weed observations are shown in Table 3 and Figures 1a to 1e. These species are all classified as category B by the State of Oregon and/or Umatilla County, indicating that limited to intensive control is required, as determined on a site-specific, case-by-case basis. In addition, surveyors observed three species of common invasive species that are not designated as noxious: including cheatgrass (*Bromus tectorum*), Russian thistle (*Salsola tragus*), and tumble mustard (*Sisymbrium altissimum*). Perennial is not required to treat or control these additional species.

Perennial will implement noxious weed control measures according to the following general guidelines:

- Qualified biologists will conduct onsite noxious weed surveys and monitoring.
- Noxious weed control may utilize manual (hand pulling), mechanical (mowing, clipping), or chemical (herbicides) treatment techniques to control weed populations.
- Perennial may utilize any of these methods on a site-specific basis but shall obtain approval from the ODFW and individual landowners prior to using specific herbicides.
- Only a state-licensed weed control contractor will apply herbicide treatments.
- Assess Project sites regularly during construction and treat weed populations as needed.
- Use certified weed-free straw bales and straw mulch for soil erosion and sedimentation control measures, and revegetation efforts.
- Finalize weed control methods, including treatment approach and use of specific herbicides, prior to construction in coordination with individual landowners, the ODFW, and Umatilla County.

3.3 Revegetation Measures

Perennial will re-seed all temporary disturbance areas where soil and vegetation have been disturbed, unless the individual landowners have requested otherwise. Re-seeding may not be necessary or appropriate in some areas, including sites where vegetation has been flattened but not crushed and areas where little or no vegetation was present prior to construction. In all cases, Perennial will seek approval from the pertinent land owner and/or farmer before re-seeding.

Agricultural Croplands

Perennial will coordinate with landowners and/or farmers and, as necessary, restore croplands to original grade and contour and repair any agricultural drainage systems that are impacted by construction. Individual landowners and/or tenant farmers will be consulted when determining the proper seed mix (usually a single type of crop seed, such as winter wheat) to be used during re-seeding activities on agricultural lands. The goal of cropland revegetation is to return croplands to a condition and production ability consistent with typical pre-construction condition. Restoration on cultivated lands, including potential re-seeding, will be conducted as soon as possible after construction has been completed.

Disturbed Grasslands and Shrub-Steppe Rangeland

During the clean-up phase of the Project, all non-cultivated temporary disturbance areas will be restored to original grade and soil condition as soon as possible after the final construction activities. For the Project, this includes areas with six different types of weedy grasslands, and one shrub-steppe area dominated by sagebrush and weedy grasses. These areas will then be evaluated to determine whether re-seeding is required to return them to pre-construction vegetation conditions. If re-seeding is necessary, this will generally be initiated immediately after construction is completed in any part of the Project site. In some cases, final re-seeding may need to be delayed, depending on the season or on weather conditions, but it should always occur as soon as appropriate after construction. Temporary seeding may be appropriate in some cases if a long delay is expected between the end of construction at a site and final restoration.

The goal of grassland and shrub-steppe rangeland restoration and re-seeding is to return these areas to a vegetative cover and species assemblage that are consistent with (not identical to) typical pre-construction conditions, or better. Individual landowners will be contacted for approval before applying seed mixes to these areas. Restoration of non-cultivated areas will utilize seed mixes that incorporate both native and desirable non-native seed species. Preliminary seed mixes have been determined and are provided in Table 4; the final seed mixes used may change as a result of further consultations with the ODA and ODFW or at the request of individual landowners.

Perennial will implement revegetation measures according to the following general guidelines:

- Re-seed areas as soon as possible after final construction disturbance in each area.
- Re-seed during the appropriate season (usually winter/spring or fall) and as weather conditions allow.
- If final construction is not completed at a time that allows immediate re-seeding, the areas will be mulched or otherwise treated to minimize erosion until seeding can occur.
- All seed mixes, planting methods, noxious weed control treatments, topsoil conservation methods, and erosion control measures will only be implemented with the approval of the ODFW and the individual landowners and/or farmers.

4 MONITORING PROCEDURES

Perennial will conduct annual monitoring of restoration efforts in all Project areas. Perennial will provide biologists and/or inspectors qualified to conduct these evaluations. Restored cultivated lands will be monitored primarily by the landowner and/or farmer for production ability after Perennial has completed final construction restoration. Landowners may report any subsequent concerns to Perennial. In many cases, the restored croplands will be replanted during the next growing season. Perennial's monitoring teams will provide general descriptions of the conditions of cultivated agricultural areas during monitoring efforts; however, these will mainly be used to verify information provided by the landowner and/or farmer. Therefore, the sections below primarily address monitoring at non-cultivated areas. However, Perennial's monitors will note substantial restoration issues observed on cultivated lands during the course of monitoring in other Project areas. Although monitoring of some measures will be applicable to all project areas (e.g., erosion control and noxious weed control), monitoring of other measures will only apply to areas that are not developed or used for agricultural farming (e.g., topsoil segregation, re-seeding). Where possible, all annual monitoring efforts will be conducted in single site visits and by the same team.

The purpose of monitoring is to evaluate the effectiveness of long-term soil stability, noxious weed control, and vegetation condition within areas disturbed during construction and to identify appropriate remedial actions that will help Perennial attain successful restoration of disturbed areas.

4.1 Erosion Control, Topsoil Management, and Soil Stabilization Monitoring Procedures

Perennial will provide construction inspectors and/or environmental inspectors during all phases of construction to oversee and inspect the implementation and maintenance of erosion control, topsoil segregation, and soil stabilization measures. During the operations and maintenance phase of the Project, Perennial's biologists and/or inspectors will conduct annual monitoring to evaluate the success of these measures.

Monitoring for these soil preservation measures will be conducted in all Project areas, but will focus on:

- Areas particularly susceptible to erosion, such as those near Project drainages and waterbodies (see Table 2) and areas with slopes;
- Areas where topsoil segregation was conducted;
- The pipeline trench line (e.g., for subsidence); and
- Areas where temporary or permanent erosion control devices (techniques) are in place.

Table 2 Project Waterbodies

Project ID	Type	Name	Location (milepost)
SS-001-003	Canal/ditch	Westland A Canal	0.00
SS-001-002	Canal/ditch	Westland A Canal	1.29
SS-001-001	Canal/ditch	High Line Canal	2.03

Monitoring crews will describe the effectiveness of the measures and differentiate between normal levels of wear-and-tear (e.g., due to weather conditions) and implementation failures. Monitors should recommend remedial actions for Perennial to take when needed, such as maintaining or repairing previously implemented measures or implementing new measure, if appropriate. All reports and recommendations for maintenance or remedial action should be supported by detailed notes and photographic documentation, and be recorded using a global positioning system (GPS).

4.2 Noxious and Invasive Weed Control Monitoring Procedures

Prior to construction, Perennial's biologists will conduct surveys for designated noxious weeds. Perennial will provide construction inspectors and/or environmental inspectors during all phases of construction to oversee and inspect the implementation of noxious weed control measures and monitor weed populations as necessary. During the operations and maintenance phase of the Project, Perennial's biologists will conduct annual noxious weed monitoring.

Monitoring of noxious weed measures will be conducted in all areas disturbed by the Project, including both temporary and permanent disturbance areas, but will focus on:

- Areas where noxious weeds were identified during pre-construction surveys;
- Any sites used as noxious weed cleaning stations during construction; and
- High traffic areas, including areas used for parking and access during construction, the operations building site, ROW access points, and drive lanes during operations and maintenance.

Monitoring crews will describe the effectiveness of noxious weed control measures across the Project area and recommend remedial actions for Perennial to conduct as necessary. Crews will inspect noxious weed sites documented during pre-construction surveys to determine if they have reestablished and, if so, if they have spread. Locations of noxious weed observations are shown in Table 3 and Figure 1a through 1e.

All recommendations for remedial actions should be supported by detailed notes and photo-documentation and be recorded using GPS. The Project Biological Resources Survey Report (Exhibit P, Appendix P-1) provides more detail on the noxious weeds observed during surveys, including species, percent cover, and extent of population. The same types of data will be collected during monitoring efforts.

4.3 Revegetation Monitoring Procedures

Perennial will provide qualified biologists to conduct annual monitoring of re-seeded areas. Biologists will select representative sites in Project revegetation areas for analysis and compare the results to the vegetation in nearby areas not disturbed by construction. Analysis at each site will be conducted at a vegetation monitoring plot within the Project boundary and a reference site outside of the Project boundary. Perennial does not have access to lands beyond its 50-foot-wide permanent ROW easement or other Project boundaries; therefore, it is not possible to conduct detailed surveys of reference plots in areas outside of the Project boundary. Instead, biologists will visually assess vegetation conditions at the reference sites in adjacent areas without leaving the Project boundary. In addition to providing detailed documentation of revegetation efforts at the vegetation monitoring plot and reference sites, the investigators will provide an overview summary of revegetation efforts across all temporary disturbance areas. This latter effort will not require sampling and will instead be based on visual inspection of the ROW conditions.

The purpose of revegetation monitoring is to help Perennial ensure that vegetative cover and species assemblage in temporary disturbance areas is restored to levels that are of similar quality or better than the conditions at reference sites. Because most of the temporary disturbance areas were already heavily disturbed and supported a large proportion of non-native plants prior to construction, achieving purely native plant assemblages is not the goal of this effort. Rather, the goal will be to achieve an acceptable level of ground cover of all plants, as well as an acceptable assemblage of desirable plant species (such as those included in the seed mix). Restoration success criteria are further described in Section 4.4.

Revegetation Monitoring Plots

Vegetation monitoring plots will each be 10 feet in diameter and be located at representative areas in some of the larger temporary disturbance areas. Plots should be visited during the growing season. The types of data recorded for vegetation monitoring plots and reference sites will be identical and will include GPS documentation, photographic documentation, and analysis for vegetative cover and species composition. The same revegetation monitoring plots and reference sites will be analyzed from year to year, unless this is not appropriate due to fire damage, disturbance by the landowner, or other occurrence.

Locations of vegetation monitoring plots and nearby reference sites will be as follows:

- At least two plots (and reference sites) per mile will be established in the pipeline ROW (10 plots total);
- Two plots (and reference sites) will be established at the construction laydown and parking area;
- One plot (and reference site) will be established in the underground electrical ROW near the McNary Substation; and

- No plots will be placed in cultivated or developed lands, in Project permanent aboveground facilities, or it he remaining smaller temporary disturbance areas.

For the Project, temporary construction disturbance will occur in areas with the following habitat types: six different types of weedy grasslands and one shrub-steppe area dominated by sagebrush and weedy grasses. In addition, cultivated areas that were re-seeded will require at least a cursory inspection to verify information provided by the landowner and/or farmer. These areas are shown in Figures 2, 3a, and 3b and are discussed in more detail in the Project's 2013 Biological Survey Report (Exhibit P, Appendix P-1).

During revegetation monitoring, the investigator will collect the following information regarding conditions at the sites:

- Confirmation that all areas requiring revegetation have been seeded (part of the overview summary of restoration efforts for the entire ROW);
- Vegetation characteristics at revegetation monitoring plots and associated reference sites, including:
  - Plant species and percent cover of species (visual estimate)
  - Percentage of total vegetative cover (visual estimate)
  - Percentage of bare soil (visual estimate)
- Percent cover of native and introduced desirable plant species (included in seed mixes or by natural recruitment);
- Percent cover of noxious weed species (those listed as noxious under the ODA Noxious Weed Control Program, by Umatilla County, or other invasive species such as cheatgrass and Russian thistle), and density estimates by species if present;
- Presence of soil condition or erosion problems that are negatively influencing revegetation success and require remedial action; and
- For cultivated agricultural lands, the monitors will report crop presence or evidence of recent harvest.

4.4 Restoration Success Criteria

Erosion control, topsoil management, and soil stabilizing measures will be deemed successful if little to no loss of native soils is visible. If the levels of recent native soil loss appears to be similar that of nearby areas outside of the Project area, Perennial will consider this to be acceptable and meeting the criteria.

Noxious weed control measures will be deemed successful if the numbers, extents, and densities of noxious weed populations are similar to pre-construction conditions, and populations have not spread to areas outside of the Project boundary that were not previously infested.

Disturbed grasslands and shrub-steppe rangeland will be considered successfully restored if the habitat quality in these areas is similar to or better than that at the reference sites. Because most of these areas were already heavily disturbed and supported a large proportion of non-native plants (including high abundance of cheatgrass) prior to construction, it is not the goal of this effort to achieve the exact levels of ground cover and species assemblages that were present prior to disturbance. Rather, the goal will be to achieve habitat quality that is similar to, or better than, the habitat quality observed at the reference site.

Based on the revegetation criteria approved by ODOE and ODFW for recent energy projects in similar habitat (ODOE 2006, 2007), Perennial will use the following criteria to determine post-construction revegetation success:

- Perennial will aim for restored sites to be dominated by desirable species; and
- Perennial will aim to achieve at least a 30 percent total canopy cover for all species and a ground cover of at least 25 percent for desirable species, unless conditions at reference sites are lower than this. Vegetation percent cover goals may be adjusted to match the typical percent cover in surrounding undisturbed areas.

For the purposes of these revegetation efforts, “desirable species” indicates not only the native or beneficial non-native species included in the seed mix, but also those that may be recruited naturally. Reseeding or replanting efforts will occur, in consultation with the ODFW, in any area where monitoring identifies a restoration failure.

Actively cultivated agricultural croplands will be considered successfully restored if these areas achieve crop production comparable to adjacent agricultural areas that were not disturbed during construction. No annual plot surveys will be conducted on active agricultural croplands. Perennial shall coordinate with the landowners and/or farmers to determine when sites have been successfully restored.

4.5 Remedial Action and Maintenance

Following each of the annual monitoring surveys described above, Perennial will conduct remedial measures as needed to address remaining soil impacts and revegetation requirements not achieved through initial plantings.

Common remediation measures that monitoring crews may recommend include:

- Re-seed select areas where significant areas of bare soil remain after establishment of initial seeding;
- Control/treat noxious weed/invasive plant species by qualified personnel using appropriate methods for the target species (e.g., herbicides applied by licensed personnel);
- Repair temporary or permanent erosion control structures;

- Install additional temporary or permanent erosion control structures; and
- Decompact soils where problematic soil conditions are negatively influencing revegetation efforts.

If the monitors recommend remedial actions, these recommendations will be provided in the annual monitoring report submitted to Perennial. Perennial will make every attempt to implement the recommended remedial actions as soon as possible, considering the season, weather conditions, and other site-dependent constraints. In general, remedial actions should be conducted within 30 days of the problems being identified in the field, if appropriate. However, if actions are needed within a shorter time frame to prevent restoration failure, the monitoring crews will notify Perennial as soon as possible after documentation of problem area (via telephone or email). Perennial will document revegetation progress and remedial actions taken in its Restoration Monitoring Report to the ODFW and ODOE (see Section 5.4).

4.6 Monitoring Schedule

During the construction phase, monitoring of restoration efforts should be initiated immediately after measures are implemented, as appropriate. Typically, Perennial’s environmental inspectors will inspect soils and noxious weed measures (e.g., erosion control and noxious weed treatments) on a daily basis in areas of active construction, or on a weekly basis in other Project areas. In addition, all erosion control techniques and devices will be inspected within 24 hours of any large rain event (0.5 inch or greater). Monitoring for revegetation success will not begin in earnest until the first growing season after the construction phase has been completed.

Post-construction restoration monitoring efforts will be conducted according to the following general guidelines:

- Monitoring for all restoration measures will be conducted concurrently, when possible, and will begin in the first growing season (fall or spring) following the completion of construction and initial restoration and continue annually for up to five years.
- When it is determined that an area of the Project has been successfully restored at any point during years 1 to 5, by satisfying all success criteria, Perennial will request concurrence from ODOE and ODFW. If ODOE and ODFW concur, Perennial will conclude that it has no further obligation to perform revegetation activities in that area of the Project. Where this is the case, the monitoring effort may require fewer than five years.
- If after five years of monitoring (and remedial actions) some sites have not attained restoration success, Perennial will coordinate with ODOE and ODFW regarding appropriate steps forward. At this point Perennial may suggest additional restoration

techniques or strategies, or Perennial may request a waiver from further restoration obligations at these sites.

4.7 Reporting

Perennial will provide an annual Restoration Monitoring Report to ODOE and ODFW following each monitoring effort. Each annual report will provide a summary of field data collected during field visits and include an assessment of whether restoration efforts are meeting the success criteria. This reports will provide assessments of restoration efforts at each representative monitoring site (i.e., the vegetation monitoring plots), as well as of restoration efforts for the Project as a whole. This will include a description of the restoration status of cultivated lands. The reports will document remedial actions (e.g., seeding, noxious weed control, and repair of erosion control structures) taken to date, additional remedial actions planned for any areas that are not trending towards success, and the anticipated dates of completion of each of these actions.

When Perennial deems an area of the Project successfully restored by satisfying all success criteria, this will be stated in the annual revegetation report. If ODOE and ODFW concur, Perennial will conclude that it has no further obligation to perform revegetation activities in that area of the Project. Therefore, the monitoring effort for some areas of the Project may require fewer than five years. If after five years of monitoring (and remedial actions) some sites have not attained restoration success, Perennial's year 5 annual report will discuss potential steps forward for these sites. Perennial may then seek guidance from ODOE and ODFW for additional restoration techniques or request a waiver from further restoration obligations at these sites. If additional restoration is required, Perennial will continue to provide annual monitoring reports to ODOE and ODFW until efforts are halted.

5 AMENDMENT OF PLAN

Perennial anticipates completing the restoration and re-seeding guidelines provided in this plan; however, the methods and timing could be altered at the request of landowners, the ODFW, and ODOE. This Restoration Monitoring Plan may be amended by agreement of Perennial and ODOE. Amendments will be prepared in consultation with ODOE and ODFW and may be made without altering the site certificate.

Table 3 Noxious Weeds Observed at the Station Site and in the 50-foot-wide Pipeline Right-of-Way

ID	Species	Location (milepost)	Cover	Diameter
NW-003-008	Diffuse knapweed	0.23	6–25%	300+ feet
NW-003-009	Diffuse knapweed	0.23	<1%	100 feet
NW-003-007	Scotch thistle	0.24	<1%	150 feet
NW-003-006	Scotch thistle	0.32	<1%	150 feet
NW-003-003	Diffuse knapweed	0.5	<1%	100 feet
NW-003-004	Scotch thistle	0.5	<1%	100 feet
NW-003-005	Kochia	0.5	26–50%	50 feet
NW-003-012	Puncturevine	0.5	1–5%	300+ feet
NW-001-013	Cereal rye	0.59	<1%	300+ feet
NW-001-012	Cereal rye	1.28	<1%	300+ feet
NW-003-001	Diffuse knapweed	1.29	<1%	10 feet
NW-003-002	Kochia	1.29	<1%	single plant
NW-001-010	Cereal rye	1.35	<1%	300+ feet
NW-001-011	Scotch thistle	1.35	<1%	single plant
NW-001-009	Cereal rye	1.55	1–5%	300+ feet
NW-001-007	Scotch thistle	2.06	<1%	50 feet
NW-001-008	Cereal rye	2.06	<1%	50 feet
NW-001-006	Cereal Rye	2.32	26–50%	300+ feet
NW-001-005	Quackgrass	2.51	<1%	100 feet
NW-001-004	Quackgrass	2.93	<1%	300+ feet
NW-001-003	Quackgrass	3.05	<1%	300+ feet
NW-001-002	Quackgrass	3.34	<1%	300+ feet
NW-001-001	Scotch thistle	4.68	<1%	300+ feet
NW-001-014	Scotch thistle	Facility Site	<1%	300+ feet
NW-001-015	Scotch thistle	Facility Site	<1%	150 feet
NW-001-016	Scotch thistle	Facility Site	<1%	150 feet
NW-001-017	Cereal rye	Facility Site	<1%	150 feet
NW-003-010	Kochia	Facility Site	<1%	10 feet
NW-003-011	Diffuse knapweed	Facility Site	6–25%	300+ feet
NW-003-014	Diffuse knapweed	Interconnect	1–5%	50 feet

*Noxious weed populations were recorded during field survey in 2013. Conditions at time of construction are expected to differ slightly.

Table 4 Seed Mixes for Temporarily Disturbed Project Areas

Vegetation Type	Common Name	Scientific Name	PLS (pounds per acre[1],[2]	Description/ Purpose
Seed Mix 1: Agricultural (irrigated, dryland, and pastures)	Wheat or other crop seed, at the request of landowner.		At landowner request	(EC)
Seed Mix 2: Disturbed native grasslands	Secarbluebunch wheatgrass	*Pseudoregneriaspicata*	6	(N) (EC) (F)
	Sherman big bluegrass	*Poaampla*	1.5	(N) (F)
	Sandberg's bluegrass	*Poasecunda*	2.0	(N) (F)
	Small burnet	*Sanguisorba minor*	2.0	(I) (F)
	Great Basin wildrye*	*Elymuscinereus*	1.0	(N) (EC) (F)
	Needle and thread grass*	*Hesperostipacomata*	1.0	(N) (EC) (F)
	Western yarrow*	*Achilleamillefolium var. occidentalis*	1.0	(N) (F)
Seed Mix 3: Shrub-steppe	Secarbluebunch wheatgrass	*Pseudoregneriaspicata*	6	(N) (EC) (F)
	Sherman big bluegrass	*Poaampla*	1.5	(N) (F)
	Sandberg's bluegrass	*Poasecunda*	2.0	(N) (F)
	Ladak alfalfa	*Medicago sativa*	1.0	(I) (F)
	Small burnet	*Sanguisorba minor*	2.0	(I) (F)
	Great Basin wildrye*	*Elymuscinereus*	1.0	(N) (EC) (F)
	Needle and thread grass*	*Hesperostipacomata*	1.0	(N) (EC) (F)
	Western yarrow*	*Achilleamillefolium var. occidentalis*	1.0	(N) (F)
	Big sagebrush*	*Artemisia tridentata*	1.0	(N) (F)

Key:

(N) = Native, (I) = Introduced, (EC) = Erosion Control, (F) = Forage

* Optional species depending on site and availability

[1] PLS = pure live seed

[2] Final pounds/acre may change at the request of the landowners or the ODFW

6 REFERENCES

ODA (Oregon Department of Agriculture). 2013. Noxious Weed Policy and Classification System 2013. Oregon Department of Agriculture Noxious Weed Control Program. Salem, Oregon, 2013.

ODOE (Oregon Department of Energy). 2007. Biglow Canyon Wind Farm: Revegetation Plan. March 10, 2007. Available at: http://www.oregon.gov/energy/Siting/docs/BCW/BCW_final_order_063006.pdf

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Umatilla County Noxious Weed Control. 2012. Umatilla County 2011 Noxious Weed List. Pendleton, Oregon.

Existing Transmission Line
Underground Transmission Line
Step-up Substation

*The approximate extent of each observed population and its associated GPS points is mapped within Project ROWs

Source: ESRI 2010, E&E Field Data 2013

Noxious Weeds*
- Cereal Rye
- Quackgrass
- Scotch Thistle
- Diffuse Knapweed
- Kochia
- Puncturevine

- Cereal Rye Extent
- Quackgrass Extent
- Scotch Thistle Extent
- Kochia
- Diffuse Knapweed
- Puncturevine

N

0 500 1,000
Feet

Figure 1a

Noxious Weeds Observed in the Proposed Facility Site, Step-up Substation, and 50-foot-wide ROW

Perennial Wind Chaser Station

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Existing Transmission Line
New Overhead Transmission Line
Natural Gas Pipeline
Natural Gas Pipeline 50-foot Buffer
Station

Noxious Weeds*
Cereal Rye
Quackgrass
Scotch Thistle
Diffuse Knapweed
Kochia
Puncturevine

Cereal Rye Extent
Quackgrass Extent
Scotch Thistle Extent
Kochia
Diffuse Knapweed
Puncturevine

*The approximate extent of each observed population and its associated GPS points is mapped within Project ROWs

Source: ESRI 2010, E&E Field Data 2013

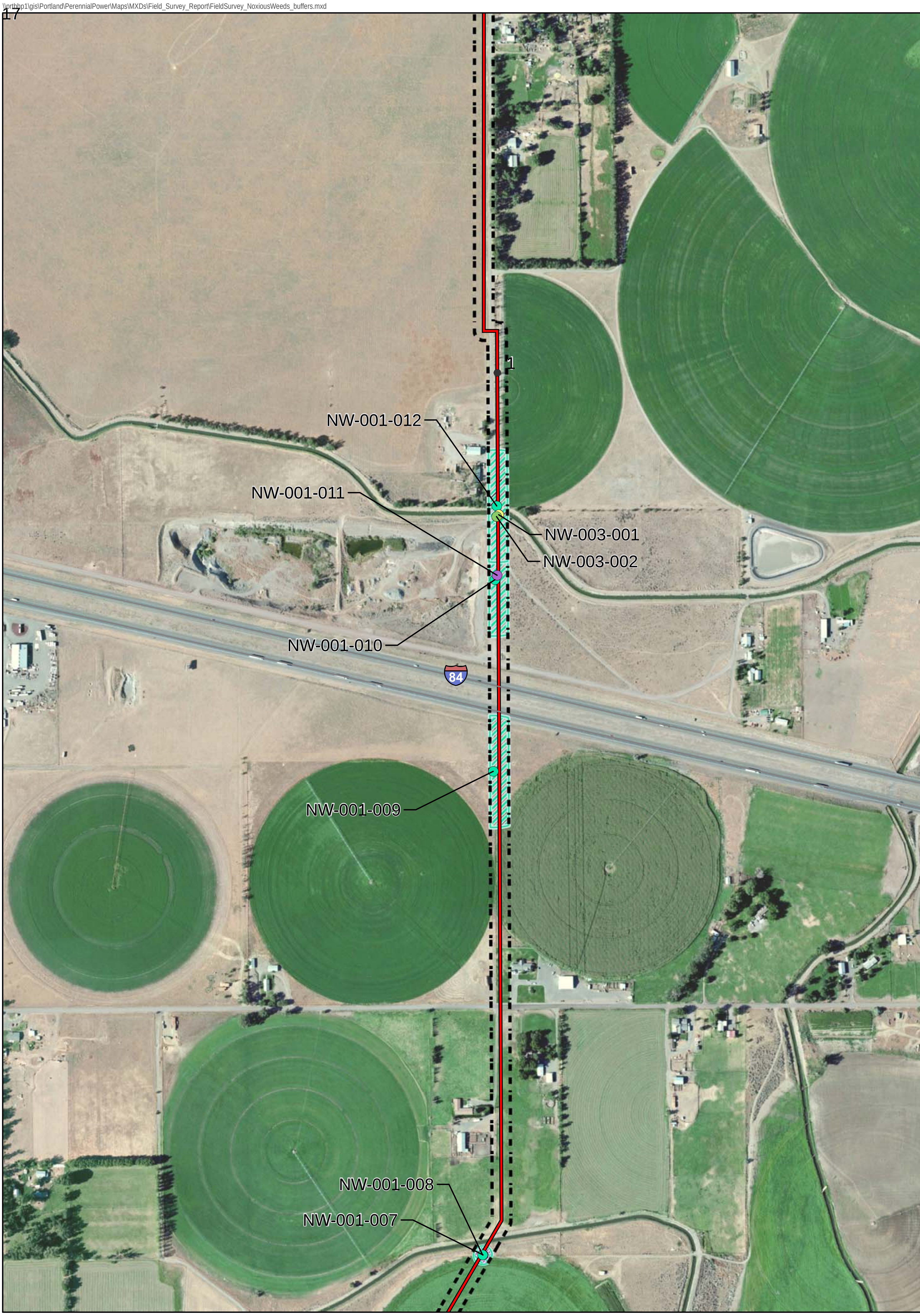
N

0 500 1,000
Feet

Figure 1b

Noxious Weeds Observed in the Proposed Facility Site and 50-foot-wide ROW

Perennial Wind Chaser Station



Natural Gas Pipeline
Natural Gas Pipeline 50-foot Buffer

Noxious Weeds*
- Cereal Rye
- Quackgrass
- Scotch Thistle
- Diffuse Knapweed
- Kochia
- Puncturevine

- Cereal Rye Extent
- Quackgrass Extent
- Scotch Thistle Extent
- Kochia
- Diffuse Knapweed
- Puncturevine

*The approximate extent of each observed population and its associated GPS points is mapped within Project ROWs

Source: ESRI 2010, E&E Field Data 2013

N

0 500 1,000
Feet

Figure 1c

Noxious Weeds Observed in the Proposed Facility Site and 50-foot-wide ROW

Perennial Wind Chaser Station

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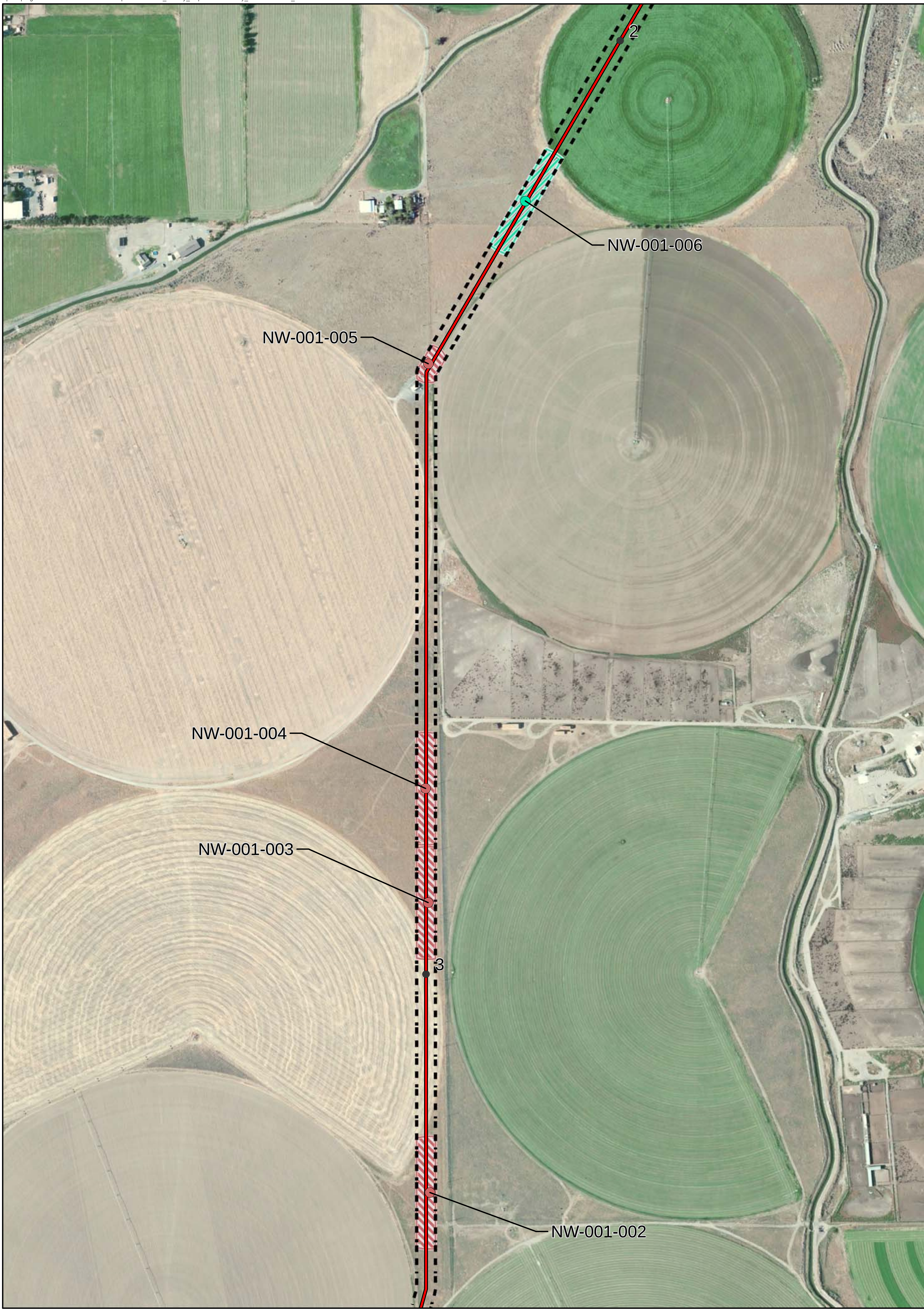


Natural Gas Pipeline

Natural Gas Pipeline 50-foot Buffer

Noxious Weeds*

- Cereal Rye
- Quackgrass
- Scotch Thistle
- Diffuse Knapweed
- Kochia
- Puncturevine

- Cereal Rye Extent
- Quackgrass Extent
- Scotch Thistle Extent
- Kochia
- Diffuse Knapweed
- Puncturevine

*The approximate extent of each observed population and its associated GPS points is mapped within Project ROWs

Source: ESRI 2010, E&E Field Data 2013

N

0 500 1,000

Feet

Figure 1d

Noxious Weeds Observed in the Proposed Facility Site and 50-foot-wide ROW

Perennial Wind Chaser Station

Natural Gas Pipeline

Natural Gas Pipeline 50-foot Buffer

Noxious Weeds*

- Cereal Rye
- Quackgrass
- Scotch Thistle
- Diffuse Knapweed
- Kochia
- Puncturevine

- Cereal Rye Extent
- Quackgrass Extent
- Scotch Thistle Extent
- Kochia
- Diffuse Knapweed
- Puncturevine

*The approximate extent of each observed population and its associated GPS points is mapped within Project ROWs

Source: ESRI 2010, E&E Field Data 2013

N

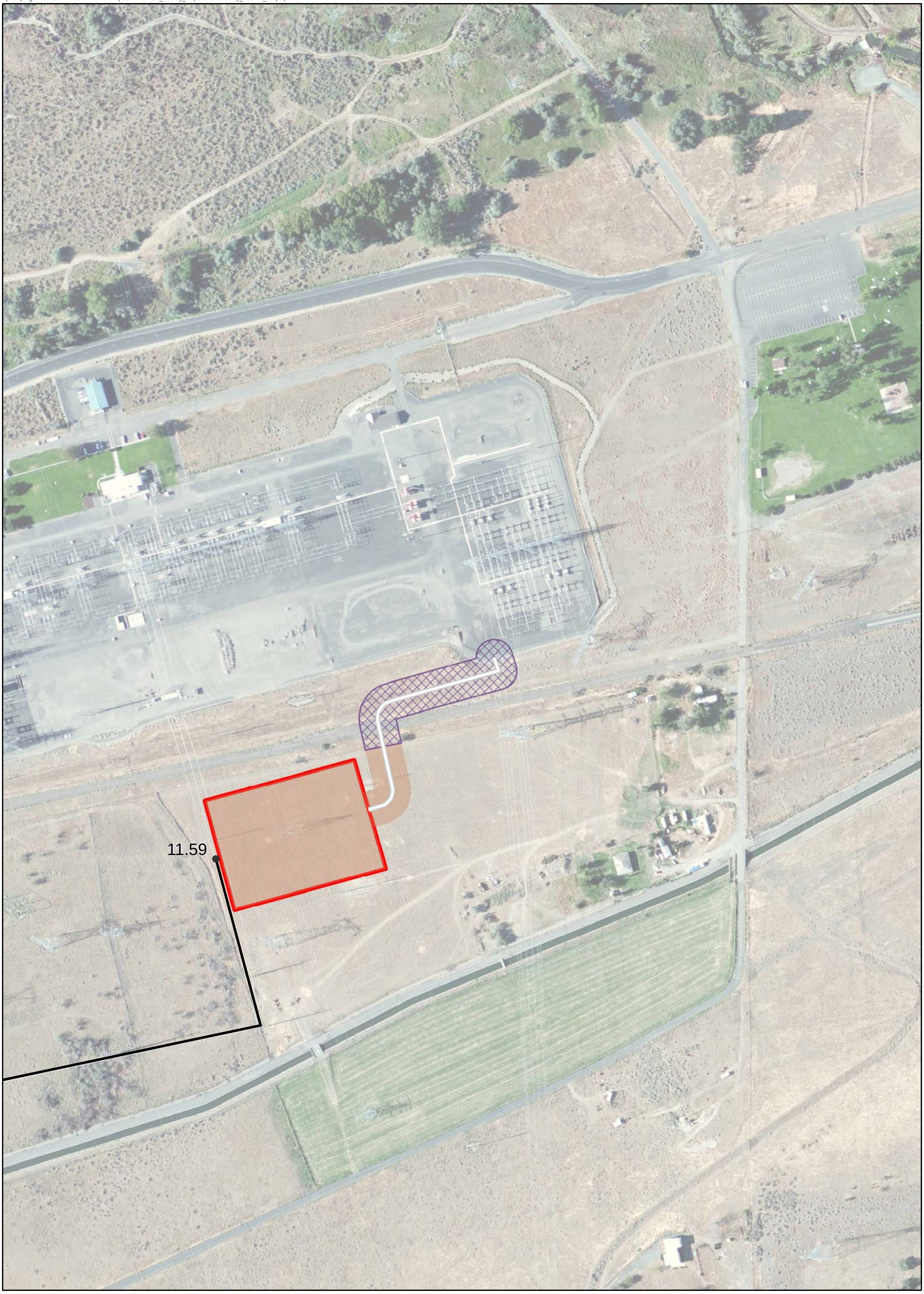
0 500 1,000

Feet

Figure 1e

Noxious Weeds Observed in the Proposed Facility Site and 50-foot-wide ROW

Perennial Wind Chaser Station



- Mileposts
- Existing Transmission Line
- Underground Transmission Line
- Step-up Substation

Field Data - Habitat

- Weedy Grassland #5
- Weedy Grassland #6

N

0 150 300

Feet

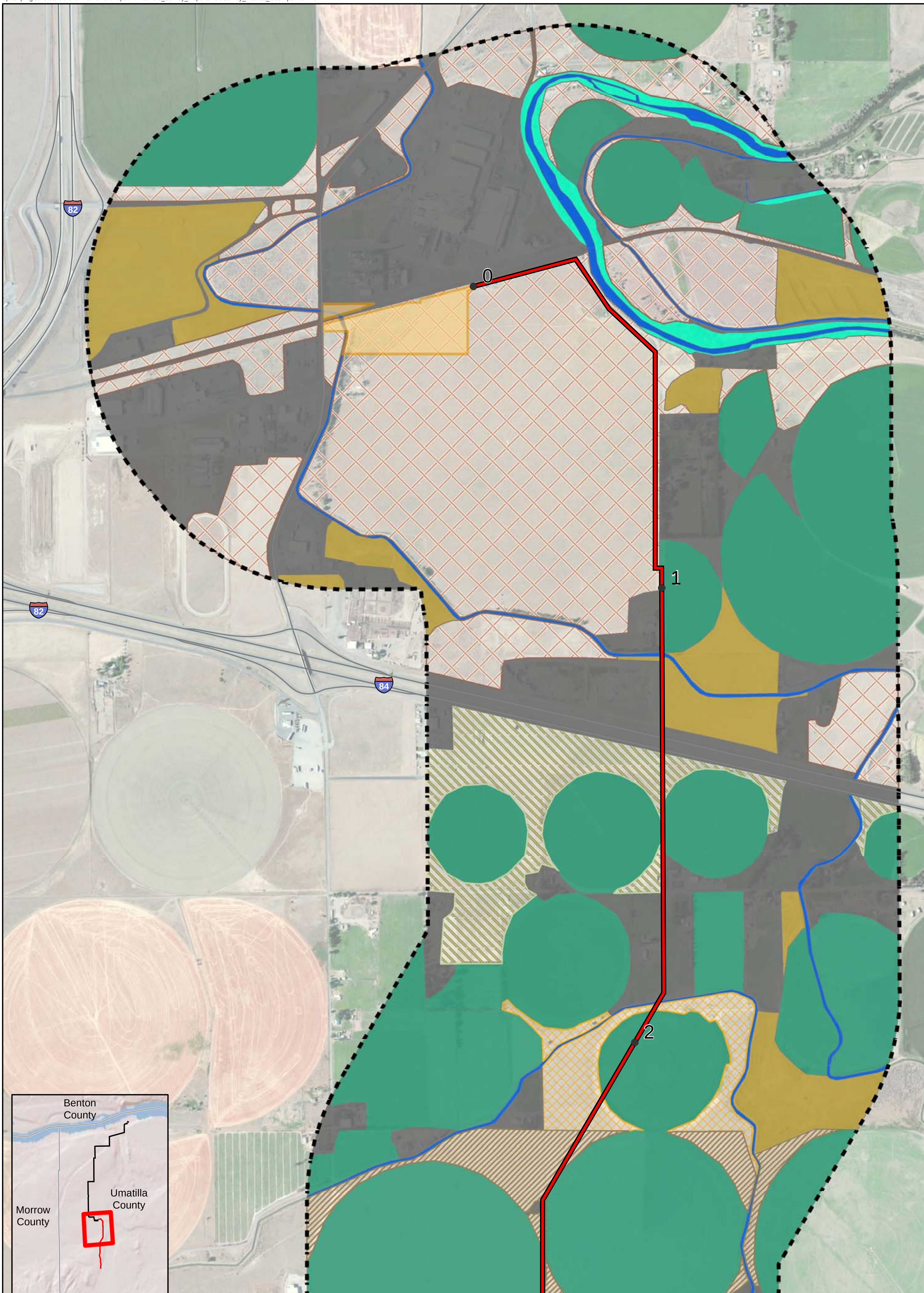
Figure 2

Field Mapped Habitats of the Proposed Step-up Substation and Its Associated Underground Transmission Line

Perennial Wind Chaser Station

Source: ESRI 2010, E&E Field Data 2013

\\prtbhp1\gis\Portland\PerennialPower\Maps\MXDs\Field_Survey_Report\FieldSurvey_Habitat_GasPipeline.mxd



- Mileposts
- Natural Gas Pipeline
- 0.5-mile Buffer
- Station

Field Data - Habitat
- Agriculture
- Developed
- Open Water
- Riparian
- Shrub Steppe
- Weedy Grassland #1
- Weedy Grassland #2
- Weedy Grassland #3
- Weedy Grassland #4

N

0 1,000 2,000

Feet

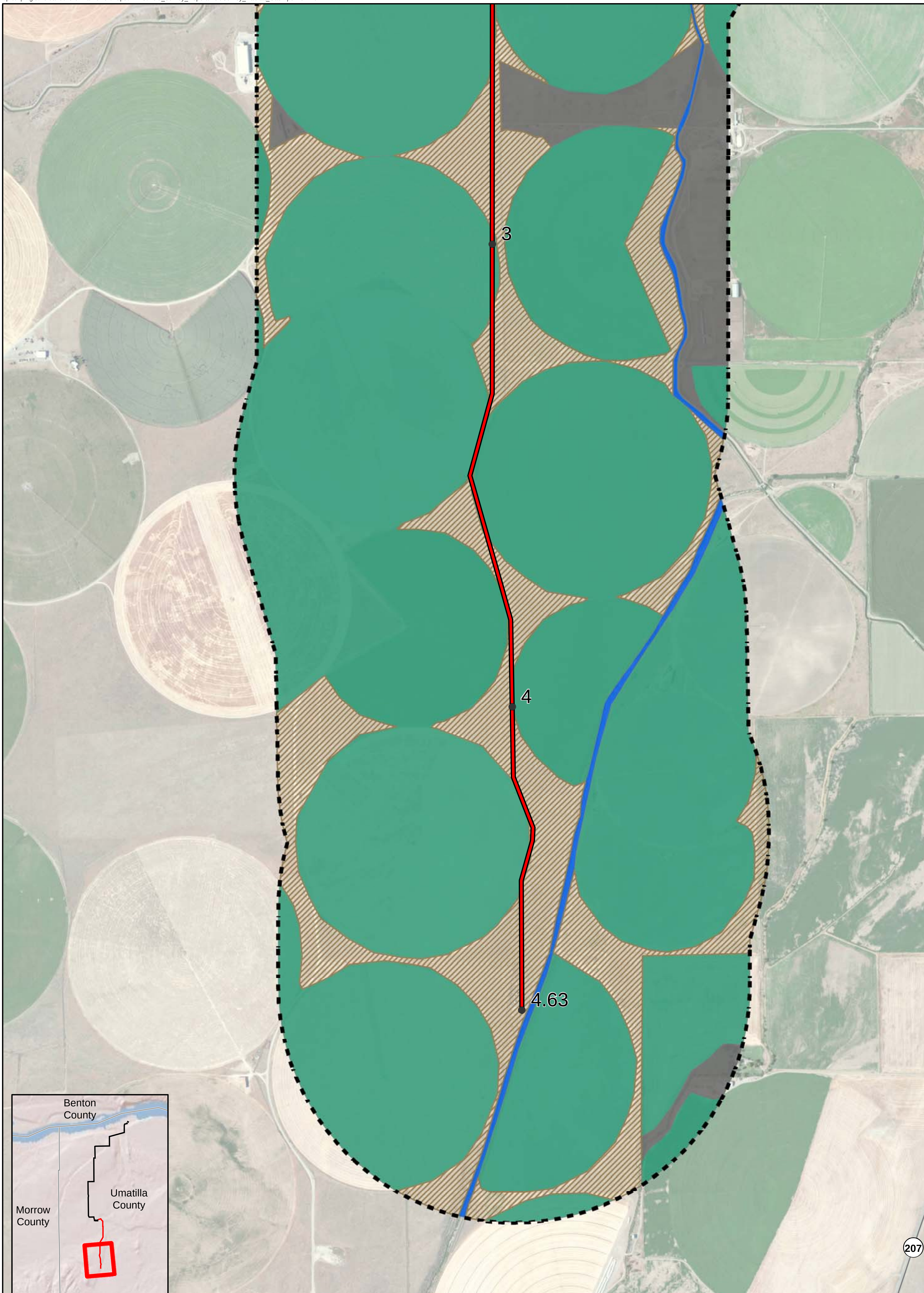
Source: ESRI 2010, E&E Field Data 2013

Figure 3a

Field Mapped Habitats within 0.5 Mile of the Proposed Facility Site and 50-foot-wide Pipeline ROW

Perennial Wind Chaser Station

\\prtbhp1\gis\Portland\PerennialPower\Maps\MXDs\Field_Survey_Report\FieldSurvey_Habitat_GasPipeline.mxd



- Mileposts
- Natural Gas Pipeline
- 0.5-mile Buffer
- Station

Field Data - Habitat
- Agriculture
- Developed
- Open Water
- Weedy Grassland #1

Figure 3b

Field Mapped Habitats within 0.5 Mile of the Proposed Facility Site and 50-foot-wide Pipeline ROW

N

0 1,000 2,000
Feet

Perennial Wind Chaser Station

Source: ESRI 2010, E&E Field Data 2013

APPENDIX P-4

Biological Monitoring Plan

Perennial Wind Chaser Station

Biological Monitoring Plan

October 2014

Prepared for:

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1 INTRODUCTION

This Biological Monitoring Plan outlines the goals, methods, and criteria that Perennial WindChaser LLC will use to evaluate and track the success of mitigation measures designed to avoid or minimize impacts on plants and wildlife and their habitats resulting from the Perennial Wind Chaser Station project (Project). These include, but are not limited to, the following types of measures: environmental training; general habitat and wildlife impacts reduction practices; pre-construction surveys for sensitive wildlife; and seasonal and spatial disturbance buffers for active migratory bird nests or other known special-status species locations.

This plan addresses monitoring procedures to be conducted during the construction phase of the Project. Habitat restoration measures will be monitored by Perennial's post-construction monitoring crews, as described in the Project Restoration Monitoring Plan (Exhibit P, Appendix P3).

The goals of the biological mitigation measures and monitoring procedures are to:

1. Avoid or minimize impacts on habitat and native wildlife in general as a result of construction and operation of the Project; and
2. Avoid impacts on special-status plant and wildlife species that may result from construction and operation of the Project.

This plan summarizes the biological mitigation measures that will be implemented during and after construction of the Project. These measures are discussed in more detail in Exhibit P, Fish and Wildlife Habitat and Exhibit Q, Threatened and Endangered Species. The monitoring procedures described in this plan supersede any monitoring procedures discussed in these other documents. This plan has been reviewed and approved by the United States Fish and Wildlife Service (USFWS), the Oregon Department of Energy (ODOE), and the Oregon Department of Fish and Wildlife (ODFW).

2 SITE DESCRIPTION AND NATURE OF IMPACTS

The Project will be located on private lands in Umatilla County, Oregon. The Project's Energy Facility Site is located in an agricultural field that is surrounded on three sides by roads, railroads, industrial property (Hermiston Generating Plant and Lamb-Weston agricultural processing plant), light industrial property (FedEx package distribution facility), and a large cattle stock yard. A natural gas pipeline is to be constructed within an existing 50-foot right-of-way, also primarily on agricultural land, that extends south for 4.63 miles. An existing transmission line will be upgraded (reconductored) to accommodate the Project (requiring only two new poles at the north boundary of the Station), and a new step-up substation will be constructed on agricultural land adjacent to the Bonneville Power Administration's existing McNary Substation.

The Project is expected to impact 60.15 acres total: 23.48 acres at permanent aboveground facilities and 36.67 acres at temporary impacts areas. These impacts include 2.03 acres of temporary disturbance in shrub-steppe habitat, 22.36 acres of temporary impacts on weedy grasslands, and 22.03 acres of permanent impacts on weeds grasslands.

In most cases, the intensity of construction impacts on vegetation and habitat in temporary disturbance areas will be low and will be limited to the flattening of vegetation by rubber-tired vehicles. In some instances, the intensity of impacts in temporary disturbance areas will be higher and will require the removal of topsoil and vegetation for grading, excavation, or drilling activities. Most of the shrub-steppe and grassland habitats present in the Project area were heavily disturbed prior to construction and supported a large proportion of non-native plants (including a high abundance of cheatgrass).

3 SUMMARY OF RESTORATION MEASURES

The following sections summarize the measures to be implemented during construction of the Project that may be relevant to monitoring procedures. These sections are intended for use as a reference by field monitoring personnel.

3.1 General Fish and Wildlife Habitat Measures

The goal of the general fish and wildlife habitat measures is to avoid or minimize impacts on plants and wildlife and their habitats.

The following measures will be implemented by Perennial to avoid and/or minimize impacts on fish, wildlife, and their habitats:

- All Project personnel will attend an environmental training session prior to entering the Project right-of-way. The training will cover topics related to the Project's environmental compliance, including, but not limited to, approved Project boundaries and access roads; sensitive wetland and waterbody resources; special-status plant and wildlife species; basic avoidance and minimization measures that Perennial will implement for the Project; the role of onsite biologist or monitors; the notification process to be followed if workers identify new sensitive resources; the major environmental laws and regulations that apply to the Project; and the penalty for not complying with laws or regulations.
- The Project will be designed, constructed, maintained, and operated following current Avian Power Line Interaction Committee guidelines to minimize risk of avian mortality.

- Any herbicides used during construction and operations and maintenance will be applied according to label instructions and any federal, state, and local regulations.
- Perennial will restrict vehicular travel to the right-of-way and other established areas within the construction, access, or maintenance easement(s).
- Roads not otherwise needed for maintenance and operations will be restored to pre-construction conditions, to the extent practicable.
- Every construction crew will carry appropriate emergency spill response equipment. If a spill occurs, the crew will temporarily halt work to contain and clean up the material and eliminate the source of the spill before resuming work.
- Perennial will restrict the refueling and maintenance of vehicles and the storage of fuels and hazardous chemicals within at least 100 feet of wetlands, surface waterbodies, and groundwater wells, or as otherwise required by federal, state, or local regulations.
- Perennial will conduct construction and scheduled maintenance activities during daylight hours, to the extent practicable.
- Perennial will impose speed limits during construction for access roads to reduce dust emissions, maintain safety, and protect wildlife.
- Perennial will restore all temporary construction-related areas to pre-construction conditions or better after work has been completed.
- Perennial will minimize compaction of soils and rutting through appropriate use of construction equipment (e.g., low ground-pressure equipment and temporary equipment mats).
- Perennial will minimize the amount of time that any excavations remain open.
- Perennial will identify, control, and minimize the spread of non-native invasive species and noxious weeds, to the extent practicable.
- Perennial will clearly demarcate boundaries of environmentally sensitive areas during construction to increase visibility to construction crews.
- Nesting raptors: If construction-related activities occur during the raptor breeding season (February 1 through August 31), pre-construction surveys will be conducted within 0.5 miles of all proposed Project features for ferruginous hawk (*Buteo regalis*) nests, and within 0.25 miles for all other raptor species nests, including burrowing owl (*Athene cunicularia*) burrows. If active nests are located, construction-related activities would be restricted within 0.5 miles of ferruginous hawk nests and 0.25 miles of all other raptor nests until the nests have failed or chicks have fledged. A biologist will monitor the status of the active nests daily during nearby active construction and document potential adverse interactions with the Project. Spatial restrictions around active raptor nests may be reduced through consultation with ODFW and the USFWS when considering factors

such as the visibility of the Project from the nest, topography, existing human disturbances, and the presence of nest monitors.

- Nesting migratory bird species (non-raptor): If construction-related activities occur during the migratory bird breeding season (March 15 through August 15) for Lewis's woodpecker (*Melanerpes lewis*), willow flycatcher (*Empidonax traillii adastus*), yellow-breasted chat (*Icteria virens*), tricolored blackbird (*Agelaius tricolor*), and other bird species, pre-construction surveys will be conducted within 20 feet of all proposed Project features for nests of all native, non-raptor species. Given the diversity of species potentially occurring in the vicinity of the Project, their varying nest initiation dates, and the possibility of multiple clutches by some species, pre-construction nest surveys for non-raptors will be valid for two weeks. If active nests are located, the Project will consult ODFW and USFWS to determine appropriate measures to take, which may include limiting construction-related activities within 20 feet of the nests until the nests have failed or chicks have fledged, and/or continuing proposed activities with the presence of a biological monitor. A biologist will monitor the status of active nests daily during nearby active construction and document potential adverse interactions with the Project.
- If the roost of a California myotis (*Myotis californicus*), an Oregon sensitive species, is observed incidentally during other biological surveys of the right-of-way, Perennial will consult ODFW to determine what, if any, appropriate measures to take. Potential measures include implementing a spatial disturbance buffer and/or continuing proposed activities with the presence of a biological monitor.
- If construction occurs during important time periods (e.g., breeding, migration, etc.) or at close distances to environmentally sensitive areas, Perennial will consult with the USFWS, ODFW, and Oregon Department of Agriculture (ODA) for guidance on seasonal and/or spatial restrictions designed to avoid and/or minimize adverse effects.
- Perennial will establish streamside management zones within 50 feet of both sides of intermittent and perennial streams and along margins of bodies of open water where removal of low-lying vegetation is minimized.
- Perennial will selectively apply herbicides, if used, within streamside management zones.

3.2 Threatened and Endangered Species Measures

The following measures will be implemented by Perennial to avoid and/or minimize impacts on federal and state threatened and endangered species:

- Fish: To avoid or minimize impacts on steelhead (Middle Columbia River, [*Onchorhynchus mykiss*]), bull trout (*Salvelinus confluentus*), margined sculpin (*Cottus marginatus*), Pacific lamprey (*Lampetra tridentata*), and other fish species, Perennial will establish streamside management zones within 50 feet of both sides of intermittent and perennial streams where removal of low-lying vegetation is minimized. The pipeline right-of-way crosses three irrigation canals, but no streams or rivers; however, it does come close to the Umatilla River.

- Northern sagebrush lizard (*Sceloporus graciosus graciosus*): Perennial will survey for northern sagebrush lizard in areas of sagebrush and other shrubby habitat that will be impacted by ground disturbance. If northern sagebrush lizards are discovered, Perennial will consult with the USFWS, ODFW, and ODA for guidance on seasonal and/or spatial restrictions designed to avoid or minimize adverse effects.
- Bats: For small-footed myotis (*Myotis ciliolabrum*), long-eared myotis (*Myotis evotis*), long-legged myotis (*Myotis volans*), Yuma myotis (*Myotis yumanensis*), and pallid bat (*Antrozous pallidus*), Perennial will examine any structures (cliffs, caves, mines, fissures, under boulders, buildings, under bridges, and trees) within the construction corridor that could potentially be roost sites. If any bat roosts are discovered, Perennial will consult with the USFWS, ODFW, and ODA for guidance on seasonal and/or spatial restrictions designed to avoid or minimize adverse effects.
- Washington ground squirrel (*Urocitellus washingtoni*): Pre-construction surveys will be conducted prior to any ground disturbance in areas with suitable habitat. If any Project components that require ground disturbance are located within 1,000 feet of potential Washington ground squirrel habitat (excluding tilled agricultural lands or developed areas), Perennial's biologists will conduct transect surveys to determine if squirrels are present, as land access allows. These surveys will follow the protocols coordinated with the ODFW and detailed in the 2013 Biological Resources Survey Report (Exhibit P, Appendix P-1). If Washington ground squirrels are found within the 1,000-foot buffer, ODFW and USFWS will be consulted to determine the best mitigation measures to avoid or reduce adverse impacts. Potential measures include prohibiting or restricting construction-related activities within an appropriate buffer, or continuing proposed activities with the presence of a biological monitor.
- Robinson's onion (*Allium robinsonii*) and Laurence's milkvetch (*Astragalus collinus var. laurentii*): Pre-construction surveys will be conducted for Robinson's onion and Laurence's milkvetch prior to any ground disturbance in areas with suitable habitat. If any individuals of these plants are discovered, Perennial will consult with the USFWS, ODFW, and ODA for guidance on spatial restrictions designed to avoid or minimize adverse effects.

4 MONITORING PROCEDURES

Perennial will monitor the implementation and effectiveness of biological mitigation measures during construction. Potential impacts on biological resources as a result of constructing the Project are expected to be temporary and short term after implementation of the measures summarized above and should dissipate soon after completion of construction as sites are restored and revegetated. Therefore, these measures will be monitored during the construction phase of the Project.

Perennial's onsite environmental inspectors will oversee the implementation of, and inspect, the general fish and wildlife mitigation measures listed above that do not involve plant or wildlife surveys or onsite construction monitoring. In general, impacts avoidance measures and techniques, such as erosion control measures, demarcation of sensitive areas, will be inspected on a daily basis in areas of active construction. In Project areas where construction is not actively occurring, these inspections will take place at least once per week.

Perennial will provide qualified biologists to conduct pre-construction surveys for special-status species in areas where suitable habitat is present. Threatened and endangered species that may require pre-construction surveys include Washington ground squirrel and Laurence's milkvetch. Pre-construction surveys will also include searches for nesting raptors and other migratory bird species. If active nests are observed, Perennial will coordinate with the USFWS and ODFW to determine what seasonal and spatial disturbance buffers are needed. If agency-required nest disturbance buffers intersect the Project area, biological monitors will monitor the nests until eggs have hatched and chicks have fledged and left the nest area. In some cases, the USFWS and ODFW may approve working within a typical disturbance buffer for an active nest, provided that a biological monitor remains onsite throughout construction in that area to monitor for altered behavior of the nesting bird. The environmental inspectors and biological monitors will coordinate on a daily basis, or as needed, to ensure compliance with all Project environmental conditions and regulatory requirements pertaining to sensitive plants and wildlife, and their habitats.

Post-construction studies by Perennial's restoration monitoring crews will assess the success of habitat restoration efforts. Therefore, this Biological Monitoring Plan does not address monitoring beyond the construction phase of the Project.

4.1 Remedial Action and Maintenance

Following the inspection or monitoring of biological measures, as described above, Perennial's environmental inspectors or biological monitors may suggest and implement corrective actions. Common corrective measures may include, but are not limited to, additional environmental training of Project personnel, adjustment of nest buffers at approval of agencies, further reduction of speed limits in specific Project areas, addition of biological monitors to specific crews or Project areas, and installation of additional signage.

If the monitors or environmental inspectors recommend remedial actions, these recommendations will be provided in the daily report to Perennial. Perennial will make every attempt to implement the recommended remedial actions as soon as possible, considering the season, weather conditions, and other site-dependent constraints. In general, remedial actions for plant and wildlife impacts avoidance should be implemented within 24 hours, if not immediately by the inspector or monitor. Perennial will document the implementation and monitoring of biological measures.

4.2 Monitoring Schedule

Monitoring and inspection of biological mitigation measures will begin prior to construction when pre-construction surveys are conducted and will continue through completion of construction. In general, impacts avoidance measures and techniques, such as erosion control measures, demarcation of sensitive areas, will be inspected on a daily basis in areas of active construction. In Project areas where construction is not actively occurring, these inspections will occur at least once per week. When biological resources (e.g., active migratory bird nests) require onsite monitoring, this will typically occur on a daily basis, or as appropriate.

4.3 Reporting

Perennial will provide monthly status reports during construction to ODOE, USFWS, and ODFW that report any adverse interactions between Project construction and sensitive plants and wildlife. Within two months of completion of the construction phase of the Project, Perennial will submit a final Project report to ODOE, USFWS, and ODFW that summarizes all plant and wildlife impacts, habitat impacts, mitigation measures implemented, and the results of inspection and monitoring during construction, including any corrective actions that were implemented.

5 AMENDMENT OF PLAN

Perennial anticipates completing the procedures provided in this plan; however, the methods and timing could be altered at the request of USFW and ODFW. This Biological Monitoring Plan may be amended by agreement of Perennial and ODOE. Amendments will be prepared in consultation with USFWS and ODFW and may be made without altering the site certificate.

EXHIBIT Q

THREATENED AND ENDANGERED SPECIES

OAR 345-021-0010(q) and OAR 345-022-0070

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TABLES

FIGURES

Q.1 INTRODUCTION

The Oregon Energy Facility Siting Council's (Council's) standards for the issuance of energy facility site certificates include protection and conservation guidelines for threatened and endangered species (Oregon Administrative Rules [OAR] 345-022-0070). For species listed as threatened or endangered by the Oregon Fish and Wildlife Commission under Oregon Revised Statutes (ORS) 496.172(2), impacts from design, construction, and operation of a proposed facility are assessed by the Council with appropriate input from state agencies.

This exhibit describes state- and federally listed threatened and endangered wildlife and plant species that have been identified in field surveys and desktop analysis as potentially occurring in the Perennial Wind Chaser Station project (Project) Site (Site). To issue a site certificate, the Council must find that the Project's design, construction, and operation, taking into account mitigation, are not likely to cause a significant reduction in the likelihood of survival or recovery of plant and wildlife species listed as threatened or endangered by the Oregon Department of Agriculture (ODA) or Oregon Fish and Wildlife Commission, respectively (ODOE 2012). Project plans must be consistent with any protection and conservation programs that the ODA has adopted under ORS 564.105(3). The Council's standards require that species federally listed as threatened, endangered, candidate, or species of concern also be addressed in this exhibit.

According to the Amended Project Order issued by ODOE on September 30, 2013, the "Analysis Area" for Project-related impacts on threatened and endangered species includes the area within the Site Boundary and 5 miles from the Site Boundary. Congruent with OAR 345-001-0010(55), the Site Boundary for the Project includes "the perimeter of the site of a proposed energy facility, its related or supporting facilities, all temporary laydown and staging areas and all corridors and micro-siting corridors proposed by the applicant" (OAR 345-001-0010(55)).

Based on data received from the Oregon Biodiversity Information Center (ORBIC) (ORBIC 2012, shown in Figures Q-1a–Q-1e) and consultations with the United States Fish and Wildlife Service (USFWS; Meyer 2013) and Oregon Department of Fish and Wildlife (ODFW; Kirsch 2014), one federally listed candidate wildlife species has the potential to exist within or near the Analysis Area: the Washington ground squirrel (*Urocitellus washingtoni*) (Table Q-1). This species is also state-listed as endangered.

The following sections provide responses to information requested in OAR 345-021-0010(1)(q) and OAR 345-022-0070. They present species characteristics, potential for occurrence within the Analysis Area, potential impacts from the Project, and proposed mitigation measures. Additional information on habitat for these species is provided in Exhibit P – Fish and Wildlife Habitat.

Q.2 IDENTIFICATION OF THREATENED AND ENDANGERED SPECIES POTENTIALLY OCCURING IN THE ANALYSIS AREA

OAR 345-021-0010(q)(A) *Based on appropriate literature and field study, identification of all threatened or endangered species listed under ORS 496.172(2), ORS 564.105(2) or 16 USC § 1533 that may be affected by the proposed facility.*

Response: Both desktop studies and field surveys were performed by Ecology and Environment, Inc. (E & E). Literature review and queries of available databases were conducted to identify species potentially occurring in the Analysis Area that are listed by the National Oceanic and Atmospheric Administration (NOAA) and USFWS as threatened, endangered, candidate, and species of concern, as well as species listed by the ODFW as threatened and endangered. Potential presence was determined using species' range, habitat requirements, and occurrence data in the Analysis Area. The following resources were used to identify these species:

- *Atlas of Oregon Wildlife* (Csuti et al. 1997);
- Birds of North America (Poole 2005);
- eBird (2013);
- *Oregon Birds* (Marshall et al. 2006);
- NatureServe (2013);
- Oregon Wildlife Explorer (OSU 2013);
- ORBIC (2012);
- United States Department of Agriculture Plants Database (USDA 2013); and
- Oregon Department of Agriculture Plant Program, Plant Conservation (ODA 2013).

The species identified in desktop analyses were verified during baseline field surveys conducted on May 9, and August 1, 2013 (refer to Exhibit P – Fish and Wildlife Habitat), and through consultation with the ODFW (Kirsch 2013). The surveys conducted by two biologists included ground surveys for raptor nests, Washington ground squirrels, special status plants and wildlife, wetlands and streams, and general wildlife occurrence and habitat within the area designated for the Station site (referred to herein as the "Station site"), 50-foot-wide gas pipeline right-of-way (ROW), and step-up substation and its associated underground transmission line ROW. The areas within the Station site boundary, referred to herein as the Energy Facility Site, and step-up substation site were surveyed on foot. The survey biologists drove along the existing transmission line ROW to verify the Oregon National Gap Analysis Program data. Table Q-1 lists species with the potential to occur in the Analysis Area.

E & E developed Washington ground squirrel survey protocols in consultation with the ODFW (Kirsch 2013) that were adapted from those set forth in the Boardman to Hemingway transmission line project. The surveys were designed to record all burrow structures characteristic of Washington ground squirrels, as well as fresh scat, visual sighting of squirrels, and auditory calls. Survey biologists examined habitat within 1,000 feet of all areas within the Energy Facility Site subject to potential ground disturbance where suitable habitat or historic records of burrows exist. 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, and the entire length of the 50-foot-wide proposed gas pipeline ROW. The proposed re-conductoring of the transmission line is not expected to result in any ground disturbance, and ODOE has indicated that surveys are not necessary for areas where re-conductoring will occur. E & E limited survey efforts along the existing transmission line to simple verification of mapped habitat types gleaned from desktop analyses (see Exhibit P – Fish and Wildlife Habitat, Appendix P-1: 2013 Biological Resources Survey Report, Section 2.0 Survey Methods).

Table Q-1 Threatened and Endangered Species Potentially Present in the Analysis Area

Common Name	Latin Name	Federal Status[1]	State Status[2]	Likelihood of Occurrence[3]
Fish				
Steelhead (Middle Columbia River)	*Onchorhynchus mykiss*	Threatened	Sensitive	Likely
Bull trout	*Salvelinus confluentus*	Threatened	Sensitive	Possible
Margined sculpin	*Cottus marginatus*	Species of Concern	None	Possible
Pacific lamprey	*Lampetra tridentata*	Species of Concern	Sensitive	Likely
Reptiles				
Northern sagebrush lizard	*Sceloporus graciosus graciosus*	Species of Concern	Sensitive	Possible
Birds				
Ferruginous Hawk	*Buteo regalis*	Species of Concern	Sensitive	Possible
Burrowing Owl	*Athene cunicularia*	Species of Concern	Sensitive	Likely
Lewis's Woodpecker	*Melanerpes lewis*	Species of Concern	Sensitive	Possible
Willow Flycatcher	*Empidonax traillii adastus*	Species of Concern	Sensitive	Possible
Yellow-breasted Chat	*Icteria virens*	Species of Concern	None	Possible
Tricolored Blackbird	*Agelaius tricolor*	Species of Concern	None	Possible
Mammals				
Small-footed myotis	*Myotis ciliolabrum*	Species of Concern	None	Possible
Long-eared myotis	*Myotis evotis*	Species of Concern	None	Possible
Long-legged myotis	*Myotis volans*	Species of Concern	Sensitive	Possible
Yuma myotis	*Myotis yumanensis*	Species of Concern	None	Possible
Pallid bat	*Antrozous pallidus*	Species of Concern	Sensitive	Possible
Washington ground squirrel	*Urocitellus washingtoni*	Candidate	Endangered	Possible
Plants				
Robinson’s onion	*Allium robinsonii*	Species of Concern	None	Possible
Laurence’s milkvetch	*Astragalus collinus var. laurentii*	Species of Concern	Threatened	Possible

Notes:
[1]The “Federal Status” column identifies each species’ designation by the USFWS or NOAA
[2]The “State Status” column identifies each species’ designation by ODFW or ODA. Species listed as “Sensitive” under “State Status” are discussed in Exhibit P and identified in Table P-1.
[3]“Likelihood of Occurrence” was determined based on available suitable habitat and documented observations in the analysis area.

“Likelihood of Occurrence” category definitions:
Possible – Analysis area lies within the species’ range, but for whom only limited suitable habitat is available and/or no occurrence data exist.
Likely – Analysis area lies within the species’ range, suitable habitat is available, and/or occurrence data exist.
Observed – Species observed during Project field surveys.

Q.3 EXISTING CONDITIONS AND POTENTIAL IMPACTS ON THREATENED AND ENDANGERED SPECIES POTENTIALLY OCCURING IN THE ANALYSIS AREA

OAR 345-021-0010(1)(q)(B) *For each species identified under 345-021-0010(1)(q)(A), a description of the nature, extent, locations and timing of its occurrence in the analysis area and how the facility might adversely affect it.*

Response: The following species accounts describe the life histories and occurrence of the species identified in Table Q-1 relative to the Project's Analysis Area. They also address potential adverse impacts on the species that may result from the construction and operation of the Project.

Steelhead

The summer run of steelhead of the Middle Columbia River Evolutionarily Significant Unit (ESU) is likely to occur within the Analysis Area. This population of steelhead occurs in the Columbia River Basin and tributaries from Hood River in Oregon and above the Wind River in Washington to, and including, the Yakima River in Washington, but not including the Snake River Basin (NatureServe 2013). All steelhead in the Columbia River Basin upstream from the Dalles Dam are inland summer-run steelhead. Steelhead juveniles stay in freshwater for one to four years before migrating to the ocean, returning to spawn at around four to five years old. The Columbia River and Umatilla River are habitat for steelhead. The Project is not anticipated to result in adverse impacts on this species, as it would not impact the Umatilla River or the Columbia River through any in-stream construction. Any crossings would be spanning the existing transmission line ROW across the waterbodies and thus not directly impacting the aquatic habitat.

Bull trout

Bull trout have more specific habitat requirements compared to other salmonids (USFWS 2013a). Bull trout can be either stream-resident and non-migratory, or migratory in cases when juvenile fish spend one to four years in their natal tributaries before migrating to a large river or lake, where they rear before returning to the tributary stream to spawn (Hemmingsen et al. 2002; NatureServe 2013; USFWS 2013a). The Columbia River and Umatilla River in the Analysis Area provide potential habitat for bull trout. The Project is not anticipated to result in adverse impacts on this species, as it would not impact the Umatilla River or the Columbia River through any in-stream construction. Any crossings would be spanning the existing transmission line ROW across the waterbodies and thus not directly impacting the aquatic habitat.

Margined sculpin

Margined sculpin is a small freshwater fish that lives on the bottom of stream pools and in rubble and gravel riffles (Mongillo and Hallock 1998; NatureServe 2013). This species is found in the Blue Mountains of Oregon and Washington (Mongillo and Hallock 1998). Sculpin species are known to feed on benthic invertebrates, fish eggs, and small fish. The Umatilla River in the Analysis Area provides potential habitat for margined sculpin. The main threats to the continued existence of this species are grazing, agricultural chemical use, logging, and shoreline development. The Project is not anticipated to result in adverse impacts on this species, as it would not impact the Umatilla River or the Columbia River through any in-stream construction. Any crossings would be spanning the existing transmission line ROW across the waterbodies and thus not directly impacting the aquatic habitat.

Pacific lamprey

Pacific lampreys are large anadromous fish that parasitize other fish. This species has two life stages: larvae (ammocoetes) and adult/juvenile body forms (Streif 2008; NatureServe 2013). The larvae live in freshwater for a few years before undergoing metamorphosis into the adult/juvenile body morphology. In the adult/juvenile stage, lampreys have a jawless sucker mouth that allows them to parasitize other fish. The adults live in the ocean one to two years before returning to freshwater streams to spawn. Primary threats include barriers on mainstream and tributary streams, reduced water quality, predation by native and non-native species, stream and floodplain degradation, and loss of estuarine habitat. The Columbia River and Umatilla River provide habitat for Pacific lamprey. The Project is not anticipated to result in adverse impacts on this species, as it would not impact the Umatilla River or the Columbia River through any in-stream construction. Any crossings would be spanning the existing transmission line ROW across the waterbodies and thus not directly impacting the aquatic habitat.

Northern sagebrush lizard

Sagebrush lizards are active throughout much of their range from March/April to September/ October (NatureServe 2013). They primarily occur in sagebrush and other shrubby habitat but may also be found in juniper and in open areas of ponderosa pine (*Pinus ponderosa*) and Douglas fir (*Pseudotsuga menziesii*) forests (NatureServe 2013; OSU 2013). Some fair habitat is available for this species in the Analysis Area; however, there are no ORBIC records documenting its presence (OSU 2013; ORBIC 2012). Northern sagebrush lizards are possible in the Analysis Area. Much of the Analysis Area is agricultural, urban (City of Hermiston), suburban, and industrial development land. Field surveys conducted in May and August 2013 detected no northern sagebrush lizards. There were no large tracts of quality habitat for this species observed. The Project may impact small, isolated patches of shrub habitat suitable for this species, but it is not expected to degrade larger areas of suitable habitat.

Ferruginous Hawk

Ferruginous Hawks breed in sagebrush plains and bunchgrass prairies of eastern Oregon (Bechard and Schmutz 1995; Marshall et al. 2006). Few of the breeding birds remain in Oregon during the winter (Marshall et al. 2006). They prefer habitats with very low densities of trees, sometimes even nesting on the ground, and are less common in cultivated areas than are closely related species like the Swainson's Hawk (Bechard and Schmutz 1995; Marshall et al. 2006). Observation records exist in the Hermiston area during the breeding season (eBird 2013). Ferruginous Hawks are possible in the Analysis Area but may be uncommon due to the heavy presence of cultivated fields and the relative lack of large areas of grassland or sagebrush habitats. Field surveys in 2013 did not detect any Ferruginous Hawks or their nests. The Project is not anticipated to result in adverse impacts on this species unless active nests are documented in close proximity to construction activities during pre-construction surveys. These potential impacts could be mitigated by avoiding disturbance of nests while they are active. Disturbance distances (construction buffers) for construction will be determined on a nest-by-nest basis with ODFW and USFWS consultation.

Western Burrowing Owl

Burrowing Owls occur in a variety of open grassland, shrub steppe, and anthropogenic habitats (Marshall et al. 2006; Poulin et al. 2011). In the Columbia River Basin, they prefer bare ground or low vegetative cover for easy detection of prey (Marshall et al. 2006). They rely heavily on badgers for nesting burrows but also use the burrows of other mammals. Suitable habitat is prevalent in the Analysis Area, and there are documented observations of Burrowing Owls in this area (eBird 2013). The USFWS reports that the Umatilla Army Depot was home to 65 known pairs in 2012 (Cary 2012). They are migratory breeders in Oregon, typically arriving as early as March (Marshall et al. 2006; Poulin et al. 2011). They are generally gone from the Columbia River Basin before October (Marshall et al. 2006). Field surveys conducted during the breeding season for the Project in 2013 did not detect any Burrowing Owls or discover any burrows potentially being used by Burrowing Owls. The Project is not anticipated to have adverse impacts on this species unless active nests are documented in close proximity to construction activities during pre-construction surveys. These potential impacts could be mitigated by avoiding disturbance of nests while they are active. Disturbance distances (construction buffers) for construction will be determined on a nest-by-nest basis with ODFW and USFWS consultation.

Lewis's Woodpecker

Lewis's Woodpeckers are associated with open woodlands near water in Oregon (Marshall et al. 2006; Vierling et al. 2013). Dead or decaying trees are typically an important component of this species' preferred habitats as well. The Analysis Area is at the edge of this species' range, and potential available habitat in the Analysis Area ranges from poor to good in quality based on mapping provided by the Oregon Natural Heritage Information Center (OSU 2013). The nearest records of Lewis's Woodpeckers include Hat Rock State Park and Cold Springs National Wildlife Refuge (eBird 2013). The most likely location and time for Lewis's Woodpeckers to be present in the Analysis Area are the riparian woodland areas along the Umatilla River during the breeding season (approximately April to September) (Marshall et al. 2006; eBird 2013). Field surveys for the Project in 2013 did not detect any Lewis's Woodpeckers. The Project is not anticipated to result in adverse impacts on this species, as it would not involve clearing any riparian woodlands in the vicinity of these habitats during construction or operations.

Willow Flycatcher

Willow Flycatchers migrate through and breed in Oregon, typically arriving in late April and departing the State by early October (Sedgwick 2000; Marshall et al. 2006; eBird 2013). In eastern Oregon, they are almost entirely associated with riparian habitats, particularly those containing willows, *Salix sp.* (Marshall et al. 2006). The Analysis Area contains small patches of high quality habitat, but none large enough to support a breeding population and the nearest known observations of the species were recorded in Cold Springs National Wildlife Refuge and Umatilla National Wildlife Refuge (OSU 2013; eBird 2013). The most likely locations for Willow Flycatchers in the Analysis Area are the riparian areas along the Umatilla River. Willow Flycatchers were not detected during 2013 field surveys. The Project is not anticipated to result in adverse impacts on this species, as it would not involve clearing any suitable riparian habitat in the vicinity of these habitats during construction or operations.

Yellow-breasted Chat

Yellow-breasted Chats migrate through and breed in Oregon, arriving in eastern Oregon in early May and departing by September (Eckerle and Thompson 2001; Marshall et al. 2006). They breed in low, dense vegetation along streams, ponds, and swamps. Small, scattered patches of fair to good habitat occur in the Analysis Area but none large enough to support a breeding population (OSU 2013). The nearest documented occurrence was recorded at Cold Springs National Wildlife Refuge in May 2009, more than 10 miles to the northeast of the Station (eBird 2013). The most likely locations for Yellow-breasted Chats in the Analysis Area are the riparian areas along the Umatilla River. Yellow-breasted Chats were not detected during 2013 field surveys. The Project is not anticipated to result in adverse impacts on this species, as it would not involve clearing any suitable riparian habitat in the vicinity of these habitats during construction or operations.

Tricolored Blackbird

Tricolored Blackbird breeding colonies are scattered and intermittent in Oregon (Beedy and Hamilton 1999; Marshall et al. 2006). Oregon breeding colonies are typically located in cattail marshes, but they also use other marsh-associated dense vegetation types (Marshall et al. 2006).

They arrive at breeding areas in late March and disperse in July. Small, scattered patches of fair to good habitat occur throughout the Analysis Area (OSU 2013). Local breeding colonies are known from marshes in the vicinity of Stanfield, Oregon, including records of occurrences approximately 3 miles to the east of the Project near Manns Pond (Beedy and Hamilton 1999; Marshall et al. 2006; eBird 2013). Tricolored Blackbirds were not detected during 2013 field surveys. The Project is not anticipated to result in adverse impacts on this species, as it would not involve clearing any suitable marshy habitat in the vicinity of these habitats during construction or operations.

Small-footed myotis

Small-footed myotis are most often associated with dry grasslands and desert scrub but may also be found in ponderosa pine and mixed conifer forests (Csuti et al. 1997; NatureServe 2013). They roost in buildings, on cliffs, in caves, under boulders, and sometimes beneath tree bark. Fair quality habitat and minimal high quality habitat are predicted throughout the Analysis Area, but there are no documented records of the species (ORBIC 2012; OSU 2013). Small-footed myotis are non-migratory in Oregon (NatureServe 2013). Loss of habitat may impact local breeding populations if grassland or desert scrub vegetation is cleared for the Project; however, any cleared suitable habitat is expected to consist of portions of isolated patches that may be too small to support small-footed myotis. Additionally, bats could be disturbed by construction-related activities if active roosts occur in close proximity. This is also not expected to occur, as anthropogenic disturbance is already common in the Analysis Area and such disturbance could preclude any roosts from establishing in the area. Furthermore, construction is not planned in close proximity to suitable man-made or rocky structures that could provide roost sites.

Long-eared myotis

Long-eared myotis are primarily associated with woodlands and forest edges, including juniper woodlands, coniferous woodlands, and willow and alder forests along streams (Csuti et al. 1997; NatureServe 2013). They may also occur in arid shrublands if suitable roosting sites are available. This species commonly roosts in buildings, mines, caves, fissures, and hollow trees. Long-legged myotis are present in Oregon during the summer months, but some have been found hibernating in western Oregon caves (Csuti et al. 1997). Loss of habitat may impact local breeding populations if wooded areas are cleared for the Project; however, the woodlands preferred by long-eared myotis are not present in the Analysis Area. Construction will mostly affect agricultural fields and non-native black locust trees (*Robinia pseudoacacia*) within the Energy Facility Site. Bats could be disturbed by construction-related activities if active roosts occur in close proximity. This is also not expected to occur, as anthropogenic disturbance is already common in the Analysis Area and such disturbance could preclude any roosts from establishing in the area. Furthermore, construction is not planned in close proximity to suitable man-made or rocky structures that could provide roost sites.

Long-legged myotis

Long-legged myotis are often associated with coniferous forests, but in drier areas such as the Analysis Area, they occur in riparian woodlands (Csuti et al. 1997). This species roosts in buildings, mines, cliff faces, and caves (Csuti et al. 1997; OSU 2013). The northern end of the Analysis Area is composed of some fair habitat (OSU 2013). This fair habitat is likely limited to riparian woodlands near the Umatilla and Columbia Rivers. There are no documented records of the species in the Analysis Area (ORBIC 2012). Long-legged myotis are present in Oregon from spring to fall, but nothing is known of their migration movements or wintering locations (NatureServe 2013). The Project is not expected to clear any valuable habitat for this species, but bats could be disturbed by construction-related activities if active roosts occur in close proximity. This is also not expected to occur, as anthropogenic disturbance is already common in the Analysis Area and such disturbance could preclude any roosts from establishing in the area. Furthermore, construction is not planned in close proximity to suitable man-made or rocky structures that could provide roost sites.

Yuma myotis

Yuma myotis predominantly feed over water with forested borders, an association with water that is stronger than with any other North American bat species (Csuti et al. 1997; BCI 2013; NatureServe 2013). A study in western Oregon found that Yuma myotis foraging was eight times higher along forested streams than streams in logged areas (BCI 2013). Yuma myotis commonly roost in buildings and bridges, and occasionally in mines or caves (BCI 2013). There are no documented records of the species in the Analysis Area or in Umatilla County, and the Analysis Area lacks heavily wooded streamside areas (ORBIC 2012; NatureServe 2013). All recent Oregon records are from the Klamath region and western Oregon (Csuti et al. 1997). The Project is not expected to clear any valuable wooded habitat along streams, nor will it remove any existing buildings or bridges. The Project is not anticipated to result in impacts to Yuma myotis.

Pallid bat

Pallid bats are associated with a variety of arid vegetation types, including sagebrush, juniper, and salt desert scrub (Csuti et al. 1997; OSU 2013). They roost in buildings, mines, cliff faces, and caves. Fair habitat for this species is scattered throughout the Analysis Area, including the Umatilla Army Depot (OSU 2013). There are no documented records of the species in the Analysis Area (ORBIC 2012). Little is known of pallid bats' migratory movement, but they are not believed to move far between summer and winter roosts (NatureServe 2013). Loss of habitat may impact local breeding populations if sagebrush and other native desert vegetation are cleared for the Project; however, any cleared shrub habitat is expected to consist of portions of isolated patches that may be too small to support pallid bats. Additionally, bats could be disturbed by construction-related activities if active roosts occur in close proximity. This is also not expected to occur, as anthropogenic disturbance is already common in the Analysis Area and construction is not planned in close proximity to suitable man-made or rocky structures.

Washington ground squirrel

Washington ground squirrels occur in grassland and shrub-steppe habitats of the Columbia Plateau, usually in areas associated with river banks, hillsides, or ravines (Rickart and Yensen 1991; Csuti et al. 1997). In Oregon, they can be found south of the Columbia River and east of the John Day River, specifically in Gilliam, Morrow, and Umatilla Counties (USFWS 2013b). Washington ground squirrels require sandy or silt-loam texture soils that are deep enough to support their burrow systems.

Washington ground squirrels are active during the early spring to summer, depending on environmental conditions. Activity is highest from February through June, and lowest during January and July. Washington ground squirrels hibernate or estivate approximately seven to eight months of the year. The importance of reproducing and restoring body fat supplies is highlighted by seven to eight months of estivation/hibernation. High annual mortality in Washington ground squirrels are attributed to starvation or freezing during estivation/ hibernation, predation, disease, and human interference (USFWS 2007).

There are records of Washington ground squirrels within the Analysis Area—specifically, south of the southern terminus of the Project and east of the McNary Substation. Field surveys in 2013 did not detect the presence of Washington ground squirrels, or any large patches of quality habitat within or directly adjacent to the step-up substation site and 50-foot-wide gas pipeline ROW. Perennial did not have permission to access parcels beyond the boundary of the 50-foot-wide ROW, or the Station and substation sites for surveys; therefore, Project biologists did not conduct protocol surveys for this species. Perennial will implement measures to avoid and/or minimize impacts on Washington ground squirrels during and after construction, including conducting pre-construction surveys and potentially restricting construction activities if this species is found (Section Q.4). Therefore, no impacts to Washington ground squirrels are expected from construction activities.

Robinson's onion

Robinson's onion is a small plant that grows in well-drained sandy and gravelly soils along rivers (NatureServe 2013). This perennial blooms from April through May (BMNHC 2013). This narrow endemic plant is found in Oregon and Washington in the mid-Columbia River Basin (BMNHC 2013; NatureServe 2013; USDA 2013). Historically known from Morrow, Sherman, and Umatilla Counties, Oregon, it is considered possibly extirpated from Oregon (eFloras 2013; NatureServe 2013). The Project will not impact the shoreline of the Umatilla River or Columbia River; therefore, no impact on Robinson's onion is expected. Field surveys in 2013 did not record the presence of Robinson's onion, nor any well-drained gravelly soils in the canals crossed by the natural gas pipeline.

Laurence's milkvetch

Laurence's milkvetch is a federal species of concern and a state of Oregon listed threatened species. It is endemic to the Columbia Plateau in Oregon and found in Gilliam, Morrow, Sherman, and Umatilla Counties (ODA 2013). There are currently fewer than 2,000 plants in existence, and no known population sites are considered protected.

Laurence's milkvetch occurs on sandy or rocky soils of dry slopes at elevations between 600 and 1040 meters (2000–3400 feet). This perennial herb is often found associated with bluebunch wheatgrass (*Pseudoroegneria spicata*), Sandberg bluegrass (*Poa seconda*), Idaho fescue (*Festuca idahoensis*), cheatgrass (*Bromus tectorum*), Carey's balsamroot (*Balsamorhiza careyana*), and California dandelion (*Agoseris grandiflora*).

Field surveys in 2013 found the Energy Facility Site to be relatively flat and absent of the dry slopes where Laurence's milkvetch is commonly found. These surveys also noted that the majority of the surveyed area was agricultural and heavily degraded. Therefore, the Energy Facility Site does not provide suitable habitat for this species, nor were any Laurence's milkvetch found during surveys.

Q.4 DESCRIPTION OF MEASURES PROPOSED TO AVOID OR REDUCE ADVERSE IMPACTS TO SPECIES

OAR 345-021-0010(1)(q)(C) *For each species identified under 345-021-0010(1)(q)(A), a description of measures proposed by the applicant, if any, to avoid or reduce adverse impact.*

Response: The Project is located in an agricultural field that is surrounded on three sides by roads, railroads, industrial property (Hermiston Generating Plant and Lamb Weston agricultural processing plant), light industrial property (FedEx package distribution facility), and a large cattle stock yard. The Project's natural gas pipeline is to be constructed within an existing 50-foot ROW that is also primarily on agricultural land. An existing transmission line will be upgraded (reconductored) to accommodate the Project, and a new step-up substation will be constructed on agricultural land adjacent to the existing Bonneville Power Administration McNary Substation.

Perennial-WindChaser LLC (Perennial) will implement the following measures to avoid and/or minimize impacts on fish, wildlife, and their habitats:

General Measures for All Species

- Personnel will be trained on health, safety, and environmental matters. Training will include practices, techniques, and protocols required by federal and state regulations and applicable permits.
- Perennial will design, construct, maintain, and operate the Project following current Avian Power Line Interaction Committee guidelines to minimize risk of avian mortality.
- Vegetation removed during clearing will be disposed of according to federal, state, and local regulations.
- Any herbicides used during construction and operations and maintenance will be applied according to label instructions and any federal, state, and local regulations.
- Perennial will restrict vehicular travel to the ROW and other established areas within the construction, access, or maintenance easement(s).
- Roads not otherwise needed for maintenance and operations will be restored to pre-construction conditions, to the extent practicable. Roads needed for maintenance and operations will be retained.
- Emergency and spill response equipment will be kept on hand during construction.
- Perennial will restrict the refueling and maintenance of vehicles and the storage of fuels and hazardous chemicals within at least 100 feet of wetlands, surface waterbodies, and groundwater wells, or as otherwise required by federal, state, or local regulations.
- Perennial will conduct construction and scheduled maintenance activities during daylight hours, to the extent practicable.
- Perennial will impose speed limits during construction for access roads to reduce dust emissions, maintain safety, and protect wildlife.
- Perennial will restore all temporary construction-related areas to pre-construction conditions or better after work has been completed.
- Perennial will minimize compaction of soils and rutting through appropriate use of construction equipment (e.g., low ground-pressure equipment and temporary equipment mats).
- Perennial will minimize the amount of time that any excavations remain open.
- Perennial will identify, control, and minimize the spread of non-native invasive species and noxious weeds, to the extent practicable.
- Perennial will clearly demarcate boundaries of environmentally sensitive areas during construction to increase visibility to construction crews.
- Perennial will selectively apply herbicides, if used, within streamside management zones.

- If construction occurs during important time periods (e.g., breeding, migration, etc.) or at close distances to environmentally sensitive areas, Perennial will consult with the USFWS, ODFW, and ODA for guidance on seasonal and/or spatial restrictions designed to avoid and/or minimize adverse effects.

<u>Species-specific Measures:</u>

- Fish: To avoid or minimize impacts on steelhead (Middle Columbia River), bull trout, margined sculpin, Pacific lamprey, and other fish species, Perennial will establish streamside management zones within 50 feet of both sides of intermittent and perennial streams and along margins of bodies of open water where removal of low-lying vegetation is minimized. The pipeline right-of-way crosses three irrigation canals, but no streams or rivers; however, it does come close to the Umatilla River.
- Northern sagebrush lizard: Perennial will survey for northern sagebrush lizard in areas of sagebrush and other shrubby habitat that will be impacted by ground disturbance. If northern sagebrush lizards are discovered, Perennial will consult with the USFWS, ODFW, and ODA for guidance on seasonal and/or spatial restrictions designed to avoid or minimize adverse effects.
- Ferruginous hawk and other raptor species: If construction-related activities occur during the raptor breeding season (February 1 through August 31), pre-construction surveys will be conducted within 0.5 miles of all proposed Project features for Ferruginous Hawk nests, and within 0.25 miles for all other raptor species nests, including burrowing owl burrows. If active nests are located, construction-related activities will be restricted within 0.5 miles of Ferruginous Hawk nests, and within 0.25 miles of all other raptor nests until the nests have failed or chicks have fledged. Spatial restrictions around active raptor nests may be reduced through consultation with the ODFW and USFWS when considering factors such as Project visibility from the nest, topography, existing human disturbances, and the presence of nest monitors.
- Migratory bird species (non-raptor): If construction-related activities occur during the migratory bird breeding season (March 15 through August 15) for Lewis’s woodpecker, willow flycatcher, yellow-breasted chat, tricolored blackbird, and other bird species, pre-construction surveys will be conducted within 20 feet of all proposed Project features for nests of all native, non-raptor species. Given the diversity of species potentially occurring in the vicinity of the Project, their varying nest initiation dates, and the possibility of multiple clutches by some species, pre-construction nest surveys for non-raptors will be valid for two weeks. If active nests are located, Perennial will consult with the ODFW and USFWS to determine appropriate measures to take, which may include limiting construction-related activities within 20 feet of the nests until the nests have failed or chicks have fledged, and/or continuing proposed activities with the presence of a biological monitor.

- Bats: For small-footed myotis, long-eared myotis, long-legged myotis, Yuma myotis, and pallid bat, Perennial will examine any structures (cliffs, caves, mines, fissures, under boulders, buildings, under bridges, and trees) within the construction corridor that could potentially be roost sites. If any bat roosts are discovered, Perennial will consult with the USFWS, ODFW, and ODA for guidance on seasonal and/or spatial restrictions designed to avoid or minimize adverse effects.
- Washington ground squirrel: Pre-construction surveys will be conducted prior to any ground disturbance in areas with suitable habitat. If any Project components that require ground disturbance are located within 1,000 feet of potential Washington ground squirrel habitat (excluding tilled agricultural lands or developed areas, per ODFW consultation; Kirsch 2014b), Perennial will conduct transect surveys to determine if squirrels are present. These surveys will follow the protocols coordinated with the ODFW and detailed in the field survey report (Exhibit P – Fish and Wildlife Habitat, Appendix P-1: 2013 Biological Resources Survey Report, Section 2.0 Survey Methods). If Washington ground squirrels are found within the 1,000-foot buffer, ODFW and USFWS will be consulted to determine the best mitigation measures to avoid or reduce adverse impacts. Potential measures include prohibiting or restricting construction-related activities within an appropriate buffer, or continuing proposed activities with the presence of a biological monitor.
- Robinson's onion and Laurence's milkvetch: Pre-construction surveys will be conducted for Robinson's onion and Laurence's milkvetch prior to any ground disturbance in areas with suitable habitat. If any individuals of these plants are discovered, Perennial will consult with the USFWS, ODFW, and ODA for guidance on spatial restrictions designed to avoid or minimize adverse effects.

When more specific construction design details and schedule determinations are made available, Perennial will consult with the ODFW and ODA to determine whether conditions have changed in a way that would warrant the preparation of a mitigation and monitoring plan. Perennial has consulted with the ODFW regarding the measures described above (Kirsch 2014b).

Q.5 FINDINGS THAT THE PROPOSED FACILITY WILL NOT LIKELY CAUSE A SIGNIFICANT REDUCTION IN THE LIKELIHOOD OF SURVIVAL OR RECOVERY OF THE LISTED PLANT SPECIES

OAR 345-021-0010(1)(q)(D) *For each plant species identified under 345-021-0010(1)(q)(A), a description of how the proposed facility, including any mitigation measures, complies with the protection and conservation program, if any, that the Oregon Department of Agriculture has adopted under ORS 564.105(3).*

OAR 345-021-0010(1)(q)(E) *For each plant species identified under 345-021-0010(1)(q)(A), if the Oregon Department of Agriculture has not adopted a protection and conservation program* *under ORS 564.105(3), a description of significant potential impacts of the proposed facility on the continued existence of the species and on the critical habitat of such species and evidence that the proposed facility, including any mitigation measures, is not likely to cause a significant reduction in the likelihood of survival or recovery of the species.*

OAR 345-022-0070(1) *For plant species that the Oregon Department of Agriculture has listed as threatened or endangered under ORS 564.105(2), the design, construction, operation, and retirement 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

Response: No occurrences of state or federally listed plant species were observed within the Analysis Area, including areas near the Station, along the transmission line route, and step-up substation. Perennial, in consultation with the ODA (Currin 2013), has determined that no plant species listed as threatened or endangered under ORS 564.105(2) are present within the Analysis Area. Therefore, the construction and operation of the proposed facilities are not anticipated to cause a significant reduction in the likelihood of survival or recovery of listed plant species.

Q.6 FINDINGS THAT THE PROPOSED FACILITY WILL NOT LIKELY CAUSE A SIGNIFICANT REDUCTION IN THE LIKELIHOOD OF SURVIVAL OR RECOVERY OF THE LISTED FISH AND WILDLIFE SPECIES

OAR 345-021-0010(1)(q)(F) *For each animal species identified under 345-021-0010(1)(q)(A), a description of significant potential impacts of the proposed facility on the continued existence of such species and on the critical habitat of such species and evidence that the proposed facility, including any mitigation measures, is not likely to cause a significant reduction in the likelihood of survival or recovery of the species.*

OAR 345-022-0070(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, operation, and retirement 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: Based on the determination of the biological surveys of the Analysis Area, that no listed species or their habitat is present on the Station Site, along the transmission line route, and step-up substation, the construction, operation, maintenance and retirement of the Project are not likely to affect any listed species.

Q.7 MONITORING PROGRAM

OAR 345-021-0010(1)(q)(G) *Applicant's proposed monitoring program, if any, for impacts to threatened and endangered species.*

Response: The Project Biological Monitoring Plan (Exhibit P, Appendix P-4) provides goals, methods, and criteria that Perennial will use to evaluate and track the success of mitigation measures designed to avoid or minimize impacts on plants and wildlife and their habitats resulting from the Project. Perennial has consulted with the USFWS and ODFW regarding the measures describe in the monitoring plan.

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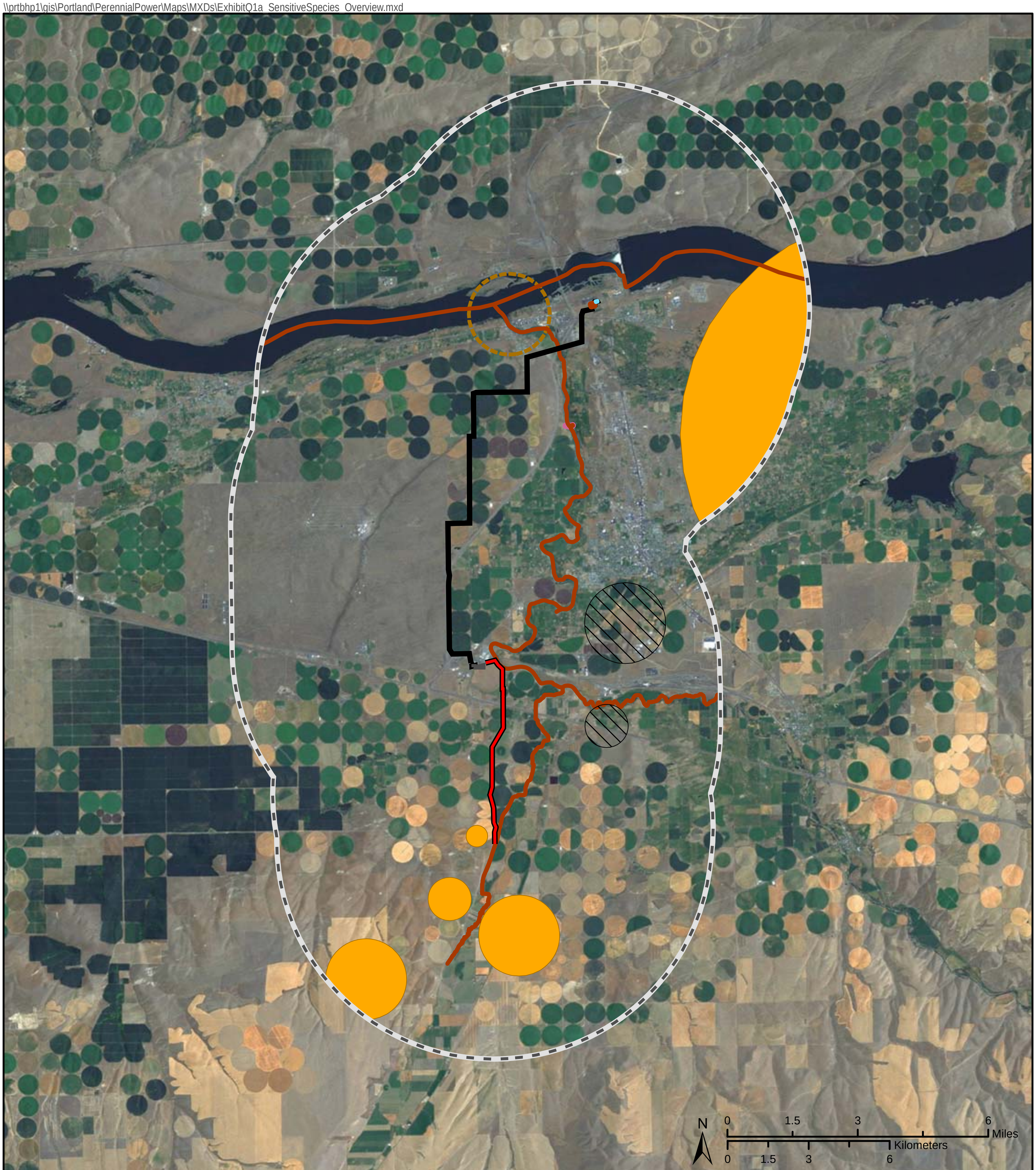

Natural Gas Pipeline ROW
Existing Transmission Line
Station
Riser Structure
Step-up Substation
5-Mile Buffer

ORBIC Data
Pacific lamprey
Bull trout (Umatilla SMU)
Robinson's onion
Steelhead (Middle Columbia River ESU, summer run)
Tricolored Blackbird
Washington ground squirrel

Figure Q-1a

Results of ORBIC Database Search

Perennial Wind Chaser Station

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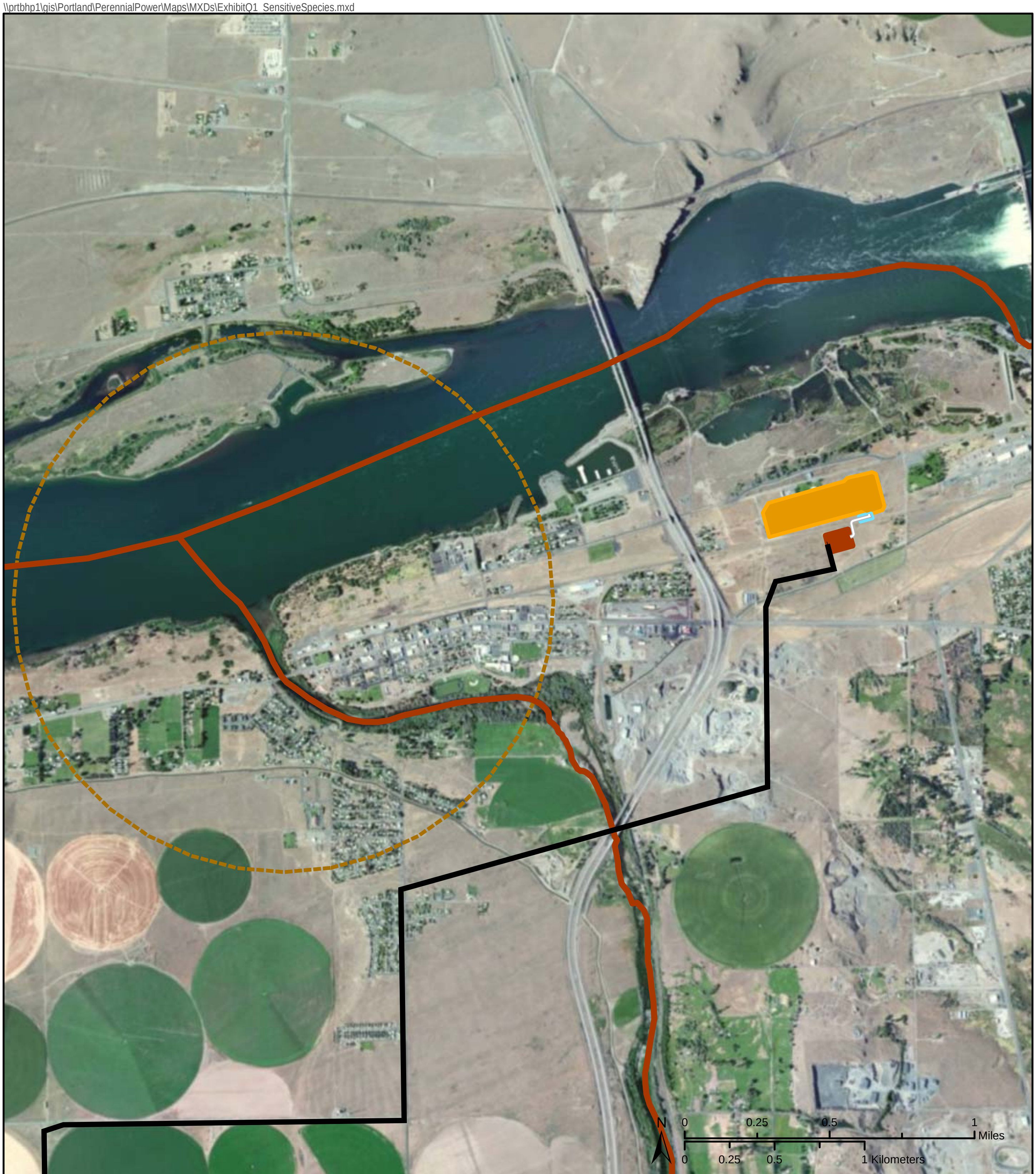

Existing Transmission Line
Underground Transmission Line
Step-up Substation
Riser Structure
Substation
5-Mile Buffer

ORBIC Data
Bull trout (Umatilla SMU)
Robinson's onion
Steelhead (Middle Columbia River ESU, summer run)

Figure Q-1b

Results of ORBIC Database Search

Perennial Wind Chaser Station

February 2014

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Existing Transmission Line

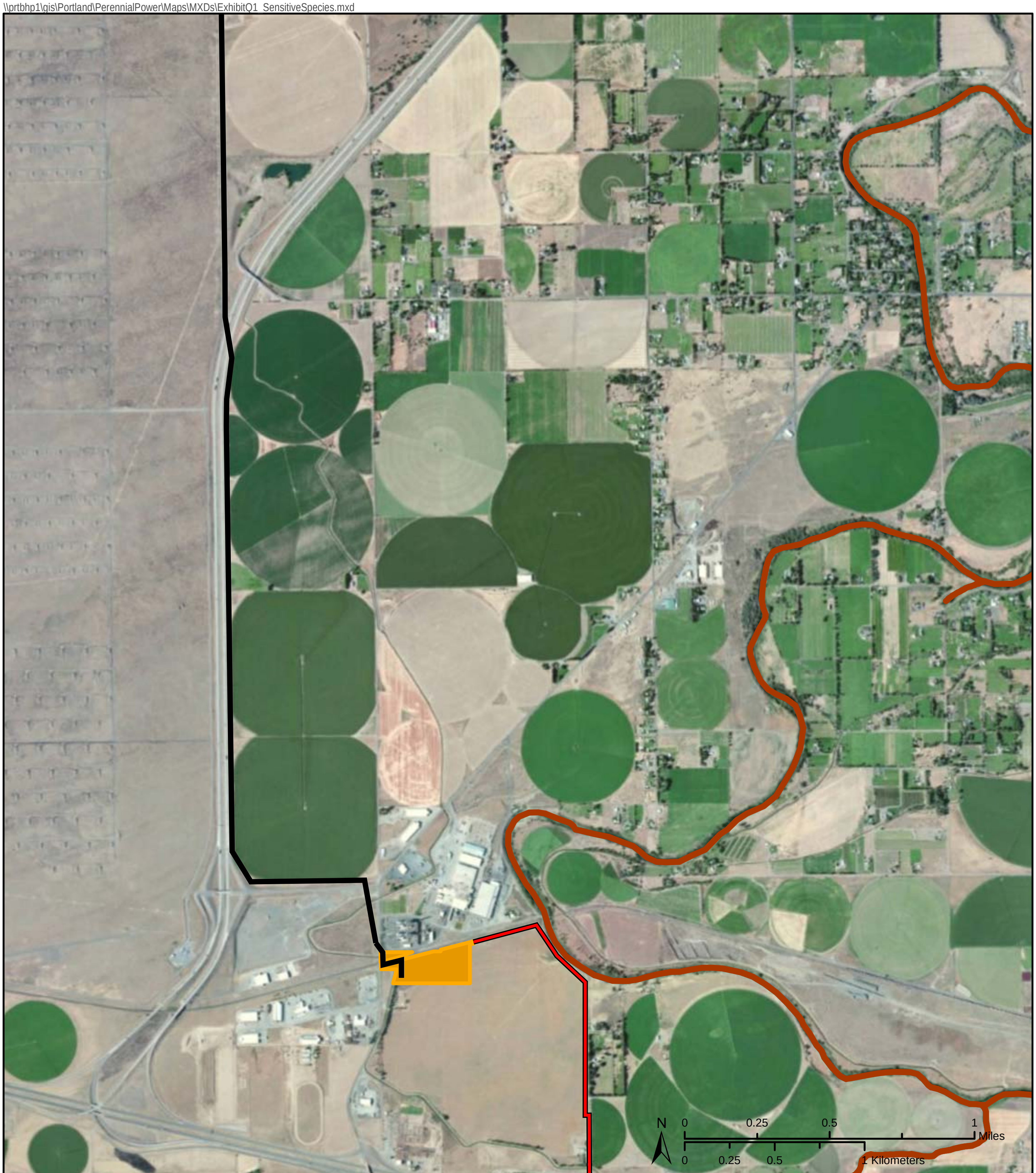
5-Mile Buffer

Figure Q-1c

Results of ORBIC Database Search

Perennial Wind Chaser Station

February 2014



- Natural Gas Pipeline ROW
- Existing Transmission Line
- Station
- 5-Mile Buffer

ORBIC Data
- Bull trout (Umatilla SMU)
- Steelhead (Middle Columbia River ESU, summer run)

Figure Q-1d

Results of ORBIC Database Search

Perennial Wind Chaser Station

February 2014

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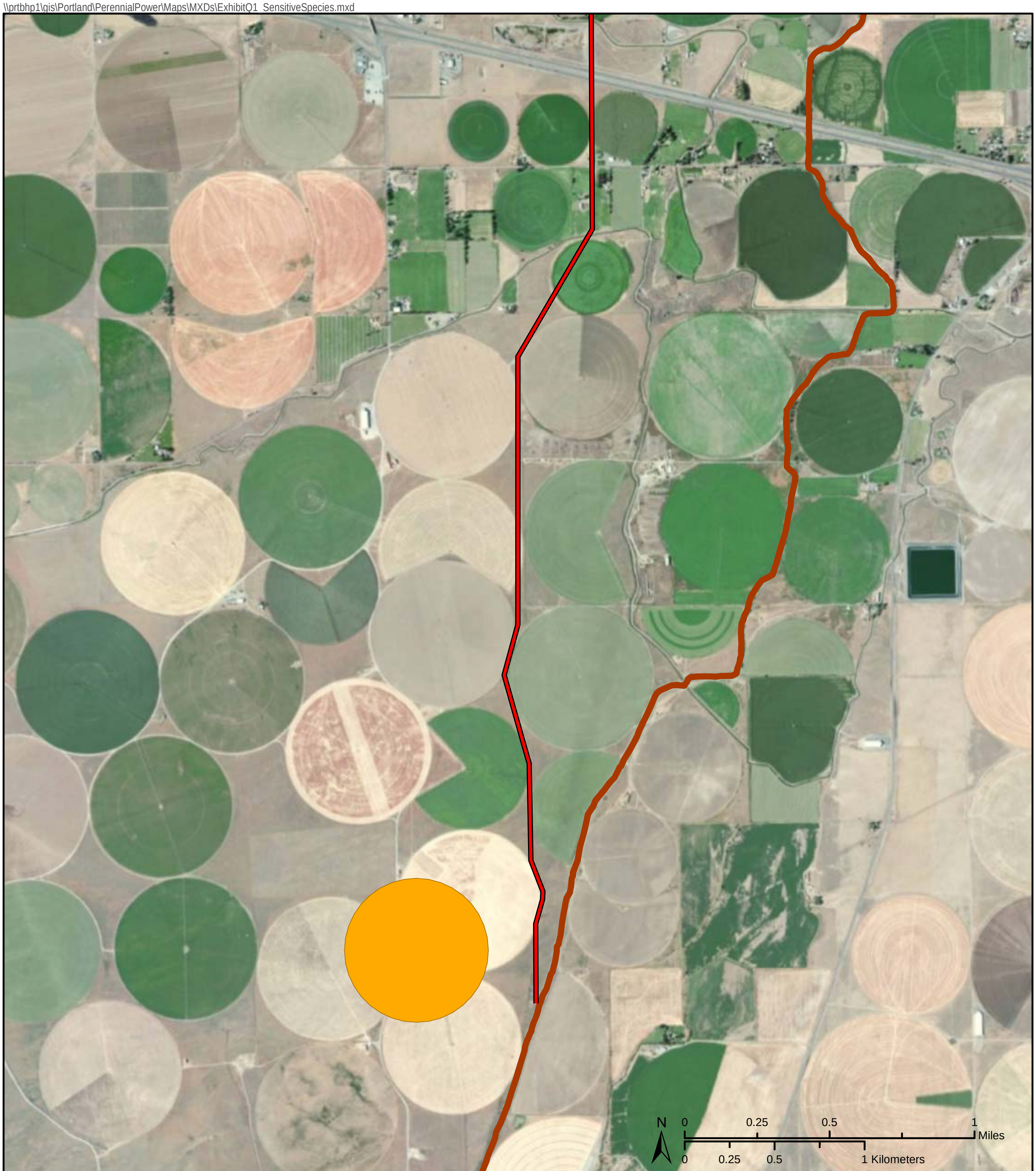

Natural Gas Pipeline ROW

5-Mile Buffer

ORBIC Data

Steelhead (Middle Columbia River ESU, summer run)

Washington ground squirrel

Figure Q-1e

Results of ORBIC Database Search

Perennial Wind Chaser Station

February 2014

EXHIBIT R

SCENIC RESOURCES
OAR 3450021-0010(l)(r)

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FIGURES

APPENDICES

R.1 INTRODUCTION

OAR 345-021-0010(1)(r) *An analysis of significant potential impacts of the proposed facility, if any, on scenic resources 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, providing evidence to support a finding by the Council as required by OAR 345-022-0080.*

Response: Oregon Administrative Rules (OAR) 345-021-0010(1)(r) requires that the Application for Site Certificate for the Perennial Wind Chaser Station project (Project), proposed by Perennial-WindChaser LLC (Perennial), include an analysis of scenic and aesthetic values that the federal and local land use planning agencies have documented as important. Under OAR 345-022-0080, the Energy Facility Siting Council (Council) must find that "the design, construction, operations, and retirement of the facility, taking into account mitigation, is not likely to result in significant adverse impact to scenic and aesthetic values identified as significant or important in applicable federal land management plans or in local land use plans in the analysis area."

This exhibit provides information regarding any potential impacts the Project may have on scenic and aesthetic resources in its vicinity. As defined by the Amended Project Order issued by the Oregon Department of Energy (ODOE) on September 30, 2013, the "Analysis Area" for Project-related impacts on visual and aesthetic resources on documented important scenic and aesthetic values includes the area within the Site Boundary and 10 miles surrounding the Site Boundary (see Figure R-1, at the end of this exhibit). This analysis includes the potential visual effects of the construction and operation of all Project-related facilities, including the Perennial Wind Chaser Station (Station), new step-up substation, and natural gas pipeline facilities. There do not appear to be any relevant federal or tribal plans that identify important scenic or aesthetic values in the Analysis Area for this resource. Relevant plans for Umatilla County identify some important scenic values in the Analysis Area; however, the Project features will not be visible from these areas.

R.2 SUMMARY

The Project comprises the Station, an underground natural gas pipeline, a transmission line upgrade, and a new step-up substation. The Project is anticipated to have some impacts on visual resources; however, the design, construction, and operation of the facility, taking into account mitigation, are not likely to result in significant adverse impacts 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. Thus, the Project complies with OAR 345-022-0080 for Scenic Resources.

The Perennial Wind Chaser Station project site (Site), which includes all Project facilities, is located approximately 4 miles southwest of Hermiston, Oregon, adjacent to the existing Hermiston Generating Plant (HGP), a 474-megawatt natural gas–fueled power plant, in an area dominated by industrial land uses. The Station, including all electrical generating equipment, switchyard, buildings, other structures, and a stormwater detention basin, will occupy approximately 20 acres. Visible features of the Station will comprise a complex of large metal structures, including four combustion turbine generator (CTG) structures, four exhaust stacks, a mechanical draft cooling tower, a water treatment building and water tanks, a control and administration building, generators and auxiliary transformers, and a 230-kilovolt (kV) switchyard. The site on which the Station will be located, along with the switchyard and temporary laydown area, is referred to as the Energy Facility Site. The structures will range in height from 12 feet for the fire pump enclosure to 45 feet for the CTG inlet air filter, with stack heights ranging from 20 to 90 feet. Most facility structures will be constructed of metal. Buildings will have metal siding and roofs. See Section R.4.7 for key building dimensions.

Potential visual impacts of the Station will be minimized by painting the buildings and structures using subdued, grey-toned colors to reduce visual contrast and glare; on-demand lighting and shielding and directive devices for lighting that adequately address security and safety; and a dark-colored coating on the perimeter fence or other style and color that is low glare and blends with the surrounding landscape.

An underground natural gas delivery pipeline will extend approximately 4.63 miles south from the Station. This pipeline will be located within the existing natural gas line right-of-way (ROW) for the neighboring HGP. Visible above-ground features associated with the natural gas pipeline will consist of a metering station similar to that used for the existing adjacent HGP gas pipeline at the lateral tie-in. The existing HGP metering station is located at the connection point with the Gas Transmission Northwest pipeline and is surrounded by irrigated agricultural fields, primarily in the form of center pivot irrigation. The existing metering station occupies an area of approximately 240 by 85 feet and is enclosed by a chain link fence. It is composed of several above-ground pipe arrays, two small metal structures, and a larger metal building. The pipe arrays are less than 10 feet high, and the small metal structures range from approximately 10 to 20 feet in height. The metal building is approximately 24 feet high and has a footprint of approximately 16 by 32 feet. New metering equipment for the Project will be added within the existing metering station footprint. The existing footprint (fenced area) will not need to be expanded. Modifications at the meter station will be conducted by GTN under its blanket Federal Energy Regulatory Commission agreement and connect the lateral to the main pipeline operated by GTN. As such, the meter station is not considered part of the Project.

The existing transmission line will undergo reconductoring of an existing 115-kV line to a

230-kV line over a distance of approximately 12 miles from the Station north to the Bonneville Power Administration (BPA) McNary Substation. With the exception of short connections at both ends, the reconductoring will use the existing steel monopole transmission structures. Existing transmission structures are approximately 95 feet in height. Connections for the transmission line to the Station in the south and the McNary Substation in the north will extend outside of the existing transmission line ROW. Four new poles on the Site, and possibly two new poles on the west side of Westland Road, will be necessary for the initial tie-in. These new poles will be similar in height and appearance to the existing poles within the transmission line ROW to be used for the Project. Because the new transmission line will consist primarily of reconductoring the existing line and will require minimal new structures for short distances adjacent to the Station and McNary Substation, visual impacts of the new transmission line will be minimal. Potential visual impacts will be minimized by using new poles similar in height and appearance to the existing poles and non-specular conductors for the new line.

A new step-up substation will be located on an undeveloped parcel adjacent to and immediately south of the existing McNary Substation and will occupy a substantially smaller area. Per agreement with the BPA, the new step-up substation will be constructed on federal land managed by the BPA and is not under the jurisdiction of the United States Army Corps of Engineers (USACE). The new step-up substation will consist of tall metal structures, transformers, and other industrial utility elements. Because the step-up substation will consist of structures and elements similar to those of the adjacent McNary Substation and will occupy a substantially smaller footprint, visual contrast and resulting impacts will be minimal. Visual contrast and resulting impacts will be further minimized by ensuring that the structures use dull finishes or subdued, grey-toned colors to reduce visual contrast and glare; on-demand lighting and shielding and directive devices for lighting, while adequately addressing security and safety; and a dark-colored coating on the perimeter fence, or other style and color that is low glare and blends with the surrounding landscape.

Figures R-2 and R-3 depict viewshed analyses, showing areas potentially visible from the top of the 90-foot emissions stacks at the Energy Facility Site (R-2) and from the top of the 20-foot step-up substation (R-3). The viewshed maps only identify potential visibility of these features based on broad topographic features and do not take into account small topographic features, trees, or buildings that may fully or partially screen them from view from surrounding areas. Based on these viewshed analyses, it appears that portions of the Station and step-up substation could potentially be visible from important viewing locations, including identified key observation points (KOPs), Riverfront Park, West Park, portions of the Umatilla River downstream of State Highway 207, the McNary Wildlife Management Area, and protected shoreline areas of Lake Wallula. However, more refined desktop assessments and field reviews indicate that views of Project elements from these areas are fully or mostly screened by small topographic features, tall trees and other vegetation, or buildings or other structures. Existing features in the landscape that fully or partially screen views of Project features from surrounding areas are described below in Sections R.3 and R.4.8 through R.4.10. Existing features that partially screen Project elements are often more dominant in appearance and cause the Project elements to be less noticeable to the casual observer. These existing, more dominant features in the landscape include:

- The HGP, with its 150–175-foot-tall stacks, and the Lamb-Weston Facilities, with their massive structures, are located adjacent to and directly north and northeast of the Energy Facility Site;
- The McNary Substation, located adjacent to and directly north of the step-up substation, is much larger in scale, contains taller elements, and effectively blocks views of it from the north, north-east, and north-west; and
- Transmission structures, which occur throughout the area.

For this Project, visual impact levels are defined as follows:

High Impacts: Typically occur where the Project components would be dominant or readily apparent from viewing locations frequented by casual observers (i.e., an observer who is not tasked with or trained in observing changes in the landscape; a common citizen). High impacts also may occur in high-quality, diverse, and rare or unique and natural landscapes.

Moderate Impacts: Occur where the Project would be co-dominant with existing landscape features and moderately apparent from viewing locations frequented by the casual observer. An example of a moderate impact would be one in which existing nearby features exhibit form, line, color, and texture similar to the Project.

Low Impacts: Occur where the Project would be subordinate in the landscape and not readily apparent from viewing locations frequented by the casual observer. The subordinate appearance of the Project may be due to other nearby features appearing more dominant or to the Project features resulting in weak contrast and blending in with their surroundings or being largely or fully screened from view. Low impacts on scenery would typically result in minimal change to the landscape character.

Moderately high and moderately low impacts would be intermediary between the respective impact levels described above.

The analysis conducted for this exhibit found that the Project will have no significant adverse impact on documented important scenic and aesthetic values within the 10-mile Analysis Area. The Project will be located within an area of existing industrial and large-scale commercial agricultural uses and adjacent to an existing natural gas–fired power plant of similar size and character; its visual impact will be moderately low. The new step-up substation will be located adjacent to an existing large substation, and its visual impact also will be moderately low. Because new transmission facilities for the Project will consist primarily of upgrading conductors on existing structures that will remain in place, the visual impact of new transmission facilities will be negligible to low.

R.3 APPLICABLE FEDERAL, TRIBAL, AND LOCAL PLANNING GUIDELINES AND PLANS

OAR 345-021-0010(1)(r)(A) *A list of the local, tribal and federal plans that address lands within the analysis area.*

Response: The federal McNary Shoreline Management Plan prepared by the USACE (2012) was reviewed for this analysis. No other applicable federal or tribal plans addressing scenic or aesthetic resources were identified. Local plans reviewed include Umatilla County Comprehensive Plan (Umatilla County 2010), Umatilla County Comprehensive Plan Technical Report (Umatilla County 1980), City of Umatilla Comprehensive Plan (City of Umatilla 2013), and the Morrow County, Oregon Comprehensive Plan (Morrow County Planning Department 1986).

OAR 345-021-0010(1)(r)(B) *Identification and description of the scenic resources identified as significant or important in the plans listed in OAR 345-021-0010(1)(r)(A),including a copy of the portion of the management plan that identifies the resource as significant or important.*

Response: The federal McNary Shoreline Management Plan prepared by the USACE (2012) was reviewed for this analysis; however, no other applicable federal or tribal plans addressing scenic or aesthetic resources were identified pertaining to the 10-mile Analysis Area surrounding the Site. The Analysis Area does not contain any state- or federally designated scenic waterways, or scenic byways as designated by the Oregon Department of Transportation.

The McNary Shoreline Management Plan states that its objective is to "achieve a balance between permitted private uses and resource protection for general public use. Management of the shoreline will provide recreation opportunities, while protecting fish and wildlife habitat, cultural resources, and the natural environment as a whole" (USACE 2012, p. 8). The plan identifies protected shoreline areas set aside to, among other purposes, maintain or restore aesthetic values. The plan does not identify or describe other significant or important scenic resources. The McNary Shoreline Management Plan (USACE 2012, p. 8) describes protected shoreline areas as follows:

Protected shoreline areas are those areas set aside to maintain or restore fish and wildlife habitat, cultural, aesthetic, or other environmental values. Shorelines may also be designated as protected to prevent development in areas subject to heavy erosion, excessive siltation, or exposure to high wind, wave, or current action, or in areas where development would interfere with navigation.

Protected shoreline areas are located upstream of Lake Umatilla on both banks of the Columbia River. The nearest protected shoreline areas to the Project are located more than 10 miles north of the Station and approximately 3 miles east of the new step-up substation. The Project will not cross or be visible from protected shoreline areas because of intervening topography, vegetation, and structures. Intervening topography includes bluffs along the river edge and several low ridges that prevent direct line-of-site to the Project from the shorelines. Shoreline areas are at elevations of approximately 340 feet above mean sea level and substantially lower in elevation than intervening bluffs and ridges which are over 500 feet above mean sea level. In addition, tall trees and various large structures are located between the protected shoreline areas and the Project that would further screen views of the Project. In combination with the long distances, these intervening features in the landscape obscure views of the Project from protected shoreline areas.

Neither the BPA, Bureau of Land Management, nor USACE have a federal land management plan that would be applicable to the Project (see Section K.8 of Exhibit K – Land Use).

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). In addition, this plan identifies the following relevant finding and policy addressing scenic resources:

Finding No. 20: Umatilla County has a number of outstanding scenic views and pleasant vistas.

Policy No. 20[1]:

(a) *Developments of potentially high visual impacts shall address and mitigate adverse visual effects in their permit application, as outlined in the Development Ordinance standards.*

(b) *It is the position of the County that the Comprehensive Plan designations and zoning already limit scenic and aesthetic conflicts by limiting land uses or by mitigating conflicts through ordinance criteria. However, to address any specific, potential conflicts, the County shall insure special consideration of the following when reviewing a proposed change of land use:*

Maintaining natural vegetation whenever possible.

Landscaping areas where vegetation is removed and erosion might result.

Screening unsightly land uses, preferably with natural vegetation or landscaping.

[1] Items c, d, and e of Policy 20 are not included here because they address publicly owned lands and specific sites that are not applicable to the Project.

Limiting rights-of-way widths and numbers of roads interesting [sic] scenic roadways to the minimum needed to safely and adequately serve the uses to which they connect.

Limiting signs in size and design so as not to distract from the attractiveness of the area.

Siting Developments to be compatible with surrounding area developments and recognizing the natural chrematistics [sic] or the location.

Limiting excavation and filling only to those areas where alteration of the natural terrain is necessary and re-vegetating such areas as soon as possible.

Protection [sic] vistas and other views which are important to be recognized because of their limited number and importance to the visual attractiveness of the area. (Umatilla County 2010, p. 8–10)

The Umatilla County Comprehensive Plan Technical Report states that "Certain developments or occurrences may conflict with scenic values. Industrial plants and energy facilities may create their own offensive scenic feature or obscure a natural scene… Scenically offensive development may ameliorate its effect by careful design, strategic placement of structures, and landscaping" (Umatilla County 1980, p. D-104). Table D-XVII, "Description of Outstanding Sites and Views" in the Umatilla County Comprehensive 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 (Umatilla County 1980). McNary Dam and Lake Wallula, an open water area of the Columbia River just upstream of the dam, are located approximately 1 mile northeast of the McNary Substation and new step-up substation site. The dam and lake are operated by the USACE and include a wildlife area (the McNary Wildlife Management Area) and recreation features such as open lawns and picnic areas, play areas, open space areas, boat launch facilities, a visitor center, trails, a fish ladder viewing area, and interpretive features. The Umatilla River downstream from State Highway 207 meanders through mostly private lands consisting largely of agricultural, industrial, and scattered low-density residential lands. The only developed public access area along the river corridor between State Highway 207 and the Columbia River is Riverfront Park in Hermiston, about 2.9 miles northeast of the Station. However, 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 in views from the wildlife area or park due to their distances from these publicly accessible areas and intervening structures, terrain, and vegetation. The new step-up substation will be located immediately south of the existing McNary Substation and screened from views from the wildlife area by the larger BPA substation. The Station will be screened from views from Riverfront Park by large buildings and the HGP facility, as well as low bluffs and tall trees along the river corridor.

The City of Umatilla Comprehensive Plan does not include any goals, policies or inventories identifying or protecting any scenic areas. The section concerning Scenic Areas, Section 5.2, is identified as "reserved for expansion" (City of Umatilla 2013, p. 30).

The Morrow County, Oregon Comprehensive Plan (Morrow County Planning Department 1986) does not include any goals, policies, or inventories identifying or protecting any specific scenic areas. The plan identifies the importance of protecting open lands, in particular agricultural lands, in the County for their "aesthetic aspects to all of the people" (Morrow County Planning Department 1986, p. 56). The plan's Natural Resource Element under the Summary of Goal 5 Resource Designations states that scenic views are "addressed in the plan (p. 69) but none identified" (Morrow County Planning Department 1986, p. 11 of 12). Furthermore, the Plan states that there are no state or federal wild or scenic waterways in the County.

R.4 POTENTIAL IMPACTS ON SCENIC AND AESTHETIC RESOURCES

OAR 345-021-0010(1)(r)(C) *A description of potential significant adverse impacts to the scenic resources identified in OAR 345-021-0010(1)(r)(B), including, but not limited to, potential impacts such as:*

(i) Loss of vegetation or alteration of the landscape as a result of construction or operation; and (ii) Visual impacts of facility structures or plumes.

Response: Although no significant or important scenic or aesthetic values are identified in federal or local plans, Perennial conducted an analysis of existing aesthetic and scenic resources within the 10-mile Analysis Area for the Project (see Figure R-1). The process for analyzing visual quality and scenic resources included the following steps:

1. Reviewing documentation for applicable federal, tribal, state, and local planning policies;
2. Reviewing the site plans, aerial photographs, and maps of the area surrounding the Project;
3. Nominating potential KOPs from site plans, aerial photographs, and maps;
4. Evaluating and photographing KOPs in the field;
5. Assessing visual sensitivity of the KOPs based on the types of users, the amount of use, the amount of public interest, and the adjacent land uses;
6. Determining scenic quality based on landform, vegetation, water, color, adjacent scenery, scarcity of the scenic resource, and existing cultural modifications; and
7. Identifying opportunities for mitigation of any impacts that may be caused by construction or operation of the facility.

Based on this analysis, the construction and operation of the Project will result primarily in minimal visual or aesthetic impacts due to the Project's low or lack of visibility from sensitive viewing locations or important scenic areas; the location of the Station in an area of existing industrial uses and adjacent to an existing power plant of similar size and character; the transmission line upgrade, consisting primarily of reconductoring of existing structures, with new structures located only near each terminus in areas of low visual quality; and the new step-up substation consisting of similar elements and located adjacent to the existing McNary Substation.

Scenic and aesthetic resources analysis focused on the landscape character in the vicinity of the Project, visually sensitive areas, and KOPs. Analysis of these features is based largely on the Federal Highway Administration (FHWA) system for Visual Impact Assessment for Highway Projects (FHWA 1988). This system was selected for this analysis because it is a widely used and defensible process for visual impact assessment and applicable for use in a broad range of landscape types, including urban and other developed lands, rural and agricultural lands, and natural areas. Similar to other established federal systems for visual impact assessment, the FHWA system entails identifying existing visual character and quality and viewer sensitivity, assessing the nature and magnitude of change to visual character and quality introduced by a project, identifying viewer responses to these changes, and assessing the degree of visual impact. The evaluative criteria of vividness, intactness, and unity are used to assess visual character and quality and visual impacts. These criteria are defined as follows:

- *Vividness is the visual power or memorability of landscape components as they combine in striking and distinctive visual patterns.*
- *Intactness is the visual integrity of the natural and man-built landscape and its freedom from encroaching elements.*
- *Unity is the visual coherence and compositional harmony of the landscape considered as a whole* (FHWA 1988).

R.4.1 Visual Characteristics of the Existing Landscape Surrounding the Perennial Wind Chaser Station Site

The Energy Facility Site is located in an area comprising primarily five general landscape character units (Figure R-1). These landscape character units are 1) agriculture consisting mostly of commercial irrigated lands; 2) shrub/scrub consisting of relatively flat rangeland, dominated by grasses, sagebrush, and other low shrubs; 3) open water, including the Columbia River, Umatilla River, and Cold Springs Reservoir; 4) developed lands consisting of both rural and urban residential, commercial, and industrial land uses; and 5) the Umatilla Army Depot, consisting primarily of managed grasslands and low shrub/scrub vegetation, with numerous munitions storage, training, and operations facilities laid out in highly regular, linear patterns.

The Energy Facility Site is located within an area of existing industrial, manufacturing, and large-scale agriculture uses. The HGP (a natural gas–fired power plant) and a large industrial facility are located immediately north of the site. Other industrial manufacturing facilities are located immediately to the west. Open agricultural fields are located south and east. The Umatilla River and two rural residences are located approximately 0.5 mile east of the site. Umatilla County has identified the Umatilla River downstream of State Highway 207 as an important site with aesthetic qualities and views (Umatilla County 1980). Most views from the river corridor toward the Energy Facility Site in this area are obscured by tall trees along the river or by other facilities, including the HGP and other large industrial facilities. Interstate Highway 82 (I-82) runs primarily north-south about 0.5 mile to the west, and Interstate Highway 84 (I-84) runs primarily east-west about 0.75 mile south of the Energy Facility Site.

R.4.2 Visual Characteristics of the Existing Landscape Surrounding the Transmission Line Right-of-Way

Work performed on the 12-mile-long transmission line connecting the Station with the McNary Substation will consist of replacing the existing 115-kV conductors with 230-kV conductors on existing structures. The extreme southern end of the line near the Station crosses a developed industrial area. The portion of the transmission line paralleling I-82 extends along the boundary between the Umatilla Army Depot and irrigated agriculture. North of that area, the transmission line meanders through irrigated agriculture fields with mostly center pivot irrigation. Near the outskirts of the community of Umatilla, the line parallels County Road 1225 and crosses through a small residential neighborhood. East of County Road 1225, the transmission line crosses a mixture of open land, agriculture fields, I-82, and the Umatilla River. Umatilla County has identified the Umatilla River downstream of State Highway 207 as an important site with aesthetic qualities and views (Umatilla County 1980). The transmission line crosses the river at a point where I-82 and other existing transmission lines also cross the river. Between the river and the McNary Substation, the transmission line crosses open fields and passes a gravel mining operation and some irrigated agriculture fields. Various large transmission lines converge in the area surrounding the substation. The landscape character along the length of the transmission line is generally flat, and the majority of this area has been altered by irrigated agriculture and development. The area has a visual character typical of the region and is of moderately low to moderate scenic quality.

R.4.3 Visual Characteristics of the Existing Landscape Surrounding the New Step-up Substation

The step-up substation will occupy approximately 3 acres and will be located immediately south of the industrial character McNary Substation. The area north of the substation is occupied by the McNary Wildlife Management Area and, although crisscrossed by numerous large transmission lines and some roads and trails, its landscape character is predominately natural. Umatilla County has identified the McNary Dam and Lake Wallula, located northeast of the proposed step-up substation, as important sites with aesthetic qualities and views (Umatilla County 1980). Views of the new step-up substation site from these features are largely obscured by intervening topography, structures, and the McNary Substation. Approximately 1,500 feet northeast of the step-up substation site is West Park, a public recreation area with open play fields and scattered trees and picnic sites; its character is primarily that of a developed recreation facility. Views of the new step-up station site from West Park are largely obscured by the McNary Substation. Surrounding the step-up substation site on the east, south, and west are open ruderal and cultivated agricultural fields containing several large transmission lines. The Umatilla River is located approximately 1 mile to the southwest of the new step-up substation. Umatilla County has identified the river downstream of State Highway 207 as an important site with aesthetic qualities and views (Umatilla County 1980). Views of the new step-up substation from the river in this area would be largely obscured by I-82 and industrial development. Several rural residences are located between 600 and 900 feet east of the site. The character of the area east, south, and west of the new step-up substation site is largely rural residential and agricultural.

R.4.4 Key Observation Points in the Vicinity of the Project

A KOP is an area that has been identified as visually sensitive based on its volume of use, expectation for scenic views, and duration of view. KOPs are generally public viewing locations identified as most representative of visually sensitive locations for viewing the proposed facilities, and they focus the viewers' attention on a particular vantage point or panoramic vista. The analysis of KOPs for the Project included identification of potential viewing locations using aerial imagery (Google Earth) and available mapping. These KOPs were then field-reviewed through site visitation and photographic documentation.

Three KOPs were identified by Perennial, confirmed by the ODOE, and then evaluated for their visual sensitivity and visual impacts related to the Project. The locations of selected KOPs are shown on Figure R-1 and include two KOPs for views of the Station and one KOP for a view of the transmission line from a residential neighborhood along the existing transmission line ROW. No KOPs were identified for views of the new step-up substation because of its proposed location next to the existing McNary Substation and somewhat separate from immediate foreground views from sensitive receptors. The visual sensitivity and impacts of the Project for each KOP are assessed below.

R.4.5 Key Observation Points for the Perennial Wind Chaser Station

Two KOPs were identified for the Station. KOP 1, shown in Photo 1, was selected to represent views of the Station from I-84 for west-bound motorists (all KOP photographs are provided in Appendix R-1). I-84 is a major interstate highway with large numbers of travelers. KOP 1 is located approximately 1 mile southeast of the Station and represents the view from the highway looking northwest toward the Site. Viewer groups traveling on the highway are typically highly varied and have varying levels of expectations or concerns regarding views. Generally, these viewers are traveling at high rates of speed, view specific features in the landscape for very short durations, and have low levels of awareness and concern for views. However, because of the large volume of viewers, visual sensitivity for this KOP will be moderate.

KOP 2, shown in Photo 2, was selected to represent views of the Station facility from I-82 for north-bound motorists. I-82 is a major interstate highway with large numbers of travelers. KOP 2 is located approximately 0.75 mile west of the Station and represents the view from the highway looking east toward the Site. Viewer groups traveling on the highway are typically highly varied and have varying levels of expectations or concerns for views. Generally, these viewers are traveling at high rates of speed, view specific features in the landscape for very short durations, and have low levels of awareness and concern for views. However, because of the large volume of viewers, visual sensitivity for this KOP also will be moderate.

R.4.6 Key Observation Points for the Transmission Line Corridor

KOP 3, shown in Photo 3, was selected to represent views of the transmission line from a residential neighborhood along the existing transmission line corridor. KOP 3 is located approximately 80–100 feet from the transmission line and represents the view from the intersection of County Road 1225 (Powerline Road) and Sparrow Avenue looking north along the transmission line corridor. Viewer groups in this neighborhood are primarily residents with frequent and long-duration views of their surroundings who typically have a high level of awareness and concern for views. Because of this, visual sensitivity for this KOP is anticipated to be high.

R.4.7 Visual Characteristics of the Project

The Project’s components are the Station, an underground natural gas pipeline, a transmission line upgrade, and a new step-up substation.

The Station will occupy approximately 20 acres (permanent disturbance) and will be constructed on a flat, open field adjacent to and just south of the existing HGP. The Energy Facility Site is zoned as Exclusive Farm Use (EFU) and is adjacent to land zoned as Light Industrial (LI) under the Umatilla County Development Code (UCDC). The transmission line portion of the Project will be located primarily on land zoned EFU, and it also crosses small portions of lands zoned LI and Rural Tourist Commercial (RTC) under the current UCDC. See Exhibit K – Land Use for a further description of land use.

Visible features of the Station will consist of a complex of large metal structures, including four CTG structures, four exhaust stacks, a mechanical draft cooling tower, a water treatment building and water tanks, a control and administration building, generators and auxiliary transformers, and a 230-kV switchyard. Most facilities will be constructed of metal. Buildings will have metal siding and roofs. See Table R-1 for building dimensions.

Other visible features of the Station include various support structures that could be visible from the Project vicinity, the chain-link security fence along the Site's perimeter, and a possible zero liquid discharge (ZLD) system. Should the Station not be able to send reclaimed water to the HGP, Perennial proposes to install a ZLD system that recycles all available water and reduces the resultant wastewater to a solid waste. The components of a ZLD system are described below.

Table R-1 Structure Dimensions

Component		Number of Units	Length	Width	Height	Diameter
CTG and Ancillary Equipment		4	200 feet	100 feet	50 feet	—
CTG Air Intake Structures		4	—	40 feet	45 feet	—
Exhaust Stacks		4	—	—	90 feet	17 feet
Cooling Tower Structure		1	165 feet	40 feet	40 feet	—
Water Tanks		4	—	—	31–40 feet	10–26 feet
Administration and Water Treatment Building		1	200 feet	40 feet	20 feet	—
ZLD System	Tank	1	—		27 feet	40 feet
	Building	1	120 feet	60	45 feet	—

Key:
CTG combustion turbine generator
ZLD zero liquid discharge

Under the ZLD system option, industrial water discharges would be treated onsite through a High-Efficiency Reverse Osmosis (HERO) process. This process would allow the treated wastewater to return to the plant as new process water, thus reducing the demand for raw water from the Port of Umatilla. A building will be required to house all HERO process equipment. Chemicals used for the treatment of process water will be delivered and stored in bulk or semi-bulk tanks, totes, drums, or bags. The tanks, totes, drums, and bags will be stored within secondary containment.

Construction of the Project will require approximately 22 months to complete. The Station and its related or supporting facilities will also require temporary disturbance of approximately 36.67 acres of land in the vicinity of the Site for construction parking, offices, lay down and assembly, and storage of construction spoils. Temporary disturbance includes areas that will be required for construction of the natural gas pipeline, transmission line, and step-up substation (see Exhibit C – Location, Table C-2 for a summary of Project facility areas).

R.4.8 Impacts on Scenic and Aesthetic Resources of the Perennial Wind Chaser Station

Views of the Project from KOP 1 and KOP 2 are shown in Photos 1 and 2, respectively. KOP 1 is approximately 1 mile from the Project site and represents the view from I-84 for west-bound motorists with moderate sensitivity. In this view, the Station will be visible just to the left of the existing HGP. The line of trees along the canal in the foreground will partially screen views of the facility. KOP 2 is approximately 0.75 mile from the Project site and represents the view from I-82 for north-bound motorists with moderate sensitivity. In this view, the Station will be visible to the right of the existing HGP, and partially screened by the structures in the foreground.

The Station will be built in a portion of an agricultural field that contains little to no native vegetation. Therefore, the Project is not anticipated to result in a substantial loss of vegetation. Views of the landscape will be somewhat altered as a result of construction and operation of the Station, as described below.

The most prominent visible features of the Station will be the four vertical 90-foot-tall exhaust stacks, which will contrast strongly with the generally flat landscape consisting of sagebrush shrub/scrub and agricultural lands. In addition, the rectilinear cooling tower, measuring 40 feet tall, 165 feet long, and 40 feet wide, will contrast strongly with the generally open, flat, agricultural landscape to the southeast of the Site.

However, these elements will be similar to the adjacent HGP located just north of the Site. Moreover, a number of other industrial buildings and vertical transmission structures are located in close proximity to the Site that contrasts with the flat, agricultural landscape character. For KOP 1, the existing power plant is partially screened by the line of trees and is not readily noticeable. Vividness is low due to the lack of memorable features and common nature of the landscape for the area. However, intactness and unity are moderately high due to the large extent of natural-appearing vegetation, dominated by the line of trees of varying heights, and lack of intrusive elements. For KOP 2, vividness, intactness, and unity are low due to the lack of scenic or memorable features, large number of structures of various forms, and lack of unifying design elements.

Although the Station will be visible from a variety of locations in the vicinity, it will be similar in form, line, color, texture, and scale to other nearby existing features surrounding it, including the HGP, industrial buildings and structures, and transmission structures, and will only incrementally increase visual contrast in the landscape. The Station will not substantially alter the existing industrial character of the area or reduce the vividness, intactness, or unity of views from KOPs 1 and 2 or other locations in the surrounding area. Therefore, impacts to visual character and quality will be incremental and less than significant. Although large numbers of viewers with moderate visual sensitivity travelling on I-84 and I-82 will view the Station, the incremental adverse effects on these viewers is anticipated to be less than significant.

The Station will emit water vapor plumes from cooling towers and exhaust stacks that occasionally will be visible from KOPs 1 and 2 and the surrounding area. Vapor plumes emanating from the Station generally will be visible during the same time periods and under the same weather conditions as those emanating from the neighboring HGP. However, vapor plumes emanating from the Station are expected to occur less frequently and be smaller in size than those emanating from the HGP because, as a peaker plant, the Station will operate intermittently and less often and the cooling towers will have a much smaller volume than the HGP and thus produce less vapor.

Exhibit Z – Cooling Tower provides detailed information regarding the formation and impacts of cooling tower plumes resulting from operation of the Station. The modeling output described in Exhibit Z demonstrates that, on an annual basis, visible plumes 200 meters long will be visible less than 50 percent of the time and that plumes up to 500 meters long will be visible 20 percent of the time on an annual basis. The period of maximum visible plume formation will be during clear, cold, and calm days. Based on meteorological records, cooler ambient temperatures that tend to promote formation of visible vapor plumes occur typically from November through March in this area, and it should also be noted that calm wind conditions registered during that period are rare (1.55 percent). Also, the relatively longer condensed plumes occur during conditions of high relative humidity when the ambient air is near saturation. The model does not account for low overcast conditions or fog that would tend to obscure the plume during such conditions. Cloud cover is often present during these winter months, and water vapor plumes forming during this period are expected to largely blend with the clouds in form, color, and texture. Because of this, the visual contrast of vapor plumes will be lessened, and plumes will be less noticeable during cloudy conditions. Visible plumes will be most noticeable during daylight hours when conditions are clear, cold, and calm and humidity is relatively high. However, these conditions occur mostly during the late fall and winter months. Although vapor plumes will occur and be visible at night, it is unlikely that they will be very noticeable provided they are not highly illuminated by lighting at the facility.

The additional plumes from the Station will slightly increase the number and add somewhat to the visibility of plumes in the area; however, they will not introduce a new element of contrast or substantially increase the presence of plumes in the landscape because they will occur coincidently with the larger plumes emanating from the HGP. For the reasons discussed above, visual impacts of visible vapor plumes will not be substantial and are anticipated to be less than significant.

Lighting of the Station will increase its visibility and the visibility of cooling vapor plumes during dark hours. Exterior lighting will be necessary for safety and security; this lighting will be shielded or directed downward and inward to minimize visual impacts.

Short-term impacts on visual quality from construction of the Station are not anticipated to be significant. Minor impacts could include the visibility of construction equipment such as cranes, scaffolding, etc. at times during the 22-month construction period.

In summary, the Station will add industrial features to an existing industrial development area, creating incremental new visual impacts. Consequently, the Station represents a low impact to the visual quality of the area.

R.4.9 Impacts on Scenic and Aesthetic Resources of the Transmission Line

A view of the transmission line from KOP 3 is shown in Photo 3. KOP 3 is approximately 80–100 feet from the transmission line and represents the view from a residential neighborhood with high visual sensitivity along the existing transmission line corridor. KOP 3 shows the view from the intersection of County Road 1225 (Powerline Road) and Sparrow Avenue looking north along the transmission line corridor. Vividness is moderately low for views in this area. Intactness and unity are generally low due to the dominating presence of the existing transmission structures and lines and their high contrast in form and line with the neatly landscaped road corridor.

Reconductoring of the existing line will not result in a substantial loss of vegetation. Views of the landscape will not be noticeably altered as a result of construction and operation of the facility as described below. Some minor short-term visual impacts may occur during the 22-month construction phase for the transmission line when existing conductors are removed and new conductors are strung due to the presence of trucks and equipment, including tall cranes. However, because these impacts are short term and temporary, they will be less than significant.

Because new transmission facilities for the Project will consist primarily of upgrading conductors on existing structures that will remain in place, the vividness, intactness, and unity of views in the area will not be substantially altered, and visual impacts of new transmission facilities on views from residences in the area of KOP 3 will be negligible to low. However, visual impacts will be further minimized by using non-specular conductors for the new line.

R.4.10 Impacts on Scenic and Aesthetic Resources of the New Step-Up Substation

No KOPs were identified for views of the new step-up substation because of its proposed location near the existing McNary Substation and somewhat separate from immediate foreground views from sensitive receptors. The new step-up substation will be located approximately 250 feet south of the McNary Substation and will be visible in views from surrounding areas, including roads, rural residences, and West Park. Vividness, intactness, and unity for these views will be low due to the dominating presence of the existing McNary Substation, transmission structures, and power lines and their high contrast in form and line with the surrounding open ruderal and agricultural fields.

The new step-up substation will result in a loss of vegetation on the undeveloped parcel; however, existing vegetation appears sparse and mostly weedy. Therefore, the Project will not result in the loss of vegetation that contributes substantially to the visual quality of the area. Views of the landscape will not be noticeably altered as a result of construction and operation of the facility, as described below. Some minor short-term visual impacts may occur during the 22-month construction phase for the step-up substation due to the presence of trucks and equipment, including tall cranes. However, because these impacts are short term and temporary, they are anticipated to be less than significant during the construction phase.

The new step-up substation will consist of tall metal structures, transformers, and other industrial utility elements similar to those of the adjacent McNary Substation. Heights of structures in and associated with the new step-up substation will be lower than those of existing structures in the McNary Substation. The tallest structures in the step-up station will be at or below 20 feet. The circuitry from the step-up substation to the riser termination structure will all be underground. Riser equipment at the north end of the underground transmission line will be up to 53 feet tall. Because of this, the new step-up substation will not contrast strongly with the existing elements in views from surrounding areas, and the low vividness, intactness, and unity of views in the area will not be substantially degraded. However, the new step-up substation will be visible from rural residences, West Park, and roads in the area, and minor visual impacts will be minimized by ensuring that the structures use dull finishes or subdued, grey-toned colors to reduce visual contrast and glare; using on-demand lighting and shielding and directive devices for lighting, while adequately addressing security and safety; and using a dark-colored coating on the perimeter fence, or otherwise using a style and color that is low glare and helps blend it with the surrounding landscape.

R.5 OPPORTUNITY FOR MITIGATION

OAR 345-021-0010(1)(r)(D) *The measures the applicant proposes to avoid, reduce or otherwise mitigate any significant adverse impacts.*

Response: Although no significant adverse impacts have been identified, visual impacts will be reduced by implementation of the following measures:

- Use dull finishes or subdued, grey-toned colors for all structures at the Station and new step-up substation to reduce visual contrast and glare;
- Use on-demand lighting, and shield and direct lighting downward and inward wherever possible at the Station and new step-up substation, while adequately addressing security and safety requirements to minimize lighting and illumination visible from surrounding areas;
- Use non-specular conductors for the new transmission line; and
- Use a dark-colored coating on perimeter fences, or otherwise use a style and color of fencing or walls that is low glare and blends with the surrounding landscape for the Station and new step-up substation.

R.6 MAP

OAR 345-021-0010(1)(r)(E) *A map or maps showing the location of the scenic resources described under OAR 345-021-0010(1)(r)(B).*

Response: Figure R-1 shows landscape character units (scenic and aesthetic values) within the 10-mile Analysis Area. No protected scenic resource areas exist within the 10-mile visual Analysis Area. Figures R-2 (Station Viewshed Analysis) and R-3 (Substation Viewshed Analysis) show areas where the station or the substation can potentially be seen within the Analysis Area. The viewshed analysis is based only on topography and does not take into account visual obstructions such as buildings and trees.

R.7 MONITORING

OAR 345-021-0010(1)(r)(F) *The applicant's proposed monitoring program, if any, for impacts to scenic resources.*

Response: The Project is not expected to result in significant adverse impacts on scenic and aesthetic values identified as important in applicable federal or tribal land management plans and local land use plans. Therefore, no monitoring efforts are proposed.

R.8 COMPLIANCE WITH REGULATORY GUIDELINES SUMMARY

The Project will comply with all applicable regulatory guidelines concerning scenic and aesthetic resources, as discussed in OAR 345-021-0010(l)(r)(A), (B), (C), (D), (E) and (F).

OAR 345-021-0010(1)(r)(A) *A list of the local, tribal and federal plans that address lands within the analysis area.*

Response: No applicable federal or tribal plans addressing scenic or aesthetic resources have been identified pertaining to the 10-mile Analysis Area surrounding the Site. The Project will not be visible from any important scenic areas designated in applicable local plans. Applicable local plans are the Umatilla County Comprehensive Plan (Umatilla County 2010), the Umatilla County Comprehensive Plan Technical Report (Umatilla County 1980), City of Umatilla Comprehensive Plan (City of Umatilla 2013) and Morrow County, Oregon Comprehensive Plan (Morrow County Planning Department 1986).

OAR 345-021-0010(1)(r)(B) *Identification and description of the scenic resources identified as significant or important in the plans listed in OAR 345-021-0010(1)(r)(A).*

Response: The Umatilla County Comprehensive Plan Technical Report identifies important sites with aesthetic qualities and views in the county in a table titled "Description of Outstanding Sites and Views" (Umatilla County 1980). Sites identified within the Analysis Area include McNary Dam, Lake Wallula, and the Umatilla River downstream from Highway 207. However, the Project, including the new step-up substation southwest of the dam and lake, will be either not visible or not noticeable in views from these areas due to distance and intervening terrain, structures, and vegetation diminishing or obstructing views as described above in sections R.4.1–R.4.3.

The City of Umatilla Comprehensive Plan does not identify any scenic resources as significant or important.

OAR 345-021-0010(1)(r)(C) *A description of potential significant adverse impacts to the scenic resources identified in OAR 345-021-0010(1)(r)(B), including, but not limited to, potential impacts such as:*

(i) Loss of vegetation or alteration of the landscape as a result of construction or operation; and

Response: The Station will be built in a portion of an agricultural field that contains little to no native vegetation. Reconductoring for the new transmission line will not require removal of any native vegetation. Construction and operation of the new step-up substation will result in a loss of vegetation on the undeveloped parcel; however, existing vegetation appears sparse and mostly weedy. No large trees or other substantial stands of native or other important vegetation will be removed as part of construction or operation of the Project. A Revegetation and Noxious Weed Control Plan has been prepared for undeveloped areas of the Station and new step-up substation sites as part of the Project and will be implemented immediately following construction (see Appendix P-2 of Exhibit P – Fish and Wildlife Habitat).

Therefore, the Project will not result in the loss of vegetation that contributes substantially to the visual quality of the area.

(ii) Visual impacts of facility structures or plumes.

Response: Although the Station will be visible from a variety of locations in the vicinity, it will be similar in form, line, color, texture, and scale to other nearby existing features surrounding it, including the HGP, industrial buildings and structures, and transmission structures, and will only incrementally increase visual contrast in the landscape. The Station will not substantially alter the existing industrial character of the area or reduce the vividness, intactness, or unity of views from KOPs 1, 2, or 3 or other locations in the surrounding area. Therefore, impacts to visual character and quality from the Station will be incremental and less than significant.

Although up to six new transmission poles will be placed as part of the Project, these will be located as part of short connections at both ends of the transmission line adjacent to industrial facilities (i.e., the Station and new step-up substation) and will be similar in height and appearance to the existing poles for the Project. Also, the new transmission line will consist primarily of reconductoring the existing line and will not introduce new forms or lines into existing views. The new transmission poles and reconductoring will not substantially alter the existing character of the area or reduce the vividness, intactness, or unity of views from KOPs 1, 2, or 3 or other locations in the surrounding area. Therefore, impacts to visual character and quality from the new transmission poles and reconductoring will be incremental and less than significant.

The addition of the ZLD system, if it becomes necessary, will not have a significant impact on visual resources.

Although visible water vapor plumes from the Station will increase the number and add to the visibility of plumes in the area, this will not introduce a new element of contrast or substantially increase the presence of plumes in the landscape due to the plumes produced by the adjacent HGP. Because plumes will occur primarily during winter months when cloudy conditions also exist in the area, their visual contrast will be lessened and they will be generally less noticeable when present. For these reasons, visual impacts of visible vapor plumes are not expected to be substantial.

OAR 345-021-0010(1)(r)(D) *The measures the applicant proposes to avoid, reduce or otherwise mitigate any significant adverse impacts.*

Response: See Section R.5, Opportunity for Mitigation.

OAR 345-021-0010(1)(r)(E) *A map or maps showing the location of the scenic resources described under OAR 345-021-0010(1)(r)(B).*

Response: See Figure R-1.

OAR 345-021-0010(1)(r)(F) *The applicant's proposed monitoring program, if any, for impacts to scenic resources.*

Response: Due to the nature and low magnitude of visual and aesthetic impacts and mitigation measures identified, no monitoring program is proposed for the Project.

R.9 REFERENCES

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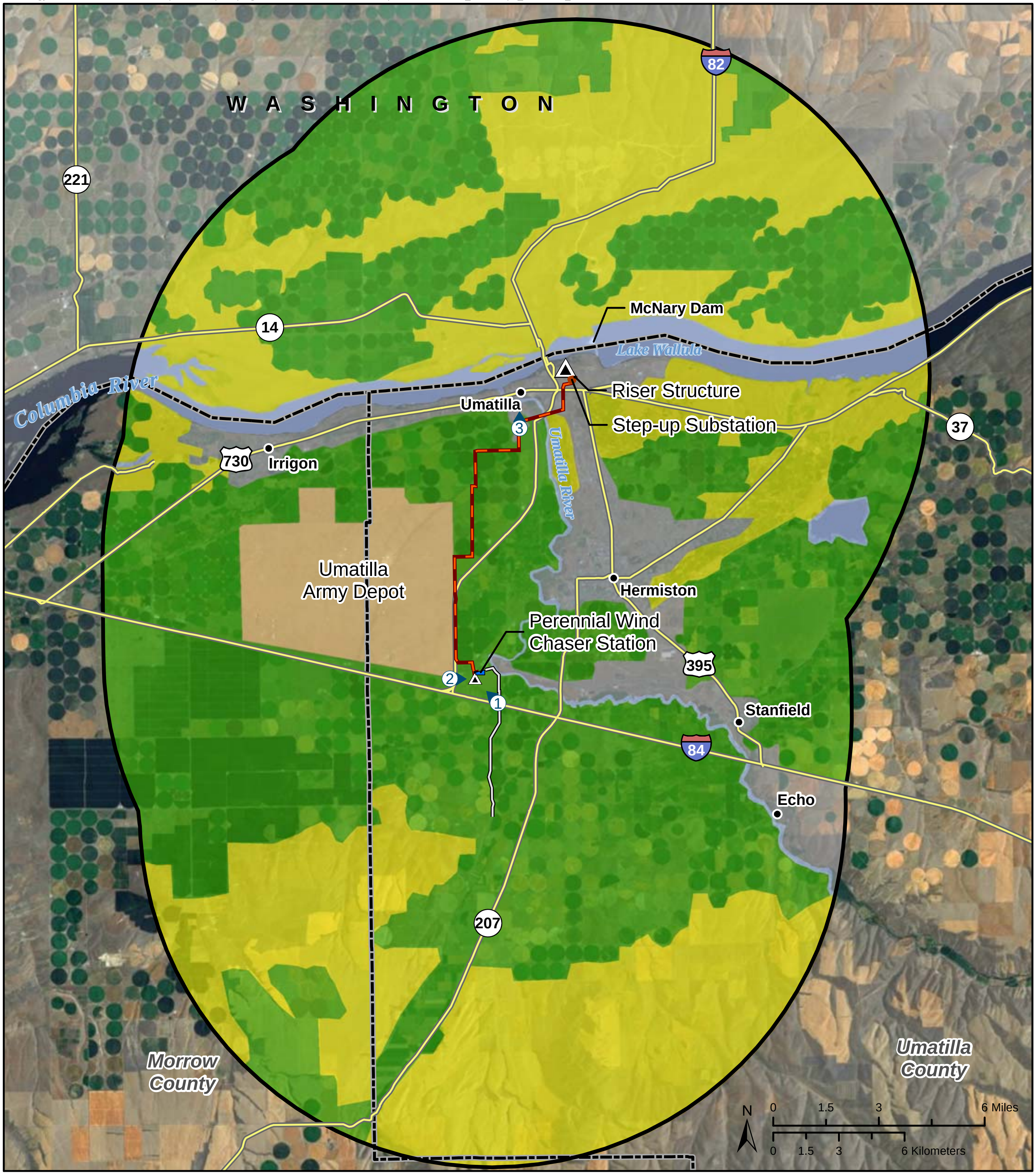


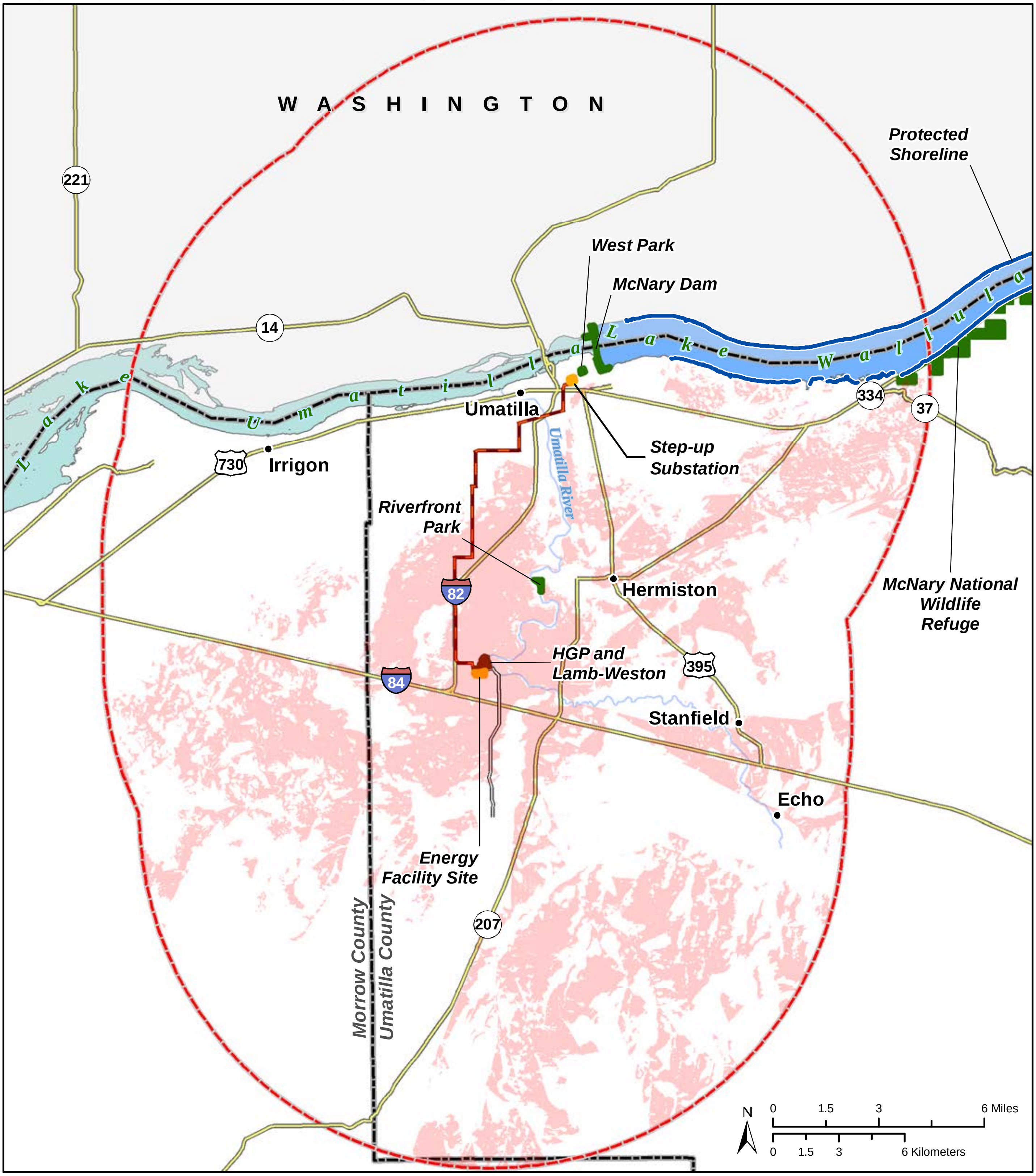
Sources: ESRI 2010

Figure R-1

Landscape Character Units and Key Observation Points

Perennial Wind Chaser Station

October 2013



Energy Facility Site & Step-up Substation
Adjacent Industrial Facilities
Natural Gas Pipeline
Existing Transmission Line
Analysis Area (10-mile radius)
Major Roads
County Boundary

Raw Viewshed from Top of 90-foot Stack at Wind Chaser Station

Scenic Resources

Scenic Parks & Protected Areas
Lake Wallula - Protected Shoreline
Lake Umatilla
Lake Wallula

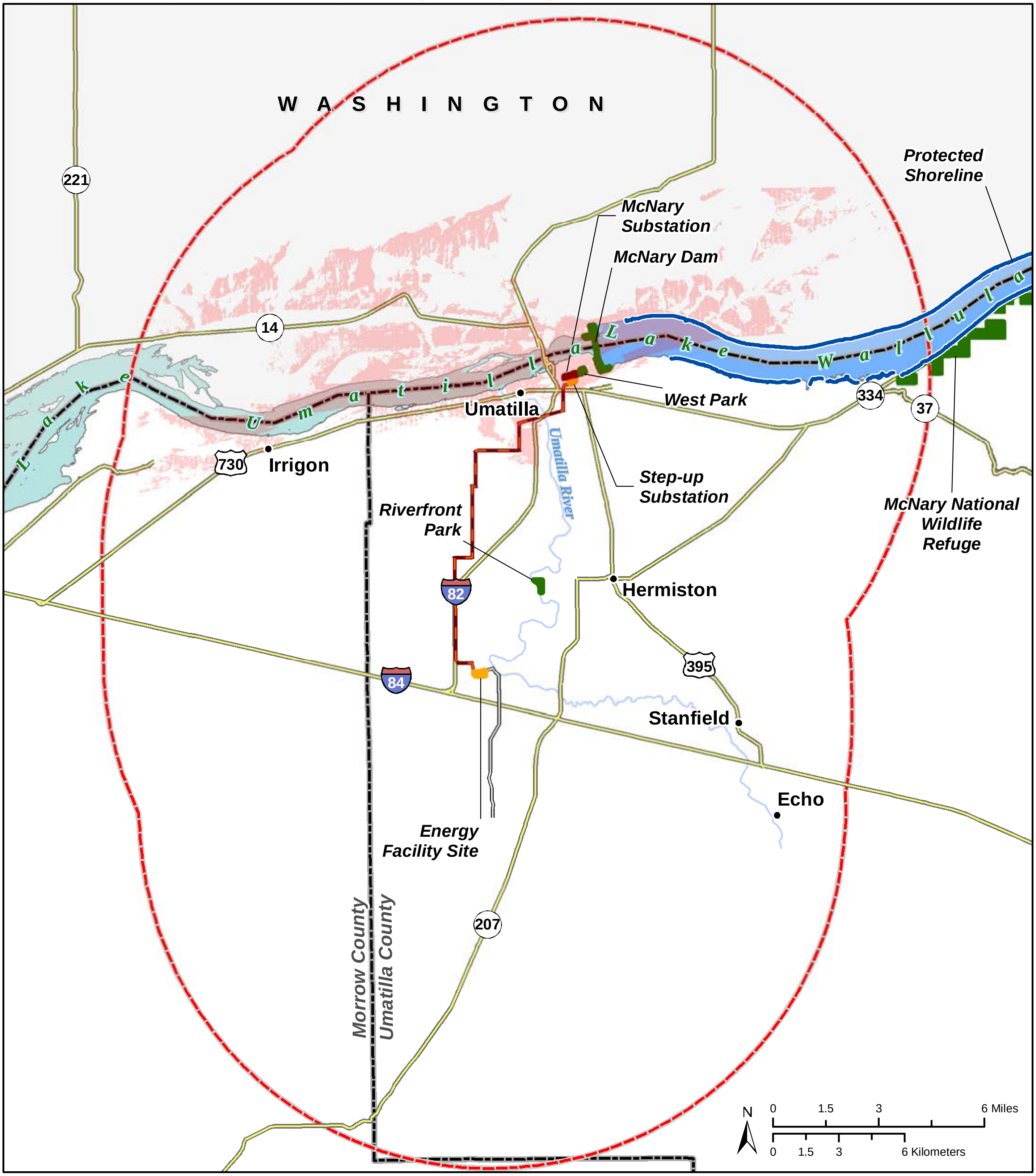
Sources: ESRI 2010

Figure R-2

Scenic Resources and Viewshed from the Energy Facility Site

Perennial Wind Chaser Station

July 2014



Energy Facility Site & Step-up Substation
McNary Substation
Natural Gas Pipeline
Existing Transmission Line
Analysis Area (10-mile radius)
Major Roads
County Boundary

Raw Viewshed from Top of 20-foot Substation

Scenic Resources

Scenic Parks & Protected Areas
Lake Wallula - Protected Shoreline
Lake Umatilla
Lake Wallula

Sources: ESRI 2010

Figure R-3

Scenic Resources and Viewshed from the Step-up Substation

Perennial Wind Chaser Station

July 2014

APPENDIX R-1

Scenic Resources - Photographs

Photo 1: KOP 1 – View northwest from I-84 toward Perennial Wind Chaser Station project site. An emission stack at the Hermiston Generating Plant is visible in the left center horizon.

Photo 2: KOP 2 – View east from I-82 toward Perennial Wind Chaser Station project site. The Hermiston Generating Plant visible to the left (north) of the railroad tracks. The Perennial Wind Chaser Station would be at the same distance, but to the right (south) of the railroad tracks.

Photo 3: KOP 3 – View north-northwest from intersection of County Road 1225 and Sparrow Avenue of existing transmission line to be reconductored.

EXHIBIT S

CULTURAL RESOURCES

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

TABLE OF CONTENTS

S.1 INTRODUCTION

OAR 345-021-0010(1)(s) *Information about historic, cultural, and archaeological resources. Information concerning the location of archaeological sites or objects may be exempt from public disclosure under ORS 192.502(4) or ORS 192.501(11). The applicant shall submit such information separately, clearly marked as "confidential," and shall request that the Department and the Council keep the information confidential to the extent permitted by law. The applicant shall include information in Exhibit S or in confidential submissions providing evidence to support a finding by the Council as required by OAR 345-022-0090.*

Response: This exhibit summarizes information collected about historical, cultural, and archaeological resources within the cultural resources Analysis Area for the Perennial Wind Chaser Station project (Project). The Project Order defines the Analysis Area for Exhibit S as the "area within the site boundary." The total area encompassed by the Site Boundary or Analysis Area is approximately 202 acres. This information is provided to allow the Oregon Energy Facility Council to "…find that the construction and operation of the facility, taking into account mitigation, are not likely to result in significant adverse impacts to… Historic, cultural or archaeological resources that have been listed on, or would likely be listed on the National Register of Historic Places" (OAR 345-022-0090). To identify historic, cultural, and archaeological resources within the Analysis Area, Archaeological Investigations Northwest, Inc. (AINW) conducted a records review followed by a field survey. The records review included the area within and near the Analysis Area, and the field survey was conducted within portions of the Analysis Area that were safe to access and that had not been previously surveyed for cultural resources. The AINW field survey covered approximately 70.26 acres, excluding Interstate Highway 84 (I-84) and the previously surveyed overhead transmission line. The results of AINW's work are summarized below. A more detailed description of the methods and results of AINW's cultural resource survey and recommendations regarding the resources' eligibility for listing in the National Register of Historic Places (NRHP) can be found in the cultural resource technical report, which is submitted separately as a confidential document to prevent public disclosure of protected archaeological site location information.

S.2 HISTORIC AND CULTURAL RESOURCES LISTED, OR POSSIBLY ELIGIBILE FOR LISTING, ON THE NATIONAL REGISTER OF HISTORIC PLACES

OAR 345-021-0010(1)(s)(A) *Historic and cultural resources within the analysis area that have been listed, or would likely be eligible for listing, on the National Register of Historic Places.*

Response: Within the Analysis Area, AINW has identified eight historic-period structures; five of these are eligible for listing in the NRHP under Criterion A, in that they are associated with events that have made a significant contribution to the broad patterns of the area's history. These five resources are: Westland Irrigation District Canals, West Extension Irrigation Canal, Union Pacific Railroad (UPRR) Messner-Hinkle Segment, Bonneville Power Administration (BPA) McNary-Boardman No.1 Transmission Line, and BPA McNary-Coyote Springs No.1 Transmission Line.

S.3 ARCHAEOLOGICAL OBJECTS AND SITES ON PRIVATE LANDS WITHIN THE ANALYSIS AREA

OAR 345-021-0010(1)(s)(B) *For private lands, archaeological objects, as defined in ORS 358.905(1)(a), and archaeological sites, as defined in ORS 358.905(1)(c), within the analysis area.*

Response: Within the Analysis Area, AINW identified one archaeological resource located on private land that falls under the definition of an archaeological object as defined in Oregon Revised Statutes (ORS) 358.905(1)(a).

The following sections describe the character of the identified archaeological resource. This discussion provides general information about the attributes of the archaeological resource used to make recommendations on NRHP eligibility.

Isolates

The Oregon State Historic Preservation Office (SHPO) defines archaeological isolates, in part, as nine or fewer artifacts found in a given location that can be associated with a particular activity that occurred in the past (SHPO 2007). Archaeological isolates fall within the definition of archaeological objects. One archaeological isolate, a single prehistoric cryptocrystalline silicate flake (12/2052-1), was found in a shovel test within the Analysis Area. Additional shovel testing conducted in the immediate vicinity of the isolated find did not reveal additional artifacts or other evidence of archaeological deposits. No further work is recommended at the isolate location because it does not appear to be part of a larger archaeological site. Furthermore, the archaeological isolate is recommended to be not eligible for listing in the NRHP as it is unlikely to contribute information important to our understanding of prehistory. As an isolated find, this flake is unlikely to provide enough data to characterize prehistoric activity at this location. Most flintknapping events produce multiple flakes; this isolated flake may be a scattered remnant of flintknapping activity.

Sites

The SHPO defines archaeological sites, in part, as 10 or more artifacts found in a given location that can be associated with a particular activity that occurred in the past (SHPO 2007). No archaeological sites have been identified within the Analysis Area.

S.4 ARCHAEOLOGICAL OBJECTS AND SITES ON PUBLIC LANDS WITHIN THE ANALYSIS AREA

OAR 345-021-0010(1)(s)(C) *For public lands, archaeological sites, as defined in ORS 358.905 (1)(c), within the analysis area.*

Response: There are no archaeological objects or sites located on public lands within the Analysis Area. The Analysis Area is located entirely on private lands, with the exception of the step-up substation location on land managed by BPA and the underground transmission line location on land managed by the U.S. Army Corps of Engineers, both of which are public (federal) lands.

S.5 SIGNIFICANT POTENTIAL IMPACTS OF CONSTRUCTION, OPERATION, AND RETIREMENT OF THE FACILITY ON HISTORIC, CULTURAL, AND ARCHAEOLOGICAL RESOURCES

OAR 345-021-0010(1)(s)(D) *The significant potential impacts, if any, of the construction, operation, and retirement of the proposed facility on the resources described in paragraphs (A), (B), and (C) and a plan for protection of those resources that includes at least the following:*

S.5.1 Methodology

OAR 345-021-0010(1)(s)(D)(i) *A description of any discovery measures, such as surveys, inventories, and limited subsurface testing work, recommended by the State Historic Preservation Officer and the National Park Service of the U.S. Department of Interior for the purpose of locating, identifying, and assessing the significance of resources listed in paragraphs OAR 345-021-0010(1)(s)(A), OAR 345-021-0010(1)(s)(B), and OAR 345-021-0010(1)(s)(C).*

Response: AINW's methods for the cultural resource survey included a records review (see Section S.5.1.1) and subsequent field surveys (see Section S.5.1.2). In addition, AINW contacted Native American tribes identified for consultation for the Project by the Oregon State Commission on Indian Services. On December 8, 2012, AINW's Project Manager, Terry Ozbun, called cultural resource contacts for the Tribes.

Teara Farrow Ferman, Program Manager of the Cultural Resources Protection Program for the Confederated Tribes of the Umatilla Indian Reservation (CTUIR), said she was familiar with the Project's Notice of Intent. She asked if there was going to be a traditional use study. Mr. Ozbun told her that she could talk with AINW's client, Ecology and Environment, Inc., about such a study and provided her the appropriate contact information. Neither Ms. Ferman nor any member of the CTUIR has contacted Ecology and Environment, Inc. to date.

Sally Bird, Cultural Resource Manager for the Confederated Tribes of the Warm Springs Reservation of Oregon, was in a meeting when called. Mr. Ozbun left her a voice message saying that AINW was starting archaeological and historical inventory fieldwork and asked her to call back if she had questions or comments. Ms. Bird has not called back with questions or comments, to date.

Johnson Meninick, Program Manager, Cultural Resources Program, Confederated Tribes and Bands of the Yakama Nation, talked with Mr. Ozbun about the Project. He indicated that people lived in that area before treaty times, although the villages were more widely separated on the Oregon side of the Columbia in that area than on the Washington side. He suggested that high winds in the area produced shifting sands that covered up archaeological materials and made them harder to find them. Mr. Ozbun told Mr. Meninick that AINW planned to dig shovel tests to identify possible subsurface archaeological deposits. Mr. Meninick did not object to this approach and made no additional recommendations regarding exploration for subsurface archaeological deposits.

Vera Sonneck, Director, Cultural Resources Program, Nez Perce Tribe, said that she would pass the information about the Project to the tribal archaeologist, Keith (Pat) Baird, who would call back if he had questions. To date, Mr. Baird has not called. Ms. Sonneck said that the Nez Perce Tribe would likely defer to the Confederated Tribes of the Umatilla Indian Reservation and support any positions they had on the Project.

AINW's technical report on archaeological and historical survey of the Analysis Area will be provided to the same Tribes for review. Comments provided by the Tribes will be addressed as a supplement to the technical report.

Records Review

AINW conducted a records review at the Oregon SHPO in Salem, reviewing reports and forms associated with previous archaeological and historical studies to determine if buildings, structures, districts, objects, or archaeological resources had been previously recorded within the Analysis Area and its vicinity. The literature review also included regional and local environmental histories, ethnographic studies, and documents pertaining to local Euroamerican history. The results of the records review, which are described in detail in AINW's technical report (Jenkins et al. 2013), are summarized here.

No previously recorded archaeological sites are present within the Analysis Area. Three previously recorded historic-period resources are located within the Analysis Area: the UPRR Mainline, BPA McNary-Boardman No. 1 Line, and BPA McNary-Coyote Springs No. 1 Line (Emerson 2012; Norman 2005).

Records at the Oregon SHPO identified a previous archaeological survey conducted for the Hermiston Generating Project's Co-generation Energy Facility within the Project's Analysis Area (Oetting 1992). This survey covered the overhead electrical transmission line and natural gas pipeline portion of the Analysis Area, resulting in the identification of one historic-period irrigation canal (Westland B Canal) in the Project's natural gas pipeline right-of-way (ROW) (Oetting 1992). No archaeological or historic-period resources were identified in the overhead electrical transmission line ROW during the previous cultural resource survey.

Field Surveys

Following the records review, AINW conducted a pedestrian field survey and shovel testing within the Analysis Area. The pedestrian survey and shovel testing were conducted on December 19 through 21, 2012; January 3 and 4, 2013; and July 10 through 12, 2013. The archaeological field investigations were carried out in conformance with Oregon SHPO standards and guidelines (SHPO 2007). The archaeological pedestrian survey was performed by professional archaeologists walking parallel transects spaced up to 15 meters (50 feet) apart.

AINW surveyed the entire Analysis Area, with the exception of its intersection with I-84, which is unsafe to traverse on foot, and two small portions of agricultural fields with standing crops to prevent harming the crop. In both cases where standing crops prevented pedestrian surveys, immediately adjacent and parallel areas had been previously surveyed, and no evidence of cultural resources had been found. AINW recommends that these areas do not need to be re-examined when crops are harvested, as there is little chance that archaeological resources are present there. In addition, a section of the Project's natural gas pipeline ROW located on the west side of Cottonwood Bend Road was not surveyed for cultural resources as the landowner did not grant AINW permission to access the property prior to the survey of the Analysis Area. AINW recommends that this area be surveyed for cultural resources once access is granted by the landowner.

At the direction of the SHPO via telephone conversation on July 8, 2013, and conformation email from John Pouley (Assistant State Archaeologist) on July 10, 2013 (Ozbun, pers. comm. 2013), there is no need to resurvey for cultural resources in areas where there is no planned ground disturbance, if a previous cultural resource survey meets current standards and did not identify cultural resources. If changes are made to the design plan or if ground-disturbing construction occurs outside of the areas surveyed, then additional surveys would be necessary.

A previous survey of an existing overhead electrical transmission line within the Project's Analysis Area was conducted in 1992 (Oetting 1992). This survey did not identify any cultural resources within the electrical transmission line ROW. AINW reviewed this survey to determine if it met current survey standards. AINW found that the survey meets current standards, but they updated the accompanying records review recorded and assessed five historic-period structures (West Extension Irrigation Canal, BPA McNary-Boardman No. 1 Line, and BPA McNary-Coyote Springs No. 1 Line, Brownell Ditch, and UPRR Umatilla Branch) that cross the 1992 survey corridor within the Analysis Area for NRHP eligibility and Project-related effects.

Shovel testing was conducted within portions of the Analysis Area where ground visibility was poor (less than 30 percent) and that were determined to have a high probability for containing cultural resources. These high probability areas were selected based on factors that predict where sites are typically found, such as on terrace landforms, near natural water sources, and near other recorded historic and prehistoric sites in the area. Since ground surface visibility was generally good, the number of shovel tests excavated was small relative to the size of the Analysis Area. A total of 33 shovel tests were excavated within the Analysis Area. If a shovel test detected an artifact, additional shovel tests were excavated in the four cardinal directions at a distance of 5 meters (16 feet) to determine whether the resources were isolated finds (nine or fewer artifacts) or archaeological sites (10 or more artifacts).

Field data collected during the archaeological survey indicated that no buildings over 50 years in age were located within the Analysis Area. AINW architectural historians conducted research of county land records and historic-period maps and records. All historic-period engineering structures (canals, railroads, and transmission lines) in the Analysis Area over 50 years in age were documented by the archaeological survey crew, then evaluated and recorded on SHPO historic resource clearance forms by an AINW architectural historian. The National Register of Historic Places uses 50 years as a standard age for initial consideration of whether a building or structure might be historically significant. This federal standard is the guideline used by the Oregon SHPO as well.

S.5.2 Survey and Inventory Results

OAR 345-021-0010(1)(s)(D)(ii) *The results of the discovery measures described in OAR 345-021-0010(1)(s)(D)(i) [such as surveys, inventories, and limited subsurface testing work],together with an explanation by the applicant of any variations from the surveys, inventory, or testing recommended.*

Response: The records review and cultural resource fieldwork identified eight cultural resources within the Analysis Area. These resources consist of five NRHP-eligible historic-period resources, two historic-period resources that are recommended to be not eligible for listing in the NRHP, and one previously unrecorded archaeological isolate that is recommended as not eligible for listing in the NRHP. State law protects archaeological sites, not isolated objects, unless they are funerary objects or objects of cultural patrimony.

S.5.3 Measures Designed to Prevent Destruction of Historic, Cultural, and Archaeological Resources

OAR 345-021-0010(1)(s)(D)(iii) *A list of measures to prevent destruction of the resources identified during surveys, inventories, and subsurface testing referred to in subparagraph (i) or discovered during construction.*

Response: Perennial-WindChaser LLC (Perennial) will take reasonable measures to avoid impacts on historic, cultural, and archaeological resources.

Known Historic Resources

Perennial will review construction details/design with the owners/operators of the five NRHP-eligible historic-period resources identified in the Cultural Resource Technical Report and obtain any necessary easements or approvals prior to construction. This will ensure that physical damage to the alignment, construction materials, and design of the five NRHP-eligible historic-period resources identified in the Cultural Resource Technical Report—Westland Irrigation District Canals; West Extension Irrigation Canal; Union Pacific Railroad Messner-Hinkle Segment; BPA McNary-Boardman No.1 Line; and BPA McNary-Coyote Springs No.1 Line—will not occur. Impacts on the historic transmission lines will be prevented by avoiding the existing BPA facilities by passing underneath or around them. The railroad alignment will be crossed by excavation under the resource through the use of trenching. In the case of canal crossings, if boring underneath the canals is not possible, trenching through the canals will be followed by restoration of the original alignment, construction materials, and design.

Inadvertent Discovery of Archaeological Resources

In the event of an inadvertent discovery of archaeological resources, construction activity within 30 meters (100 feet) of the discovery would stop immediately and the area would be flagged or marked, as per ORS 358.920. The Project proponent would immediately notify a professional archaeologist. The consulting archaeologist would make a preliminary assessment of whether the archaeological material is potentially significant and recommend additional steps to mitigate the effect on the resource. This assessment and recommendation must be sent to the SHPO for concurrence prior to commencement of any ground-disturbing activities. The SHPO may ask a project sponsor to retain a consulting archaeologist to assist in the development of a treatment plan for the resource, depending upon factors such as the nature of the discovery, the project scope, and the statutory jurisdiction.

Inadvertent Discovery of Human Remains

If human remains are inadvertently discovered during the Project, and are not clearly modern, then there is a high probability that the remains are Native American, and therefore ORS 97.740-.760 would apply. These statutes require immediate notification to the State Police, the SHPO, the Commission on Indian Services, and the appropriate Native American tribes. For the Project, the Legislative Commission on Indian Services has determined that the appropriate Native American tribes are the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of Warm Springs, the Confederated Tribes and Bands of the Yakama Indian Nation, and the Nez Perce Tribe. All parties involved should implement a culturally sensitive plan for the reburial of the remains. The remains and associated objects should not be disturbed, manipulated, or transported from the original location until a plan is developed in consultation with the parties named above. These actions will help ensure compliance with Oregon state law that prohibits any person from willfully removing human remains and/or objects of cultural significance from their original location (ORS 97.745).

S.6 PROPOSED MONITORING PROGRAM

OAR 345-021-0010(1)(s)(E) *The applicant's proposed monitoring program, if any, for impacts to historic, cultural, and archaeological resources during construction, operation and retirement of the proposed facility.*

Response: Based on the findings of the archaeological surveys and the fact that potential impacts on the five NRHP-eligible historic-period resources will be avoided, a monitoring program for impacts to historic, cultural, and archaeological resources during construction is not proposed. Based on the results of Project archaeological surveys and previous archaeological surveys in the immediate area, it is unlikely that significant cultural or archaeological deposits will be impacted by construction and operation of the Project.

S.7 REFERENCES

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Ozbun, Terry. July 8 and 10, 2013. Personal Communication with John O. Pouley, Oregon SHPO, Assistant State Archaeologist.

EXHIBIT T

RECREATION

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

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TABLES

FIGURES

T.1 INTRODUCTION

OAR 345-021-0010(1)(t) *Information about the impacts the proposed facility would have on important recreational opportunities in the analysis area, providing evidence to support a finding by the Council as required by OAR 345-022-0100.*

Response: To issue a site certificate for an energy facility, Oregon Administrative Rules (OAR) 345-022-0100(1) require that the Oregon Energy Facility Siting Council (Council) find that the design, construction, and operation of a project will not result in significant adverse impacts to important recreational opportunities within the Analysis Area. In making this determination, the Council can take mitigation into account if there are potential adverse impacts.

The Analysis Area for recreational opportunities, as defined in the Project Order issued for the Perennial Wind Chaser Station project (Project), 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. This exhibit identifies existing and proposed recreational opportunities within the Analysis Area and establishes that the Project is not expected to result in adverse impacts to these resources.

T.2 SUMMARY

There are two state-owned recreational areas within the Analysis Area, referred to as State Wildlife Areas. Recreational opportunities within the Analysis Area include the Umatilla River, various City of Hermiston recreational facilities, and a National Scenic and National Historic Trail. The Project will not adversely impact any identified existing recreational opportunities within the 5-mile Analysis Area and will cause no loss of recreational use. The Project will not detract from the recreational opportunities generally available in the vicinity, such as fishing, waterfowl hunting, hiking, cycling, and boating.

T.3 IMPORTANT RECREATIONAL OPPORTUNITIES AND FACILITIES IN THE ANALYSIS AREA

OAR-345-021-0010 (1)(t)(A) *A description of important recreational opportunities in the analysis area that includes information on the factors listed in OAR 345-022-0100(1) as a basis for identifying important recreational opportunities.*

Response: In order for the Council to judge the importance of recreational opportunities within the Analysis Area, the following factors of OAR 345-022-0100(1) must be considered:

(a) Any special designation or management of the location;

(b) The degree of demand;

(c) Outstanding or unusual qualities;

(d) Availability or rareness; [and]

(e) Irreplaceability or irretrievability of the opportunity.

Most recreational opportunities in the Project's Analysis Area (including fishing, waterfowl hunting, hiking, cycling, and boating) are concentrated along the Columbia River and nearby or within National and State wildlife areas, thereby making these opportunities "important" due to "outstanding or unusual qualities," "irreplaceability of the opportunity," and "special designation or management of the location." Figure T-1 shows the location of all sites that qualify as "important recreational opportunities" within 5 miles of the Project. Table T-1 lists these sites, as well as the distance from the sites to the Project's Energy Facility Site and step-up substation.

T.3.1 State and Federal Recreational Opportunities

State Wildlife Areas

The Oregon Department of Fish and Wildlife (ODFW) and its partners have opened tens of thousands of acres of private land to hunting in Wasco, Sherman, Gilliam, Morrow, and Umatilla Counties. These areas, known as State Wildlife Areas, are managed by the ODFW and provide wildlife habitat as well as hunting opportunities. Management of these areas is funded through federal excise taxes on sporting arms and ammunition, in addition to hunting license dollars. Because these areas are managed by ODFW, they are considered important based on the "special designation or management" criterion listed in OAR 345-022-0100(1).

Irrigon Wildlife Area

The Irrigon Wildlife Area is a State Wildlife Area consisting of nearly 1,000 acres split between grassland, sagebrush steppe/shrubland, and permanently and seasonally flooded wetland. The area fronts the Columbia River on the Oregon side for approximately 7 miles, straddling Morrow and Umatilla Counties. It is managed for both wildlife protection and recreation. Recreational facilities include a walking and riding trail, as well as two public beaches (ODFW 2008).

Power City Wildlife Area

Power City is a State Wildlife Area consisting of 100 acres split between grassland and wetland (seasonal/perennial) habitat located north of Hermiston and south of Umatilla. The area is used for hiking; hunting California quail, pheasant, mourning dove, duck, and deer; and wildlife viewing (upland birds, waterfowl, songbirds, amphibians, and reptiles are common during most of the year) (ODFW 2008; ODFW 2013).

Steelhead Park

In addition to the State Wildlife Areas it manages, the ODFW owns Steelhead Park, a public park that is approximately 7.4 acres. This area is considered suitable for passive use, as there are no established trails and it is not maintained by the ODFW. The area is open for public access via Riverfront Park downstream for fishing, hiking, and wildlife viewing (Duke 2013).

Federally Managed Recreational Areas

These recreational opportunities are also considered important based on the "special designation or management" criterion listed in OAR 345-022-0100(1) due to the areas' management by the United States Army Corps of Engineers (USACE). In addition, certain other criteria within the rule may apply depending on the specific features of each location, including elements such as the unique opportunity afforded to fishermen fishing in the ponds stocked by ODFW, the special designation of a location (i.e., Lewis & Clark Commemorative Trail), and the popularity of an area with visitors.

Lewis & Clark Commemorative Trail

The Lewis & Clark Commemorative Trail is a day use hiking and equestrian trail located along the Columbia River upstream from the McNary Dam. The trail is a part of the Lewis and Clark National Historic Trail and is designated as one of the National Scenic and National Historic Trails. The trailhead is located at the Warehouse Beach Recreation Area. The distance of the trail between Warehouse Beach and McNary Beach is approximately 7 miles. The trailhead at Warehouse Beach is the primary staging area for equestrians using the trail. The facilities available at the trailhead include hitching posts, horse trailer parking, picnic tables, barbeque grills, shade, restrooms, and a swimming area. The operating agency is the USACE (USACE 2013a).

McNary Wildlife Nature Area

The McNary Wildlife Nature Area is a 318-acre day use recreation area and boat ramp on the Oregon side of the Columbia River at approximately Columbia River Mile 291. It is managed by the USACE, but its ponds are stocked by the ODFW. It is 1.5 miles east of Umatilla, Oregon, at the head of Lake Umatilla. The McNary Dam lies immediately upstream of the Nature Area, and further upstream is McNary Beach. Recreational activities in this area consist of day use, wildlife viewing, shoreline fishing access, boating, and hiking (USACE 2013b).

McNary Dam (Lake Wallula/Umatilla)

The USACE manages the 17-acre area directly adjacent to the McNary Dam located at Columbia River Mile 292, on the river banks of both Oregon and Washington. The recreational opportunities at this site consist of day use facilities and boating; there are three launch ramps and four lanes total (the Washington shore has one lane, and the Oregon shore has three); a handling dock; an open lawn; shade; fire/grills; drinking water; a fish-viewing room; a powerhouse display gallery; a Pacific salmon visitor information center; natural resource offices; and fishing areas (USACE 2013c).

McNary Beach Park

McNary Beach Park is a 118-acre area located at Columbia River Mile 293, on the Oregon side. The recreational opportunities at this site consist of day use facilities and hiking access, including tables, covered picnic shelter, open lawn, barbeque grills, flush toilets, cold showers, a vault toilet, swimming area, hiking trials, a playground, and fishing access (USACE 2014a).

Plymouth Park

Plymouth Park is a 112-acre park located adjacent to the town of Plymouth, Washington. The park offers both a day use area consisting of picnic tables, barbecue facilities, a swimming beach, and a boat launch and fishing, and a campground that is suitable for recreational vehicle or tent camping. Plymouth Park is not directly on the river; however, fishing is available 1 mile away at the day use area (Free Guide to Northwest Camping 2013). Anglers fish for chinook, steelhead, walleye, sturgeon, and shad (Reserve America 2013).

Spillway Park / Pacific Salmon Visitor Center

Spillway Park is located directly adjacent to McNary Dam and the McNary Wildlife Nature Area. The park offers a day use area that includes picnic tables, access to restrooms, drinking water, shaded areas, and shoreline. The Pacific Salmon Visitor Center is located immediately adjacent to Spillway Park and includes interpretive displays and programs, in addition to a juvenile fish facility (USACE 2014b,c).

West Park

West Park is located to the south of the McNary Wildlife Area and to the east of the existing McNary Substation, on the southeast corner of the intersection of 3rd Street and Scaplehorn Road. The park offers a day use area that includes picnic shelters and tables, barbeque frills, a playground, horseshoe pits, and a baseball field, in addition to access to fishing, drinking water, and flush toilets (USACE 2014d).

T.3.2 Morrow County Recreational Opportunities

With the exception of the Irrigon Wildlife Area, there are no developed recreational opportunities in Morrow County within the Project's 5-mile Analysis Area.

T.3.3 Umatilla County Recreational Opportunities

With the exception of the State and Federal sites listed in Section T.3.1, recreational opportunities in Umatilla County within the 5-mile Analysis Area are operated by the City of Hermiston and the City of Umatilla.

City of Hermiston

The City of Hermiston owns and manages approximately 112 acres of public park lands; this, combined with other lands featuring public access controlled by other agencies, totals over 1,000 acres of recreational areas in the Hermiston area (Carter Burgess 2007). The City's comprehensive plan addresses natural area inventories for fish and wildlife habitats, as well as wetlands, erosion hazards, seismic hazards, aquifer recharge soils areas, and agriculture and farm lands in accordance with the City's Parks, Recreation & Open Space Policy (Policy #16), which responds to Goal 8: Recreational Needs of Oregon's Statewide Planning Goals & Guidelines (OAR 660-015-0000(8)).

Due to significant usage by residents and visitors, City parks located within the Analysis Area are considered important based on the "degree of demand" criterion listed in OAR 345-022-0100(1). Table T-1 shows the parks managed by the City within the Analysis Area and the distance of each park from the Energy Facility Site.

Future recreational opportunities on City-owned public lands include the Hermiston Loop Project, which consists of 6.5 miles of trails (Fetter 2013). According to the Director of the Hermiston Parks and Recreation Department, this trails system is 70 percent complete, with the trailhead at Riverfront Park (Fetter 2013). No future park designations are planned, although Steelhead Park, managed by the ODFW, may be under consideration for City ownership and/or management (Duke 2013).

City of Umatilla

The City of Umatilla operates several parks providing access to the Umatilla River and Columbia River. These include Nugent Park and Umatilla Landing, which front the Umatilla River and are operated by the City's Public Works Department (City of Umatilla 2011) and the Umatilla Marina Park, which features boat docking and recreational vehicle parking, in addition to access fishing, hunting, water skiing, and river cruising activities onsite (City of Umatilla 2013).

Due to these parks' location in proximity to the rivers, they are considered important under the "outstanding qualities" criterion of OAR 345-022-0100(1).

Table T-1 Important Recreational Opportunity Areas within 5 Miles of the Energy Facility and Substation Sites

Park Name	Operator	Distance from Energy Facility Site (miles)	Distance from Substation (miles)
Lewis & Clark Commemorative Trail	USACE	10.00	2.19
McNary Wildlife Nature Area	USACE	8.55	0.24
McNary Dam	USACE	9.08	0.79
McNary Beach Park	USACE	9.76	1.87
Plymouth Park	USACE	8.45	1.45
Spillway Park / Pacific Salmon Visitor Center	USACE	9.37	0.78
West Park	USACE	8.83	0.24
Irrigon Wildlife Area	ODFW	7.60	1.98
Power City Wildlife Area	ODFW	7.01	1.58
Steelhead Park	ODFW	2.48	6.23
Riverfront Park	City of Hermiston	2.73	5.69
Harrison Park	City of Hermiston	3.47	5.54
Victory Square Park	City of Hermiston	3.65	5.61
Belt Park	City of Hermiston	3.68	5.89
Butte Park	City of Hermiston	4.26	5.00
Hermiston Family Aquatic Center	City of Hermiston	4.25	4.99
McKenzie Park	City of Hermiston	4.14	5.78
Hodge Park	City of Hermiston	4.22	6.09
Theater Sports Park	City of Hermiston	4.74	4.51
Newport Park	City of Hermiston	4.67	5.85
Sunset Park	City of Hermiston	4.99	5.20
Oxbow Trail (Hermiston Loop)	City of Hermiston	3.00	6.36
Nugent Park	City of Umatilla	7.67	1.62

Table T-1 Important Recreational Opportunity Areas within 5 Miles of the Energy Facility and Substation Sites

Park Name	Operator	Distance from Energy Facility Site (miles)	Distance from Substation (miles)
Umatilla Landing	City of Umatilla	7.81	1.88
Umatilla Marina Park	City of Umatilla	8.44	0.65

Source: Carter Burgess 2007; AllTrails, Inc. 2013; USACE 2013a,b,c; USACE 2014a,b,c,d.
Key:
ODFW Oregon Department of Fish and Wildlife
USACE United States Army Corps of Engineers

T.3.4 Informal Recreational Opportunities

Fishing, hunting, water-skiing, boating, camping, sailing, hiking, and cycling are possible recreational opportunities within and around the Analysis Area. This stretch of the Columbia River is also part of the historic Lewis & Clark Commemorative Trail.

T.4 SIGNIFICANT POTENTIAL ADVERSE IMPACTS TO THE OPPORTUNITIES IDENTIFIED

OAR 345-021-0010(1)(t)(B) *A description of significant potential adverse impacts to the important opportunities identified in OAR 345-021-0010(1)(t)(A) including, but not limited to:*

(i) Direct or indirect loss of a recreational opportunity as a result of facility construction or operation.

Response: Project construction and operation are not expected to result in significant adverse impacts on the identified important recreational opportunities, due to Project location. Distance from the Energy Facility Site and substation to the identified opportunities is provided in Table T-1. However, the primary impacts of the Project would result from the construction and operation of the Station, which is located adjacent to the existing Hermiston Generating Plant and other industrial facilities; therefore, there is little potential for development of recreational opportunities or facilities in this area. No aspect of the Project would preclude formal or informal recreational opportunities outside of the Site Boundary, based on local and state recreational plans.

(ii) Noise resulting from facility construction or operation.

Response: Construction of the Project will result in temporary short-term noise levels but will have no long-term impact on the identified important recreational opportunities (Table T-1). Based on the Energy Facility Site's distance from these recreational opportunities, and the proposed noise control measures,[1] the noise modeling results indicate that Station operation will not increase the noise level greater than 10 dBA above the lowest-measured background hourly L_{50} for each noise-sensitive property. Thus, the construction or operation of the Station or the step-up substation is not expected to result in significant potential adverse noise impacts that would preclude formal or informal recreational opportunities outside of the site boundary, based on local and state recreational plans.

(iii) Increased traffic resulting from facility construction or operation.

Response: The estimated peak-period traffic within the Analysis Area, is expected to be about 200 vehicles during the daily AM and PM peaks over the course of the construction phase of the Project. This increase in traffic will be temporary and limited to the construction period. During operation of the Project, the estimated six to eight full time personnel required will cause an increase in traffic of approximately five to ten vehicles per day. Traffic increases will occur primarily at the Interstate Highway 84 and Westland Road interchange. Important recreational opportunities and facilities are not available near these roads; therefore, the traffic impact resulting from construction and operation of the Project would not adversely affect recreational opportunities.

A more detailed discussion of traffic increases resulting from Project construction and operation is provided in Exhibit U – Public Services.

(iv) Visual impacts of facility structures or plumes.

Response: The Project will result mostly in minimal impacts to recreational facilities.

In order to analyze visual impacts resulting from the Energy Facility Site and step-up substation, a viewshed analysis was carried out. This analysis shows all points visible from a point 90 feet high at the Station (corresponding to stack height) and from a point 20 feet high at the step-up substation (corresponding to the height of the substation), based on local topography. The

[1]For an explanation of noise control measures, see Exhibit X – Noise. Vendor-provided noise reduction values were included in the model for standard silencers to be installed in the combustion turbine inlet and exhaust, inlet filter house surfaces, and the variable bleed valve; pulse media and acoustic improvements at the combustion inlet filter; internal lining and external cladding applied to combustion air inlet duct walls; and lagging applied to the combustion exhaust stacks, expansion joints, catalyst sections and intercooler ducts, transitions, and expansion joints.

analysis was overlaid with the identified important recreational opportunities in Figures T-2 and T-3.

Figures T-2 and T-3 show that:

- The Station at the Energy Facility Site would potentially be visible from portions of Sunset Park, McKenzie Park, Newport Park, and the Hermiston Family Aquatic Center.
- The step-up substation would potentially be visible from portions of Plymouth Park, McNary Wildlife Nature Area, McNary Dam, Spillway Park, McNary Beach, Umatilla Marina Park, and Nugent Park.

However, it should be noted that this analysis takes into account only topography. It is in fact unlikely that the Station and substation would be visible from most of these parks because, as is visible in Figures T-2 and T-3:

- Recreational areas potentially visually impacted by the Station are all located within the city of Hermiston and are separated from the Station by 1 to 2 miles of urban development within City limits, in addition to industrial development immediately adjacent to the Station (the Hermiston Generating Plant and Lamb-Weston).
- The McNary Substation is located directly in between the step-up substation and all of the parks that would potentially be impacted, with the exception of Nugent Park. Nugent Park, however, is separated from the Station by over 1 mile of urban development in the City of Umatilla.

Regarding the remaining project components:

- Visual impacts from transmission line upgrades are unlikely, because the work would consist primarily in reconductoring, and new structures would only be constructed near each terminus in areas of low visual quality.
- No visual impacts are expected from upgrades to the natural gas line, since that line will run in an existing right-of-way.

Regarding potential visual impacts from plumes:

- Although the additional plumes from the Project will increase the number and add to the visibility of plumes in the area, this will not introduce a new element of contrast or substantially increase the presence of plumes in the landscape, thereby causing minimal impact to both existing and future recreational facilities located within the Analysis Area. Although vapor plumes will occur and be visible at night, it is unlikely that they will be very noticeable due to existing plumes from existing industrial activity or impact recreational facilities within the Analysis Area. For the reasons discussed above, impacts of vapor plumes will not be substantial and will be less than significant.

T.5 MITIGATION MEASURES

OAR 345-021-0010(1)(t)(C) *A description of any measures the applicant proposes to avoid, reduce or otherwise mitigate the significant adverse impacts identified in OAR 345-021-0010(1)(t)(B).*

Response: The existing recreational opportunities and future planned recreational sites, such as the Hermiston Loop Project, will not be impacted by the Project due to the distance of the recreational sites from the Project features. Furthermore, the important recreational opportunities, located primarily along the Columbia River, will not be adversely impacted due to the distance from the Project (see Figure T-1). Therefore, no mitigation measures are proposed at this time.

T.6 MAP OF ANALYSIS AREA

OAR 345-021-0010(1)(t)(D) *A map of the analysis area showing the locations of important recreational opportunities identified in OAR 345-021-0010(1)(t)(A).*

Response: Figure T-1, at the end of this exhibit, shows the Analysis Area for recreational opportunities and facilities.

T.7 MONITORING PROGRAM

OAR 345-021-0010(1)(t)(E) *The applicant's proposed monitoring program, if any, for impacts to important recreational opportunities.*

Response: The existing recreational opportunities and future planned recreational sites, such as the Hermiston Loop Project, will not be impacted by the proposed Project due to the distance of the recreational sites from the Project features. Therefore, no monitoring program is proposed at this time.

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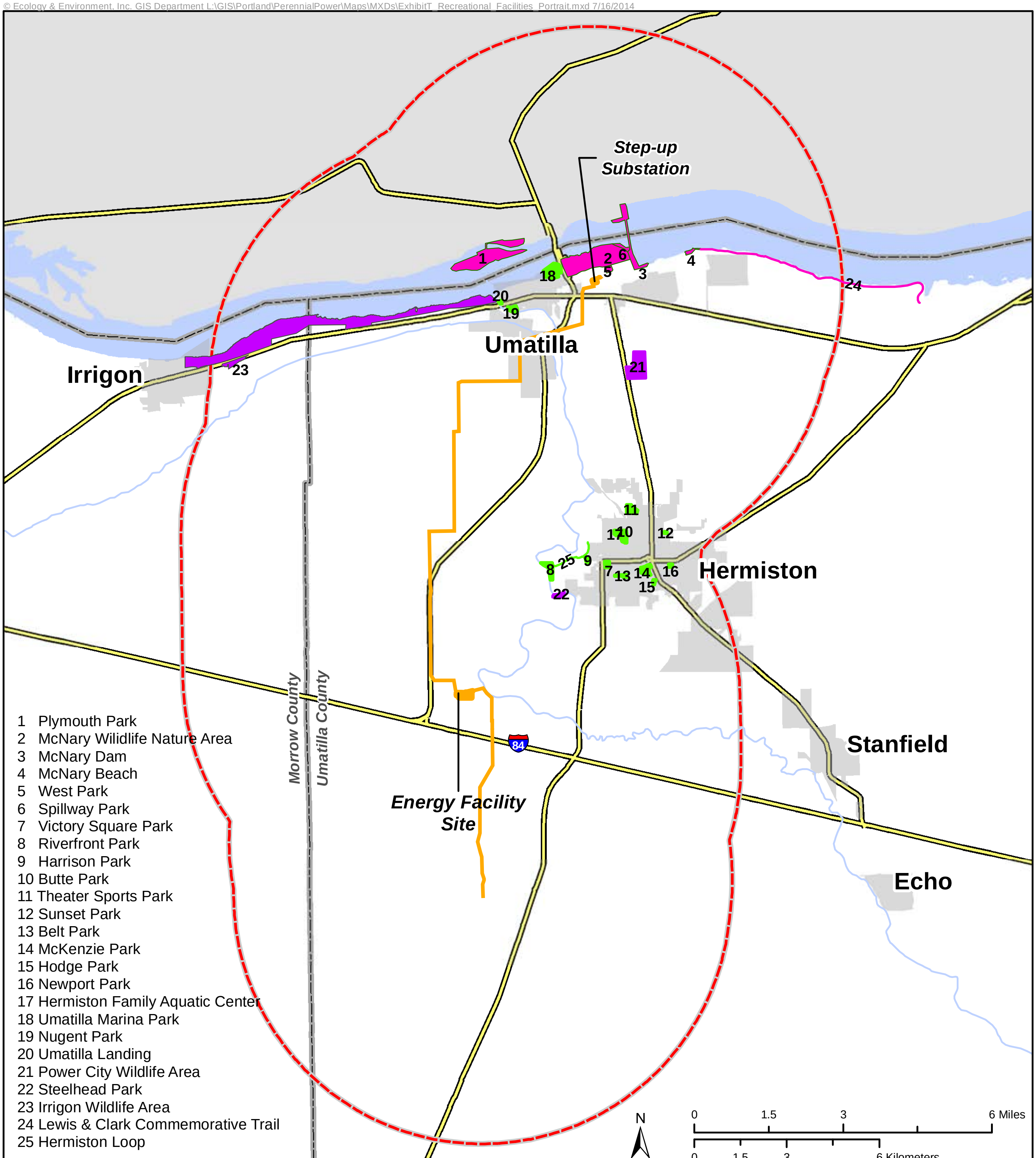


Project Facilities

Analysis Area (5-mile Radius)

Major Roads

County and State Boundaries

Important Recreation Opportunities (by managing entity)

U.S. Army Corps of Engineers

OR Department of Fish and Wildlife

City of Hermiston / City of Umatilla

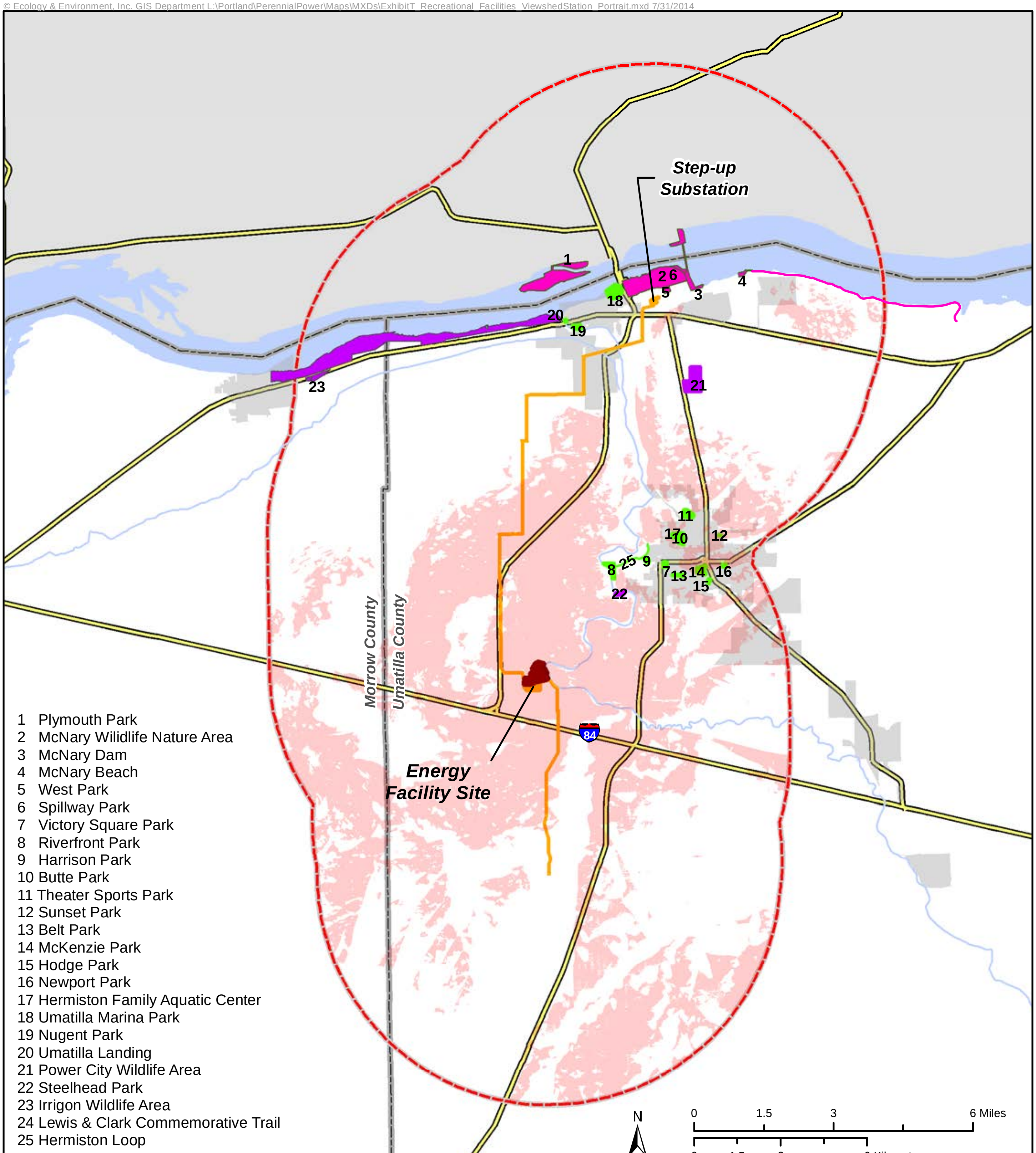
Figure T-1

Important Recreation Opportunities within 5 miles of the Site Boundary

Perennial Wind Chaser Station

Sources: ESRI 2010; Carter Burgess 2007; City of Umatilla 2011, 2013; ODFW 2008; USACE 2013, 2014

July 2014



Project Facilities
HGP and Lamb-Weston
Analysis Area (5-mile Radius)
Major Roads
County and State Boundaries

Raw Viewshed from Top of 90-foot Stack at Wind Chaser Station

Important Recreational Opportunities (by managing entity)
U.S. Army Corps of Engineers
OR Department of Fish and Wildlife
City of Hermiston / City of Umatilla

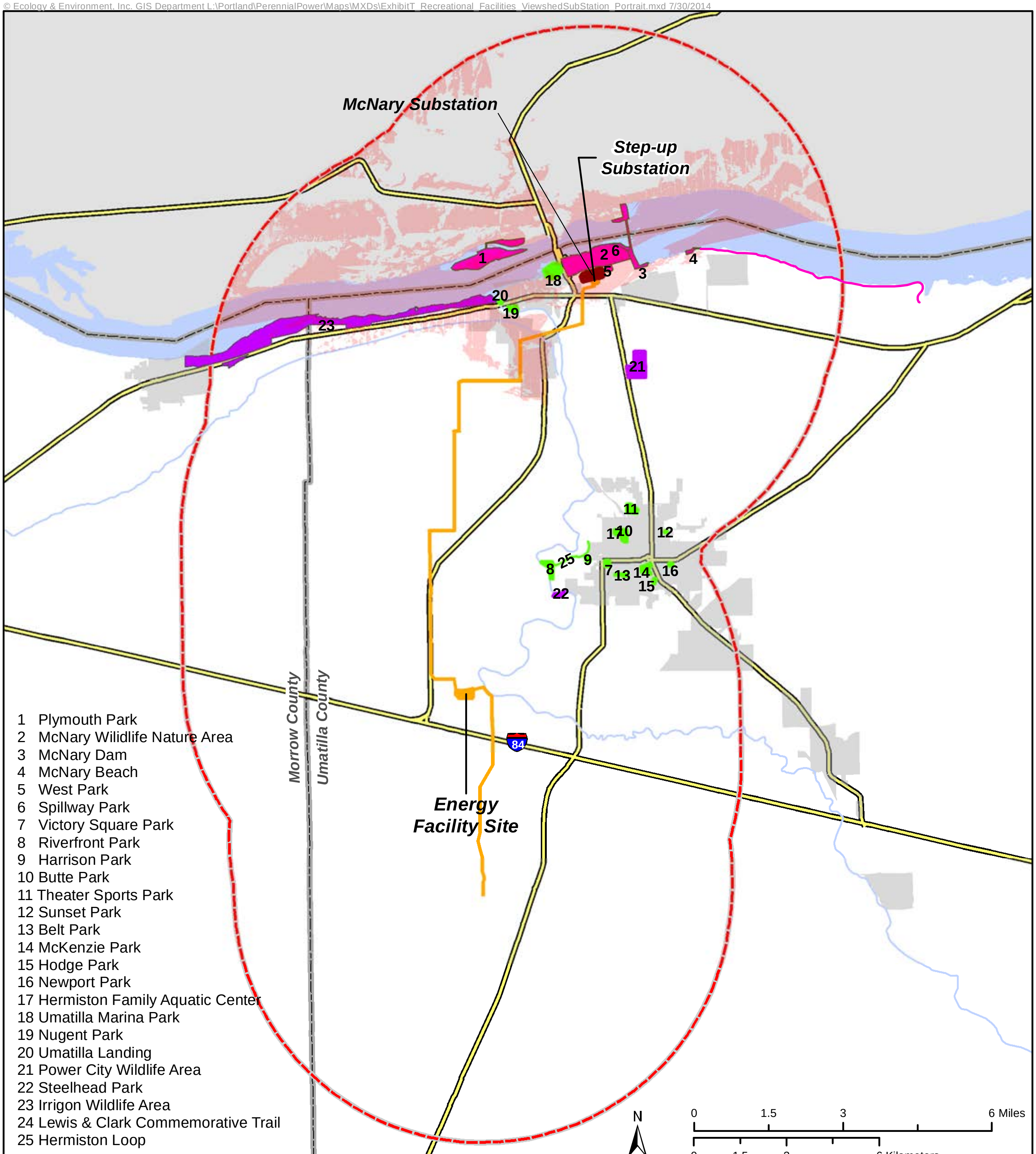
Figure T-2

Important Recreation Opportunities and Viewshed from the Energy Facility Site

Perennial Wind Chaser Station

Sources: ESRI 2010; Carter Burgess 2007; City of Umatilla 2011, 2013; ODFW 2008; USACE 2013, 2014

July 2014



Project Facilities
McNary Substation
Analysis Area (5-mile Radius)
Major Roads
County and State Boundaries

Raw Viewshed from Top of 20-foot Substation

Important Recreational Opportunities (by managing entity)

U.S. Army Corps of Engineers
OR Department of Fish and Wildlife
City of Hermiston / City of Umatilla

Figure T-3

Important Recreation Opportunities and Viewshed from the Step-up Substation

Perennial Wind Chaser Station

Sources: ESRI 2010; Carter Burgess 2007; City of Umatilla 2011, 2013; ODFW 2008; USACE 2013, 2014

July 2014

EXHIBIT U

PUBLIC SERVICES
OAR 345-021-0010(1)(u)

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FIGURES

APPENDICES

U.1 INTRODUCTION

OAR 345-021-0010(1)(u) *Information about significant potential adverse impacts of construction and operation of the proposed facility on the ability of public and private providers in the analysis area to provide the services listed in OAR 345-022-0110, providing evidence to support a finding by the Council as required by OAR 345-022-0110.*

Response: Under Oregon Administrative Rules (OAR) 345-022-0110, the Energy Facility Siting Council (Council) must find that the construction and operation of the facility, taking into account mitigation, are not likely to result in significant adverse impacts on the ability of public and private providers within the analysis area described in the Amended 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.

For the Perennial Wind Chaser Station project (Project), the analysis area for potential impacts on public service is defined as the Site Boundary and 10 miles from the Site Boundary, per the Amended Project Order. The Site Boundary and the analysis area boundary are shown on Figure U-1.

The jurisdictions located within the 10-mile boundary of the analysis area, and their populations, are shown in Table U-1.

Table U-1 Population of Cities and Counties Located Within Analysis Area

Communities within 10 miles	2010 Population
City of Boardman, Oregon	3,220
City of Echo, Oregon	699
City of Hermiston, Oregon	16,745
City of Irrigon, Oregon	1,826
City of Stanfield, Oregon	2,043
City of Umatilla, Oregon	6,906
Counties in the Analysis Area	**2010 Population**
Morrow County, Oregon	11,173
Umatilla County, Oregon	75,889
Benton County, Washington	175,177

Source: U.S. Census Bureau 2010

U.2 IMPORTANT ASSUMPTIONS USED TO EVALUATE POTENTIAL IMPACTS

OAR 345-021-0010(1)(u)(A) *The important assumptions the applicant used to evaluate potential impacts.*

Response: The Project will be located in Umatilla County, Oregon, approximately 3 miles southwest of the Hermiston city limits. However, the analysis area also includes parts of Morrow County, Oregon, and Benton County, Washington. For analysis purposes, only Oregon communities were considered for potential impacts to public services because:

- The areas of Benton County that fall within the analysis area have very low populations and do not include any incorporated areas or Census Designated Places.
- Nearly all service providers in Benton County operate out of Prosser or the Kennewick area, both of which lie outside the Project's analysis area.
- Given the large number of service providers available on the Oregon side of the Columbia River, it is unlikely that demands will be placed on providers from Washington.

The Project includes the following components, which are described in detail in Exhibit B – Project Information:

- 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).

This assessment of the Project's impact on public services considered the size of the workforce, the temporary nature of the construction period, and the estimated permanent work force. These factors were then evaluated to determine if the level of service currently provided to communities would be adversely impacted as a result of the Project.

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 the analysis area. Wherever possible, construction and service providers are expected to be from local Oregon communities, primarily Hermiston, Umatilla, Stanfield, Irrigon, and Boardman.

Construction is anticipated to take approximately 22 months. 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.

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 the BPA.

The natural gas pipeline will be constructed within an existing 4.63-mile ROW and managed by the Cascade Natural Gas Corporation using a local contractor. Construction will take place within the same timeframe as the transmission line and the Project as a whole. No additional permanent employees will be required to operate the natural gas pipeline.

U.3 PUBLIC AND PRIVATE PROVIDERS IN THE ANALYSIS AREA

OAR 345-021-0010(1)(u)(B) *Identification of the public and private providers in the analysis area that would likely be affected.*

Response: Table U-2 identifies the likely affected public service providers for the communities in the analysis area. A full description of service providers in the area, including providers not likely to be affected, follows below.

Table U-2 Likely Affected Public Service Providers in the Analysis Area

<table>
<tr><th>Public Services</th><th>Proposed Facility / Jurisdiction</th><th>Likely Affected Public Service Entity</th></tr>
<tr><td>Sewage Collection and Treatment</td><td>City of Hermiston</td><td>Hermiston Recycled Water Facility</td></tr>
<tr><td rowspan="2">Water Supply</td><td>Potable: Onsite well or Port of Umatilla</td><td rowspan="2">Port of Umatilla</td></tr>
<tr><td>Process: Port of Umatilla</td></tr>
<tr><td>Wastewater (non-sewage)</td><td>Hermiston Generating Plant, or Zero Liquid Discharge (ZLD) system</td><td>None</td></tr>
<tr><td>Stormwater</td><td>Onsite detention</td><td>None</td></tr>
</table>

Table U-2 Likely Affected Public Service Providers in the Analysis Area

Public Services	Proposed Facility / Jurisdiction	Likely Affected Public Service Entity
Solid Waste	Umatilla County	Finley Buttes Regional Landfill Sanitary Disposal, Inc.
Police	Umatilla County	County Sheriff – Hermiston Office
	City of Hermiston	Police Department
	State of Oregon	Oregon State Police
Fire & Rescue	Hermiston Fire and Emergency Services District	Hermiston Fire and Emergency Services
Health Care	City of Hermiston	Good Shepherd Medical Center
Education	City of Hermiston	Hermiston School District
Roads & Traffic	Umatilla County	Umatilla County Department of Public Works
	State of Oregon	Oregon Department of Transportation

Sources: Port of Umatilla 2008 (Exhibit O – Water Use, Appendix O-1); Word 2013; Finley Buttes Landfill 2013; City of Hermiston 2013a; Hermiston Fire and Emergency Services 2013; Umatilla County 2013a, 2013b; Good Shepherd Health Care System 2013.

U.3.1 Sewage Collection and Treatment

Construction: Portable toilets will be used during construction of the Project, and sanitary sewage will be managed and transported to a licensed sewage treatment plant by a contractor. The closest wastewater treatment plant is the City of Hermiston's Recycled Water Facility.

Operation: During operation, sewage collection, treatment, and disposal will be conducted through an onsite septic system, and no service providers will be required.

U.3.2 Water Supply and Disposal

Construction: All non-potable water used for construction activities will be obtained from the Port of Umatilla, using temporary pumps and conduits until the permanent system is built (see "Operation," below, for a description of water supply during operation).

Non-sewage wastewater generated during testing and commissioning of the water supply systems, hydrostatic testing and flushing of the water lines, washing equipment and vehicles, and washing concrete trucks after delivery of concrete loads will be treated with an oil/water separator and managed to prevent offsite discharge. Wastewater will be tested (dependent upon its use) to determine the concentrations of the constituents present, then either trucked offsite for processing and disposal in an approved facility or routed to the HGP to supplement its cooling tower makeup water demand.

Operation: Under average operating conditions, the Perennial Wind Chaser Station (Station) is anticipated to use 1,319 gallons per minute (gpm) of raw water for industrial purposes. Under summer peak use conditions, raw water use would be slightly greater, at 1,637 gpm. The Port of Umatilla system will supply raw water via a new pipeline from the HGP with a dedicated capacity of 2,000 gpm to meet this need.

Potable water needs are less than 5,000 gallons per day (gpd) and will be supplied either from an onsite well or from a tie-in to the Port of Umatilla raw water line, with appropriate supplementary treatment.

It is estimated that approximately 90 percent of the raw water used by the Project plant will be lost in process use. Residual wastewater (other than sewage) will be reclaimed of in one of the following manners:

- Preferred option: Wastewater will be reclaimed and sent to the cooling tower basins of the HGP, which is operated by a subsidiary of Perennial Power Holdings, Inc., to be recycled as circulating water for the HGP or sent on to the Lamb Weston Hermiston Plant. The only exception is combustion turbine water wash wastes, a total of 4,000 gallons per year (less than 0.001 percent of total incoming water), which will be trucked offsite for processing and disposal.

- Alternative option: Under this option, a Zero-Liquid Discharge (ZLD) system would be incorporated into the Project, such that the only wastewaters produced would be sewage (treated, as discussed in Section U.3.1) and combustion turbine water wash wastes (trucked offsite for processing and disposal). The ZLD alternative is being investigated because the Project will be dependent upon the third party Water Pollution Control Facilities (WPCF) Permit of Lamb Weston's Hermiston Plant with regard to managing its reclaimed waters. Lamb Weston's WPCF Permit allows Lamb Weston to manage and dispose of the HGP's reclaimed water. Lamb Weston's WPCF permit is currently being renewed through the Oregon Department of Environmental Quality (DEQ). Because the permit is under review, Lamb Weston has not been able to consent to the Project sending reclaimed water over to the HGP. If Lamb Weston is eventually able to accept reclaimed water from the HGP generated by the Station, then Perennial will prefer to have all the necessary process and approvals in place to do so. This exhibit, therefore, will detail any likely adverse impacts from both the preferred option (reclamation via the HGP) and the alternative option (ZLD).

Appendix O-1 of Exhibit O – Water Use contains a letter from the Port of Umatilla stating that it has the capacity and permits needed to supply the quantities of water necessary for the construction and operation of the Project. More detailed information on water availability is provided in Exhibit O – Water Use. More detailed information on wastewater disposal methods is provided in Exhibit V – Solid Waste and Wastewater.

U.3.3 Stormwater

Construction: Stormwater runoff will be controlled and treated through a range of best management practices specified in the Erosion and Sediment Control Plan submitted to DEQ for a National Pollution Discharge Elimination System (NPDES) Permit 1200-C. A copy of the submitted permit application and a letter from the DEQ stating their anticipated timeline in issuing the permit are provided in Exhibit I – Soils, Appendix I-2.

Control and treatment measures include, but are not limited to, sediment fences, straw wattles, bio-filter bags, permanent and temporary mulching, sediment traps, rock check dams, gravel filter berms, gravel construction entrances, and revegetation with native species. Best management practices will be selected according to the most appropriate methods for each construction site; a detailed description of erosion and sediment control measures by site is provided in Exhibit I – Soils, Section I.6. As shown in the Erosion and Sediment Control Plan drawings, runoff generated at the Station and substation sites will be retained onsite through a system of berms and ditches directing stormwater flow to detention basins.

Operation: The operational facility will divert stormwater into an onsite 0.9-acre lined detention basin. The low annual precipitation rate, high evaporation rate, and high observed rates of percolation onsite (Shannon & Wilson 2013) indicate that the expected stormwater accumulation will be low. It is proposed that the infiltration and evaporation basin be designed for a 100-year return period 24-hour storm event plus another 50 percent capacity.

U.3.4 Solid Waste

Construction: Perennial and its construction contractor will minimize waste and recycle as much material as possible. Solid waste that cannot be recycled will be transported to an approved landfill. The nearest approved landfill is the Finley Buttes Regional Landfill, located approximately 14 miles west of the Project site, as shown in Figure U-1.

Operation: Solid waste generated during operation of the Station will be collected by Sanitary Disposal, Inc., who has the franchise for solid waste disposal in western Umatilla County (Jewett 2013). The Station is expected to be classified as a Conditionally Exempt Small Quantity Generator of Hazardous Waste per 40 Code of Federal Regulations 261.5, meaning that it will produce less than 220 pounds per month of hazardous waste (see Exhibits E – Permits and V – Solid Waste and Wastewater for applicable permits and explanation of how Perennial will manage and/or recycle its solid waste).

U.3.5 Police and Fire

The region is served by a variety of law enforcement and fire protection service providers. However, since the majority of construction workers will be dedicated to the construction of the Station, and during operation employees will be located only at the Station, the police and fire service providers likely to be affected are those with jurisdiction near Hermiston.

Perennial has therefore consulted with the following entities regarding potential impacts on law enforcement services and fire protection services:

- Oregon State Police;
- City of Hermiston Police Department; and
- Hermiston Fire & Emergency Services.

Perennial also attempted to contact the Umatilla County Sheriff's Office for consultation, as the Station will be located within its jurisdiction. Attempts to contact Undersheriff Littlefield and Sheriff Rowan were made by telephone on February 6, 2014, and via email on February 14, 2014. There have been no responses to date.

Because only a small segment of the transmission line ROW (approximately 1.5 miles) will be located within the city of Umatilla, it is not anticipated that the Project would substantially affect the City of Umatilla Police Department.

The following section describes the current levels of police and fire services available to the communities in the analysis area.

911 Services

Emergency communication for geographic areas within Umatilla County is managed by the Umatilla County Telecommunications/911 Center. The center is located in Pendleton and receives both emergency 911 and non-emergency calls from the cities of Adams, Athena, Echo, Helix, Meacham, Pendleton, Pilot Rock, Stanfield, Ukiah, Umatilla, and Weston, as well as the unincorporated areas of Umatilla County, including the Project location (Umatilla County 2013b).

For the city of Hermiston, the Hermiston Police Department Communications Center is the Public Safety Answering Point. The Telecommunications Specialists also dispatch for Emergency Medical and Fire Services for Rural Fire Districts for Hermiston and Stanfield (City of Hermiston 2013b).

Law Enforcement

The Oregon State Police are responsible for primary law enforcement for state facilities, such as state roads and, as needed, support local law enforcement authorities. For Umatilla County, the State Police work out of the Pendleton Area Command, with a work site in Hermiston.

The Hermiston Work Site is supported by five troopers and one sergeant. There are two 8-hour shifts that run from 6 a.m. to 4:00 p.m. and 4:00 p.m. to 2:00 a.m. The State Police have mutual aid agreements with the respective County Sheriffs' Offices. These agreements position the Sheriffs' Offices as the primary law enforcement agency, with the state police providing backup as needed. For Umatilla County, the County Sheriff's headquarters is in Pendleton, but a Sheriff's office is also located in Hermiston that is currently staffed with four deputies (Oregon State Police Staff 2013).

Although the Project will not be located within the city limits of Hermiston, the City Police Department can provide backup support as needed. The City Police Department has a total of 27 paid and volunteer personnel, including positions for four sergeants and 12 patrol officers. In addition, the City has four detective staff positions (City of Hermiston 2013b).

Fire Protection

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).

The Project is located within the Region 10 Oregon Hazardous Materials team boundary. The State of Oregon has 13 Regional Hazardous Materials Emergency Response Teams who are charged with protecting life and the environment by responding to chemical emergencies and minimizing the dangers associated with them. These teams are located statewide to provide response to hazardous materials incidents and consist primarily of volunteer and career firefighters, with some law enforcement and public works employees (Oregon State Police 2013). The Region 10 team is led by Hermiston Fire and Emergency Services in the analysis area (Ruiz-Temple 2014).

U.3.6 Health Care

As required by the Amended Project Order, the analysis area for health care impacts is extended to the nearest health care facility, regardless of its distance from the Project site.

The nearest full service health care center to the Project site is the Good Shepherd Medical Center, located approximately 5 miles from the Project, which provides Trauma Level III services. The Center includes a 25-bed hospital and an emergency room that is open 24 hours a day (Good Shepherd Health Care System 2013). Saint Anthony's Hospital in Pendleton is a 25-bed facility also located in Umatilla County and is designated as a Trauma Level IV service provider by the Oregon Health Authority (St. Anthony Hospital 2013; Oregon Health Authority 2013a).

For ambulance service, the Hermiston Fire and Rescue District operates five ambulances to provide emergency medical transportation. Fire-Med, a commercial ambulance service provider, is also available to provide emergency medical transportation (Hermiston Fire & Emergency Services 2013).

For evacuation services, Life Flight Network provides air medical evacuation services from multiple bases in eastern Oregon, including Pendleton, and has reciprocal agreements with Northwest Medstar, which operates out of Tri-Cities, Washington (Hermiston Fire & Emergency Services 2013; Northwest Medstar 2013; Life Flight Network 2013).

For mental health care services, Blue Mountain Recovery Center is a 60-bed inpatient adult mental health care facility in Pendleton, operated by the Oregon Health Authority's Addictions and Mental Health Division (Oregon Health Authority 2013b).

U.3.7 Schools

School enrollment and capacity data for public schools in the analysis area are summarized in Table U-3. The data show that enrollment growth in recent years in the analysis area has been concentrated primarily in the Hermiston School District and secondarily in the Umatilla School District. Both of these districts may therefore be experiencing capacity issues in certain schools and may be affected by an influx of new workers into the analysis area.

Table U-3 Enrollment Summary of the School Districts in the Analysis Area

School District	2006–2007 Enrollment	2009–2010 Enrollment	2011–2012 Enrollment	2012–2013 Enrollment
Echo School District #5	266	253	261	247
Hermiston School District #8	4,776	4,993	5,093	5,209
Morrow School District #1	2,262	2,256	2,190	2,184
Stanfield School District #61	551	585	542	513
Umatilla School District #6R	1,270	1,339	1,382	1,356

Source: Oregon Department of Education 2013.

U.3.8 Housing

Housing Units/Vacancy Rate

U.S. Census data from 2010 show that there are a total of 35,135 housing units in Morrow and Umatilla Counties. For Morrow County housing units, there is a vacancy rate of approximately 11.8 percent, and for Umatilla County, approximately 9.4 percent. For the city of Hermiston, Oregon, the community in closest proximity to the Project, there are 6,373 housing units, with a vacancy rate of 5.1 percent (U.S. Census Bureau 2010).

Perennial expects that temporary construction workers will either (a) live in their current communities, (b) be travelling construction workers living in their own trailers, or (c) will obtain temporary housing within the vicinity of Hermiston, Oregon. The construction workforce is expected to be spread over a period of 22 months, with a peak workforce of 225 workers. Construction is anticipated to begin in the third quarter of 2015 and end in the first quarter of 2017.

Table U-4 Permanent Housing Supply and Availability in the Analysis Area

Jurisdiction	Total Housing Units	Total Vacancy Rate	Vacant Rental Units
Morrow County	4,442	11.8%	70
City of Irrigon, Oregon	640	5.9%	11
Umatilla County	29,693	9.4%	718
City of Echo, Oregon	256	4.3%	1
City of Hermiston, Oregon	6,373	5.1%	97
City of Stanfield, Oregon	735	7.2%	22
City of Umatilla, Oregon	1,766	7.5%	63

Source: U.S. Census Bureau 2010.

U.3.9 Roads and Traffic

The Umatilla County Department of Public Works is responsible for maintaining county roads and bridges immediately adjacent to the Project. The Oregon Department of Transportation is responsible for the maintenance of state roads and Interstate highways within Oregon. Enforcement of traffic safety is the responsibility of law enforcement agencies, as noted above.

A Project-specific Traffic Impact Analysis (TIA) has been performed to determine the Project's potential impacts on traffic and road safety, as well as any potential actions needed to mitigate these impacts. The TIA report is provided as Appendix U-1.

U.4 ADVERSE IMPACT TO THE ABILITY OF PROVIDERS TO PROVIDE SERVICES

OAR 345-021-0010(1)(u)(C) *A description of any likely adverse impact to the ability of the providers identified in OAR 345-021-0010(1)(u)(B) to provide the services listed in OAR 345-022-0110.*

Response: In general, the Project will impose very little new demand on local public service providers for either construction or operational needs.

The construction and operation of the Project will create some demand for services due to onsite activities. This demand is expected to affect water supply and disposal, solid waste disposal, and police and fire services.

New demand for offsite services is likely to be minimal, given the very limited influx of new workers into the area as a result of the Project. Perennial expects the existing industrial base/skilled labor in the region to be an important component of the labor used for the Project during construction. Because of the duration of the construction period and the use of local contractors and labor as much as possible, it is unlikely that new families would move permanently to the area. During operations, the Station will create six to eight full-time jobs over the course of the lifetime of the energy facility.

The following sections describe potential adverse impacts expected for each service type.

U.4.1 Sewage Collection and Treatment

Construction: No adverse impact to providers is expected. The American National Standards Institute calls for one portable toilet per 10 workers for a 40-hour work week. For a peak construction crew of approximately 225 workers, as expected for the Project, approximately 25 portable toilets will be required. According to staff at the City of Hermiston's Recycled Water Facility, the volume of wastewater associated with 25 portable toilets will not pose any impact to the ability of the facility to provide service. The facility has a current receiving capacity of 1.7 million gpd of sewage, and this capacity will increase to 3.4 million gpd when a new plant comes online in November 2014 (Schmittle 2014).

Operation: No adverse impact to service providers is expected, as no service provider will be employed for sewage collection and treatment. An onsite septic field will be constructed. Prior to construction of this system, Perennial will apply for a construction installation permit from the DEQ in Pendleton. Results from the preliminary geotechnical report indicate that it is possible to design a septic system that meets DEQ requirements. Details of the Project's sanitary system and its compliance with DEQ rules regarding septic systems are included in Exhibit V – Solid Waste and Wastewater, Appendix V-2.

U.4.2 Water Supply and Disposal

Construction, Supply: No adverse impact to service providers is expected. Perennial anticipates using approximately 2.3 million gallons of water over the entire construction phase, equivalent to less than 20 hours of the dedicated 2,000 gpm allocation of water available from the Port of Umatilla.

Construction, Disposal (non-sewer): No adverse impact to service providers is expected. Disposal of non-sewage water during construction would take place as described in Section U.3.2. Perennial will manage stormwater and other surface water discharges in conformance with the issued NPDES Stormwater Discharge General Permit #1200-C. A copy of the NPDES application and DEQ's Acknowledgement Letter is included in Exhibit I – Soils.

Operation, Supply: No adverse impact to service providers is expected. As described, the Station will be supplied with process water from the Port of Umatilla, and potable water will come from an onsite well or as a tie-in to the process water line with appropriate treatment. Potable water demand is anticipated to be below 5,000 gpd. Therefore, potential well water usage should be limited enough (< 5,000 gpd) not to require a groundwater permit.

For process water, as noted in Exhibit O – Water Use, all water required for the Project's construction and operation will be supplied by the Port under a reserved allocation capacity. Oregon Water Resources Department Permit S-49497 allows the Port to appropriate up to 155 cubic feet per second (cfs) of Columbia River water. This appropriation is less than 0.2 percent of the 95 percent exceedance of the Columbia River. By 2027, the Port estimates water demand to be about 59 cfs, per its Revised Water Management and Conservation Plan issued in September 2008, which is only 38 percent of its allocation to provide water to its entire service area (Port of Umatilla 2008). Even fully utilized, the 2,000 gpm reserved allocation for the Project is only 2.9 percent of the Port's total allocation.

A letter from the Port of Umatilla confirming availability of raw water is provided in Appendix O-1 of Exhibit O – Water Use.

Operation, Disposal (non-sewer): No adverse impact to service providers is expected.

- Under the preferred option (reclamation and reuse), all industrial water discharges will be routed to the HGP for reuse as make-up cooling water. As noted in Exhibit O – Water Use, discharges will be intermittent, peaking at 315 gpm during summer operations. Nevertheless, reuse by the HGP is possible because of the higher quality of wastewater generated from the Project. The HGP will be able to handle the variable rates of incoming reclaimed wastewater. Exhibit V – Solid Waste and Wastewater provides additional information regarding process wastewater handling at the Project and at the HGP.
- Under the alternative option (ZLD), industrial water discharges would be treated onsite through a High-Efficiency Reverse Osmosis process. This process would allow the

treated wastewater to return to the plant as new process water, thus reducing the demand for raw water from the Port of Umatilla.

U.4.3 Stormwater

Construction: No adverse impact to service providers is expected. As stated in sections U.3.3 and U.4.2, Perennial will manage stormwater and other surface water discharges in conformance with the issued NPDES Stormwater Discharge General Permit #1200-C. Stormwater runoff Project-wide will be controlled and treated through a range of best management practices specified in an Erosion and Sediment Control Plan submitted to DEQ for the NPDES Permit. Runoff generated at the Station and substation sites will be held in a detention basin. Control and treatment measures include, but are not limited to, sediment fences, straw wattles, bio-filter bags, permanent and temporary mulching, sediment traps, rock check dams, gravel filter berms, gravel construction entrances, and revegetation with native species. Best management practices will be selected according to the most appropriate methods for each construction site. A more detailed description of the erosion and sediment control measures to be implemented by site is provided in Exhibit I – Soils, Section I.6, and in the Erosion and Sediment Control Plan. Exhibit I also includes a copy of the NPDES application, including the Erosion and Sediment Control Plan, and DEQ's Acknowledgement Letter.

Operation: No adverse impact to service providers is expected. Perennial will construct the Station to prevent stormwater from leaving the Site. This will be achieved by grading the Site and installing stormwater detention soil berms around the Station and a stormwater detention basin. Detailed design of the stormwater drainage system and basin have not been completed, but given the low annual precipitation, high percolation rate, and high evaporation rate, significant stormwater accumulation is not anticipated. It should be noted that the HGP also has a stormwater detention basin, and this system has worked very well for that facility. It is proposed that the basin be designed for a 100-year return period 24-hour storm event, plus another 50 percent capacity.

Further information on the proposed stormwater detention basin, including data and calculations to determine the most efficient size and location, is provided in Exhibit V – Solid Waste and Wastewater, Appendix V-3.

U.4.4 Solid Waste

Construction: No adverse impact to service providers is expected. Total solid waste production during construction is estimated at approximately 2.5 tons per month over the 18 months of significant construction. Construction solid waste that cannot be recycled or reused will be trucked to an approved landfill. The nearest approved landfill is Finley Buttes Regional Landfill. Expected impact on landfill capacity is minimal, as the Finley Buttes Regional Landfill has an estimated lifetime of over 200 years and an annual receiving capacity of 1,000,000 tons of waste (Young 2013).

Operation: No adverse impact to service providers is expected. The Station will produce approximately 10 tons per year of refuse during normal operation. The waste minimization efforts described in Exhibit V – Solid Waste and Wastewater are intended to limit the amount of waste generated through re-use and recycling, as appropriate. These efforts include development of a Waste Management Procedure that outlines waste determination procedures, proper storage and handling requirements, recordkeeping requirements, training requirements, and ongoing evaluations to minimize waste. Solid waste will consist of office and maintenance waste with very limited amounts of hazardous waste such as batteries, fluorescent lights, or equipment and vehicle maintenance solvents and oils. Any recyclable materials will be separated from the solid waste stream. If a ZLD system is installed (see Sections U.3.2 and U.4.2), that system will produce approximately 1,540 tons per year of crystallized solids as a byproduct of the treatment of industrial water discharges. This solid waste is expected to be non-hazardous and transported to a landfill.

The contracted solid waste management provider in western Umatilla County is Sanitary Disposal, Inc., and it is expected that they will provide solid waste pick-up during operations, and that they will take waste to the Finley Buttes Regional Landfill. Given the receiving capacity of the Finley Buttes Landfill (which currently receives 600,000 tons per year and can handle over 1,000,000), this should not pose a significant impact on the ability of this waste to be received by a landfill (Large 2013). In addition, Sanitary Disposal, Inc. has confirmed that the higher quantity of waste under the ZLD option, corresponding to an average of 30 tons/week, can be handled without affecting its ability to provide waste disposal services in the area (Jewett 2013).

Further details regarding solid waste generation from the Project are provided in Exhibit V – Solid Waste and Wastewater.

U.4.5 Police and Fire

Construction: Due to an increase of construction personnel traveling to the Project site and potentially living in the area, there may be a short-term impact on local law enforcement and fire agencies. Jason Edmiston, Chief of Police, indicated that any Project-related impact would be due to added calls for service, and that the added load would not have an impact on the Hermiston Police Department's ability to provide service (Edmiston 2014). The Assistant Chief for Hermiston Fire and Emergency Services has stated that the Project will pose no significant impact on Hermiston Fire and Emergency Services' ability to provide public service in their district (Stanton 2013). Evidence regarding the likely extent of these impacts is detailed in Section U.5.1.

Operation: No adverse impact to service providers is expected. The Station will employ only six to eight people, so new offsite demand for police and fire services will be minimal. The limited potential impact due to onsite activities is itself mitigated by the following:

- Regarding law enforcement, the Project will be fenced within an industrial area with a monitored gated entrance. Once operations have begun, an access gate, closed circuit television camera, and security lighting will be installed on the site. The step-up substation will have a perimeter fence. These measures will minimize opportunities for theft and vandalism.
- Regarding fire and rescue services, all required fire protection equipment will be stored at the Station, and the facility will implement all measures in accordance with the Oregon Fire Code, the Uniform Fire Code, and all other applicable fire protection standards in effect at the time of construction. The fire protection system will include a fire water system, a carbon dioxide extinguishing system provided with the CTGs, portable fire extinguishers, and smoke detection system. A loop road system within the Station will connect to Westland Road. The road will be paved with asphalt and will be approximately 24 feet wide. These measures will limit the risk of fire, contain the risk of small fires spreading throughout the facility, and provide onsite equipment and water to contain a larger incident within the facility should one arise. A complete description of the facility fire protection system can be found in Exhibit B – Project Information, Section B.3.4.

U.4.6 Health Care

No adverse impact to service providers is expected during construction or operation, due to the number and proximity of available health care facilities in the region and the small incoming population during the construction and operations phases. There is redundancy in both regional hospital facilities (available in Hermiston and Pendleton) and in transport options in case medical evacuations are required.

U.4.7 Schools

Construction: No adverse impact to service providers is expected. The total estimated influx of workers renting or purchasing permanent housing in the area is 15 (see section U.4.8, below), corresponding to up to 30 children, assuming two children per worker. Both local school districts experiencing growing enrollment (Hermiston School District and Umatilla School District) have confirmed that receiving the total estimated influx within their district would not have an impact on their ability to provide service (Sipe 2014; Smith 2014). No impact is expected in other school districts, as their enrollment has been stable or in slight decline.

Operation: No adverse impact to service providers is expected, as there will only be six to eight permanent jobs at the facility.

U.4.8 Housing

Construction: No adverse impact is expected. Due to the site's remote location, Perennial anticipates that up to 65 percent of craft could migrate into the area during the construction period. However, only 10 percent of the in-migrating workforce is expected to rent or buy permanent housing. The majority of in-migrating workers are expected to bring their own trailers. As a result, Perennial anticipates that no more than 15 housing units will be rented or bought in the area by in-migrating construction workers. There were 182 vacant rental units in the cities of Hermiston, Stanfield, and Umatilla in 2010, based on U.S. Census information, as shown in Table U-4. Therefore, housing demand generated by the active construction site will not substantially impact the availability of housing in the analysis area during the construction period.

Operations: No adverse impact is expected. The six to eight permanently employed staff will have an insignificant impact on the availability of local housing.

U.4.9 Roads and Traffic

Construction: No adverse impact to service providers is expected. A traffic impact analysis for the Project was conducted, and the results are provided as Appendix U-1. This assessment verified the traffic impact of the Project during both the construction and operations phases at the following nearby intersections:

- Interstate Highway 82 (I-82) Southbound (Eastbound) Ramps at Lamb Road,
- I-82 Northbound (Westbound) Ramps at Lamb Road,
- Interstate Highway (I-84) Eastbound Ramps at Westland Road,
- I-84 Westbound Ramps at Westland Road,
- Lamb Road at Westland Road, and
- Westport Lane at Westland Road.

The traffic impact analysis found that:

- All of the studied public roadways and intersections within the vicinity of the Project will continue to operate within the applicable performance standards established by Umatilla County and the Oregon Department of Transportation.
- No safety deficiencies or crash patterns were identified at study intersections.
- The proposed site access on Westland Road conforms to Umatilla County's access management guidelines and would provide adequate access for trucks during construction and operations, provided all access to the site comes from the south.

In order to ensure that all truck movements at the site-access intersection are made to and from the south, the traffic impact analysis recommended that:

- Right-turn prohibition sign with a supplemental “TRUCKS” rider plaque to be mounted facing the westbound (driveway) approach.
- Left-turn prohibition sign with a supplemental “TRUCKS” rider plaque to be mounted facing the southbound (Westland Road) approach.

The traffic impact analysis also recommended that:

- Prior to truck delivery of any oversize loads, a formal routing and delivery plan should be developed by the contractor in conjunction with the Oregon Department of Transportation and Umatilla County staff.

- Landscaping, signing, and aboveground utilities should be located and maintained to ensure that adequate sight distance is maintained after build-out.

Perennial will maintain contact with Umatilla County to ensure the final site access configuration complies with the recommendations of the traffic impact analysis.

Operations: No adverse impact to service providers is expected. The estimated six to eight full time personnel required during operation of the Station will have minimal impact.

U.5 EVIDENCE THAT ADVERSE IMPACTS ARE UNLIKELY TO BE SIGNIFICANT AND RELEVANT MITIGATION MEASURES

OAR 345-021-0010(1)(u)(D) *Evidence that adverse impacts described in OAR 345-021-0010(1)(u)(C) are not likely to be significant, taking into account any measures Applicant proposes to avoid, reduce or otherwise mitigate the impacts.*

Response: As discussed in Section U.4, adverse impacts are possible for police and fire services. These impacts would occur only during the construction phase. No adverse impacts are expected during the operation phase. The following subsections outline the evidence regarding the extent of any adverse impacts and detail the mitigation measures to address any identified significant impacts.

U.5.1 Police and Fire

Construction: Hermiston Fire & Emergency Services does not expect the Project to have any significant impact on the district’s ability to provide services, since construction work does not involve closing any roads (Stanton 2013). Assuming a peak workforce of 225 workers on site, more than half of whom would be migrating in from outside the area, the City of Hermiston Police Department does not anticipate the additional potential calls for service to pose a significant impact on the ability of the department to provide law enforcement services (Edmiston 2014). As explained in Section U.3.5, the Umatilla County Sheriff's Office has not returned any comment to Perennial regarding potential impacts on that agency's capacity to provide law enforcement services. In addition, based on the findings of the traffic impact analysis (see Section U.4.9 and Appendix U-1) anticipated traffic impacts suggest that the need for additional traffic control is extremely limited.

Mitigation: Based on the above information, any adverse impact on police and fire service providers will not be significant. Therefore, no mitigation measures are proposed.

U.6 MONITORING PROGRAMS

OAR 345-021-0010(1)(u)(E) *The applicant's proposed monitoring program, if any, for impacts to the ability of the providers identified in OAR 345-021-0010(1)(u)(B) to provide the services listed in OAR 345-022-0010.*

Response: Because the construction and operation of the Project will have no significant adverse impacts on the ability of service providers in the analysis area to provide the services assessed in this exhibit, there are no monitoring programs under development in relation to impacts.

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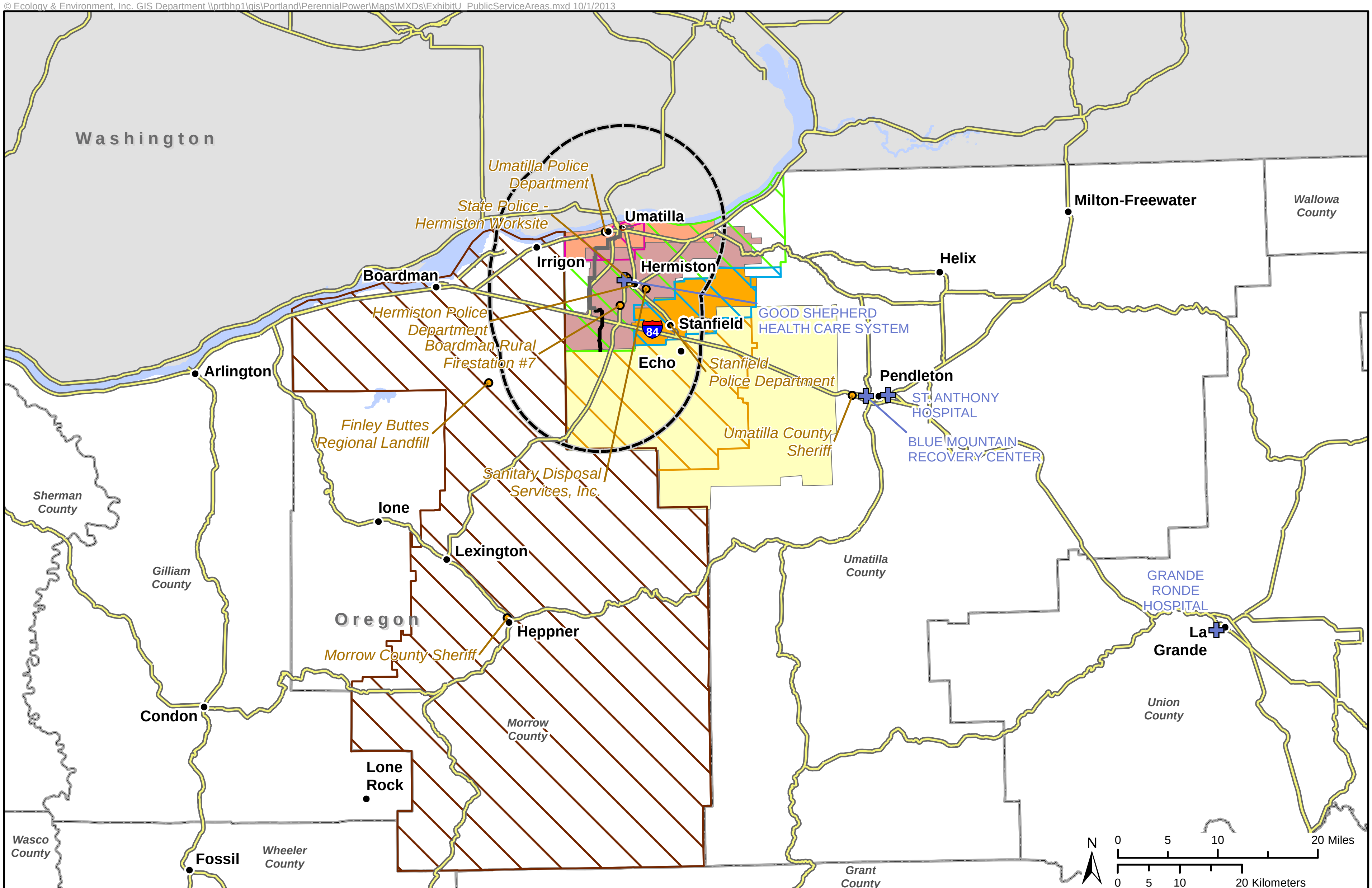

- Natural Gas Pipeline
- Existing Transmission Line
- Station
- Step-up Substation
- Riser Structure
- Boundary per OAR 345-001-0010 (57)
- Public Service Location
- Hospital

School Districts
- Echo School District #5
- Hermiston School District #8
- Morrow School District #1
- Stanfield School District #61
- Umatilla School District #6R

- City
- Major Roads
- County Boundary

Fire Districts
- Echo
- Hermiston
- Stanfield
- Umatilla

Figure U-1

Public and Private Service Providers

Perennial Wind Chaser Station

October 2013

*The Ione School District is a Charter School District and can receive students from other school districts, including the Morrow County School District.

APPENDIX U-1

Traffic Impact Analysis

Transportation Impact Analysis

Perennial Wind Chaser Station

Umatilla County, Oregon

December 2013

Kittelson & Associates, Inc.
Transportation Engineering/Planning

Transportation Impact Analysis

Perennial Wind Chaser Station TIA

Umatilla County, Oregon

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JULY 9, 2001
WADE E. SCARBROUGH
Expires: 6/30/2014

Project No. 13954

December 2013

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Section 1
Executive Summary

EXECUTIVE SUMMARY

Perennial-Windchaser LLC (Perennial) is seeking permits to construct and operate a natural gas-fired electrical generating plant northeast of the I-82/I-84 Interchange in western Umatilla County, Oregon. The traffic-related impacts of the completed project as well as those impacts during the peak construction phases are addressed within this Traffic Impact Analysis (TIA) report. Based on existing traffic operations and the estimated future traffic conditions, the proposed development is not expected to have a significant impact on the adjacent roadway traffic operations upon build-out. Furthermore, during the construction phase, all study intersections will continue to operate within the applicable performance standards and targets.

This TIA report resulted in the following key findings and recommendations.

FINDINGS

- All of the study intersections and critical movements operate acceptably during the weekday a.m. and p.m. peak hours.
- No safety deficiencies or crash patterns were identified at the study intersections.
- Under 2017 background conditions, all study intersections are forecast to continue operating acceptably during the weekday a.m. and p.m. peak hours.
- The proposed Perennial Wind Chaser Energy Facility (Station) is estimated to generate approximately 8 and 12 trip ends during the a.m. and p.m. peak hours of a typical weekday, respectively.
- Under year 2017 total traffic conditions with the addition of permanent site-generated traffic, all study intersections are forecast to continue operating within acceptable performance standards during the weekday a.m. and p.m. peak hours.
- At the peak of the construction period, the projected construction effort is estimated to generate approximately 196 trip ends during each of the weekday a.m. and p.m. peak hours.
- Under year 2016 total traffic conditions with the addition of construction-related traffic, all study intersections will continue to meet the relevant performance targets.
- The proposed site access on Westland Road conforms with Umatilla County's access management standards.
- Intersection sight distances are adequate at both the permanent and temporary (construction-related) proposed site access intersections.
- A truck turning path analysis found that the proposed permanent site access driveway design will accommodate truck ingress and egress movements without impacting the

existing guard rail at the railroad crossing, provided that all truck movements are made to/from the south (i.e. via the I-84/Westland Road interchange).

- During construction of the site, the proposed temporary site-access driveway design, which shifts the access south of the permanent driveway location utilizing the adjacent property, will accommodate full turning movements for standard trucks sizes (including the WB-67 design vehicle).

RECOMMENDATIONS

- To ensure that all truck movements at the site-access intersection under the permanent operation are made to and from the south, truck turn restriction signs should be mounted at the site-access intersection as follows:
  - A right-turn prohibition sign with a supplemental “TRUCKS” rider plaque should be mounted facing the westbound (driveway) approach.
  - A left-turn prohibition sign with a supplemental “TRUCKS” rider plaque should be mounted facing the southbound (Westland Road) approach.
- If truck delivery of oversized loads is required during construction of the Station, a formal routing and delivery plan should be developed by the contractor in conjunction with ODOT and Umatilla County staff. These oversized vehicles may require special geometric and/or traffic control accommodations that are beyond the scope of this analysis.
- Locate and maintain site landscaping, signing and any aboveground utilities to ensure that adequate sight distance is maintained after build out.

Section 2
Introduction

INTRODUCTION

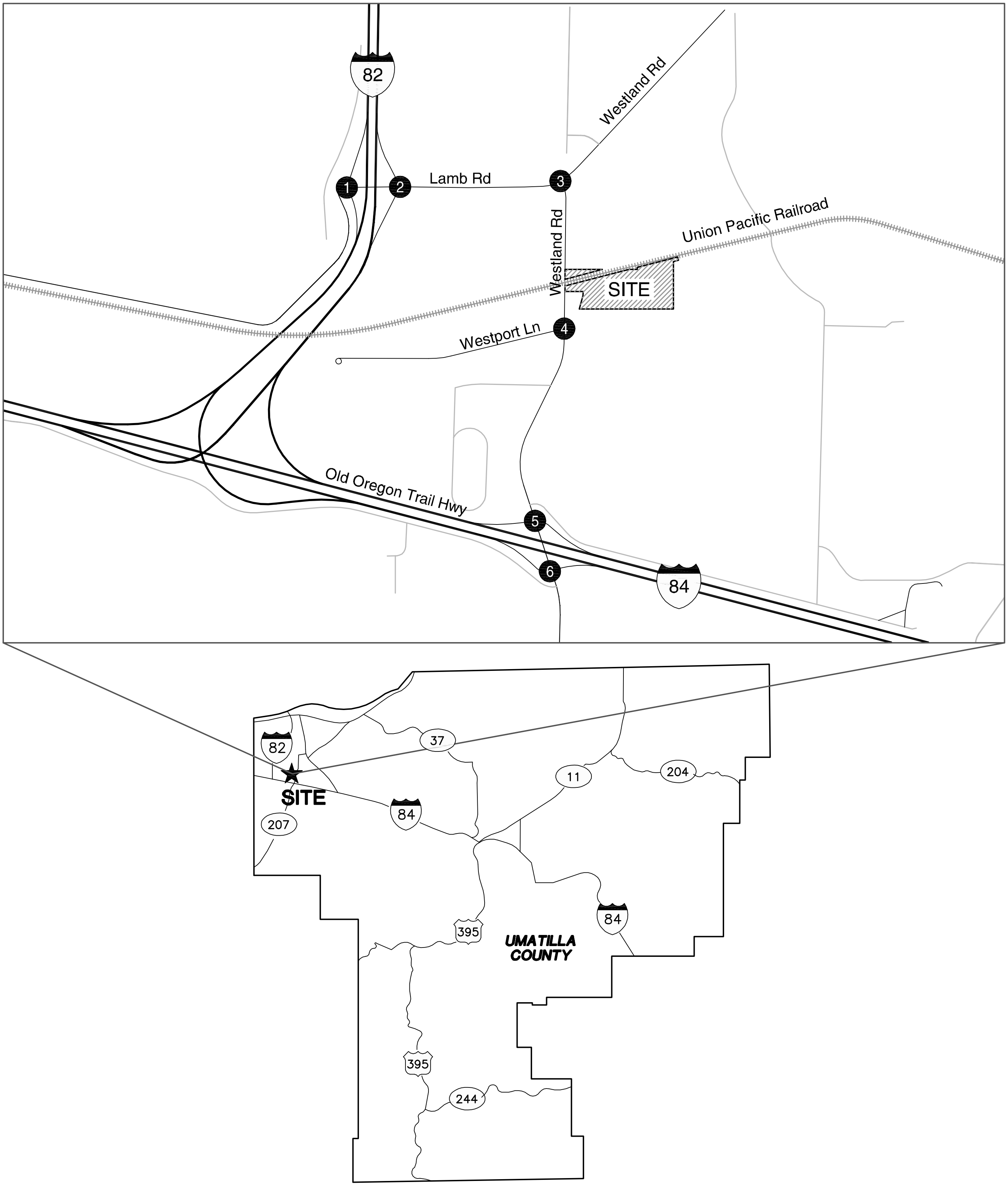
SCOPE OF THE REPORT

This analysis determines the transportation-related impacts associated with the proposed Station. A site vicinity map is provided in Figure 1. As shown, the site is located in Umatilla County near the junction of Interstate 82 and Interstate 84; there are six (6) study intersections for which the traffic impact of the proposed Station was analyzed. The study scope and overall study area for this project were selected based on a review of the local transportation system and conversations with the project team, Umatilla County, and Oregon Department of Transportation (ODOT) staff. The report addresses the following transportation issues:

- Existing year 2013 traffic conditions during the weekday a.m. and p.m. peak hours;
- Forecast year 2017 background traffic conditions during the weekday a.m. and p.m. peak hours (this does not include the construction traffic or the site-generated traffic, but does include general growth and planned developments in the site vicinity);
- Forecast year 2017 total traffic conditions with full build-out of the project during typical weekday a.m. and p.m. peak hours (this includes full build-out daily operations with site-generated traffic);
- Forecast year 2016 total traffic conditions with peak construction of the project during typical weekday a.m. and p.m. peak hours (this includes peak construction daily operations with site-generated traffic); and,
- Analysis of the proposed project's construction phase to address heavy vehicle operations, peak traffic flows, transportation network geometry, safety, and efficiency.

Based on our review of the surrounding road network, previous traffic analyses, and conversations with Umatilla County staff, the following study intersections were included as part of the transportation analysis:

- I-82 Southbound (Eastbound) Ramps at Lamb Road (ODOT maintained)
- I-82 Northbound (Westbound) Ramps at Lamb Road (ODOT maintained)
- I-84 Eastbound Ramps at Westland Road (ODOT maintained)
- I-84 Westbound Ramps at Westland Road (ODOT maintained)
- Lamb Road at Westland Road (County maintained)
- Westport Lane at Westland Road (County maintained)



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- Study Intersections

Site Vicinity
Umatilla County, Oregon

Figure 1

Data Collection

The following data were collected to support the operations and safety analysis for this study:

- 2-hour mid-week turn movement counts conducted at each of the study intersection.
- 24-hour mid-week tube counts conducted along Westland Road and Lamb Road

Appendix A includes the collected traffic counts.

Operations Parameters

All level-of-service (LOS) analyses were performed based on procedures outlined in the 2000 *Highway Capacity Manual*, published by the Transportation Research Board (Reference 1). *Appendix B includes a description of LOS methodology.*

Operating Standard

As defined in Umatilla County's *2002 Transportation System Plan* (TSP) (Reference 2), the applicable performance standard for the County intersections is LOS E or better (See Attachment B). The state highway mobility target as set forth by ODOT in the *Oregon Highway Plan* (Reference 3) for the study intersections at the freeway ramp terminals is a maximum volume-to-capacity ratio of 0.80.

Section 3
Existing Conditions

EXISTING CONDITIONS

The existing conditions analysis identifies the site conditions and geometric characteristics of the roadways within the study area. Kittelson & Associates, Inc. (KAI) staff visited and inventoried the site and surrounding study area in October 2013. At that time, KAI collected information regarding adjacent land uses, existing traffic operations, and transportation facilities in the study area.

SITE CONDITIONS AND ADJACENT LAND USES

The approximately 20-acre Station site is currently undeveloped and located east of Westland Road and south of the Hermiston Generating Plant (HGP) and Union Pacific Railroad line. The Station site may be described as a tract of land in the Northwest Quarter of Section 30, Township 4 North, Range 28 East, Willamette Meridian; said tract being divided by the O.W.R. & R. Railroad. In addition to its proximity to HGP, the FedEx Freight LTL site is located near the Station site, north and east of the Interstate 84 and Interstate 82 interchange in western Umatilla County. Access to the FedEx site is from a private road, Westport Lane, which intersects with the County road, Westland Road.

Access to the Station site is proposed via a new driveway that would be located approximately 600 feet north of Westport Lane and approximately 105 feet south of the Union Pacific Railroad line (measured from center of driveway to center of railroad tracks). Figure 2 shows the proposed site plan and site access location.

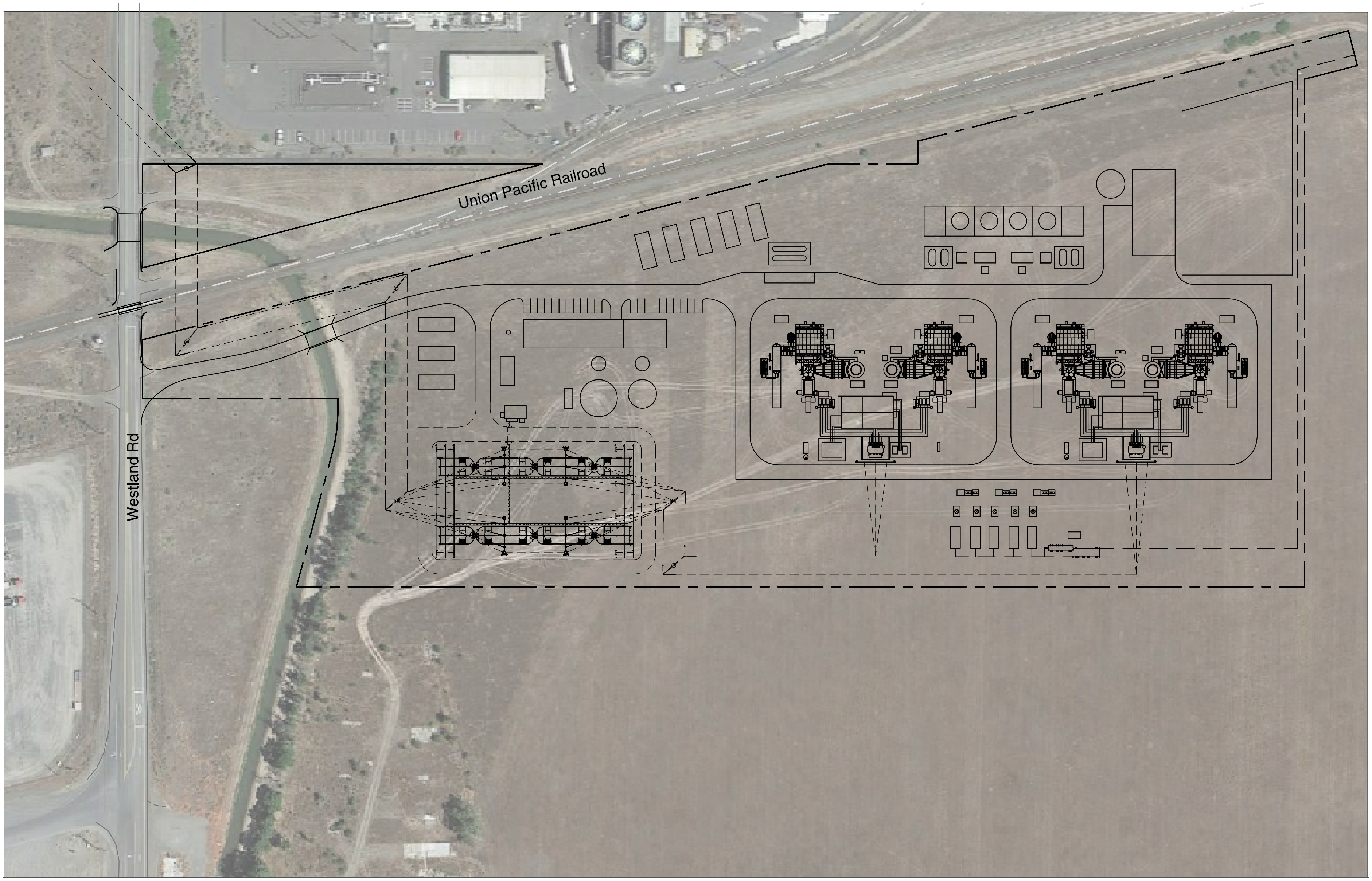
TRANSPORTATION FACILITIES

Table 1 summarizes the existing transportation facilities and roadways in the study area. The existing intersection lane configurations and traffic control devices are illustrated in Figure 3.

Table 1: Existing transportation facilities and roadways in the study area

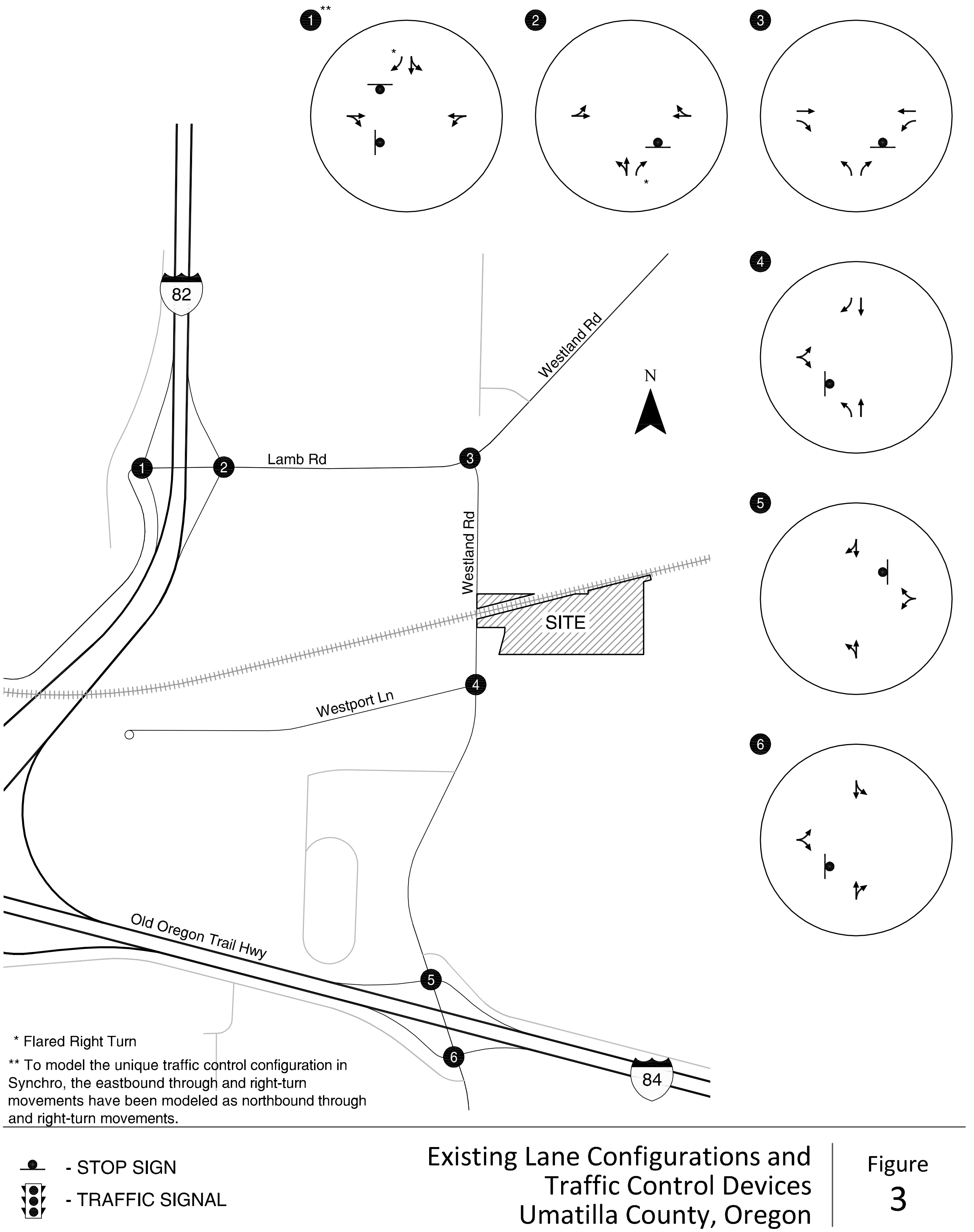
Roadway	Classification	Cross Section	Posted Speed[1]	Sidewalk?	Shoulder Width (ft)	Overall Pavement Width (ft)	Median?	On-Street Parking?
Lamb Road	Major Collector	2-Lanes	NP	No	2’-4’	Varies	No	No
Westland Road	Major Collector	2-lanes	NP	No	2’-4’	Varies	No	No

[1] NP = not posted. Basic rule 55 mph speed limit applies.



Proposed Site Plan
Umatilla County, Oregon

Figure 2



Existing Lane Configurations and Traffic Control Devices
Umatilla County, Oregon

Figure 3

Safety Analysis

The crash history at each study intersection was reviewed in an effort to identify potential safety issues. Crash records were obtained from ODOT for the five-year period from January 1, 2008 through December 31, 2012. Table 2 shows a summary of the crashes at each study intersection. As shown, there have been no more than two crashes at any study intersection over the most recent 5-year analysis period. As such, there are no distinguishable patterns of intersection-related crashes to warrant safety-based mitigations.

Table 2: Intersection Crash History (January 1, 2008 – December 31, 2012)

Intersection	Collision Type				Severity			Total
	Rear-End	Turning	Angle	Other	PDO[1]	Injury	Fatal	
I-82 Southbound Ramps at Lamb Road	1	-	-	-	-	1	-	1
I-82 Northbound Ramps at Lamb Road	-	-	-	-	-	-	-	0
I-84 Eastbound Ramps at Westland Road	-	-	2	-	1	1	-	2
I-84 Westbound Ramps at Westland Road	-	-	-	-	-	-	-	0
Lamb Road at Westland Road	1	1	-	-	2	-	-	2
Westport Lane at Westland Road	-	-	-	-	-	-	-	0

[1] Property Damage Only

Segment crashes were also investigated along Westland Road and Lamb Road in the site vicinity. Table 3 summarizes the segment crash data also obtained from ODOT. Based on this review of crash records, there are no discernible safety trends that would necessitate mitigation.

Table 3: Segment Crash History (January 1, 2008 – December 31, 2012)

Segment	Collision Type				Severity			Total
	Rear-End	Turning	Angle	Other	PDO[1]	Injury	Fatal	
Westland Road between Livestock Road and Stable Road	1	-	-	-	-	1	-	1
Westland Road between Stable Road and Lamb Road	-	-	1	1	-	2	-	2
Lamb Road between Westland Road and I-82 Northbound Ramps	1	-	-	-	1	-	-	1

[1] Property Damage Only

The crash data is included in Attachment C.

Existing Traffic Operations

Manual turning movement traffic counts were conducted at each of the study intersections during a typical weekday in October 2013. The distribution of traffic volumes over a 24-hour period is illustrated below in Exhibit 1 and Exhibit 2 along Lamb Road and Westland Road, respectively.

Exhibit 1: 24-Hour Traffic Volumes along Lamb Road East of I-82 Interchange Ramps (October 16, 2013)

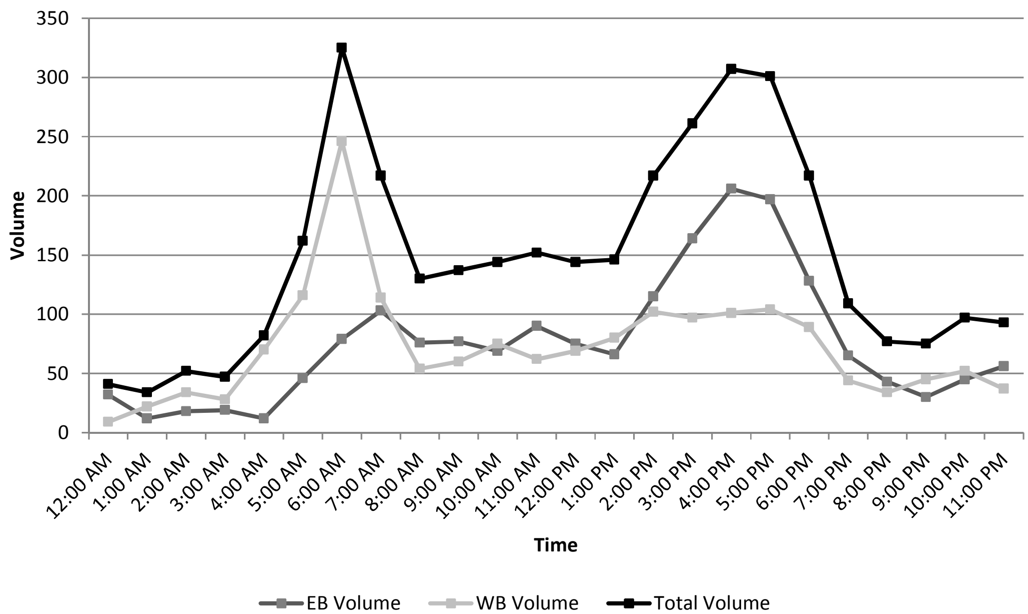
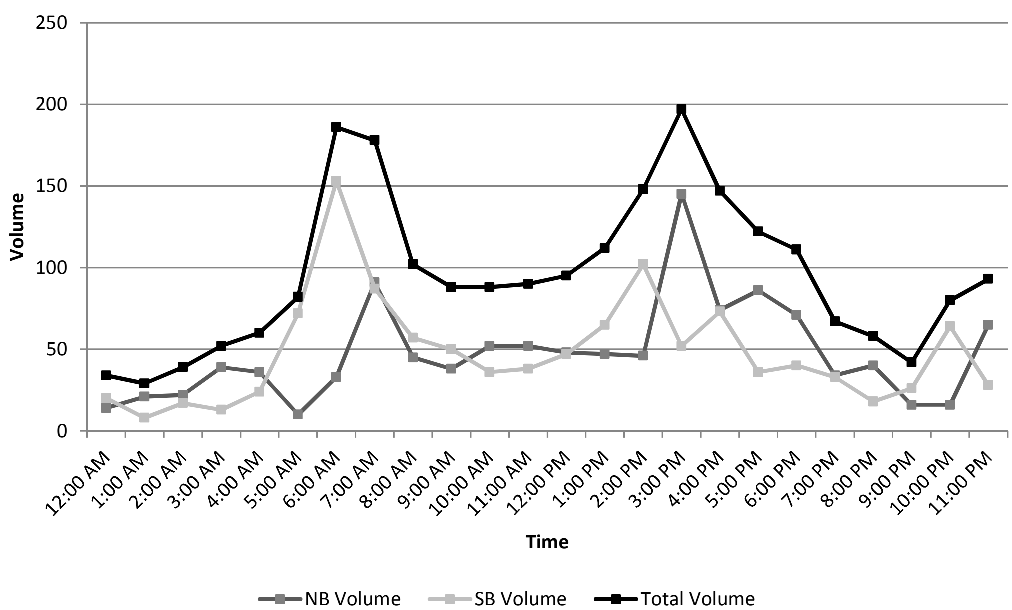


Exhibit 2: 24-Hour Traffic Volumes along Westland Road North of I-84 Interchange Ramps (October 16, 2013)



As shown in Exhibit 1, there is a noticeable directional split relative to peak periods along Lamb Road. The a.m. peak hour occurs from 6:00 to 7:00 a.m. with a heavier flow in the westbound direction, while the p.m. peak hour occurs from 4:00 to 5:00 p.m. with a heavier flow in the eastbound direction. As shown in Exhibit 2, there is also a noticeable directional split relative to peak periods along Westland Road. The a.m. peak hour occurs between 6:00 and 7:00 a.m. for the southbound direction, while the p.m. peak hour occurs between 3:00 and 4:00 p.m. for the northbound direction.

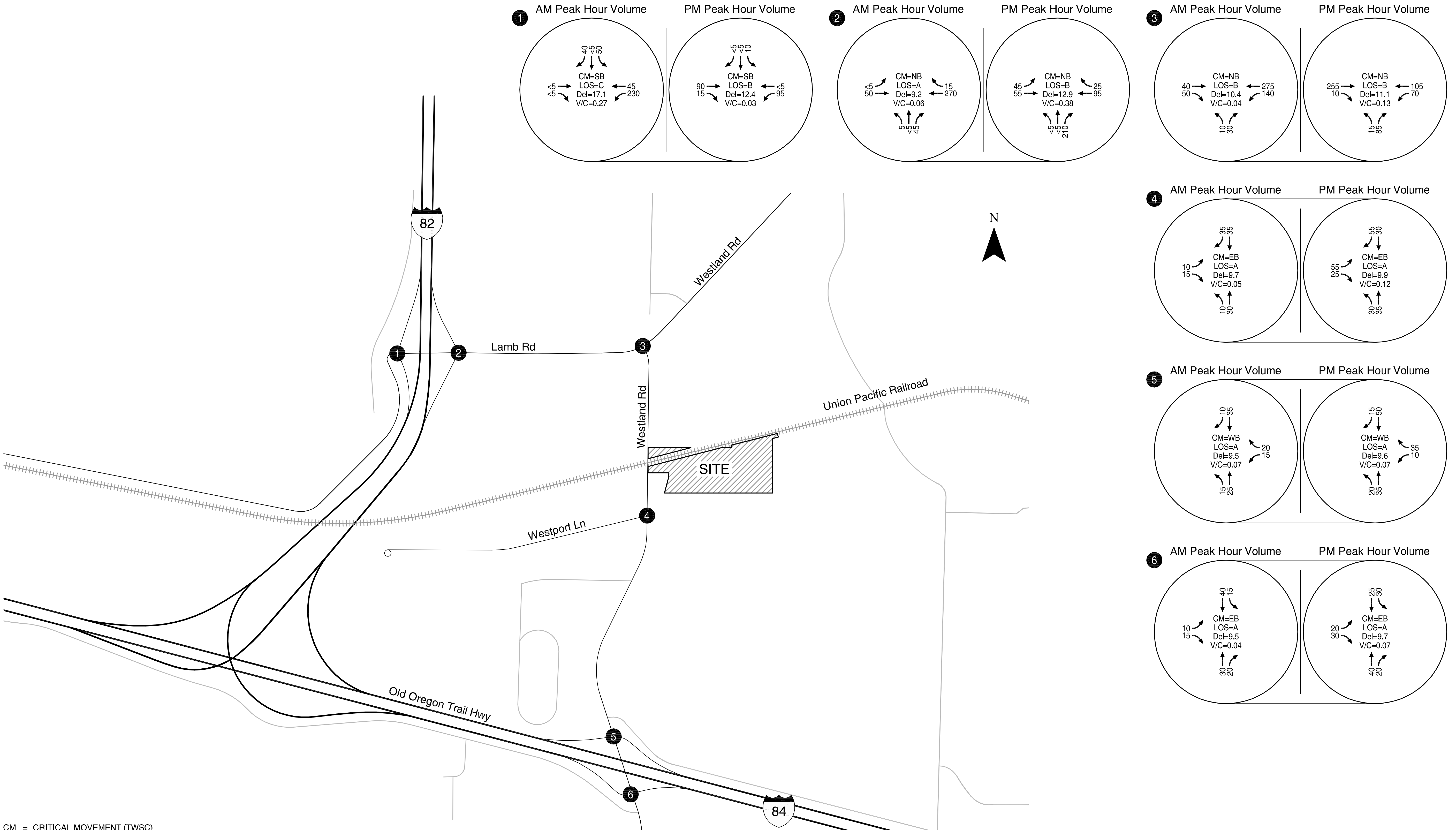
The peak period turning movement counts were analyzed to identify a system peak hour at the study intersection. The morning peak hour was observed to occur from 6:05 to 7:05 a.m. and the afternoon peak hour was observed to occur from 4:30 to 5:30 p.m. The turning movement counts were summarized and rounded to the nearest five vehicles per hour as shown in Figure 4.

For operational analysis purposes, 30th highest hour volume (30HV) were calculated in accordance with procedures presented in ODOT's *Analysis Procedures Manual* (APM) (Reference 4). The agriculture trend was used from the Seasonal Factor Table to estimate the seasonal adjustment factor, as calculated below:

$$\frac{\text{Traffic Counts (15-October)} = 0.9263}{\text{Peak Period Seasonal Factor} = 0.7981} = 1.16$$

Therefore, all study intersection traffic volumes were increased by a factor of 1.16 to develop the 30 HV.

As shown in Figure 4, all study intersections operate acceptably during the peak season weekday a.m. and p.m. peak hour analysis periods. *Attachment D contains the existing traffic operations worksheets.*



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V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWC = TWO-WAY STOP CONTROL
AWSC= ALL-WAY STOP CONTROL

2013 Existing Traffic Conditions
Weekday AM & PM Peak Hours
Umatilla County, Oregon

Figure 4

Section 4
Transportation Impact Analysis

TRANSPORTATION IMPACT ANALYSIS

The transportation impact analysis identifies how the study area's transportation system will operate upon full build-out of the Station. The following analyses are provided within this section:

- Forecast year 2017 background traffic conditions (includes regional growth and in-process planned developments during the build-out year, but does not include traffic from the proposed development) during the weekday a.m. and p.m. peak hours;
- Forecast year 2017 total traffic conditions (includes background traffic growth and the forecast site-generated traffic upon build-out of the site) during the weekday a.m. and p.m. peak hours;
- Forecast year 2016 total traffic conditions with peak construction of the project during typical weekday a.m. and p.m. peak hours (includes peak construction daily operations due to site-generated traffic); and,
- Analysis of the project construction phase to address heavy vehicle operations, peak traffic flows, transportation network geometry, safety, and efficiency.

YEAR 2017 BACKGROUND TRAFFIC CONDITIONS

The background traffic analysis identifies how the study area's transportation system will operate in the build-out year of the proposed development without site-generated traffic from the proposed development. The purpose of this analysis is to establish a basis of comparison for future conditions. As such, the background traffic analysis includes traffic growth from developments in the area plus general growth in the region, but does not include the traffic from the proposed development.

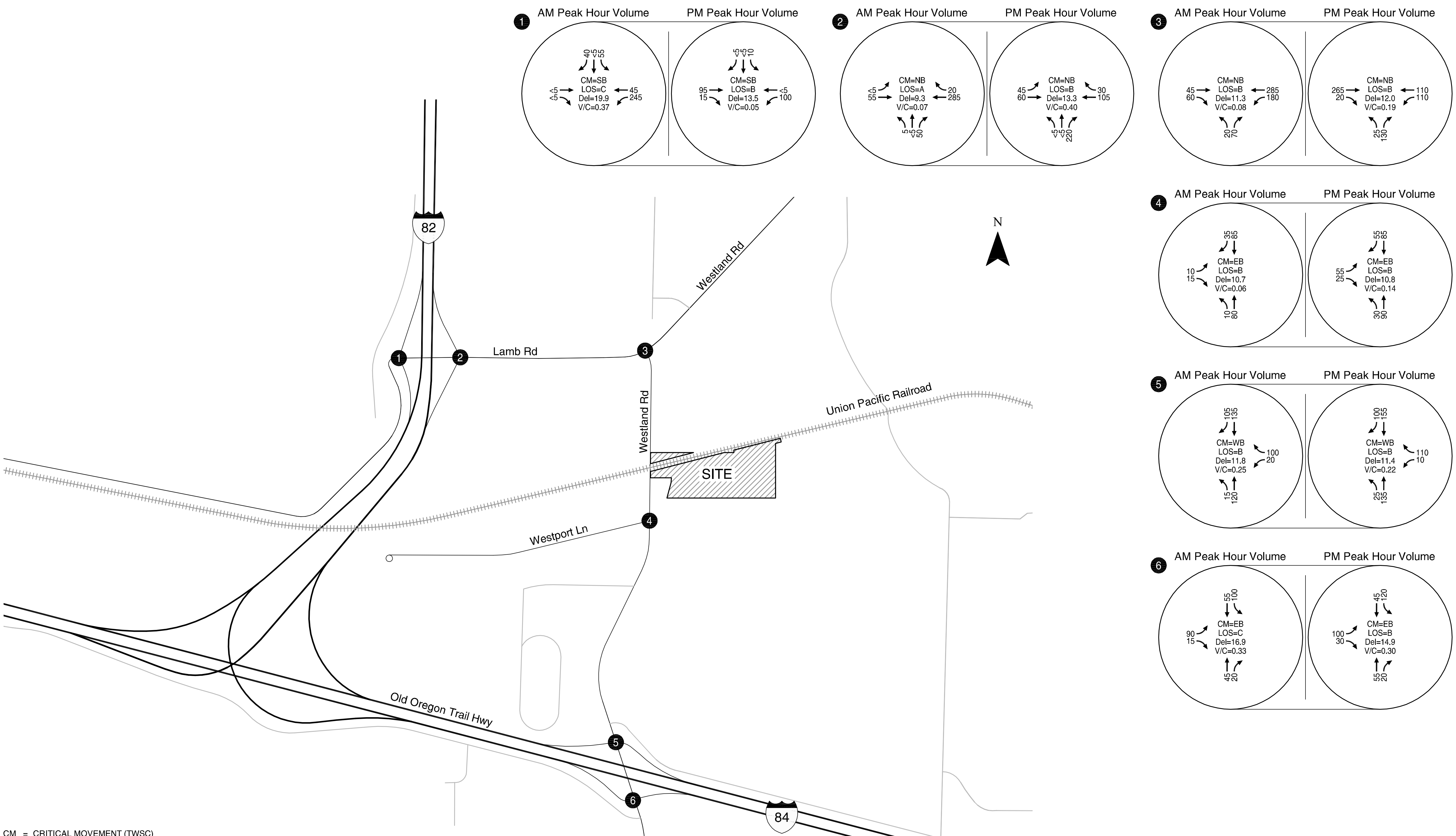
Planned Developments and Transportation Improvements

Based on information provided by Umatilla County, the Westland Road Travel Center is a pending development approximately ½ mile south of the Station site. While the land use process is ongoing for this project, it has been included in this analysis as an in-process development in order to provide a conservative assessment of future traffic conditions.

A Traffic Impact Analysis Report (Westland Road Travel Center TIA) was most recently prepared by KAI in December 2013 documenting the estimated weekday p.m. peak hour trip generation and the transportation impacts of the proposed development. The development will be located west of Westland Road, south of Stable Road, and north of I-84 and will include a truck fueling station, market, truck-washing station, auto fueling station, and restaurant space. The estimated trip generation for the site as described in the report is approximately 470 trips during the weekday p.m. peak hour (225 in, 245 out) and 460 trips during the weekday a.m. peak hour (220 in, 240 out). The a.m. in-process trips were estimated by applying trip rates from the Trip Generation manual, 9th Edition for the assumed land uses. *Attachment E contains the in-process traffic volumes.*

Regional Growth

To account for regional growth, a 1.0 percent annual growth rate was applied based on conversations with Umatilla County staff. The year 2017 background traffic operations include the anticipated traffic from the in-process development as well as general regional growth in traffic volumes and are shown in Figure 5. As shown, each of the study intersections is forecast to continue to operate acceptably. Attachment F contains the year 2015 background traffic operations worksheets.



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AWSC= ALL-WAY STOP CONTROL

2017 Background Traffic Conditions
Weekday AM & PM Peak Hours
Umatilla County, Oregon

Figure
5

YEAR 2017 TOTAL TRAFFIC CONDITIONS

The total traffic analysis identifies how the study area's transportation system will operate in the build-out year with the completed proposed development traffic on the transportation system. As such, the year 2017 total traffic analysis includes traffic growth from developments in the area, general growth in the region, and forecast traffic from the proposed development.

Proposed Development plan

Perennial Wind Chaser LLC proposes to construct and operate up to four General Elective (GE) natural gas-fired combustion turbine generators, which will produce up to approximately 415 megawatts of electric power. Access to the site is proposed via a new private driveway as shown in the proposed site plan on Figure 2. The following sections summarize the expected operational characteristics of the surrounding roadway network during typical daily operations of the proposed development.

Trip Generation

Once constructed and operational, the Station will have a relatively consistent operational pattern. Based on information supplied by the operator of the proposed facility, the plant will operate under the following characteristics:

- Typical operations will consist of approximately 6-8 daily employees, with an average day shift of about 6 employees and an average evening staff of about 2 employees to perform general operation and maintenance duties. Each shift will be 12-hours in duration with shift changes expected to occur at 5:00 a.m. and 5:00 p.m.
- Truck deliveries will be limited to daily parcel delivery services and weekly chemical supply services.
- Visitors will access the facility on an infrequent basis and typically during daytime operating hours.
- The facility will be accessed via a gated private access drive on Westland Road, as shown in Figure 2.

Table 4 shows the estimated trip generation based on the above characteristics for the proposed development daily operations.

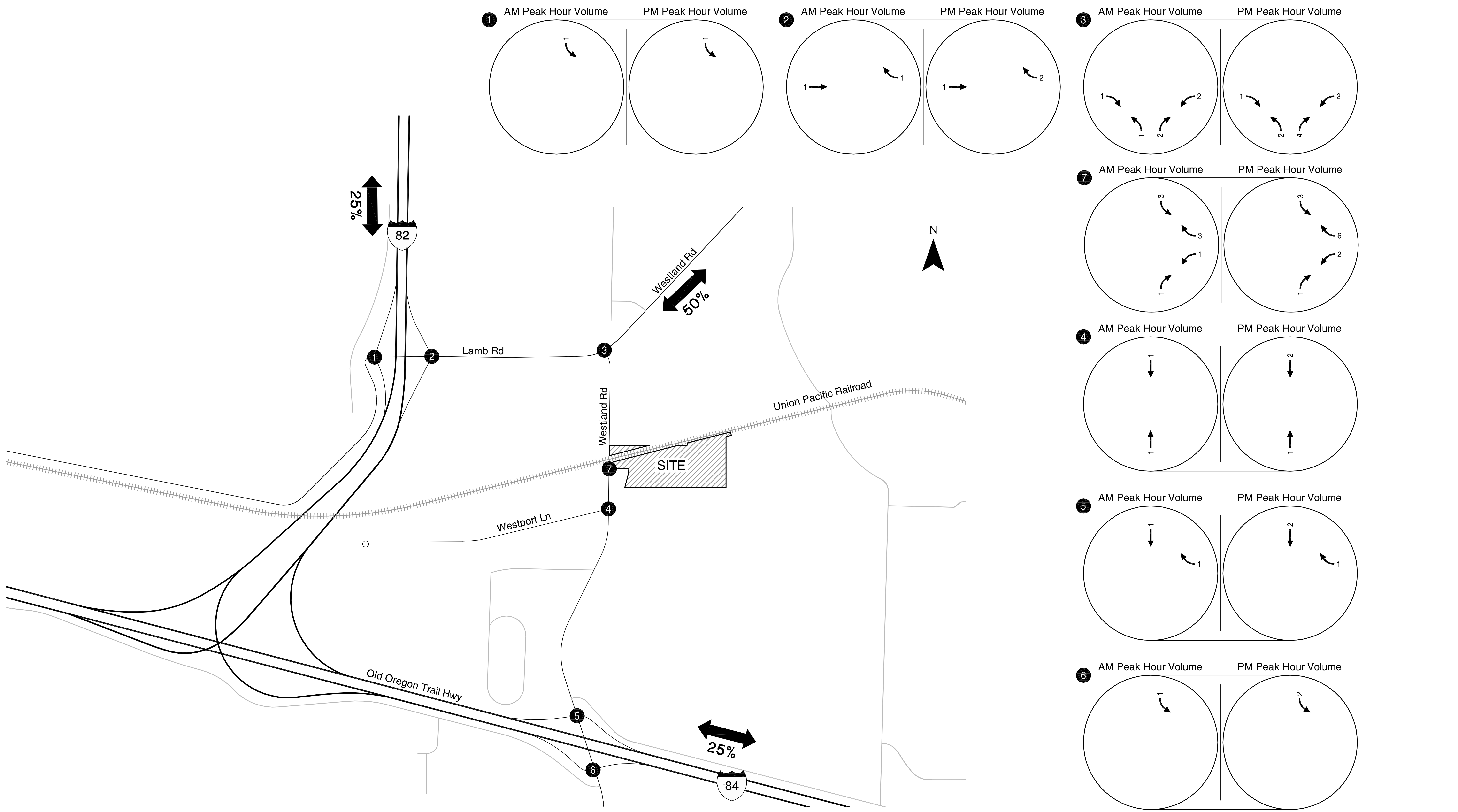
Table 4: Estimated Trip Generation

	Weekday AM Peak Hour			Weekday PM Peak Hour		
Trip Type	Total	In	Out	Total	In	Out
Employee	4	2	2	8	2	6
Visitor	2	1	1	2	1	1
Delivery Truck	2	1	1	2	1	1
Total	**8**	**4**	**4**	**12**	**4**	**8**

The estimated trip distribution pattern and site-generated trip assignment are summarized in Figure 6. The trip distribution pattern was developed based on existing turning movement counts. As a result, it is expected that approximately twenty-five percent of trips will originate north of the I-82/Lamb Road interchange; fifty percent will originate east of the Westland Road/Lamb Road intersection, and twenty-five percent east of the Westland Road/I-84 interchange.

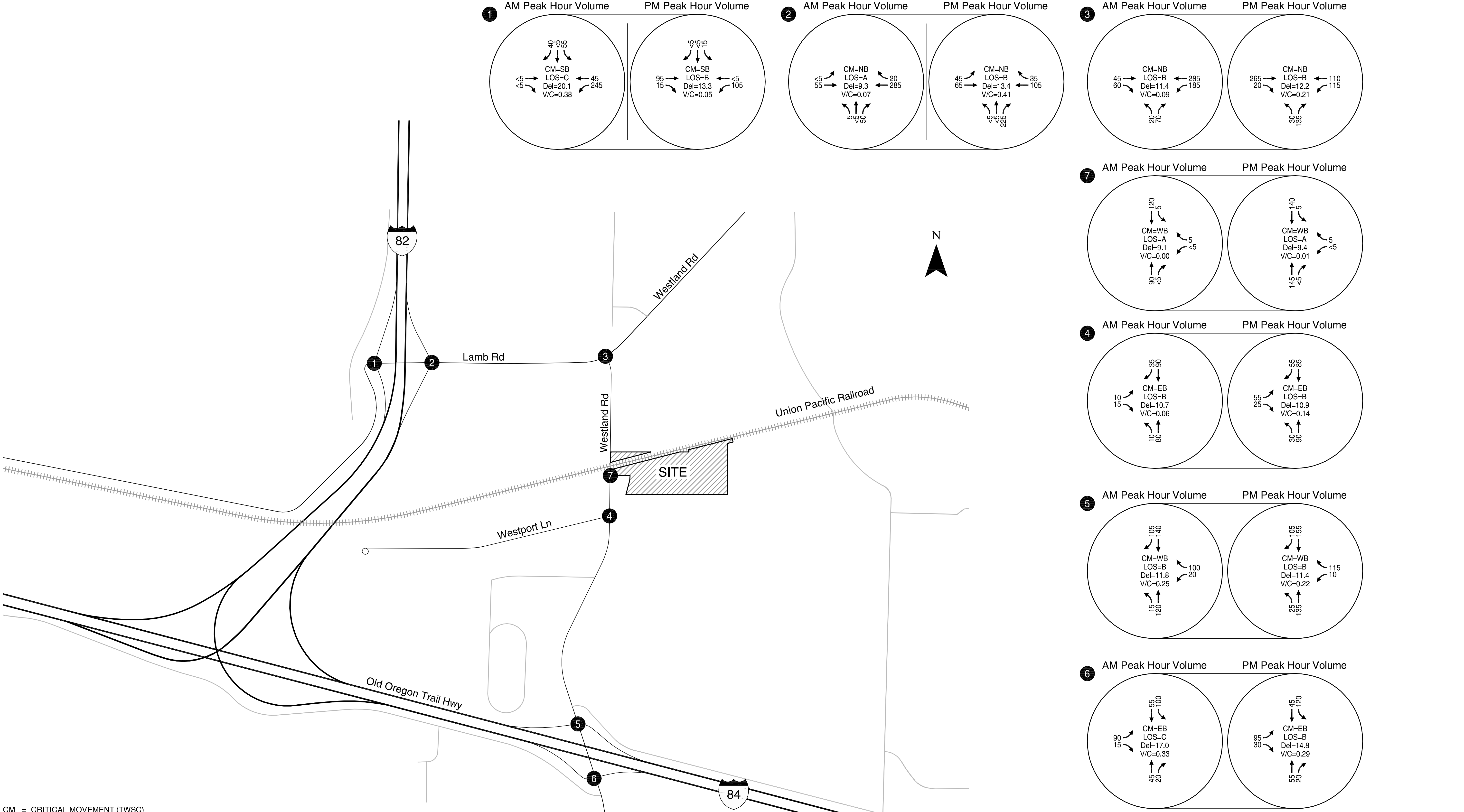
Year 2017 Total Traffic Operations

The site-generated volumes shown in Figure 6 were added to the background volumes shown in Figure 5 to arrive at the 2017 total traffic volumes shown in Figure 7. As shown in Figure 7, each of the study intersections is forecast to continue to operate acceptably during 2017 total traffic conditions. *Attachment G contains the year 2017 total traffic operations worksheets and left-turn warrants.*



2017 Build-Out Trip Distribution and Site-Generated Trips
Weekday AM & PM Peak Hours
Umatilla County, Oregon

Figure
6



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AWSC= ALL-WAY STOP CONTROL

2017 Total Traffic Conditions
Weekday AM & PM Peak Hours
Umatilla County, Oregon

Figure 7

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING/PLANNING

YEAR 2016 PEAK CONSTRUCTION TOTAL TRAFFIC CONDITIONS

A transportation assessment of the construction period was prepared in addition to build-out year 2017 total traffic conditions to support the application process. This assessment includes an evaluation of each study intersection, focusing on the ability to adequately accommodate construction traffic from an operations and safety perspective. The following section summarizes the expected operational characteristics of the surrounding roadway network during the construction phase of the project.

Year 2016 Background Traffic

To account for regional growth, a 1.0 percent annual growth rate was estimated using historical and nearby jurisdiction trends. The year 2016 background traffic operations include the anticipated traffic from the Westland Travel Center development as well as general regional growth in traffic volumes.

Peak Construction Trip Generation

It is expected that construction worker and truck traffic will be an important element to address in the application and approval process. As such, KAI has worked with the project team to obtain a preliminary breakdown of the staffing levels during the construction period. Estimates of pertinent information obtained include the following:

- The total construction period is estimated to last approximately 16 months and may begin as early as 2015 depending upon completion of the review and approval process for Perennial's Site Certificate Application.
- At the peak of the construction period, approximately 225 workers will be employed at the site, and will all work the same day shift (7:00 a.m. to 5:30 p.m.).
- Forty truck deliveries are assumed to be distributed evenly throughout the day shift.

As described above, a higher number of vehicle trips are expected to travel to and from the site during the construction phase than during post-construction daily operations. During the peak construction period, a maximum of approximately 225 day-shift workers are anticipated to be working on-site during a typical workday. Based on experience at other large construction sites, a 1.2 vehicle occupancy rate is anticipated for workers traveling to and from the site during construction phase. A traffic operations analysis was conducted for this peak of construction, considering vehicle occupancy, to identify the *reasonable worst-case* potential peak hour impacts of the construction phase traffic on the study intersections. Based on this conservative trip generation approach, the estimated site-generated trips during peak construction are shown in Table 5.

Table 5: Peak Construction Estimated Trip Generation

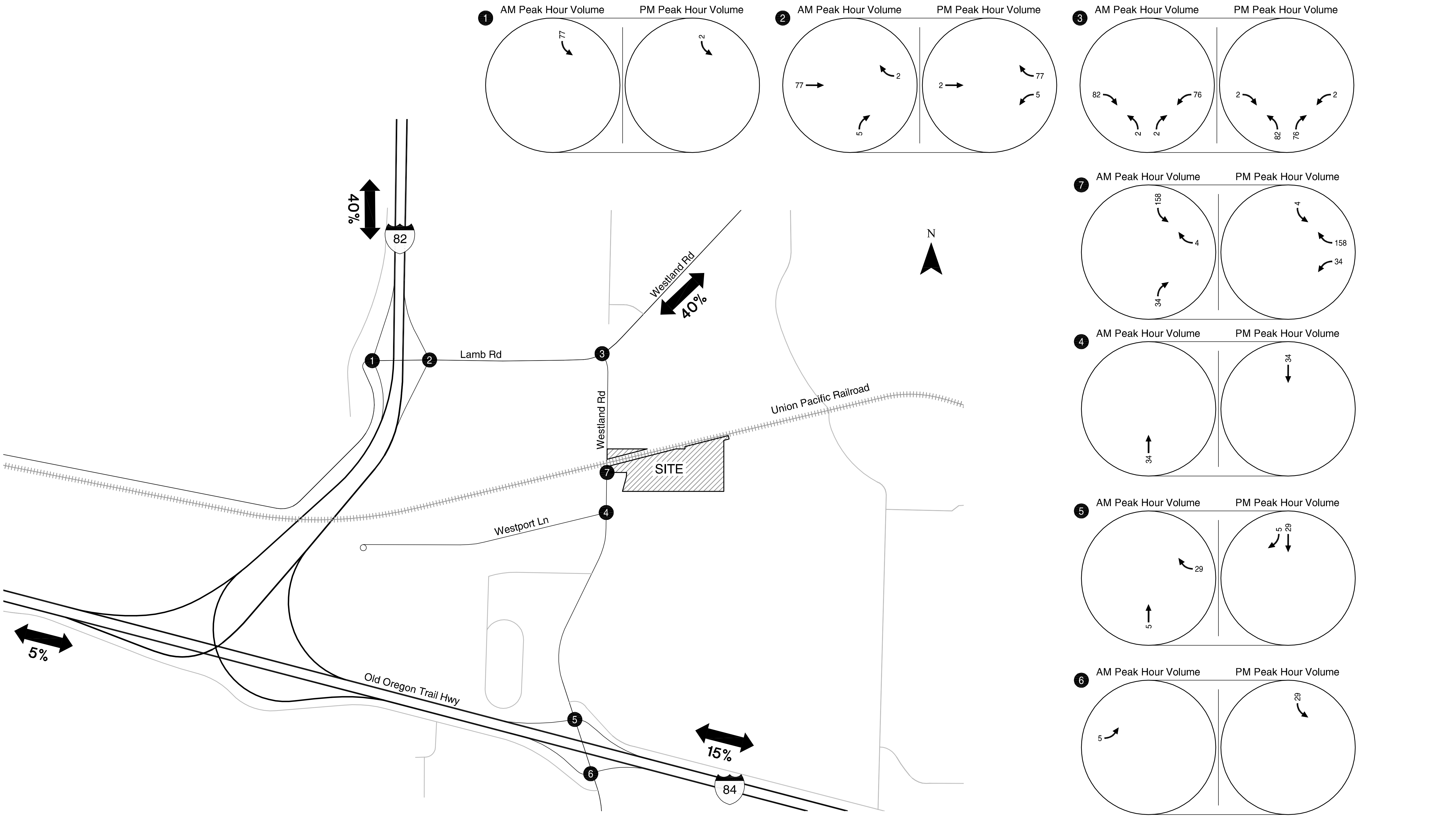
Trip Type	Weekday AM Peak Hour			Weekday PM Peak Hour		
	Total	In	Out	Total	In	Out
Employee[1]	188	188	0	188	0	188
Delivery Truck	8	4	4	8	4	4
Total	**196**	**192**	**4**	**196**	**4**	**192**

[1] 225 employees with an assumed average vehicle occupancy of 1.2 persons/vehicle

The estimated trip distribution pattern is summarized in Figure 8 along with the site-generated trip assignment. The trip distribution pattern was developed based on existing turning movement counts. As a result, it is expected that approximately forty percent of trips will originate north of the I-82/Lamb Road interchange; forty percent will originate east of the Westland Road/Lamb Road intersection, fifteen percent east of the Westland Road/I-84 interchange, and five percent west of the Westland Road/I-84 interchange.

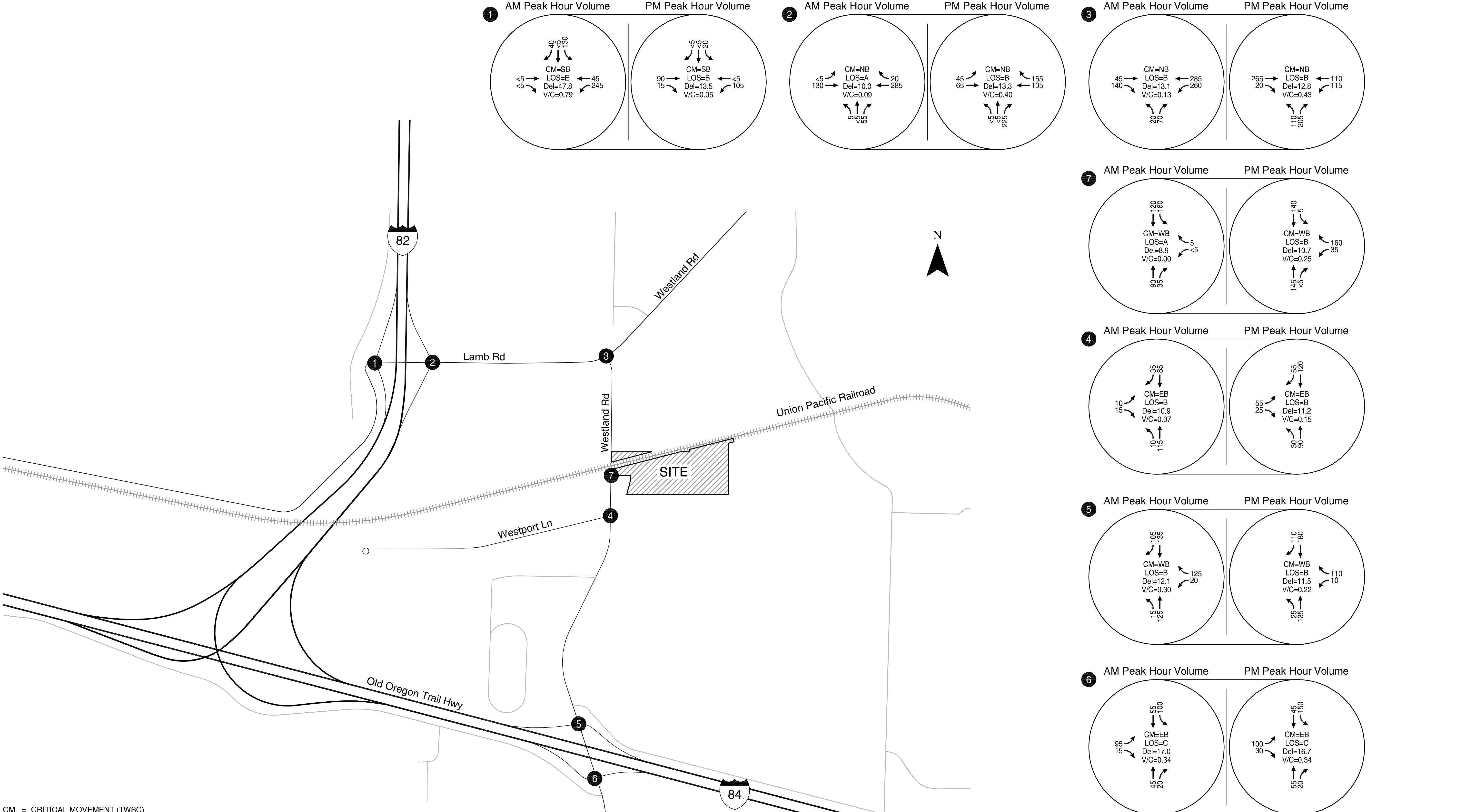
Year 2016 Total Traffic Operations

The site-generated volumes shown in Figure 8 were added to the 2016 background volumes to arrive at the 2016 total traffic volumes shown in Figure 9. As shown in Figure 9, each of the study intersections is forecast to continue to operate acceptably during 2016 total traffic conditions. *Attachment H contains the year 2016 total traffic operations worksheets.*



2016 ConstructionTrip Distribution and Site-Generated Trips
Weekday AM & PM Peak Hours
Umatilla County, Oregon

Figure
8



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2016 Total Traffic Conditions
Weekday AM & PM Peak Hours
Umatilla County, Oregon

Figure 9

SITE-ACCESS DRIVEWAY DESIGN REVIEW

KAI has reviewed the design of the site-access driveway and coordinated with the site designers as well as staff from Umatilla County and ODOT Rail Division to ensure that the proposed site-access intersection conforms to current operational and safety standards of practice.

A scaled depiction of the proposed permanent driveway design is shown in Figure 10. Given the higher volume of traffic and delivery vehicles that will be accessing the site during construction of the Station, Perennial has proposed to construct a temporary access roadway approximately 75-100 feet south of the permanent driveway, utilizing a portion of the adjacent property under a temporary agreement with the property owner. A conceptual layout of the temporary site-access driveway is shown in Figure 11. Under the temporary access scenario, the permanent access intersection would not be open and all traffic movements will be made at the temporary driveway.

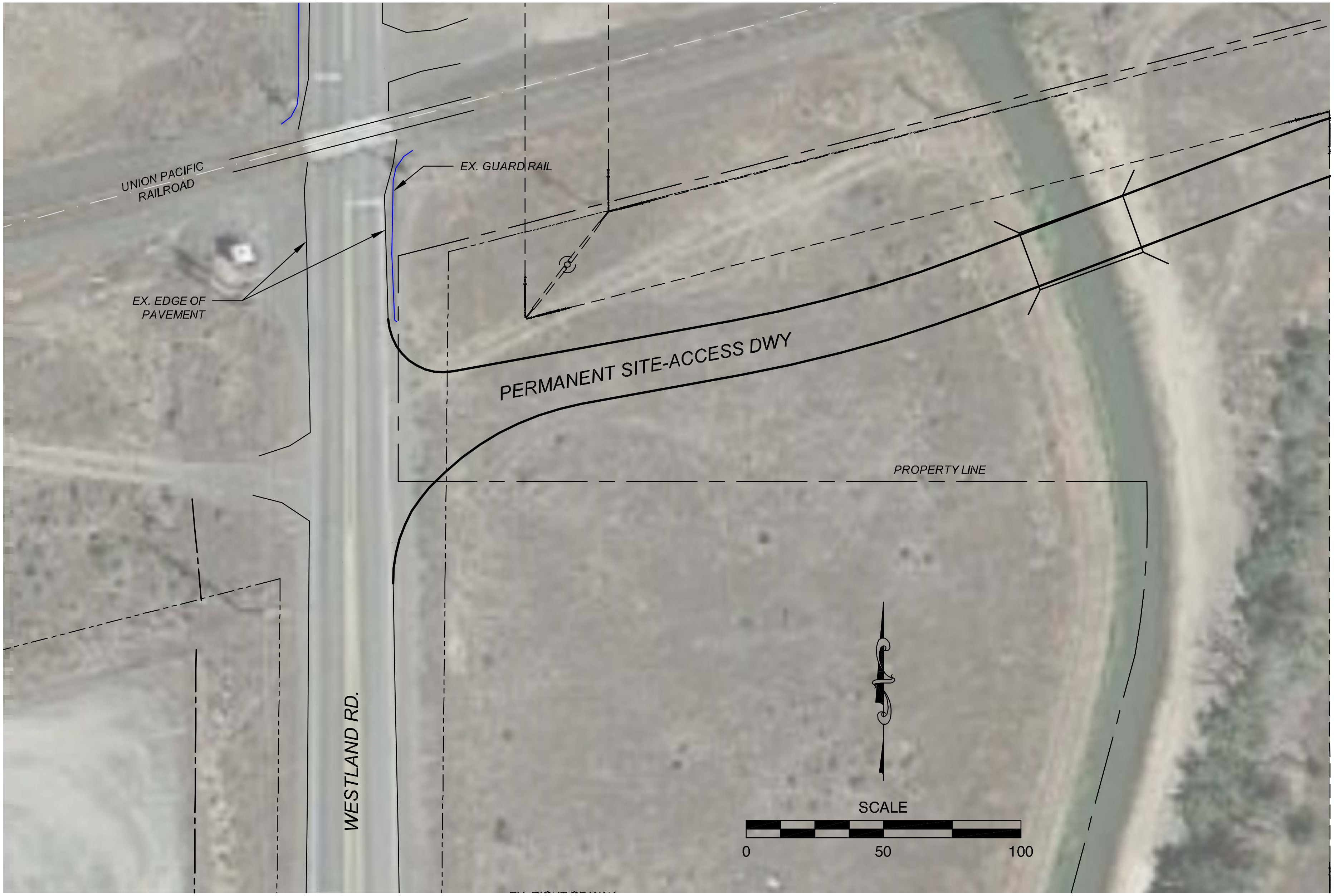
This review included assessing access management standards, truck turning accommodations, intersection sight distances, and spacing to the railroad grade crossing. The remainder of this section summarizes the finding and recommendations related to this review.

Access Management Standards

The *Umatilla County Transportation System Plan* provides recommended access management standards for County-owned roadways. As a Major Collector, Westland Road has an access spacing standard of 250 feet between private driveways and 500 feet between public roads. Based on a review of recent aerial photography and field observations, the proposed driveway for the Perennial Wind Chaser Station development would be approximately 250 feet to the nearest driveway to the north. This driveway appears to be a seldom-used access point for maintenance vehicles to access the drainage canal. The nearest driveway of consequence to the north is the Hermiston Generating Plant Access, which is approximately 670 feet from the proposed site access. To the south, the nearest access point is Westport Lane, which is located approximately 580 feet from the proposed site-access driveway. Therefore, the proposed driveway location conforms to the County's access management standards.

Intersection Sight Distance

KAI conducted field reviews of intersection sight distances at the proposed site access point on Westland Road. Intersection sight distances were evaluated in accordance with the guidelines outlined in the 2011 AASHTO publication *A Policy on Geometric Design of Highways and Streets*. Based on the 55-mph design speed of Westland Road, the AASHTO-computed intersection sight distance is 610 feet. Field observations revealed that grades along Westland Road are relatively flat and there are no landscape features or objects that would obstruct sight distance from either the permanent access point or the temporary access point. Therefore, this analysis concluded that intersection sight distances are adequate from the proposed site access locations. All new site landscaping, signing and any aboveground utilities should be located and maintained to ensure that adequate sight distance is maintained after build out.



PERMANENT SITE-ACCESS DRIVEWAY DESIGN
Umatilla County, Oregon

FIGURE 10

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KITTELSON & ASSOCIATES, INC.
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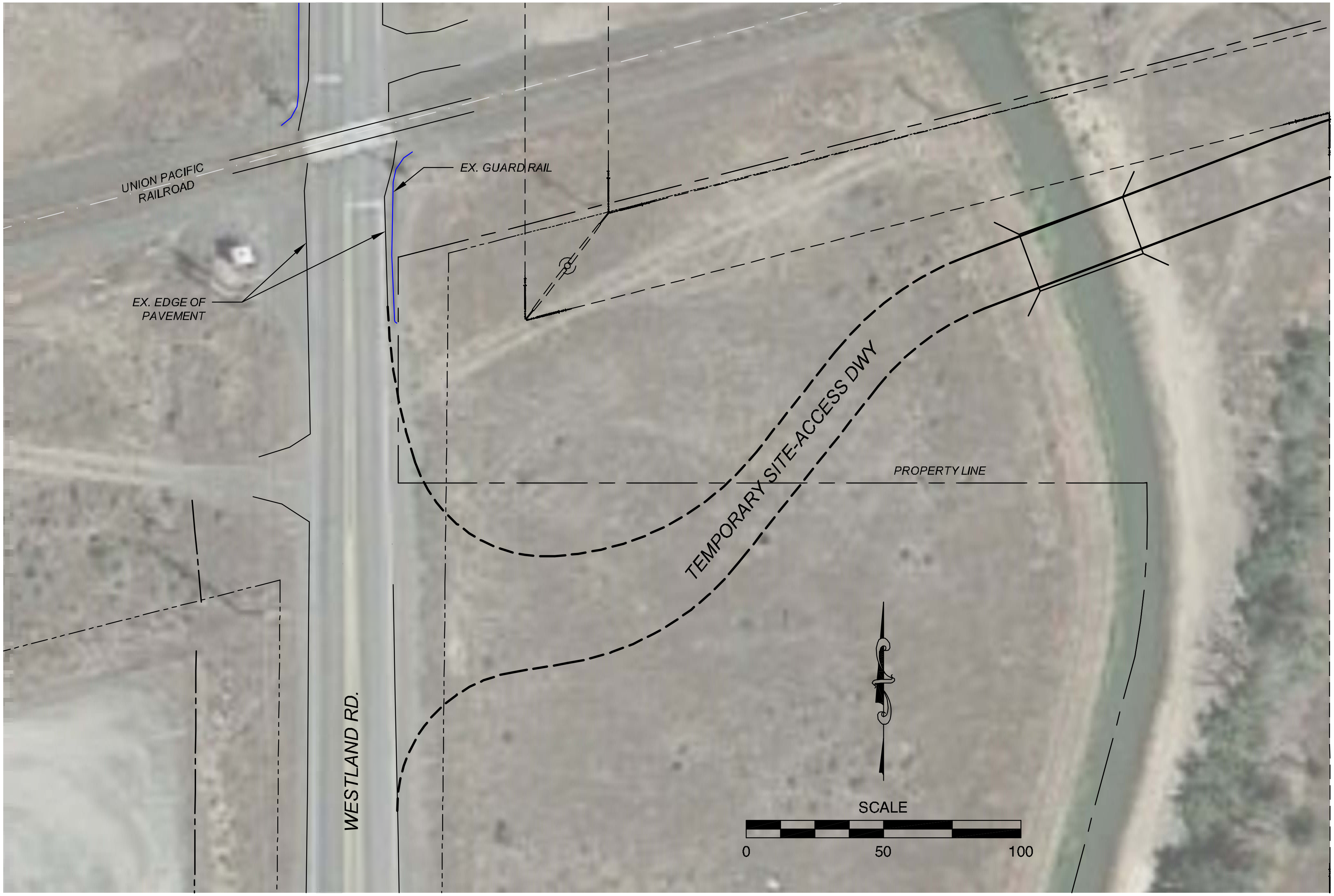

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TEMPORARY SITE-ACCESS DRIVEWAY CONCEPTUAL DESIGN
Umatilla County, Oregon

FIGURE
11

Truck Turning Analysis

KAI reviewed standard truck turning paths at both the permanent access intersection and the temporary (construction-related) access intersection.

Permanent Driveway Design

Under the permanent (post-construction) operation of the Station, truck deliveries will be infrequent and typically consist of weekly delivery of chemical supplies. Due to the relatively narrow property frontage in combination with the existing guard rail located at the railroad crossing gate, the permanent site-access driveway cannot be designed to accommodate truck movements to or from the north. Therefore, all truck movements to the Station should be directed to enter the site from the south (i.e. from the I-84/Westland Road interchange). Additionally, all trucks exiting the site should be directed to turn left out of the driveway onto southbound Westland Road (towards I-84). Figures 12 and 13 show the inbound and outbound turning paths, respectively, for the WB-67 design vehicle under the permanent driveway configuration.

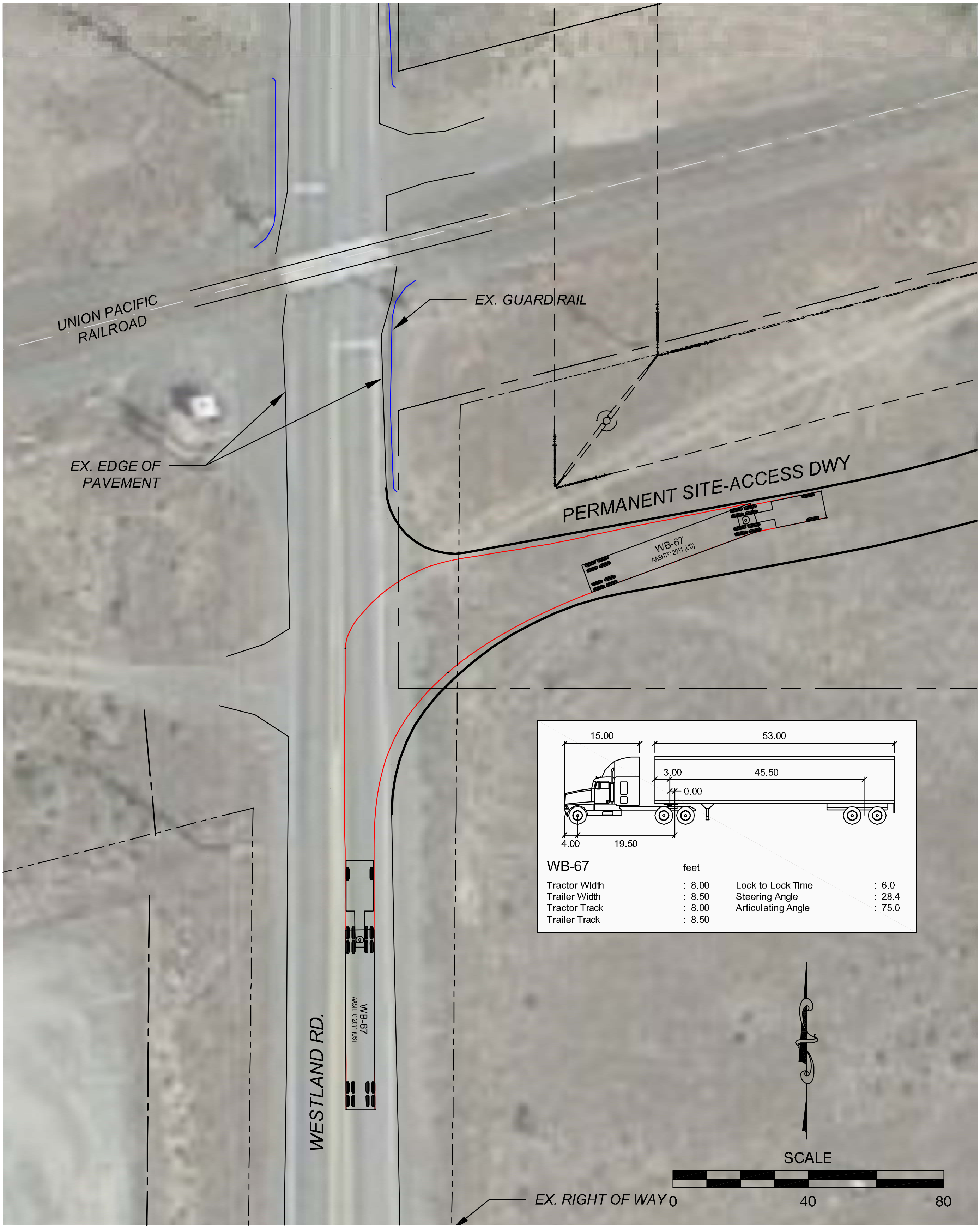
To enforce the intended ingress and egress truck routes, truck turn restriction signs should be mounted at the intersection as follows:

- A right-turn prohibition sign with a supplemental “TRUCKS” rider plaque should be mounted on the westbound (driveway) approach at the intersection.
- A left-turn prohibition sign with a supplemental “TRUCKS” rider plaque should be mounted on the southbound (Westland Road) approach at the intersection.

Temporary Driveway Design

Under the temporary driveway configuration with the access shifted to the south onto the adjacent property, it is anticipated that the intersection will accommodate full turning movements for standard trucks. Figure 14 shows the inbound and outbound right-turn paths for the standard WB-67 design vehicle.

With regard to oversized loads, it is expected that the construction process will necessitate the delivery of several over-dimensional items such as turbines and heat recovery systems. Although the specifics are not yet known, it is anticipated that some over-dimensional items may arrive at the construction site via the existing rail line directly adjacent to the site. For those over-dimensional items that cannot be delivered to the site via the rail line, the remaining items will then need to be delivered via truck. Given that these items typically require the use of specially designed over-sized trailers, a formal routing plan and delivery plan is expected to be developed by the contractor in conjunction with ODOT and Umatilla County for these deliveries.



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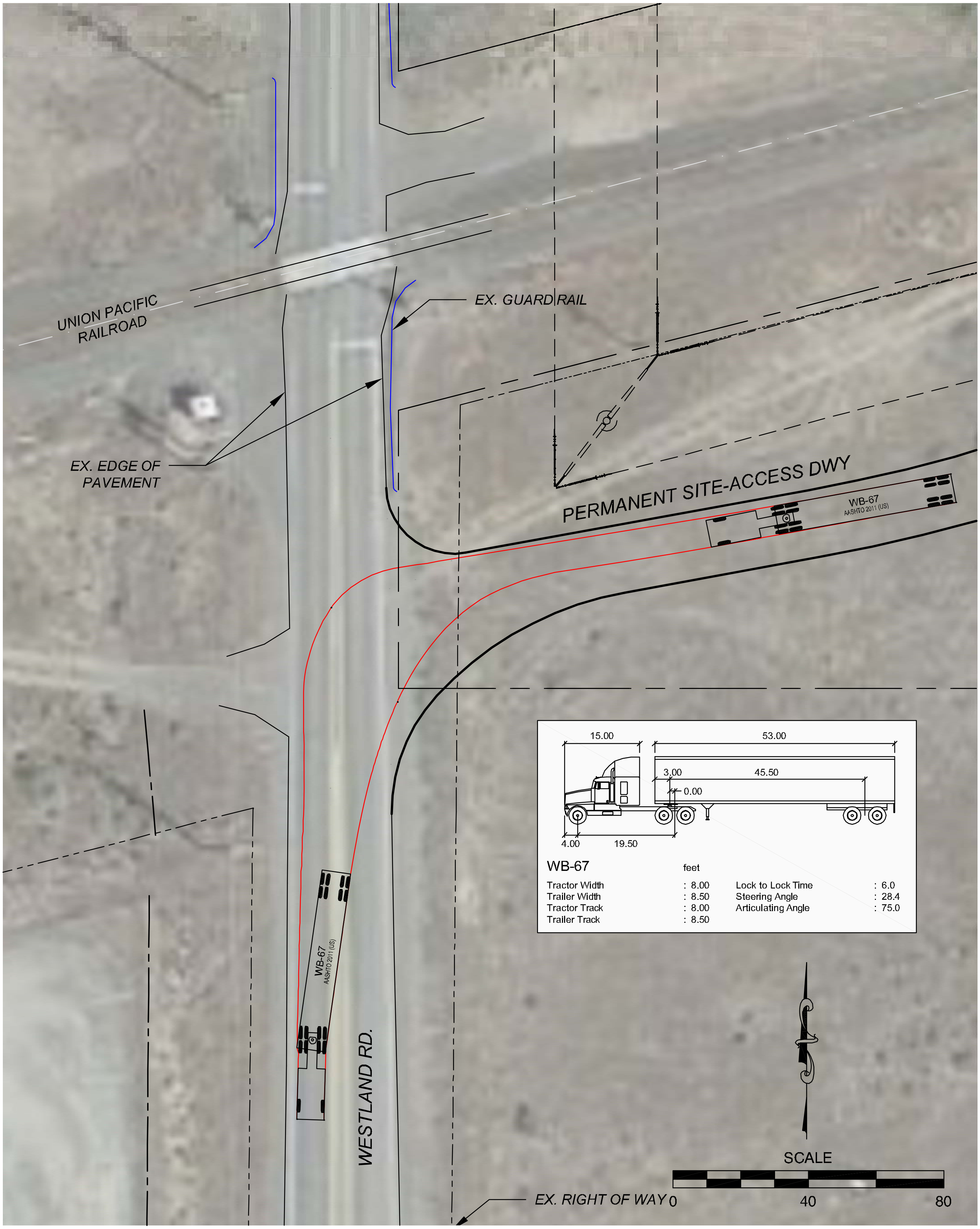
WB-67 VEHICLE TURNING PATH
INBOUND MOVEMENT
PERMANENT DRIVEWAY DESIGN

FIGURE 12



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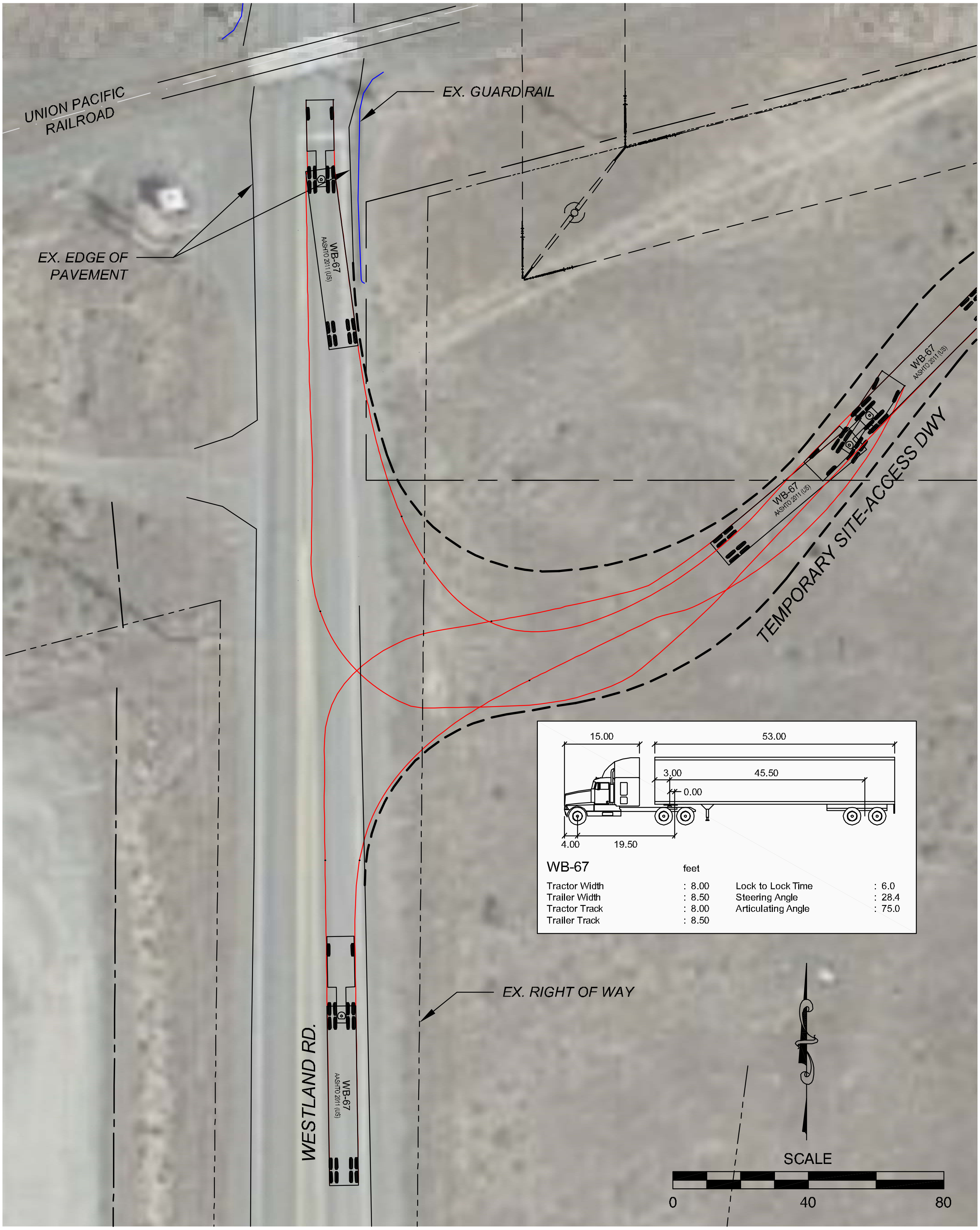
WB-67 VEHICLE TURNING PATH
OUTBOUND MOVEMENT
PERMANENT DRIVEWAY DESIGN

FIGURE 13



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WB-67 VEHICLE TURNING PATHS
TEMPORARY DRIVEWAY DESIGN
(DURING CONSTRUCTION)

FIGURE 14

Spacing to Rail Crossing

KAI coordinated with staff from ODOT's Rail Division to ensure the proposed site access design would meet ODOT's operational and safety standards with respect to the adjacent signalized at-grade rail crossing on Westland Road. The jurisdiction of the state for the regulation of highway-rail grade crossings includes all roadways open to and used by the public, which are equipped with protective devices. In the case of the Westland Road rail crossing, the state's jurisdiction extends a distance of 495 feet from the rail crossing, measured back from the location of the stop clearance lines at the grade crossing. As the proposed site-access intersection for the Station would be located approximately 80 feet from the nearest stop clearance line on Westland Road, it is located within ODOT's jurisdiction.

After reviewing the preliminary site plan, ODOT Rail Division staff concluded that the existing crossing is not being altered by the proposed site development, and therefore the proposed access location would be acceptable.[1] ODOT staff also noted that truck turning paths should be reviewed to ensure that turning movements at the driveway would not require modification of the existing guardrail. An analysis of truck turning movements was presented in the preceding section of this report. As previously discussed, all truck deliveries to the site under the permanent operation (post construction) will be made by entering from and exiting to the south on Westland Road. Therefore, truck movements will only include the northbound right-turn into the site and the westbound left-turn movement out of the site. As shown in Figures 12 and 13, these truck movements will be accommodated without impacting the existing guard rail. Additionally, during construction of the Station, a temporary driveway design has been proposed such that full-access truck movements will be accommodated without impacting the guard rail (see Figure 14).

[1] Conversation with Zach Hunter, ODOT Rail Crossing Compliance Specialist, on November 13, 2013.

Section 5
Conclusions and Recommendations

CONCLUSIONS AND RECOMMENDATIONS

This analysis of existing traffic operations and estimated future traffic conditions resulted in the following key findings and recommendations.

FINDINGS

- All of the study intersections and critical movements operate acceptably during the weekday a.m. and p.m. peak hours.
- No safety deficiencies or crash patterns were identified at the study intersections.
- Under 2017 background conditions, all study intersections are forecast to continue operating acceptably during the weekday a.m. and p.m. peak hours.
- The proposed Perennial Wind Chaser Energy Facility (Station) is estimated to generate approximately 8 and 12 trip ends during the a.m. and p.m. peak hours of a typical weekday, respectively.
- Under year 2017 total traffic conditions with the addition of permanent site-generated traffic, all study intersections are forecast to continue operating within acceptable performance standards during the weekday a.m. and p.m. peak hours.
- At the peak of the construction period, the projected construction effort is estimated to generate approximately 196 trip ends during each of the weekday a.m. and p.m. peak hours.
- Under year 2016 total traffic conditions with the addition of construction-related traffic, all study intersections will continue to meet the relevant performance targets.
- The proposed site access on Westland Road conforms with Umatilla County’s access management standards.
- Intersection sight distances are adequate at both the permanent and temporary (construction-related) proposed site access intersections.
- A truck turning path analysis found that the proposed permanent site access driveway design will accommodate truck ingress and egress movements without impacting the existing guard rail at the railroad crossing, provided that all truck movements are made to/from the south (i.e. via the I-84/Westland Road interchange).
- During construction of the site, the proposed temporary site-access driveway design, which shifts the access south of the permanent driveway location utilizing the adjacent property, will accommodate full turning movements for standard trucks sizes (including the WB-67 design vehicle).

RECOMMENDATIONS

- To ensure that all truck movements at the site-access intersection under the permanent operation are made to and from the south, truck turn restriction signs should be mounted at the site-access intersection as follows:
    - A right-turn prohibition sign with a supplemental “TRUCKS” rider plaque should be mounted facing the westbound (driveway) approach.
    - A left-turn prohibition sign with a supplemental “TRUCKS” rider plaque should be mounted facing the southbound (Westland Road) approach.
- If truck delivery of oversized loads is required during construction of the Station, a formal routing and delivery plan should be developed by the contractor in conjunction with ODOT and Umatilla County staff. These oversized vehicles may require special geometric and/or traffic control accommodations that are beyond the scope of this analysis.
- Locate and maintain site landscaping, signing and any aboveground utilities to ensure that adequate sight distance is maintained after build out.

Section 6
References

REFERENCES

1. Transportation Research Board. *Highway Capacity Manual*. 2000.

2. Umatilla County. *2002 Transportation System Plan.* April 2002.

3. The Oregon Department of Transportation. *Oregon Highway Plan*. 1999.

4. The Oregon Department of Transportation. *Analysis Procedures Manual.* 2010.

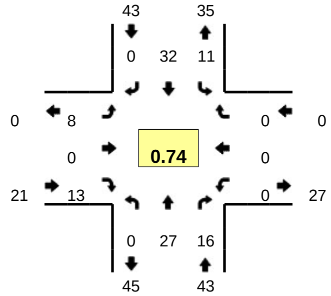
5. American Association of State Highway and Transportation Officials, *A Policy on Geometric Design of Highways and Streets*. 2011

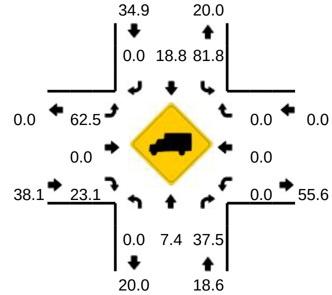
Appendix A
Traffic Count Data

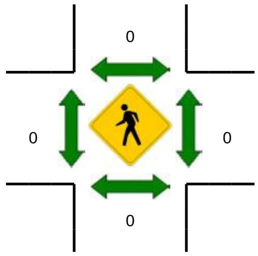
Type of peak hour being reported: User-Defined | Method for determining peak hour: Total Entering Volume

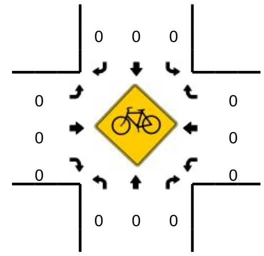
LOCATION: Westland Rd -- I-84 Eastbound Ramps | **QC JOB #:** 11340201
CITY/STATE: Hermiston, OR | **DATE:** Wed, Oct 16 2013

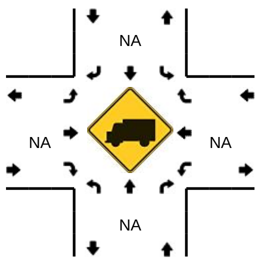
Peak-Hour: 6:05 AM -- 7:05 AM
Peak 15-Min: 6:50 AM -- 7:05 AM

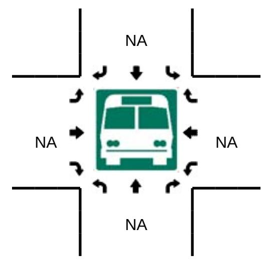












5-Min Count Period Beginning At	Westland Rd (Northbound) Left	Thru	Right	U	Westland Rd (Southbound) Left	Thru	Right	U	I-84 Eastbound Ramps (Eastbound) Left	Thru	Right	U	I-84 Eastbound Ramps (Westbound) Left	Thru	Right	U	Total	Hourly Totals
6:00 AM	0	3	1	0	0	3	0	0	0	0	3	0	0	0	0	0	10	
6:05 AM	0	4	0	0	1	1	0	0	0	0	1	0	0	0	0	0	7	
6:10 AM	0	2	0	0	1	4	0	0	0	0	1	0	0	0	0	0	8	
6:15 AM	0	2	0	0	2	3	0	0	0	0	0	0	0	0	0	0	7	
6:20 AM	0	3	3	0	0	0	0	0	1	0	1	0	0	0	0	0	8	
6:25 AM	0	0	0	0	2	0	0	0	0	0	2	0	0	0	0	0	4	
6:30 AM	0	1	0	0	0	4	0	0	1	0	1	0	0	0	0	0	7	
6:35 AM	0	2	1	0	0	4	0	0	2	0	2	0	0	0	0	0	11	
6:40 AM	0	4	2	0	1	3	0	0	0	0	0	0	0	0	0	0	10	
6:45 AM	0	1	4	0	0	3	0	0	0	0	1	0	0	0	0	0	9	
6:50 AM	0	4	3	0	1	3	0	0	2	0	0	0	0	0	0	0	13	
6:55 AM	0	1	1	0	0	6	0	0	2	0	3	0	0	0	0	0	13	107
7:00 AM	0	3	2	0	3	1	0	0	0	0	1	0	0	0	0	0	10	107
7:05 AM	0	0	0	0	6	2	0	0	0	0	2	0	0	0	0	0	10	110
7:10 AM	0	2	0	0	5	5	0	0	2	0	2	0	0	0	0	0	16	118
7:15 AM	0	4	1	0	2	2	0	0	0	0	1	0	0	0	0	0	10	121
7:20 AM	0	1	2	0	1	0	0	0	2	0	1	0	0	0	0	0	7	120
7:25 AM	0	3	0	0	1	2	0	0	0	0	3	0	0	0	0	0	9	125
7:30 AM	0	3	3	0	2	3	0	0	2	0	1	0	0	0	0	0	14	132
7:35 AM	0	0	1	0	5	5	0	0	1	0	0	0	0	0	0	0	12	133
7:40 AM	0	0	1	0	3	2	0	0	0	0	0	0	0	0	0	0	6	129
7:45 AM	0	3	2	0	4	3	0	0	0	0	2	0	0	0	0	0	14	134
7:50 AM	0	1	1	0	0	5	0	0	3	0	2	0	0	0	0	0	12	133
7:55 AM	0	2	0	0	0	7	0	0	0	0	0	0	0	0	0	0	9	129

Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	0	32	24	0	16	40	0	0	16	0	16	0	0	0	0	0	144
Heavy Trucks	0	8	0		12	8	0		12	0	0		0	0	0		40
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

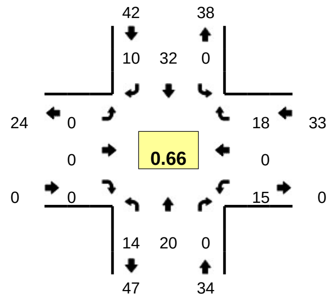
Comments:

Report generated on 12/9/2013 11:54 AM

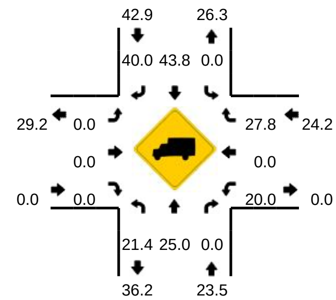
SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

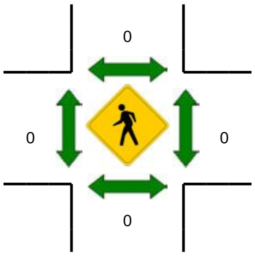
Type of peak hour being reported: User-Defined | Method for determining peak hour: Total Entering Volume

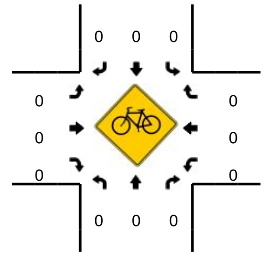
LOCATION: Westland Rd -- I-84 Westbound Ramps | **QC JOB #:** 11340203
CITY/STATE: Hermiston, OR | **DATE:** Wed, Oct 16 2013

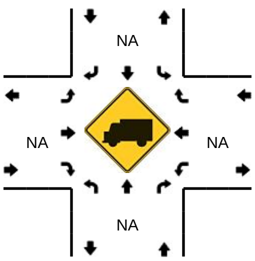


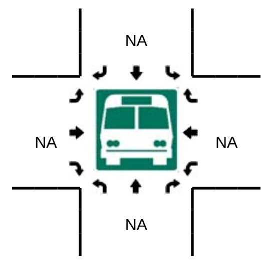
Peak-Hour: 6:05 AM -- 7:05 AM
Peak 15-Min: 6:50 AM -- 7:05 AM











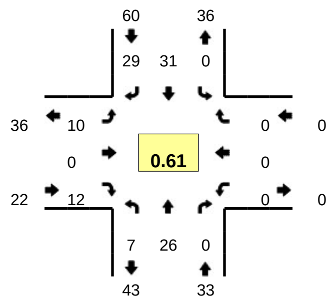
5-Min Count Period Beginning At	Westland Rd (Northbound) Left	Thru	Right	U	Westland Rd (Southbound) Left	Thru	Right	U	I-84 Westbound Ramps (Eastbound) Left	Thru	Right	U	I-84 Westbound Ramps (Westbound) Left	Thru	Right	U	Total	Hourly Totals
6:00 AM	2	1	0	0	0	2	0	0	0	0	0	0	1	0	0	0	6	
6:05 AM	2	2	0	0	0	1	2	0	0	0	0	0	1	0	0	0	8	
6:10 AM	1	1	0	0	0	5	0	0	0	0	0	0	1	0	1	0	9	
6:15 AM	2	0	0	0	0	3	0	0	0	0	0	0	1	0	0	0	6	
6:20 AM	2	2	0	0	0	0	1	0	0	0	0	0	0	0	2	0	7	
6:25 AM	0	0	0	0	0	2	1	0	0	0	0	0	1	0	0	0	4	
6:30 AM	0	2	0	0	0	5	0	0	0	0	0	0	0	0	3	0	10	
6:35 AM	1	3	0	0	0	2	0	0	0	0	0	0	1	0	2	0	9	
6:40 AM	3	1	0	0	0	1	0	0	0	0	0	0	2	0	0	0	7	
6:45 AM	0	1	0	0	0	1	0	0	0	0	0	0	3	0	3	0	8	
6:50 AM	2	4	0	0	0	5	3	0	0	0	0	0	0	0	4	0	18	
6:55 AM	0	3	0	0	0	2	1	0	0	0	0	0	5	0	1	0	12	104
7:00 AM	1	1	0	0	0	5	2	0	0	0	0	0	0	0	2	0	11	109
7:05 AM	0	2	0	0	0	3	1	0	0	0	0	0	1	0	1	0	8	109
7:10 AM	1	3	0	0	0	8	1	0	0	0	0	0	2	0	2	0	17	117
7:15 AM	2	2	0	0	0	3	0	0	0	0	0	0	1	1	1	0	10	121
7:20 AM	1	2	0	0	0	0	0	0	0	0	0	0	1	0	2	0	6	120
7:25 AM	2	1	0	0	0	3	0	0	0	0	0	0	0	0	2	0	8	124
7:30 AM	1	4	0	0	0	5	0	0	0	0	0	0	1	0	1	0	12	126
7:35 AM	0	1	0	0	0	6	0	0	0	0	0	0	3	0	2	0	12	129
7:40 AM	0	0	0	0	0	5	1	0	0	0	0	0	0	0	3	0	9	131
7:45 AM	2	1	0	0	0	6	0	0	0	0	0	0	1	0	1	0	11	134
7:50 AM	0	4	0	0	0	5	1	0	0	0	0	0	0	0	2	0	12	128
7:55 AM	2	0	0	0	0	6	0	0	0	0	0	0	2	0	3	0	13	129

Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	12	32	0	0	0	48	24	0	0	0	0	0	20	0	28	0	164
Heavy Trucks	12	12	0		0	24	16		0	0	0		4	0	8		76
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

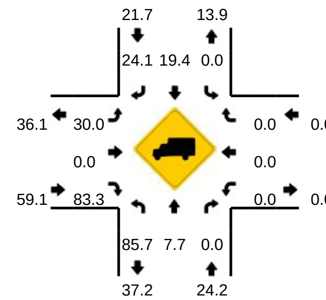
Comments:

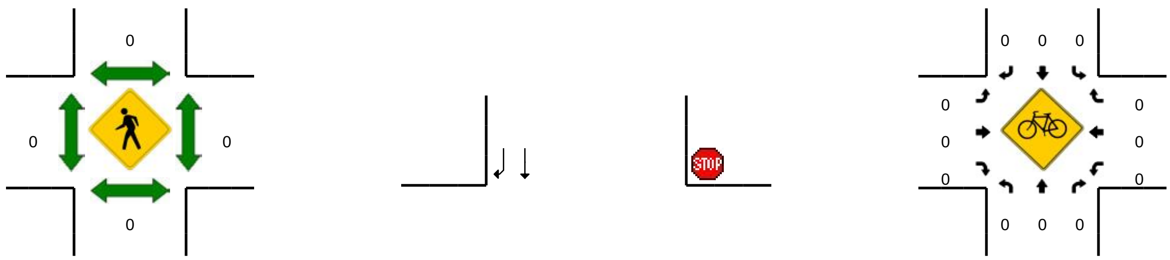
Type of peak hour being reported: User-Defined | Method for determining peak hour: Total Entering Volume

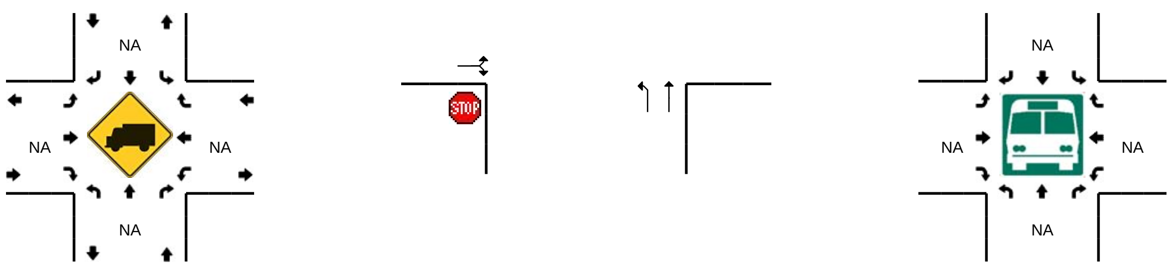
LOCATION: Westland Rd -- Westport Ln | **QC JOB #:** 11340205
CITY/STATE: Hermiston, OR | **DATE:** Wed, Oct 16 2013



Peak-Hour: 6:05 AM -- 7:05 AM
Peak 15-Min: 6:50 AM -- 7:05 AM







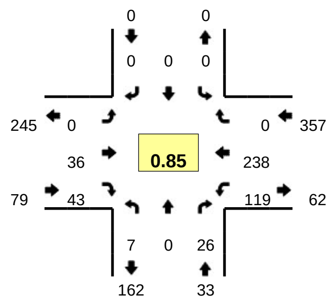
5-Min Count Period Beginning At	Westland Rd (Northbound) Left	Thru	Right	U	Westland Rd (Southbound) Left	Thru	Right	U	Westport Ln (Eastbound) Left	Thru	Right	U	Westport Ln (Westbound) Left	Thru	Right	U	Total	Hourly Totals
6:00 AM	1	1	0	0	0	2	2	0	1	0	0	0	0	0	0	0	7	
6:05 AM	1	1	0	0	0	3	0	0	1	0	1	0	0	0	0	0	7	
6:10 AM	0	2	0	0	0	5	2	0	1	0	1	0	0	0	0	0	11	
6:15 AM	0	0	0	0	0	3	1	0	0	0	0	0	0	0	0	0	4	
6:20 AM	0	4	0	0	0	1	2	0	3	0	0	0	0	0	0	0	10	
6:25 AM	0	1	0	0	0	2	4	0	0	0	1	0	0	0	0	0	8	
6:30 AM	0	2	0	0	0	5	2	0	0	0	0	0	0	0	0	0	9	
6:35 AM	1	4	0	0	0	1	0	0	0	0	0	0	0	0	0	0	6	
6:40 AM	0	1	0	0	0	0	0	0	2	0	1	0	0	0	0	0	4	
6:45 AM	0	4	0	0	0	1	3	0	0	0	1	0	0	0	0	0	9	
6:50 AM	1	4	0	0	0	5	3	0	2	0	2	0	0	0	0	0	17	
6:55 AM	3	1	0	0	0	2	5	0	1	0	1	0	0	0	0	0	13	105
7:00 AM	1	2	0	0	0	3	7	0	0	0	4	0	0	0	0	0	17	115
7:05 AM	1	0	0	0	0	3	3	0	1	0	1	0	0	0	0	0	9	117
7:10 AM	1	3	0	0	0	6	3	0	1	0	2	0	0	0	0	0	16	122
7:15 AM	1	3	0	0	0	2	1	0	1	0	0	0	0	0	0	0	8	126
7:20 AM	1	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	4	120
7:25 AM	2	1	0	0	0	2	2	0	0	0	1	0	0	0	0	0	8	120
7:30 AM	2	3	0	0	0	4	2	0	1	0	1	0	0	0	0	0	13	124
7:35 AM	1	2	0	0	0	3	5	0	2	0	2	0	0	0	0	0	15	133
7:40 AM	0	2	0	0	0	5	3	0	2	0	2	0	0	0	0	0	14	143
7:45 AM	1	2	0	0	0	3	2	0	0	0	3	0	0	0	0	0	11	145
7:50 AM	2	2	0	0	0	5	2	0	0	0	0	0	0	0	0	0	11	139
7:55 AM	3	2	0	0	0	5	2	0	2	0	0	0	0	0	0	0	14	140

Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	20	28	0	0	0	40	60	0	12	0	28	0	0	0	0	0	188
Heavy Trucks	20	0	0		0	8	8		4	0	20		0	0	0		60
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

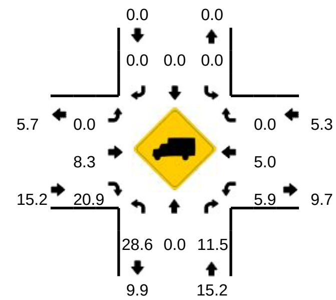
Comments:

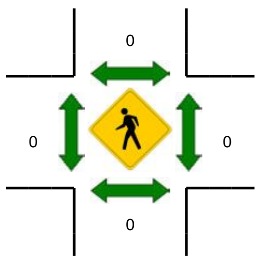
Type of peak hour being reported: User-Defined   Method for determining peak hour: Total Entering Volume

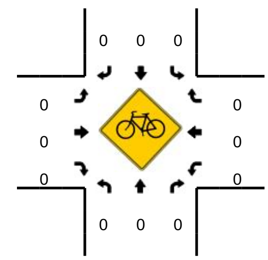
LOCATION: Westland Rd -- Lamb Rd   **QC JOB #:** 11340207
CITY/STATE: Hermiston, OR   **DATE:** Wed, Oct 16 2013

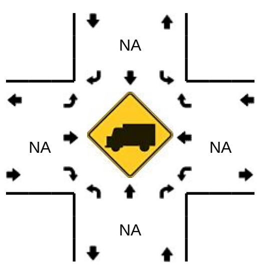


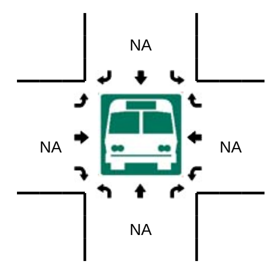
Peak-Hour: 6:05 AM -- 7:05 AM
Peak 15-Min: 6:20 AM -- 6:35 AM











5-Min Count Period Beginning At	Westland Rd (Northbound) Left	Thru	Right	U	Westland Rd (Southbound) Left	Thru	Right	U	Lamb Rd (Eastbound) Left	Thru	Right	U	Lamb Rd (Westbound) Left	Thru	Right	U	Total	Hourly Totals
6:00 AM	2	0	1	0	0	0	0	0	0	3	2	0	3	15	0	0	26	
6:05 AM	0	0	3	0	0	0	0	0	0	1	0	0	3	19	0	0	26	
6:10 AM	1	0	2	0	0	0	0	0	0	1	1	0	9	23	0	0	37	
6:15 AM	0	0	1	0	0	0	0	0	0	2	1	0	7	30	0	0	41	
6:20 AM	2	0	0	0	0	0	0	0	0	3	4	0	7	30	0	0	46	
6:25 AM	0	0	3	0	0	0	0	0	0	2	4	0	6	28	0	0	43	
6:30 AM	0	0	1	0	0	0	0	0	0	4	6	0	12	26	0	0	49	
6:35 AM	0	0	1	0	0	0	0	0	0	4	4	0	10	20	0	0	39	
6:40 AM	1	0	0	0	0	0	0	0	0	4	6	0	11	18	0	0	40	
6:45 AM	2	0	2	0	0	0	0	0	0	6	4	0	13	11	0	0	38	
6:50 AM	1	0	5	0	0	0	0	0	0	1	6	0	20	13	0	0	46	
6:55 AM	0	0	3	0	0	0	0	0	0	3	4	0	13	7	0	0	30	461
7:00 AM	0	0	5	0	0	0	0	0	0	5	3	0	8	13	0	0	34	469
7:05 AM	4	0	7	0	0	0	0	0	0	5	2	0	8	3	0	0	29	472
7:10 AM	4	0	25	0	0	0	0	0	0	5	2	0	4	6	0	0	46	481
7:15 AM	3	0	18	0	0	0	0	0	0	7	1	0	2	6	0	0	37	477
7:20 AM	0	0	2	0	0	0	0	0	0	11	1	0	2	10	0	0	26	457
7:25 AM	1	0	1	0	0	0	0	0	0	5	4	0	3	9	0	0	23	437
7:30 AM	0	0	3	0	0	0	0	0	0	16	1	0	4	16	0	0	40	428
7:35 AM	1	0	3	0	0	0	0	0	0	2	2	0	8	9	0	0	25	414
7:40 AM	0	0	2	0	0	0	0	0	0	8	3	0	6	11	0	0	30	404
7:45 AM	0	0	1	0	0	0	0	0	0	4	2	0	3	5	0	0	15	381
7:50 AM	1	0	4	0	0	0	0	0	0	6	1	0	6	9	0	0	27	362
7:55 AM	0	0	4	0	0	0	0	0	0	6	0	0	8	6	0	0	24	356

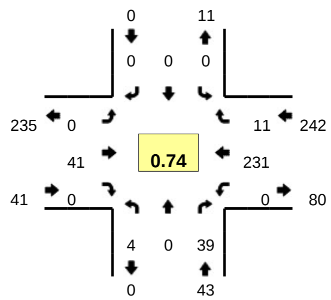
Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	8	0	16	0	0	0	0	0	0	36	56	0	100	336	0	0	552
Heavy Trucks	0	0	4		0	0	0		0	4	12		12	0	0		32
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

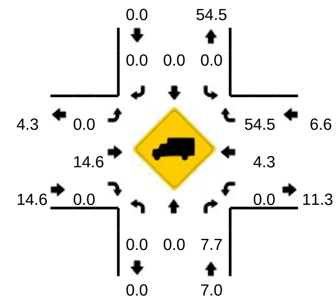
Type of peak hour being reported: User-Defined — Method for determining peak hour: Total Entering Volume

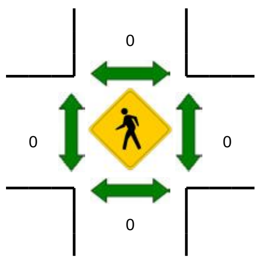
LOCATION: NB I-82 Ramps -- Lamb Rd — **QC JOB #:** 11340209

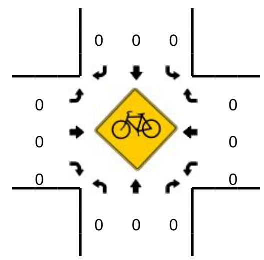
CITY/STATE: Hermiston, OR — **DATE:** Wed, Oct 16 2013

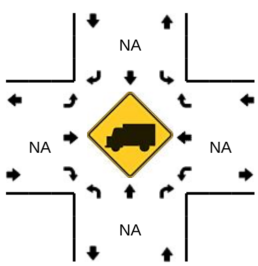


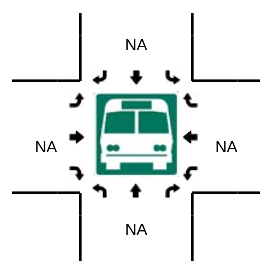
Peak-Hour: 6:05 AM -- 7:05 AM
Peak 15-Min: 6:15 AM -- 6:30 AM











5-Min Count Period Beginning At	NB I-82 Ramps (Northbound) Left	Thru	Right	U	NB I-82 Ramps (Southbound) Left	Thru	Right	U	Lamb Rd (Eastbound) Left	Thru	Right	U	Lamb Rd (Westbound) Left	Thru	Right	U	Total	Hourly Totals
6:00 AM	0	0	2	0	0	0	0	0	0	2	0	0	0	16	1	0	21	
6:05 AM	1	0	1	0	0	0	0	0	0	0	0	0	0	17	0	0	19	
6:10 AM	1	0	0	0	0	0	0	0	0	1	0	0	0	25	2	0	29	
6:15 AM	0	0	2	0	0	0	0	0	0	6	0	0	0	27	2	0	37	
6:20 AM	2	0	1	0	0	0	0	0	0	3	0	0	0	27	2	0	35	
6:25 AM	0	0	5	0	0	0	0	0	0	6	0	0	0	26	1	0	38	
6:30 AM	0	0	4	0	0	0	0	0	0	2	0	0	0	26	0	0	32	
6:35 AM	0	0	4	0	0	0	0	0	0	4	0	0	0	20	1	0	29	
6:40 AM	0	0	6	0	0	0	0	0	0	6	0	0	0	19	1	0	32	
6:45 AM	0	0	5	0	0	0	0	0	0	4	0	0	0	13	1	0	23	
6:50 AM	0	0	2	0	0	0	0	0	0	4	0	0	0	12	1	0	19	
6:55 AM	0	0	4	0	0	0	0	0	0	4	0	0	0	10	0	0	18	332
7:00 AM	0	0	5	0	0	0	0	0	0	1	0	0	0	9	0	0	15	326
7:05 AM	0	0	4	0	0	0	0	0	0	3	0	0	0	3	4	0	14	321
7:10 AM	0	0	5	0	0	0	0	0	1	1	0	0	0	6	4	0	17	309
7:15 AM	0	0	4	0	0	0	0	0	0	5	0	0	0	6	3	0	18	290
7:20 AM	0	0	10	0	0	0	0	0	0	4	0	0	0	11	0	0	25	280
7:25 AM	0	0	7	0	0	0	0	0	0	2	0	0	0	9	0	0	18	260
7:30 AM	0	1	10	0	0	0	0	0	0	2	0	0	0	12	3	0	28	256
7:35 AM	0	0	7	0	0	0	0	0	0	1	0	0	0	10	1	0	19	246
7:40 AM	0	0	3	0	0	0	0	0	0	3	0	0	0	12	0	0	18	232
7:45 AM	1	0	5	0	0	0	0	0	0	3	0	0	0	3	0	0	12	221
7:50 AM	0	0	4	0	0	0	0	0	0	2	0	0	0	9	2	0	17	219
7:55 AM	0	0	6	0	0	0	0	0	0	1	0	0	0	5	0	0	12	213

Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	8	0	32	0	0	0	0	0	0	60	0	0	0	320	20	0	440
Heavy Trucks	0	0	4		0	0	0		0	8	0		0	12	8		32
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 12/9/2013 11:54 AM

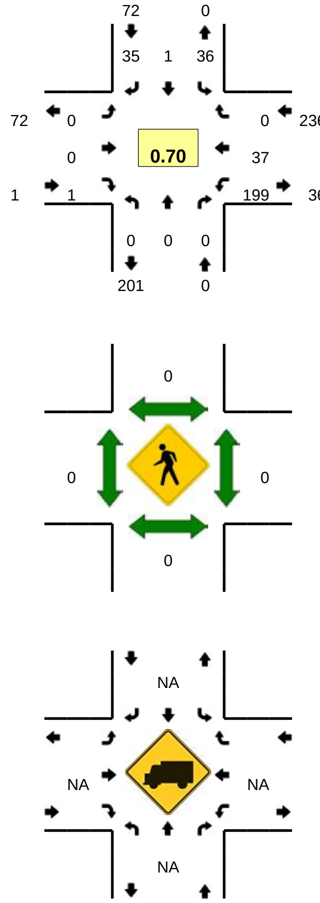
Type of peak hour being reported: User-Defined | Method for determining peak hour: Total Entering Volume

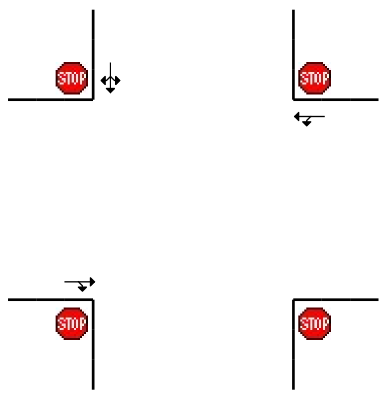
LOCATION: SB I-82 Ramps -- Lamb Rd | **QC JOB #:** 11340211

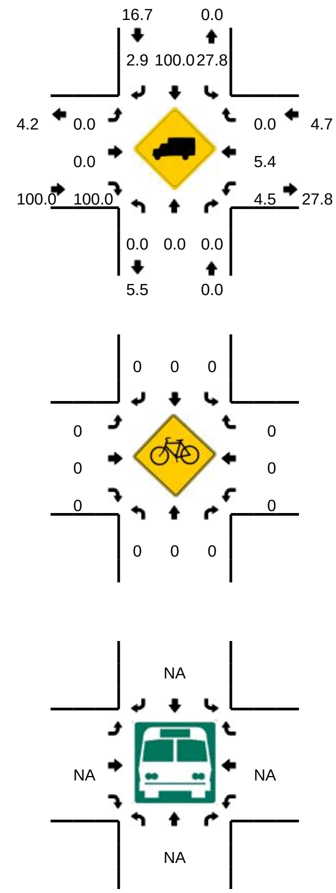
CITY/STATE: Hermiston, OR | **DATE:** Wed, Oct 16 2013

Peak-Hour: 6:05 AM -- 7:05 AM

Peak 15-Min: 6:10 AM -- 6:25 AM







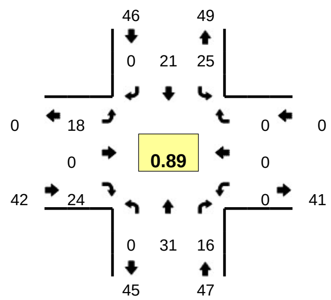
5-Min Count Period Beginning At	SB I-82 Ramps (Northbound) Left	Thru	Right	U	SB I-82 Ramps (Southbound) Left	Thru	Right	U	Lamb Rd (Eastbound) Left	Thru	Right	U	Lamb Rd (Westbound) Left	Thru	Right	U	Total	Hourly Totals
6:00 AM	0	0	0	0	3	0	2	0	0	0	0	0	13	6	0	0	24	
6:05 AM	0	0	0	0	0	0	7	0	0	0	0	0	12	8	0	0	27	
6:10 AM	0	0	0	0	1	0	13	0	0	0	0	0	15	8	0	0	37	
6:15 AM	0	0	0	0	4	0	4	0	0	0	0	0	17	9	0	0	34	
6:20 AM	0	0	0	0	3	0	6	0	0	0	0	0	24	7	0	0	40	
6:25 AM	0	0	0	0	5	0	1	0	0	0	0	0	26	3	0	0	35	
6:30 AM	0	0	0	0	2	0	1	0	0	0	0	0	23	0	0	0	26	
6:35 AM	0	0	0	0	4	0	1	0	0	0	0	0	21	0	0	0	26	
6:40 AM	0	0	0	0	5	0	0	0	0	0	0	0	19	0	0	0	24	
6:45 AM	0	0	0	0	4	0	1	0	0	0	0	0	10	0	0	0	15	
6:50 AM	0	0	0	0	4	0	0	0	0	0	0	0	13	0	0	0	17	
6:55 AM	0	0	0	0	4	1	0	0	0	0	0	0	9	0	0	0	14	319
7:00 AM	0	0	0	0	0	0	1	0	0	0	1	0	10	2	0	0	14	309
7:05 AM	0	0	0	0	3	0	0	0	0	0	0	0	3	0	0	0	6	288
7:10 AM	0	0	0	0	1	0	0	0	0	1	1	0	6	0	0	0	9	260
7:15 AM	0	0	0	0	3	0	0	0	0	0	0	0	6	0	0	0	9	235
7:20 AM	0	0	0	0	4	0	1	0	0	0	0	0	7	0	0	0	12	207
7:25 AM	0	0	0	0	2	0	0	0	0	0	0	0	12	1	0	0	15	187
7:30 AM	0	0	0	0	2	0	0	0	0	0	0	0	9	1	0	0	12	173
7:35 AM	0	0	0	0	2	0	0	0	0	0	0	0	10	0	0	0	12	159
7:40 AM	0	0	0	0	3	0	0	0	0	0	0	0	9	1	0	0	13	148
7:45 AM	0	0	0	0	2	0	0	0	0	0	0	0	6	1	0	0	9	142
7:50 AM	0	0	0	0	3	0	0	0	0	0	0	0	7	1	0	0	11	136
7:55 AM	0	0	0	0	1	0	0	0	0	0	1	0	6	0	0	0	8	130

Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	0	0	0	0	32	0	92	0	0	0	0	0	224	96	0	0	444
Heavy Trucks	0	0	0		16	0	4		0	0	0		16	8	0		44
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

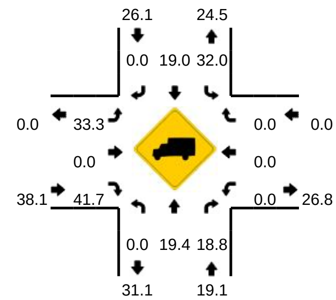
Comments:

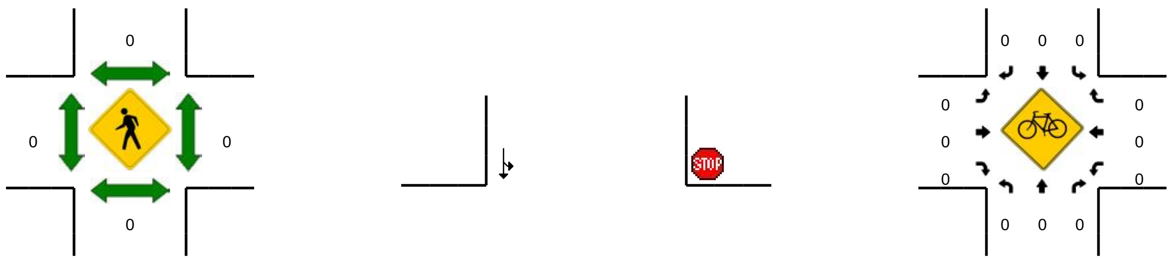
Type of peak hour being reported: System Peak — Method for determining peak hour: Total Entering Volume

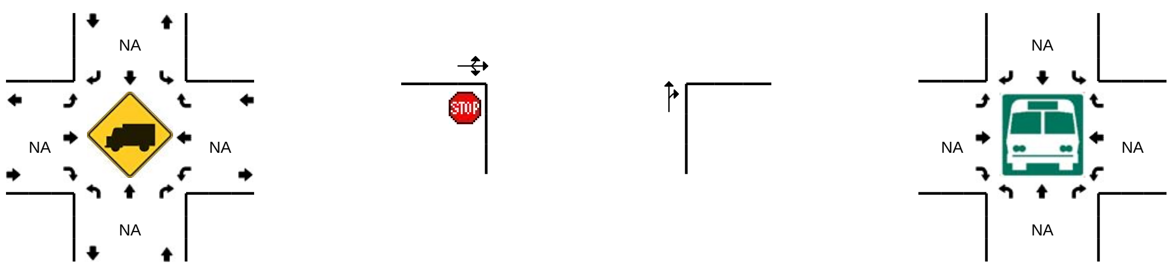
LOCATION: Westland Rd -- I-84 Eastbound Ramps — **QC JOB #:** 11340202
CITY/STATE: Hermiston, OR — **DATE:** Wed, Oct 16 2013



Peak-Hour: 4:30 PM -- 5:30 PM
Peak 15-Min: 4:35 PM -- 4:50 PM







5-Min Count Period Beginning At	Westland Rd (Northbound) Left	Thru	Right	U	Westland Rd (Southbound) Left	Thru	Right	U	I-84 Eastbound Ramps (Eastbound) Left	Thru	Right	U	I-84 Eastbound Ramps (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	0	2	3	0	2	0	0	0	0	0	0	0	0	0	0	0	7	
4:05 PM	0	1	1	0	2	1	0	0	2	0	2	0	0	0	0	0	9	
4:10 PM	0	4	1	0	4	2	0	0	0	0	0	0	0	0	0	0	11	
4:15 PM	0	1	0	0	2	1	0	0	1	0	3	0	0	0	0	0	8	
4:20 PM	0	1	4	0	3	0	0	0	0	0	5	0	0	0	0	0	13	
4:25 PM	0	2	2	0	2	1	0	0	0	0	3	0	0	0	0	0	10	
4:30 PM	0	1	1	0	1	0	0	0	3	0	3	0	0	0	0	0	9	
4:35 PM	0	3	3	0	1	2	0	0	0	0	0	0	0	0	0	0	9	
4:40 PM	0	5	1	0	2	5	0	0	1	0	4	0	0	0	0	0	18	
4:45 PM	0	3	1	0	1	3	0	0	1	0	2	0	0	0	0	0	11	
4:50 PM	0	4	2	0	0	0	0	0	2	0	3	0	0	0	0	0	11	
4:55 PM	0	1	1	0	2	2	0	0	3	0	3	0	0	0	0	0	12	128
5:00 PM	0	3	1	0	4	1	0	0	0	0	1	0	0	0	0	0	10	131
5:05 PM	0	2	0	0	4	2	0	0	0	0	1	0	0	0	0	0	9	131
5:10 PM	0	2	2	0	4	3	0	0	0	0	1	0	0	0	0	0	12	132
5:15 PM	0	3	2	0	1	1	0	0	1	0	0	0	0	0	0	0	8	132
5:20 PM	0	3	1	0	3	0	0	0	3	0	3	0	0	0	0	0	13	132
5:25 PM	0	1	1	0	2	2	0	0	4	0	3	0	0	0	0	0	13	135
5:30 PM	0	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0	3	129
5:35 PM	0	2	0	0	2	1	0	0	0	0	3	0	0	0	0	0	8	128
5:40 PM	0	2	2	0	1	4	0	0	1	0	3	0	0	0	0	0	13	123
5:45 PM	0	7	2	0	1	2	0	0	0	0	1	0	0	0	0	0	13	125
5:50 PM	0	0	1	0	1	2	0	0	1	0	0	0	0	0	0	0	5	119
5:55 PM	0	0	1	0	0	2	0	0	2	0	1	0	0	0	0	0	6	113

Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	0	44	20	0	16	40	0	0	8	0	24	0	0	0	0	0	152
Heavy Trucks	0	4	4		8	0	0		4	0	12		0	0	0		32
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

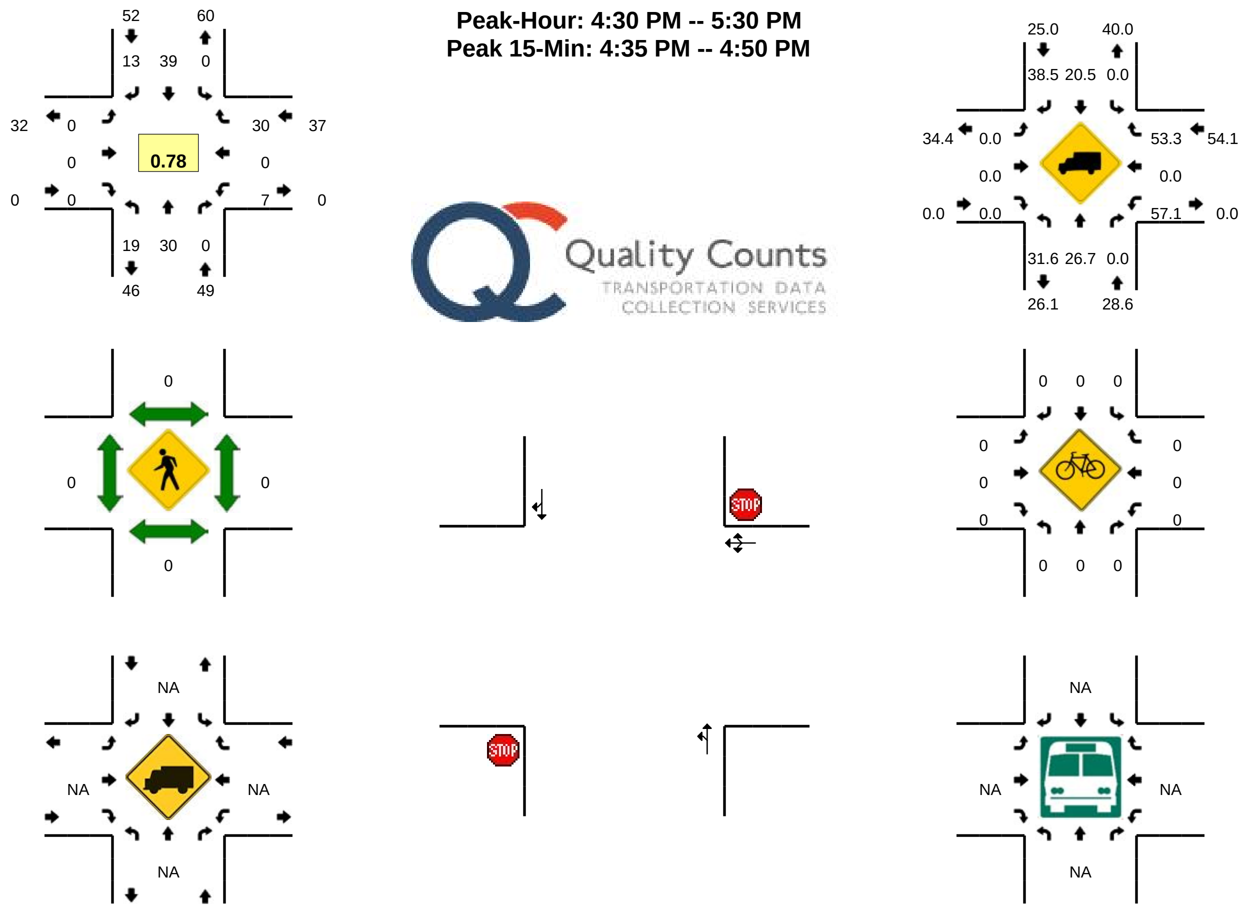
Comments:

Type of peak hour being reported: System Peak — Method for determining peak hour: Total Entering Volume

LOCATION: Westland Rd -- I-84 Westbound Ramps — **QC JOB #:** 11340204

CITY/STATE: Hermiston, OR — **DATE:** Wed, Oct 16 2013

Peak-Hour: 4:30 PM -- 5:30 PM
Peak 15-Min: 4:35 PM -- 4:50 PM



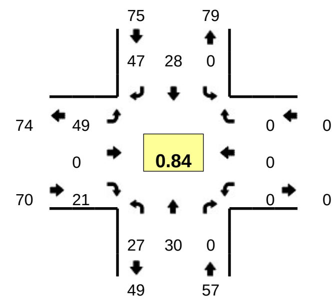
5-Min Count Period Beginning At	Westland Rd (Northbound) Left	Thru	Right	U	Westland Rd (Southbound) Left	Thru	Right	U	I-84 Westbound Ramps (Eastbound) Left	Thru	Right	U	I-84 Westbound Ramps (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	1	1	0	0	0	2	0	0	0	0	0	0	0	0	1	0	5	
4:05 PM	0	3	0	0	0	4	1	0	0	0	0	0	0	0	5	0	13	
4:10 PM	1	2	0	0	0	5	0	0	0	0	0	0	0	0	5	0	13	
4:15 PM	0	2	0	0	0	4	1	0	0	0	0	0	0	0	1	0	8	
4:20 PM	1	0	0	0	0	3	0	0	0	0	0	0	0	0	5	0	9	
4:25 PM	1	1	0	0	0	2	1	0	0	0	0	0	1	0	2	0	8	
4:30 PM	1	3	0	0	0	1	0	0	0	0	0	0	0	0	1	0	6	
4:35 PM	1	2	0	0	0	5	0	0	0	0	0	0	0	0	7	0	15	
4:40 PM	4	2	0	0	0	6	2	0	0	0	0	0	0	0	2	0	16	
4:45 PM	1	3	0	0	0	2	2	0	0	0	0	0	1	0	4	0	13	
4:50 PM	1	5	0	0	0	0	2	0	0	0	0	0	0	0	2	0	10	
4:55 PM	2	2	0	0	0	3	1	0	0	0	0	0	1	0	2	0	11	127
5:00 PM	0	2	0	0	0	5	0	0	0	0	0	0	1	0	4	0	12	134
5:05 PM	1	2	0	0	0	5	1	0	0	0	0	0	1	0	3	0	13	134
5:10 PM	1	1	0	0	0	5	2	0	0	0	0	0	1	0	1	0	11	132
5:15 PM	3	1	0	0	0	2	2	0	0	0	0	0	1	0	3	0	12	136
5:20 PM	3	3	0	0	0	2	0	0	0	0	0	0	0	0	0	0	8	135
5:25 PM	1	4	0	0	0	3	1	0	0	0	0	0	1	0	1	0	11	138
5:30 PM	1	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	4	136
5:35 PM	0	2	0	0	0	3	2	0	0	0	0	0	0	0	0	0	7	128
5:40 PM	1	2	0	0	0	3	2	0	0	0	0	0	2	0	0	0	10	122
5:45 PM	3	4	0	0	0	2	1	0	0	0	0	0	0	0	3	0	13	122
5:50 PM	1	0	0	0	0	1	0	0	0	0	0	0	2	0	1	0	5	117
5:55 PM	0	2	0	0	0	0	1	0	0	0	0	0	2	0	0	0	5	111

Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	24	28	0	0	0	52	16	0	0	0	0	0	4	0	52	0	176
Heavy Trucks	4	8	0		0	8	12		0	0	0		0	0	20		52
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

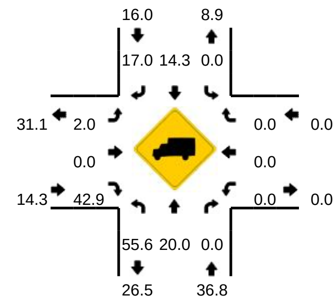
Comments:

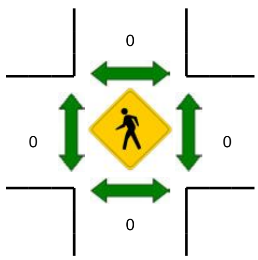
Type of peak hour being reported: System Peak — Method for determining peak hour: Total Entering Volume

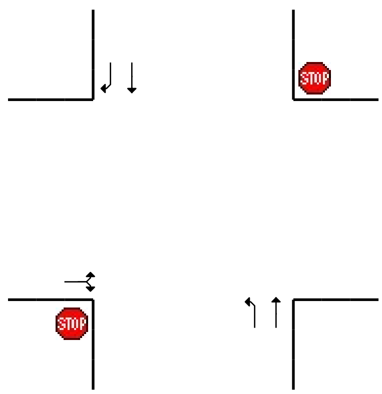
LOCATION: Westland Rd -- Westport Ln — **QC JOB #:** 11340206
CITY/STATE: Hermiston, OR — **DATE:** Wed, Oct 16 2013

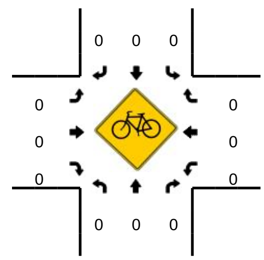


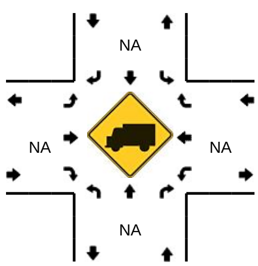
Peak-Hour: 4:30 PM -- 5:30 PM
Peak 15-Min: 4:35 PM -- 4:50 PM

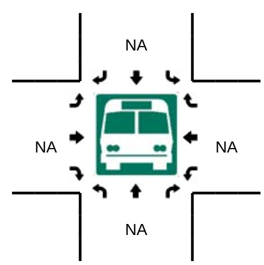












5-Min Count Period Beginning At	Westland Rd (Northbound) Left	Thru	Right	U	Westland Rd (Southbound) Left	Thru	Right	U	Westport Ln (Eastbound) Left	Thru	Right	U	Westport Ln (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	2	2	0	0	0	1	2	0	1	0	1	0	0	0	0	0	9	
4:05 PM	2	4	0	0	0	3	0	0	2	0	1	0	0	0	0	0	12	
4:10 PM	0	5	0	0	0	1	4	0	4	0	1	0	0	0	0	0	15	
4:15 PM	3	1	0	0	0	1	2	0	1	0	1	0	0	0	0	0	9	
4:20 PM	3	1	0	0	0	1	2	0	2	0	1	0	0	0	0	0	10	
4:25 PM	1	3	0	0	0	0	4	0	1	0	0	0	0	0	0	0	9	
4:30 PM	2	4	0	0	0	0	10	0	6	0	1	0	0	0	0	0	23	
4:35 PM	3	3	0	0	0	4	5	0	3	0	2	0	0	0	0	0	20	
4:40 PM	3	3	0	0	0	7	5	0	0	0	2	0	0	0	0	0	20	
4:45 PM	0	2	0	0	0	3	6	0	8	0	1	0	0	0	0	0	20	
4:50 PM	6	3	0	0	0	0	6	0	3	0	0	0	0	0	0	0	18	
4:55 PM	3	0	0	0	0	2	5	0	2	0	3	0	0	0	0	0	15	180
5:00 PM	1	5	0	0	0	2	2	0	6	0	3	0	0	0	0	0	19	190
5:05 PM	3	2	0	0	0	3	1	0	4	0	2	0	0	0	0	0	15	193
5:10 PM	1	2	0	0	0	3	1	0	5	0	3	0	0	0	0	0	15	193
5:15 PM	2	2	0	0	0	2	1	0	5	0	1	0	0	0	0	0	13	197
5:20 PM	2	1	0	0	0	1	4	0	3	0	2	0	0	0	0	0	13	200
5:25 PM	1	3	0	0	0	1	1	0	4	0	1	0	0	0	0	0	11	202
5:30 PM	2	2	0	0	0	0	1	0	5	0	0	0	0	0	0	0	10	189
5:35 PM	1	2	0	0	0	1	2	0	9	0	2	0	0	0	0	0	17	186
5:40 PM	1	0	0	0	0	4	1	0	2	0	2	0	0	0	0	0	10	176
5:45 PM	3	3	0	0	0	1	0	0	1	0	2	0	0	0	0	0	10	166
5:50 PM	1	3	0	0	0	1	1	0	2	0	0	0	0	0	0	0	8	156
5:55 PM	0	1	0	0	0	1	4	0	2	0	1	0	0	0	0	0	9	150

Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	24	32	0	0	0	56	64	0	44	0	20	0	0	0	0	0	240
Heavy Trucks	8	8	0		0	12	0		4	0	12		0	0	0		44
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

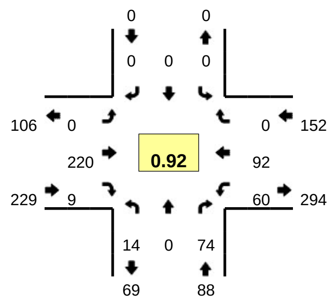
Report generated on 10/28/2013 1:10 PM — SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

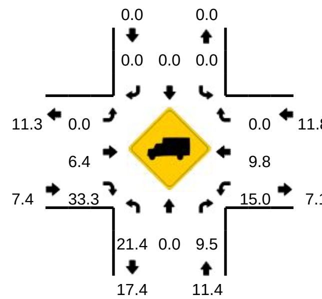
Type of peak hour being reported: System Peak | Method for determining peak hour: Total Entering Volume

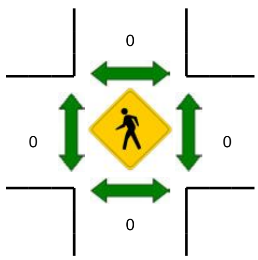
LOCATION: Westland Rd -- Lamb Rd
CITY/STATE: Hermiston, OR

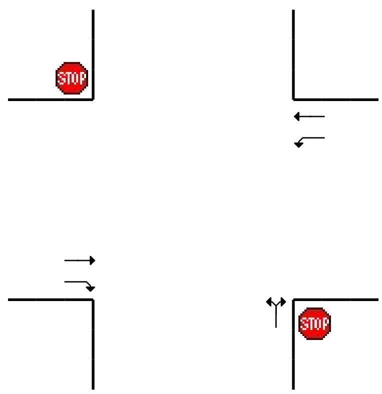
QC JOB #: 11340208
DATE: Wed, Oct 16 2013

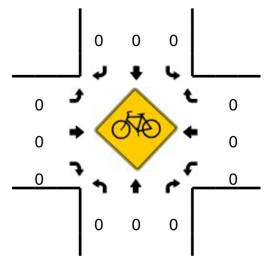
Peak-Hour: 4:30 PM -- 5:30 PM
Peak 15-Min: 4:35 PM -- 4:50 PM

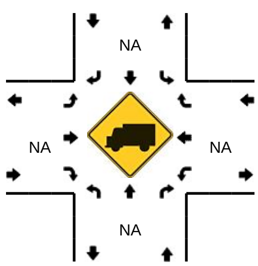


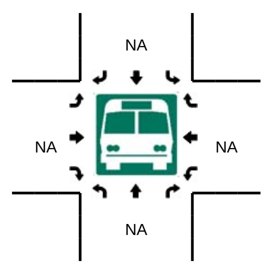












5-Min Count Period Beginning At	Westland Rd (Northbound) Left	Thru	Right	U	Westland Rd (Southbound) Left	Thru	Right	U	Lamb Rd (Eastbound) Left	Thru	Right	U	Lamb Rd (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	1	0	3	0	0	0	0	0	0	9	0	0	3	5	0	0	21	
4:05 PM	2	0	9	0	0	0	0	0	0	14	1	0	1	8	0	0	35	
4:10 PM	3	0	4	0	0	0	0	0	0	13	2	0	3	8	0	0	33	
4:15 PM	1	0	4	0	0	0	0	0	0	16	1	0	4	9	0	0	35	
4:20 PM	1	0	2	0	0	0	0	0	0	12	2	0	1	6	0	0	24	
4:25 PM	0	0	5	0	0	0	0	0	0	10	1	0	2	6	0	0	24	
4:30 PM	2	0	7	0	0	0	0	0	0	22	1	0	10	6	0	0	48	
4:35 PM	0	0	6	0	0	0	0	0	0	15	1	0	6	9	0	0	37	
4:40 PM	0	0	5	0	0	0	0	0	0	22	1	0	11	5	0	0	44	
4:45 PM	3	0	6	0	0	0	0	0	0	22	1	0	8	7	0	0	47	
4:50 PM	0	0	5	0	0	0	0	0	0	18	1	0	5	12	0	0	41	
4:55 PM	1	0	3	0	0	0	0	0	0	17	0	0	7	7	0	0	35	424
5:00 PM	1	0	8	0	0	0	0	0	0	11	1	0	2	5	0	0	28	431
5:05 PM	1	0	6	0	0	0	0	0	0	9	0	0	4	6	0	0	26	422
5:10 PM	2	0	8	0	0	0	0	0	0	21	0	0	3	7	0	0	41	430
5:15 PM	2	0	8	0	0	0	0	0	0	25	0	0	1	13	0	0	49	444
5:20 PM	1	0	6	0	0	0	0	0	0	16	2	0	2	7	0	0	34	454
5:25 PM	1	0	6	0	0	0	0	0	0	22	1	0	1	8	0	0	39	469
5:30 PM	1	0	5	0	0	0	0	0	0	18	0	0	1	9	0	0	34	455
5:35 PM	4	0	6	0	0	0	0	0	0	10	1	0	1	3	0	0	25	443
5:40 PM	0	0	5	0	0	0	0	0	0	13	1	0	6	8	0	0	33	432
5:45 PM	1	0	3	0	0	0	0	0	0	21	1	0	1	10	0	0	37	422
5:50 PM	0	0	7	0	0	0	0	0	0	14	0	0	4	5	0	0	30	411
5:55 PM	0	0	4	0	0	0	0	0	0	12	0	0	5	9	0	0	30	406

Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	12	0	68	0	0	0	0	0	0	236	12	0	100	84	0	0	512
Heavy Trucks	4	0	8		0	0	0		0	4	0		4	0	0		20
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

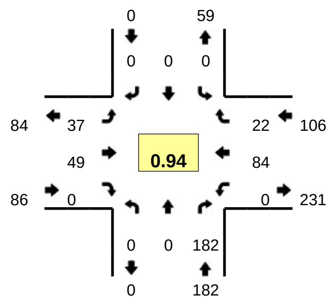
Report generated on 10/28/2013 1:10 PM

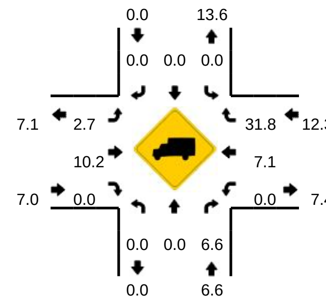
SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

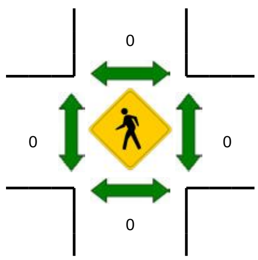
Type of peak hour being reported: System Peak | Method for determining peak hour: Total Entering Volume

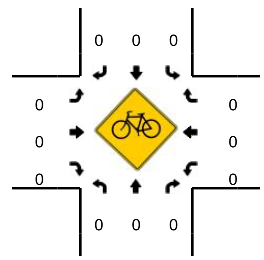
LOCATION: NB I-82 Ramps -- Lamb Rd | **QC JOB #:** 11340210
CITY/STATE: Hermiston, OR | **DATE:** Wed, Oct 16 2013

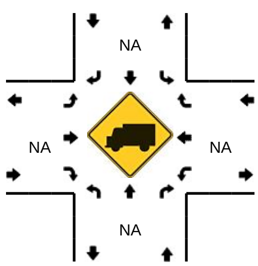
Peak-Hour: 4:30 PM -- 5:30 PM
Peak 15-Min: 4:35 PM -- 4:50 PM

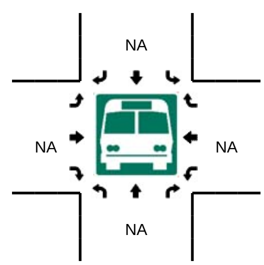












5-Min Count Period Beginning At	NB I-82 Ramps (Northbound) Left	Thru	Right	U	NB I-82 Ramps (Southbound) Left	Thru	Right	U	Lamb Rd (Eastbound) Left	Thru	Right	U	Lamb Rd (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	0	0	8	0	0	0	0	0	0	0	0	0	0	6	1	0	15	
4:05 PM	1	0	15	0	0	0	0	0	3	7	0	0	0	8	1	0	35	
4:10 PM	0	0	8	0	0	0	0	0	0	4	0	0	0	10	2	0	24	
4:15 PM	0	0	12	0	0	0	0	0	3	2	0	0	0	8	1	0	26	
4:20 PM	0	0	13	0	0	0	0	0	0	1	0	0	0	5	0	0	19	
4:25 PM	0	0	14	0	0	0	0	0	0	1	0	0	0	7	2	0	24	
4:30 PM	0	0	14	0	0	0	0	0	3	5	0	0	0	5	2	0	29	
4:35 PM	0	0	16	0	0	0	0	0	1	8	0	0	0	8	1	0	34	
4:40 PM	0	0	13	0	0	0	0	0	2	7	0	0	0	4	0	0	26	
4:45 PM	0	0	20	0	0	0	0	0	2	6	0	0	0	6	5	0	39	
4:50 PM	0	0	15	0	0	0	0	0	2	3	0	0	0	10	2	0	32	
4:55 PM	0	0	13	0	0	0	0	0	1	4	0	0	0	7	1	0	26	329
5:00 PM	0	0	7	0	0	0	0	0	3	0	0	0	0	5	1	0	16	330
5:05 PM	0	0	13	0	0	0	0	0	4	1	0	0	0	6	1	0	25	320
5:10 PM	0	0	18	0	0	0	0	0	5	3	0	0	0	7	3	0	36	332
5:15 PM	0	0	19	0	0	0	0	0	10	4	0	0	0	11	4	0	48	354
5:20 PM	0	0	19	0	0	0	0	0	4	6	0	0	0	7	1	0	37	372
5:25 PM	0	0	15	0	0	0	0	0	0	2	0	0	0	8	1	0	26	374
5:30 PM	0	0	15	0	0	0	0	0	0	1	0	0	0	9	1	0	26	371
5:35 PM	0	0	13	0	0	0	0	0	0	1	0	0	0	5	5	0	24	361
5:40 PM	0	0	13	0	0	0	0	0	0	0	0	0	0	5	0	0	18	353
5:45 PM	1	0	19	0	0	0	0	0	1	2	0	0	0	9	2	0	34	348
5:50 PM	0	0	14	0	0	0	0	0	0	0	0	0	0	5	0	0	19	335
5:55 PM	0	0	11	0	0	0	0	0	0	0	0	0	0	5	3	0	19	328

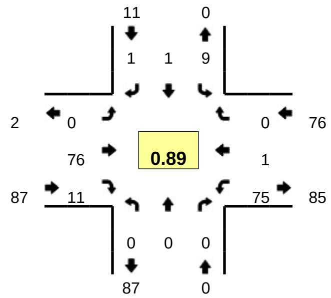
Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	0	0	196	0	0	0	0	0	20	84	0	0	0	72	24	0	396
Heavy Trucks	0	0	0		0	0	0		0	4	0		0	0	4		8
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

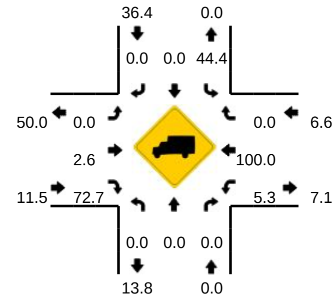
Comments:

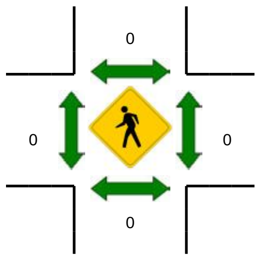
Type of peak hour being reported: System Peak | Method for determining peak hour: Total Entering Volume

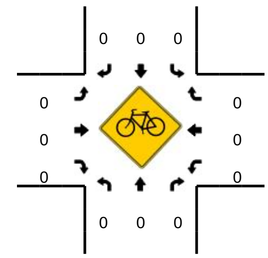
LOCATION: SB I-82 Ramps -- Lamb Rd | **QC JOB #:** 11340212
CITY/STATE: Hermiston, OR | **DATE:** Wed, Oct 16 2013

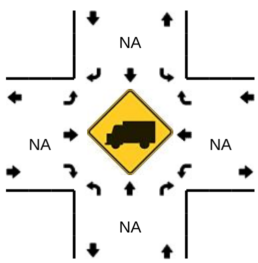
Peak-Hour: 4:30 PM -- 5:30 PM
Peak 15-Min: 4:35 PM -- 4:50 PM

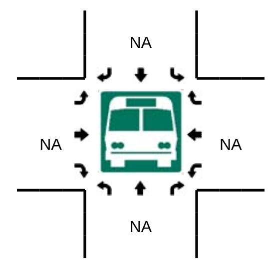












5-Min Count Period Beginning At	SB I-82 Ramps (Northbound)				SB I-82 Ramps (Southbound)				Lamb Rd (Eastbound)				Lamb Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	5	
4:05 PM	0	0	0	0	1	0	0	0	0	8	0	0	8	0	0	0	17	
4:10 PM	0	0	0	0	1	0	0	0	0	3	1	0	11	0	0	0	16	
4:15 PM	0	0	0	0	0	0	0	0	0	5	1	0	8	0	0	0	14	
4:20 PM	0	0	0	0	1	0	0	0	0	0	0	0	6	0	0	0	7	
4:25 PM	0	0	0	0	1	0	0	0	0	0	0	0	7	0	0	0	8	
4:30 PM	0	0	0	0	1	0	0	0	0	7	1	0	5	0	0	0	14	
4:35 PM	0	0	0	0	1	0	0	0	0	8	4	0	6	0	0	0	19	
4:40 PM	0	0	0	0	2	0	0	0	0	7	1	0	6	0	0	0	16	
4:45 PM	0	0	0	0	1	1	0	0	0	6	1	0	5	0	0	0	14	
4:50 PM	0	0	0	0	1	0	0	0	0	5	0	0	10	0	0	0	16	
4:55 PM	0	0	0	0	1	0	0	0	0	3	0	0	6	0	0	0	10	156
5:00 PM	0	0	0	0	0	0	0	0	0	3	0	0	6	0	0	0	9	160
5:05 PM	0	0	0	0	0	0	0	0	0	5	0	0	6	0	0	0	11	154
5:10 PM	0	0	0	0	0	0	0	0	0	8	1	0	4	0	0	0	13	151
5:15 PM	0	0	0	0	1	0	0	0	0	13	2	0	8	1	0	0	25	162
5:20 PM	0	0	0	0	1	0	0	0	0	9	0	0	5	0	0	0	15	170
5:25 PM	0	0	0	0	0	0	1	0	0	2	1	0	8	0	0	0	12	174
5:30 PM	0	0	0	0	1	0	0	0	0	0	0	0	13	0	0	0	14	174
5:35 PM	0	0	0	0	1	0	0	0	0	0	0	0	3	0	0	0	4	159
5:40 PM	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	8	151
5:45 PM	0	0	0	0	1	0	0	0	0	2	0	0	9	1	0	0	13	150
5:50 PM	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	5	139
5:55 PM	0	0	0	0	0	0	0	0	0	0	0	0	4	1	0	0	5	134

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	16	4	0	0	0	84	24	0	68	0	0	0	196
Heavy Trucks	0	0	0		4	0	0		0	0	24		0	0	0		28
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

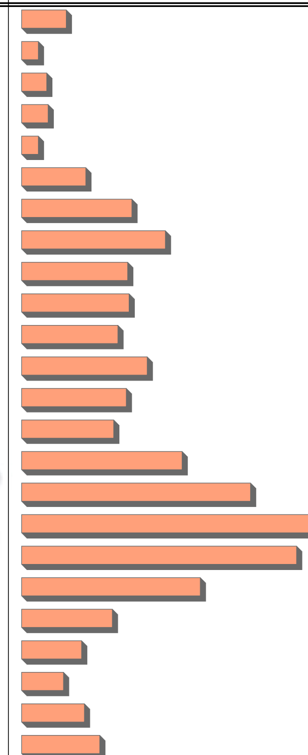
Comments:

Report generated on 10/28/2013 1:10 PM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of report: Tube Count - Volume Data

LOCATION: Lamb Rd east of I-82 **QC JOB #:** 11340213
SPECIFIC LOCATION: 0 ft from **DIRECTION:** EB
CITY/STATE: Hermiston, OR **DATE:** Oct 16 2013 - Oct 16 2013

Start Time	Mon	Tue	Wed 16-Oct-13	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM			32			32			32	
1:00 AM			12			12			12	
2:00 AM			18			18			18	
3:00 AM			19			19			19	
4:00 AM			12			12			12	
5:00 AM			46			46			46	
6:00 AM			79			79			79	
7:00 AM			**103**			**103**			**103**	
8:00 AM			76			76			76	
9:00 AM			77			77			77	
10:00 AM			69			69			69	
11:00 AM			90			90			90	
12:00 PM			75			75			75	
1:00 PM			66			66			66	
2:00 PM			115			115			115	
3:00 PM			164			164			164	
4:00 PM			**206**			**206**			**206**	
5:00 PM			197			197			197	
6:00 PM			128			128			128	
7:00 PM			65			65			65	
8:00 PM			43			43			43	
9:00 PM			30			30			30	
10:00 PM			45			45			45	
11:00 PM			56			56			56	
Day Total			1823			1823			1823	
% Weekday Average			100.0%							
% Week Average			100.0%			100.0%				
AM Peak Volume			7:00 AM 103			7:00 AM 103			7:00 AM 103	
PM Peak Volume			4:00 PM 206			4:00 PM 206			4:00 PM 206	



Comments:

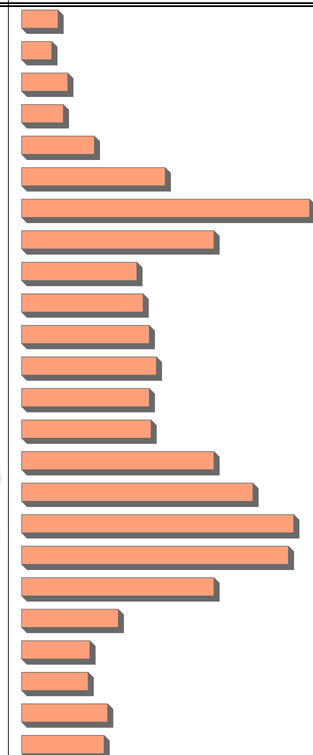
Report generated on 10/21/2013 5:10 PM SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

LOCATION: Lamb Rd east of I-82
SPECIFIC LOCATION: 0 ft from
CITY/STATE: Hermiston, OR

QC JOB #: 11340213
DIRECTION: EB/WB
DATE: Oct 16 2013 - Oct 16 2013

Start Time	Mon	Tue	Wed 16-Oct-13	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic
12:00 AM			41			41			41
1:00 AM			34			34			34
2:00 AM			52			52			52
3:00 AM			47			47			47
4:00 AM			82			82			82
5:00 AM			162			162			162
6:00 AM			**325**			**325**			**325**
7:00 AM			217			217			217
8:00 AM			130			130			130
9:00 AM			137			137			137
10:00 AM			144			144			144
11:00 AM			152			152			152
12:00 PM			144			144			144
1:00 PM			146			146			146
2:00 PM			217			217			217
3:00 PM			261			261			261
4:00 PM			**307**			**307**			**307**
5:00 PM			301			301			301
6:00 PM			217			217			217
7:00 PM			109			109			109
8:00 PM			77			77			77
9:00 PM			75			75			75
10:00 PM			97			97			97
11:00 PM			93			93			93
Day Total			3567			3567			3567
% Weekday Average			100.0%						
% Week Average			100.0%			100.0%			
AM Peak Volume			6:00 AM 325			6:00 AM 325			6:00 AM 325
PM Peak Volume			4:00 PM 307			4:00 PM 307			4:00 PM 307

Average Week Profile



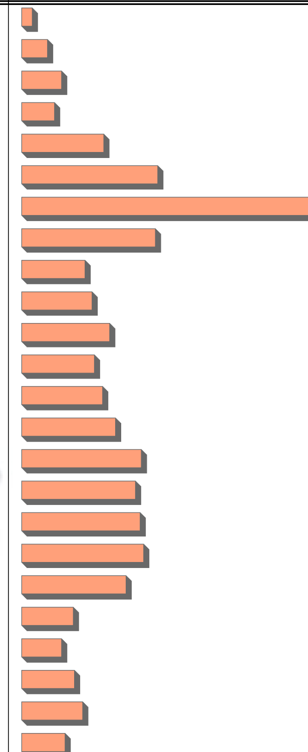
Comments:

Type of report: Tube Count - Volume Data

LOCATION: Lamb Rd east of I-82
SPECIFIC LOCATION: 0 ft from
CITY/STATE: Hermiston, OR

QC JOB #: 11340213
DIRECTION: WB
DATE: Oct 16 2013 - Oct 16 2013

Start Time	Mon	Tue	Wed 16-Oct-13	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM			9			9			9	
1:00 AM			22			22			22	
2:00 AM			34			34			34	
3:00 AM			28			28			28	
4:00 AM			70			70			70	
5:00 AM			116			116			116	
6:00 AM			**246**			**246**			**246**	
7:00 AM			114			114			114	
8:00 AM			54			54			54	
9:00 AM			60			60			60	
10:00 AM			75			75			75	
11:00 AM			62			62			62	
12:00 PM			69			69			69	
1:00 PM			80			80			80	
2:00 PM			102			102			102	
3:00 PM			97			97			97	
4:00 PM			101			101			101	
5:00 PM			**104**			**104**			**104**	
6:00 PM			89			89			89	
7:00 PM			44			44			44	
8:00 PM			34			34			34	
9:00 PM			45			45			45	
10:00 PM			52			52			52	
11:00 PM			37			37			37	
Day Total			1744			1744			1744	
% Weekday Average			100.0%							
% Week Average			100.0%			100.0%				
AM Peak Volume			6:00 AM 246			6:00 AM 246			6:00 AM 246	
PM Peak Volume			5:00 PM 104			5:00 PM 104			5:00 PM 104	



Comments:

Report generated on 10/21/2013 5:10 PM

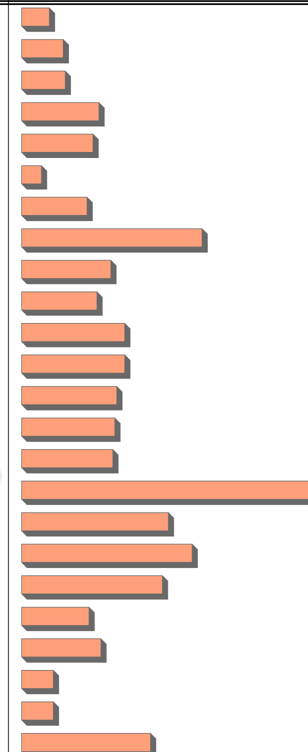
SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

LOCATION: Westland Rd north of I-84
SPECIFIC LOCATION: 0 ft from
CITY/STATE: Hermiston, OR

QC JOB #: 11340214
DIRECTION: NB
DATE: Oct 16 2013 - Oct 16 2013

Start Time	Mon	Tue	Wed 16-Oct-13	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic
12:00 AM			14			14			14
1:00 AM			21			21			21
2:00 AM			22			22			22
3:00 AM			39			39			39
4:00 AM			36			36			36
5:00 AM			10			10			10
6:00 AM			33			33			33
7:00 AM			**91**			**91**			**91**
8:00 AM			45			45			45
9:00 AM			38			38			38
10:00 AM			52			52			52
11:00 AM			52			52			52
12:00 PM			48			48			48
1:00 PM			47			47			47
2:00 PM			46			46			46
3:00 PM			**145**			**145**			**145**
4:00 PM			74			74			74
5:00 PM			86			86			86
6:00 PM			71			71			71
7:00 PM			34			34			34
8:00 PM			40			40			40
9:00 PM			16			16			16
10:00 PM			16			16			16
11:00 PM			65			65			65
Day Total			1141			1141			1141
% Weekday Average			100.0%						
% Week Average			100.0%			100.0%			
AM Peak Volume			7:00 AM 91			7:00 AM 91			7:00 AM 91
PM Peak Volume			3:00 PM 145			3:00 PM 145			3:00 PM 145

Average Week Profile

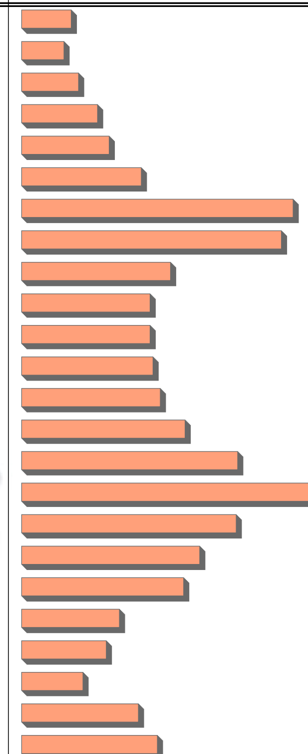


Comments:

LOCATION: Westland Rd north of I-84
SPECIFIC LOCATION: 0 ft from
CITY/STATE: Hermiston, OR

QC JOB #: 11340214
DIRECTION: NB/SB
DATE: Oct 16 2013 - Oct 16 2013

Start Time	Mon	Tue	Wed 16-Oct-13	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM			34			34			34	
1:00 AM			29			29			29	
2:00 AM			39			39			39	
3:00 AM			52			52			52	
4:00 AM			60			60			60	
5:00 AM			82			82			82	
6:00 AM			**186**			**186**			**186**	
7:00 AM			178			178			178	
8:00 AM			102			102			102	
9:00 AM			88			88			88	
10:00 AM			88			88			88	
11:00 AM			90			90			90	
12:00 PM			95			95			95	
1:00 PM			112			112			112	
2:00 PM			148			148			148	
3:00 PM			**197**			**197**			**197**	
4:00 PM			147			147			147	
5:00 PM			122			122			122	
6:00 PM			111			111			111	
7:00 PM			67			67			67	
8:00 PM			58			58			58	
9:00 PM			42			42			42	
10:00 PM			80			80			80	
11:00 PM			93			93			93	
Day Total			2300			2300			2300	
% Weekday Average			100.0%							
% Week Average			100.0%			100.0%				
AM Peak Volume			6:00 AM 186			6:00 AM 186			6:00 AM 186	
PM Peak Volume			3:00 PM 197			3:00 PM 197			3:00 PM 197	



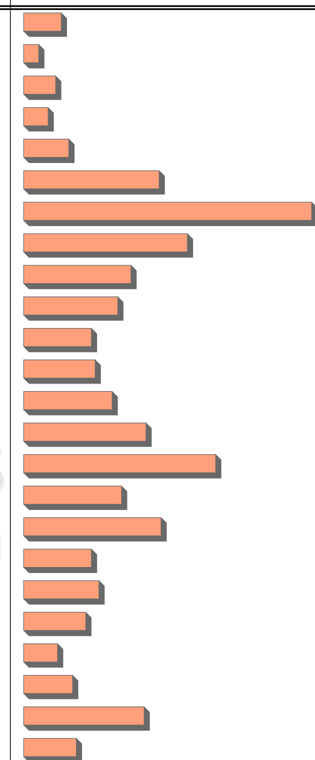
Comments:

Type of report: Tube Count - Volume Data

LOCATION: Westland Rd north of I-84
SPECIFIC LOCATION: 0 ft from
CITY/STATE: Hermiston, OR

QC JOB #: 11340214
DIRECTION: SB
DATE: Oct 16 2013 - Oct 16 2013

Start Time	Mon	Tue	Wed 16-Oct-13	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM			20			20			20	
1:00 AM			8			8			8	
2:00 AM			17			17			17	
3:00 AM			13			13			13	
4:00 AM			24			24			24	
5:00 AM			72			72			72	
6:00 AM			**153**			**153**			**153**	
7:00 AM			87			87			87	
8:00 AM			57			57			57	
9:00 AM			50			50			50	
10:00 AM			36			36			36	
11:00 AM			38			38			38	
12:00 PM			47			47			47	
1:00 PM			65			65			65	
2:00 PM			**102**			**102**			**102**	
3:00 PM			52			52			52	
4:00 PM			73			73			73	
5:00 PM			36			36			36	
6:00 PM			40			40			40	
7:00 PM			33			33			33	
8:00 PM			18			18			18	
9:00 PM			26			26			26	
10:00 PM			64			64			64	
11:00 PM			28			28			28	
Day Total			1159			1159			1159	
% Weekday Average			100.0%							
% Week Average			100.0%			100.0%				
AM Peak Volume			6:00 AM 153			6:00 AM 153			6:00 AM 153	
PM Peak Volume			2:00 PM 102			2:00 PM 102			2:00 PM 102	



Comments:

Report generated on 10/21/2013 5:10 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Appendix B
Description of Level-of-Service Methods and Criteria

APPENDIX B LEVEL-OF-SERVICE CONCEPT

Level of service (LOS) is a concept developed to quantify the degree of comfort (including such elements as travel time, number of stops, total amount of stopped delay, and impediments caused by other vehicles) afforded to drivers as they travel through an intersection or roadway segment. Six grades are used to denote the various level of service from "A" to "F".1

SIGNALIZED INTERSECTIONS

The six level-of-service grades are described qualitatively for signalized intersections in Table B1. Additionally, Table B2 identifies the relationship between level of service and average control delay per vehicle. Control delay is defined to include initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. Using this definition, Level of Service "D" is generally considered to represent the minimum acceptable design standard.

Table B-1 Level-of-Service Definitions (Signalized Intersections)

Level of Service	Average Delay per Vehicle
A	Very low average control delay, less than 10 seconds per vehicle. This occurs when progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.
B	Average control delay is greater than 10 seconds per vehicle and less than or equal to 20 seconds per vehicle. This generally occurs with good progression and/or short cycle lengths. More vehicles stop than for a level of service A, causing higher levels of average delay.
C	Average control delay is greater than 20 seconds per vehicle and less than or equal to 35 seconds per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.
D	Average control delay is greater than 35 seconds per vehicle and less than or equal to 55 seconds per vehicle. The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle length, or high volume/capacity ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.
E	Average control delay is greater than 55 seconds per vehicle and less than or equal to 80 seconds per vehicle. This is usually considered to be the limit of acceptable delay. These high delay values generally (but not always) indicate poor progression, long cycle lengths, and high volume/capacity ratios. Individual cycle failures are frequent occurrences.
F	Average control delay is in excess of 80 seconds per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with oversaturation. It may also occur at high volume/capacity ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also contribute to such high delay values.

1 Most of the material in this appendix is adapted from the Transportation Research Board, Highway Capacity Manual, (2000).

Table B2 Level-of-Service Criteria for Signalized Intersections

Level of Service	Average Control Delay per Vehicle (Seconds)
A	<10.0
B	>10 and ≤20
C	>20 and ≤35

D	>35 and ≤55
E	>55 and ≤80
F	>80

UNSIGNALIZED INTERSECTIONS

Unsignalized intersections include two-way stop-controlled (TWSC) and all-way stop-controlled (AWSC) intersections. The 2000 Highway Capacity Manual (HCM) provides models for estimating control delay at both TWSC and AWSC intersections. A qualitative description of the various service levels associated with an unsignalized intersection is presented in Table B3. A quantitative definition of level of service for unsignalized intersections is presented in Table B4. Using this definition, Level of Service "E" is generally considered to represent the minimum acceptable design standard.

Table B3 Level-of-Service Criteria for Unsignalized Intersections

Level of Service	Average Delay per Vehicle to Minor Street
A	• Nearly all drivers find freedom of operation. • Very seldom is there more than one vehicle in queue.
B	• Some drivers begin to consider the delay an inconvenience. • Occasionally there is more than one vehicle in queue.
C	• Many times there is more than one vehicle in queue. • Most drivers feel restricted, but not objectionably so.
D	• Often there is more than one vehicle in queue. • Drivers feel quite restricted.
E	• Represents a condition in which the demand is near or equal to the probable maximum number of vehicles that can be accommodated by the movement. • There is almost always more than one vehicle in queue. • Drivers find the delays approaching intolerable levels.
F	• Forced flow. • Represents an intersection failure condition that is caused by geometric and/or operational constraints external to the intersection.

Table B4 Level-of-Service Criteria for Unsignalized Intersections

Level of Service	Average Control Delay per Vehicle (Seconds)
A	<10.0

B	>10.0 and ≤ 15.0
C	>15.0 and ≤ 25.0
D	>25.0 and ≤ 35.0
E	>35.0 and ≤ 50.0
F	>50.0

It should be noted that the level-of-service criteria for unsignalized intersections are somewhat different than the criteria used for signalized intersections. The primary reason for this difference is that drivers expect different levels of performance from different kinds of transportation facilities. The expectation is that a signalized intersection is designed to carry higher traffic volumes than an unsignalized intersection. Additionally, there are a number of driver behavior considerations that combine to make delays at signalized intersections less galling than at unsignalized intersections. For example, drivers at signalized intersections are able to relax during the red interval, while drivers on the minor street approaches to TWSC intersections must remain attentive to the task of identifying acceptable gaps and vehicle conflicts. Also, there is often much more variability in the amount of delay experienced by individual drivers at unsignalized intersections than signalized intersections. For these reasons, it is considered that the control delay threshold for any given level of service is less for an unsignalized intersection than for a signalized intersection. While overall intersection level of service is calculated for AWSC intersections, level of service is only calculated for the minor approaches and the major street left turn movements at TWSC intersections. No delay is assumed to the major street through movements. For TWSC intersections, the overall intersection level of service remains undefined: level of service is only calculated for each minor street lane.

In the performance evaluation of TWSC intersections, it is important to consider other measures of effectiveness (MOEs) in addition to delay, such as v/c ratios for individual movements, average queue lengths, and 95th-percentile queue lengths. By focusing on a single MOE for the worst movement only, such as delay for the minor-street left turn, users may make inappropriate traffic control decisions. The potential for making such inappropriate decisions is likely to be particularly pronounced when the HCM level-of-service thresholds are adopted as legal standards, as is the case in many public agencies.

Appendix C ODOT Crash Data

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Westland Road & Lamb Road
January 1, 2008 through December 31, 2012

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2011														
TURNING MOVEMENTS	0	0	1	1	0	0	0	0	0	1	0	1	0	0
2011 TOTAL	0	0	1	1	0	0	0	0	0	1	0	1	0	0
YEAR: 2008														
REAR-END	0	0	1	1	0	0	0	0	1	1	0	1	0	0
2008 TOTAL	0	0	1	1	0	0	0	0	1	1	0	1	0	0
FINAL TOTAL	0	0	2	2	0	0	0	0	1	2	0	2	0	0

Disclaimer: A higher number of crashes are reported for the 2011 data file compared to previous years. This does not reflect an increase in annual crashes. The higher numbers result from a change to an internal departmental process that allows the Crash Analysis and Reporting Unit to add previously unavailable, non-fatal crash reports to the annual data file. Please be aware of this change when comparing pre-2011 crash statistics.

TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
COUNTY ROAD CRASH LISTING

UMATILLA COUNTY

Westland Road & Lamb Road
January 1, 2008 through December 31, 2012

SER# INVEST	S P E E D / E A L C / D R U G S / C R S H / W O R K	DATE DAY TIME	MILEPNT DIST FROM INTERSECT	COUNTY ROADS FIRST STREET SECOND STREET	RD CHAR DIRECT LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL TRAF-CONTL	OFF-RD RNDBT DRVWY	WTHR SURF LIGHT	CRASH TYP COLL TYP SVRTY	V#	SPCL USE TRLR QTY OWNER VEH TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
00292	N N N N N	5/16/2008	1.02	WESTLAND RD	INTER	CROSS	N	N	CLR	S-1STOP	01	NONE 0	STRGHT											32
COUNTY		Fri			UN		NONE	N	WET	REAR		PRVTE	S N									000		00
		7A			06	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	63	M	OR-Y		052	000		32
																			OR<25					
											02	NONE 0	STOP											
												PRVTE	S N									012		00
												PSNGR CAR		01	DRVR	NONE	56	M	OR-Y		000	000		00
																			OR<25					
00268	N N N	4/25/2011	1.02	WESTLAND RD	INTER	CROSS	N	N	UNK	ANGL-OTH	01	NONE 0	TURN-R											03
NO RPT		Mon			CN		STOP SIGN	N	UNK	TURN		PRVTE	W S									000		00
		10A			03	0		N	DAY	PDO		UNKNOWN		01	DRVR	NONE	00	U	UNK		021	000		03
																			UNK					
											02	NONE 0	STRGHT											
												PRVTE	N S									000		00
												PSNGR CAR		01	DRVR	NONE	61	M	OR-Y		000	000		00
																			OR<25					

006 OLD OREGON TRAIL

Eastbound I-84 (Hwy 006) on/off ramps & Westland Road
January 1, 2008 through December 31, 2012

```
       S  D
       P  R S W                                   RD#  FC                           INT-TYP                                      SPCL USE
       E A U C O DATE      COUNTY                 COMPNT    CONN #          RD CHAR (MEDIAN)  INT-REL  OFFRD WTHR  CRASH TYP   TRLR QTY  MOVE                  A  S
SER#   E L G H R DAY       CITY                   MLG TYP   FIRST  STREET   DIRECT    LEGS    TRAF-    RNDBT SURF  COLL TYP    OWNER     FROM       PRTC INJ   G  E  LICNS PED
INVEST D C S L K TIME      URBAN AREA             MILEPNT   SECOND STREET   LOCTN    (#LANES) CNTL     DRVWY LIGHT SVRTY    V# VEH TYPE  TO     P# TYPE SVRTY E  X  RES   LOC ERROR        ACTN EVENT       CAUSE

00727  N N N N N 09/26/2011 UMATILLA                1   09   2              INTER     CROSS  N             N CLR  ANGL-OTH  01 NONE    0 STRGHT                                                              03
COUNTY           Mon                                 6 0                    CN               STOP SIGN     N DRY  ANGL         PRVTE     N  S                                               000              00
                 1P                               180.46                    03          0                  N DAY  INJ         PSNGR CAR        01 DRVR INJA  31 M  OR-Y        000          000              00
                                                                                                                                                                  OR<25

                                                                                                                          02 NONE    0 STRGHT
                                                                                                                             PRVTE     W  E                                               015              00
                                                                                                                            PSNGR CAR        01 DRVR INJC  31 M  OTH-Y       021          000              03
                                                                                                                                                                  N-RES

00940  N N N N N 12/23/2011 UMATILLA                1   09   2              INTER     CROSS  N             N CLR  ANGL-OTH  01 NONE    0 STRGHT                                                              03
COUNTY           Fri                                 6 0                    CN               STOP SIGN     N DRY  ANGL         PRVTE     W  E                                               000              00
                 1P                               180.46                    03          0                  N DAY  PDO         PSNGR CAR        01 DRVR NONE  21 M  OTH-Y       021          000              03
                                                                                                                                                                  N-RES

                                                                                                                          02 NONE    0 STRGHT
                                                                                                                             PRVTE     N  S                                               000              00
                                                                                                                            PSNGR CAR        01 DRVR NONE  54 M  OR-Y        000          000              00
                                                                                                                                                                  OR<25
```

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Lamb Road & I-82 (Hwy 070) NB on/off ramps
January 1, 2008 through December 31, 2012

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR:														
TOTAL														
FINAL TOTAL														

Disclaimer: A higher number of crashes are reported for the 2011 data file compared to previous years. This does not reflect an increase in annual crashes. The higher numbers result from a change to an internal departmental process that allows the Crash Analysis and Reporting Unit to add previously unavailable, non-fatal crash reports to the annual data file. Please be aware of this change when comparing pre-2011 crash statistics.

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CONTINUOUS SYSTEM CRASH LISTING

070 MCNARY

Lamb Road & I-82 (Hwy070) SB on/off ramps
January 1, 2008 through December 31, 2012

```
       S   D
       P   R S W                                 RD#  FC                               INT-TYP                                         SPCL USE
       E A U C O  DATE        COUNTY             COMPNT   CONN #           RD CHAR  (MEDIAN)  INT-REL  OFFRD WTHR  CRASH TYP          TRLR QTY  MOVE                      A  S
SER#   E L G H R  DAY         CITY               MLG TYP  FIRST  STREET    DIRECT     LEGS    TRAF-    RNDBT SURF  COLL TYP           OWNER     FROM       PRTC  INJ      G  E  LICNS  PED
INVEST D C S L K  TIME        URBAN AREA         MILEPNT  SECOND STREET    LOCTN    (#LANES)  CNTL     DRVWY LIGHT SVRTY          V# VEH TYPE   TO      P# TYPE  SVRTY   E  X  RES    LOC  ERROR       ACTN EVENT      CAUSE

00665  N N N N N  09/29/2009  UMATILLA             1   09  1             INTER      3-LEG   N             N CLR   S-1STOP       01 NONE    0  STRGHT                                                                     07
STATE             Tue                              6 0                   N                  STOP SIGN     N DRY   REAR             PRVTE      N  S                                                   000             00
                  5P                               9.79                  06            0                  N DAY   INJ             PSNGR CAR            01 DRVR  INJC   57  M  OR-Y         043         000             07
                                                                                                                                                                        OR<25

                                                                                                                               02 NONE    0  STOP
                                                                                                                                 PRVTE      N  S                                                   011             00
                                                                                                                                PSNGR CAR            01 DRVR  NONE   51  F  OR-Y         000         000             00
                                                                                                                                                                        OR<25
```

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

WB I-84 (Hwy 006) on/off ramps & Westland Road (Hwy 006)
January 1, 2008 through December 31, 2012

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR:														
TOTAL														
FINAL TOTAL														

Disclaimer: A higher number of crashes are reported for the 2011 data file compared to previous years. This does not reflect an increase in annual crashes. The higher numbers result from a change to an internal departmental process that allows the Crash Analysis and Reporting Unit to add previously unavailable, non-fatal crash reports to the annual data file. Please be aware of this change when comparing pre-2011 crash statistics.

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Lamb Road from I-82 (Hwy 070) NB on/off ramps to I-82 (Hwy070) SB on/off ramps
January 1, 2008 through December 31, 2012

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR:														
TOTAL														
FINAL TOTAL														

Disclaimer: A higher number of crashes are reported for the 2011 data file compared to previous years. This does not reflect an increase in annual crashes. The higher numbers result from a change to an internal departmental process that allows the Crash Analysis and Reporting Unit to add previously unavailable, non-fatal crash reports to the annual data file. Please be aware of this change when comparing pre-2011 crash statistics.

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Westland Road (Hwy 006) between I-84 (Hwy 006) EB and WB on/off ramps
January 1, 2008 through December 31, 2012

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR:														
TOTAL														
FINAL TOTAL														

Disclaimer: A higher number of crashes are reported for the 2011 data file compared to previous years. This does not reflect an increase in annual crashes. The higher numbers result from a change to an internal departmental process that allows the Crash Analysis and Reporting Unit to add previously unavailable, non-fatal crash reports to the annual data file. Please be aware of this change when comparing pre-2011 crash statistics.

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Westland Road (Hwy 006) between I-84 WB on/off ramps & Livestock Road
January 1, 2008 through December 31, 2012

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR:														
TOTAL														
FINAL TOTAL														

Disclaimer: A higher number of crashes are reported for the 2011 data file compared to previous years. This does not reflect an increase in annual crashes. The higher numbers result from a change to an internal departmental process that allows the Crash Analysis and Reporting Unit to add previously unavailable, non-fatal crash reports to the annual data file. Please be aware of this change when comparing pre-2011 crash statistics.

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
COUNTY ROAD CRASH LISTING

UMATILLA COUNTY

Westland Road from Stable Road to Lamb Road
January 1, 2008 through December 31, 2012

SER# INVEST	SPEED	ALC	DRUGS	SCHL	WORK	DATE DAY TIME	MILEPNT DIST FROM INTERSECT	COUNTY ROADS FIRST STREET SECOND STREET	RD CHAR DIRECT LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL TRAF-CONTL	OFF-RD RNDBT DRVWY	WTHR SURF LIGHT	CRASH TYP COLL TYP SVRTY	V#	SPCL USE TRLR QTY OWNER VEH TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
00061	N	Y	N	N	N	2/3/2010	0.84	WESTLAND RD	STRGHT		N	N	CLD	O-STRGHT	01	NONE 0	STRGHT										013	05
STATE						Wed			UN	(NONE)	UNKNOWN	N	WET	SS-M		PRVTE	S N									000	013	00
						5A			05			N	DARK	INJ		PSNGR CAR		01	DRVR	INJA	67	M	OR-Y		080	000		05
										(02)													OR<25					
															02	NONE 0	STRGHT											
																PRVTE	N S									000		00
																PSNGR CAR		01	DRVR	NONE	65	F	OR-Y		000	000		00
																							OR<25					
															03	NONE 0	STRGHT											
																PRVTE	N S									000		00
																PSNGR CAR		01	DRVR	INJB	62	M	OR-Y		000	000		00
																							OR<25					
00913	Y	N	N	N	N	12/24/2008	1.00	WESTLAND RD	CURVE		N	Y	SLT	FIX OBJ	01	NONE 0	STRGHT										043,124	01
COUNTY						Wed			UN	(NONE)	NONE	N	ICE	FIX		PRVTE	N S									000	043,124	00
						2P			01			N	DAY	INJ		PSNGR CAR		01	DRVR	INJB	39	F	OR-Y		081	017		01
										(02)													OR<25					
																		02	PSNG	INJB	42	M			000	000		00

TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
COUNTY ROAD CRASH LISTING

UMATILLA COUNTY

Westland Road between Livestock Road and Stable Road
January 1, 2008 through December 31, 2012

SER# INVEST	S P E E D / D R A U G / A L C / S C H L / W O R K	DATE DAY TIME	MILEPNT DIST FROM INTERSECT	COUNTY ROADS FIRST STREET SECOND STREET	RD CHAR DIRECT LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL TRAF-CONTL	OFF-RD RNDBT DRVWY	WTHR SURF LIGHT	CRASH TYP COLL TYP SVRTY	V#	SPCL USE TRLR QTY OWNER VEH TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
00809	N N N N N	12/1/2008	0.23	WESTLAND RD	CURVE		N	N	CLD	S-1STOP	01	NONE 0	STRGHT											32,27
COUNTY		Mon			UN	(NONE)	UNKNOWN	N	WET	REAR		PRVTE	N S									001		00
		9A			03			Y	DAY	INJ		PSNGR CAR		01	DRVR	NONE	45	M	OR-Y		052,016,026	038		32,27
						(02)													OR<25					
											02	NONE 0	STOP											
												PRVTE	N S									012		00
												PSNGR CAR		01	DRVR	NONE	68	M	OR-Y		000	000		00
																			OR<25					
														02	PSNG	INJC	42	M			000	000		00

TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT

COUNTY ROAD CRASH LISTING

UMATILLA COUNTY

Lamb Road from Westland Road to NB I-84 on/off ramps

January 1, 2008 through December 31, 2012

```
       S   D
       P   R S W                                                              INT-TYP                                   SPCL USE
       E A U C O DATE       MILEPNT   COUNTY ROADS                   RD CHAR  (MEDIAN) INT-REL  OFF-RD WTHR  CRASH TYP     TRLR QTY  MOVE                   A S
SER#   E L G H R DAY        DIST FROM FIRST  STREET                  DIRECT     LEGS   TRAF-    RNDBT  SURF  COLL TYP      OWNER     FROM     PRTC INJ      G E LICNS PED
INVEST D C S L K TIME       INTERSECT SECOND STREET                  LOCTN    (#LANES) CONTL    DRVWY  LIGHT SVRTY      V# VEH TYPE  TO    P# TYPE SVRTY  E X RES   LOC ERROR      ACTN EVENT      CAUSE
00468  N N N N N 7/15/2011    0.01    LAMB RD                        STRGHT            N            N  CLR   S-1STOP    01 NONE   0 STRGHT                                                            27
COUNTY           Fri                                                 UN        (NONE)  UNKNOWN      N  DRY   REAR          PRVTE     W  E                                              000            00
                 5P                                                  03                             N  DAY   PDO          PSNGR CAR       01 DRVR NONE  20 M OR-Y       026          038            27
                                                                                (02)                                                                       OR<25

                                                                                                                        02 NONE   0 STOP
                                                                                                                           PRVTE     W  E                                              011            00
                                                                                                                          PSNGR CAR       01 DRVR NONE  48 M OR-Y       000          000            00
                                                                                                                                                             OR<25
```

ACTION CODE TRANSLATION LIST

ACTION CODE	SHORT DESCRIPTION	LONG DESCRIPTION
000	NONE	NO ACTION OR NON-WARRANTED
001	SKIDDED	SKIDDED
002	ON/OFF V	GETTING ON OR OFF STOPPED OR PARKED VEHICLE
003	LOAD OVR	OVERHANGING LOAD STRUCK ANOTHER VEHICLE, ETC.
006	SLOW DN	SLOWED DOWN
007	AVOIDING	AVOIDING MANEUVER
008	PAR PARK	PARALLEL PARKING
009	ANG PARK	ANGLE PARKING
010	INTERFERE	PASSENGER INTERFERING WITH DRIVER
011	STOPPED	STOPPED IN TRAFFIC NOT WAITING TO MAKE A LEFT TURN
012	STP/L TRN	STOPPED BECAUSE OF LEFT TURN SIGNAL OR WAITING, ETC.
013	STP TURN	STOPPED WHILE EXECUTING A TURN
015	GO A/STOP	PROCEED AFTER STOPPING FOR A STOP SIGN/FLASHING RED.
016	TRN A/RED	TURNED ON RED AFTER STOPPING
017	LOSTCTRL	LOST CONTROL OF VEHICLE
018	EXIT DWY	ENTERING STREET OR HIGHWAY FROM ALLEY OR DRIVEWAY
019	ENTR DWY	ENTERING ALLEY OR DRIVEWAY FROM STREET OR HIGHWAY
020	STR ENTR	BEFORE ENTERING ROADWAY, STRUCK PEDESTRIAN, ETC. ON SIDEWALK OR SHOULDER
021	NO DRVR	CAR RAN AWAY - NO DRIVER
022	PREV COL	STRUCK, OR WAS STRUCK BY, VEHICLE OR PEDESTRIAN IN PRIOR COLLISION BEFORE ACC. STABILIZED
023	STALLED	VEHICLE STALLED
024	DRVR DEAD	DEAD BY UNASSOCIATED CAUSE
025	FATIGUE	FATIGUED, SLEEPY, ASLEEP
026	SUN	DRIVER BLINDED BY SUN
027	HDLGHTS	DRIVER BLINDED BY HEADLIGHTS
028	ILLNESS	PHYSICALLY ILL
029	THRU MED	VEHICLE CROSSED, PLUNGED OVER, OR THROUGH MEDIAN BARRIER
030	PURSUIT	PURSUING OR ATTEMPTING TO STOP ANOTHER VEHICLE
031	PASSING	PASSING SITUATION
032	PRKOFFRD	VEHICLE PARKED BEYOND CURB OR SHOULDER
033	CROS MED	VEHICLE CROSSED EARTH OR GRASS MEDIAN
034	X N/SGNL	CROSSING AT INTERSECTION - NO TRAFFIC SIGNAL PRESENT
035	X W/ SGNL	CROSSING AT INTERSECTION - TRAFFIC SIGNAL PRESENT
036	DIAGONAL	CROSSING AT INTERSECTION - DIAGONALLY
037	BTWN INT	CROSSING BETWEEN INTERSECTIONS
038	DISTRACT	DRIVER'S ATTENTION DISTRACTED
039	W/TRAF-S	WALKING, RUNNING, RIDING, ETC., ON SHOULDER WITH TRAFFIC
040	A/TRAF-S	WALKING, RUNNING, RIDING, ETC., ON SHOULDER FACING TRAFFIC
041	W/TRAF-P	WALKING, RUNNING, RIDING, ETC., ON PAVEMENT WITH TRAFFIC
042	A/TRAF-P	WALKING, RUNNING, RIDING, ETC., ON PAVEMENT FACING TRAFFIC
043	PLAYINRD	PLAYING IN STREET OR ROAD
044	PUSH MV	PUSHING OR WORKING ON VEHICLE IN ROAD OR ON SHOULDER
045	WORK ON	WORKING IN ROADWAY OR ALONG SHOULDER
050	LAY ON RD	STANDING OR LYING IN ROADWAY
051	ENT OFFRD	ENTERING / STARTING IN TRAFFIC LANE FROM OFF-ROAD
088	OTHER	OTHER ACTION
099	UNK	UNKNOWN ACTION

CAUSE CODE TRANSLATION LIST

CAUSE CODE	SHORT DESCRIPTION	LONG DESCRIPTION
00	NO CODE	NO CAUSE ASSOCIATED AT THIS LEVEL
01	TOO-FAST	TOO FAST FOR CONDITIONS (NOT EXCEED POSTED SPEED
02	NO-YIELD	DID NOT YIELD RIGHT-OF-WAY
03	PAS-STOP	PASSED STOP SIGN OR RED FLASHER
04	DIS--RAG	DISREGARDED R-A-G TRAFFIC SIGNAL.
05	LEFT-CTR	DROVE LEFT OF CENTER ON TWO-WAY ROAD
06	IMP-OVER	IMPROPER OVERTAKING
07	TOO-CLOS	FOLLOWED TOO CLOSELY
08	IMP-TURN	MADE IMPROPER TURN
09	DRINKING	ALCOHOL OR DRUG INVOLVED
10	OTHR-IMP	OTHER IMPROPER DRIVING
11	MECH-DEF	MECHANICAL DEFECT
12	OTHER	OTHER (NOT IMPROPER DRIVING)
13	IMP LN C	IMPROPER CHANGE OF TRAFFIC LANES
14	DIS TCD	DISREGARDED OTHER TRAFFIC CONTROL DEVICE
15	WRNG WAY	WRONG WAY ON ONE-WAY ROADWAY
16	FATIGUE	DRIVER DROWSY/FATIGUED/SLEEPY
18	IN RDWY	NON-MOTORIST ILLEGALLY IN ROADWAY
19	NT VISBL	NON-MOTORIST CLOTHING NOT VISIBLE
20	IMP PKNG	VEHICLE IMPROPERLY PARKED
21	DEF STER	DEFECTIVE STEERING MECHANISM
22	DEF BRKE	INADEQUATE OR NO BRAKES
24	LOADSHFT	VEHICLE LOST LOAD OR LOAD SHIFTED
25	TIREFAIL	TIRE FAILURE
26	PHANTOM	PHANTOM / NON-CONTACT VEHICLE
27	INATTENT	INATTENTION
30	SPEED	DRIVING IN EXCESS OF POSTED SPEED
31	RACING	SPEED RACING (PER PAR)
32	CARELESS	CARELESS DRIVING (PER PAR)
33	RECKLESS	RECKLESS DRIVING (PER PAR)
34	AGGRESV	AGGRESSIVE DRIVING (PER PAR)
35	RD RAGE	ROAD RAGE (PER PAR)

COLLISION TYPE CODE TRANSLATION LIST

COLL CODE	SHORT DESCRIPTION	LONG DESCRIPTION
&	OTH	MISCELLANEOUS
-	BACK	BACKING
0	PED	PEDESTRIAN
1	ANGL	ANGLE
2	HEAD	HEAD-ON
3	REAR	REAR-END
4	SS-M	SIDESWIPE - MEETING
5	SS-O	SIDESWIPE - OVERTAKING
6	TURN	TURNING MOVEMENT
7	PARK	PARKING MANEUVER
8	NCOL	NON-COLLISION
9	FIX	FIXED OBJECT OR OTHER OBJECT

CRASH TYPE CODE TRANSLATION LIST

CRASH TYPE	SHORT DESCRIPTION	LONG DESCRIPTION
&	OVERTURN	OVERTURNED
0	NON-COLL	OTHER NON-COLLISION
1	OTH RDWY	MOTOR VEHICLE ON OTHER ROADWAY
2	PRKD MV	PARKED MOTOR VEHICLE
3	PED	PEDESTRIAN
4	TRAIN	RAILWAY TRAIN
6	BIKE	PEDALCYCLIST
7	ANIMAL	ANIMAL
8	FIX OBJ	FIXED OBJECT
9	OTH OBJ	OTHER OBJECT
A	ANGL-STP	ENTERING AT ANGLE - ONE VEHICLE STOPPED
B	ANGL-OTH	ENTERING AT ANGLE - ALL OTHERS
C	S-STRGHT	FROM SAME DIRECTION - BOTH GOING STRAIGHT
D	S-1TURN	FROM SAME DIRECTION - ONE TURN, ONE STRAIGHT
E	S-1STOP	FROM SAME DIRECTION - ONE STOPPED
F	S-OTHER	FROM SAME DIRECTION-ALL OTHERS, INCLUDING PARKING
G	O-STRGHT	FROM OPPOSITE DIRECTION - BOTH GOING STRAIGHT
H	O-1TURN	FROM OPPOSITE DIRECTION - ONE TURN, ONE STRAIGHT
I	O-1STOP	FROM OPPOSITE DIRECTION - ONE STOPPED
J	O-OTHER	FROM OPPOSITE DIRECTION-ALL OTHERS INCL. PARKING

DRIVER LICENSE CODE TRANSLATION LIST

LIC CODE	SHORT DESC	LONG DESCRIPTION
0	NONE	NOT LICENSED (HAD NEVER BEEN LICENSED)
1	OR-Y	VALID OREGON LICENSE
2	OTH-Y	VALID LICENSE, OTHER STATE OR COUNTRY
3	SUSP	SUSPENDED/REVOKED

DRIVER RESIDENCE CODE TRANSLATION LIST

RES CODE	SHORT DESC	LONG DESCRIPTION
1	OR<25	OREGON RESIDENT WITHIN 25 MILE OF HOME
2	OR>25	OREGON RESIDENT 25 OR MORE MILES FROM HOME
3	OR-?	OREGON RESIDENT - UNKNOWN DISTANCE FROM HOME
4	N-RES	NON-RESIDENT
9	UNK	UNKNOWN IF OREGON RESIDENT

ERROR CODE TRANSLATION LIST

ERROR CODE	SHORT DESCRIPTION	FULL DESCRIPTION
000	NONE	NO ERROR
001	WIDE TRN	WIDE TURN
002	CUT CORN	CUT CORNER ON TURN
003	FAIL TRN	FAILED TO OBEY MANDATORY TRAFFIC TURN SIGNAL, SIGN OR LANE MARKINGS
004	L IN TRF	LEFT TURN IN FRONT OF ONCOMING TRAFFIC
005	L PROHIB	LEFT TURN WHERE PROHIBITED
006	FRM WRNG	TURNED FROM WRONG LANE
007	TO WRONG	TURNED INTO WRONG LANE
008	ILLEG U	U-TURNED ILLEGALLY
009	IMP STOP	IMPROPERLY STOPPED IN TRAFFIC LANE
010	IMP SIG	IMPROPER SIGNAL OR FAILURE TO SIGNAL
011	IMP BACK	BACKING IMPROPERLY (NOT PARKING)
012	IMP PARK	IMPROPERLY PARKED
013	UNPARK	IMPROPER START LEAVING PARKED POSITION
014	IMP STRT	IMPROPER START FROM STOPPED POSITION
015	IMP LGHT	IMPROPER OR NO LIGHTS (VEHICLE IN TRAFFIC)
016	INATTENT	FAILED TO DIM LIGHTS (UNTIL 4/1/97) / INATTENTION (AFTER 4/1/97)
017	UNSF VEH	DRIVING UNSAFE VEHICLE (NO OTHER ERROR APPARENT)
018	OTH PARK	ENTERING/EXITING PARKED POSITION W/ INSUFFICIENT CLEARANCE; OTHER IMPROPER PARKING MANEUVER
019	DIS DRIV	DISREGARDED OTHER DRIVER'S SIGNAL
020	DIS SGNL	DISREGARDED TRAFFIC SIGNAL
021	RAN STOP	DISREGARDED STOP SIGN OR FLASHING RED
022	DIS SIGN	DISREGARDED WARNING SIGN, FLARES OR FLASHING AMBER
023	DIS OFCR	DISREGARDED POLICE OFFICER OR FLAGMAN
024	DIS EMER	DISREGARDED SIREN OR WARNING OF EMERGENCY VEHICLE
025	DIS RR	DISREGARDED RR SIGNAL, RR SIGN, OR RR FLAGMAN
026	REAR-END	FAILED TO AVOID STOPPED OR PARKED VEHICLE AHEAD OTHER THAN SCHOOL BUS
027	BIKE ROW	DID NOT HAVE RIGHT-OF-WAY OVER PEDALCYCLIST
028	NO ROW	DID NOT HAVE RIGHT-OF-WAY
029	PED ROW	FAILED TO YIELD RIGHT-OF-WAY TO PEDESTRIAN
030	PAS CURV	PASSING ON A CURVE
031	PAS WRNG	PASSING ON THE WRONG SIDE
032	PAS TANG	PASSING ON STRAIGHT ROAD UNDER UNSAFE CONDITIONS
033	PAS X-WK	PASSED VEHICLE STOPPED AT CROSSWALK FOR PEDESTRIAN
034	PAS INTR	PASSING AT INTERSECTION
035	PAS HILL	PASSING ON CREST OF HILL
036	N/PAS ZN	PASSING IN "NO PASSING" ZONE
037	PAS TRAF	PASSING IN FRONT OF ONCOMING TRAFFIC
038	CUT-IN	CUTTING IN (TWO LANES - TWO WAY ONLY)
039	WRNGSIDE	DRIVING ON WRONG SIDE OF THE ROAD
040	THRU MED	DRIVING THROUGH SAFETY ZONE OR OVER ISLAND
041	F/ST BUS	FAILED TO STOP FOR SCHOOL BUS

ERROR CODE TRANSLATION LIST

ERROR CODE	SHORT DESCRIPTION	FULL DESCRIPTION
042	F/SLO MV	FAILED TO DECREASE SPEED FOR SLOWER MOVING VEHICLE
043	TO CLOSE	FOLLOWING TOO CLOSELY (MUST BE ON OFFICER'S REPORT)
044	STRDL LN	STRADDLING OR DRIVING ON WRONG LANES
045	IMP CHG	IMPROPER CHANGE OF TRAFFIC LANES
046	WRNG WAY	WRONG WAY ON ONE-WAY ROADWAY (DELIBERATELY TRAVELING ON WRONG SIDE)
047	BASCRULE	DRIVING TOO FAST FOR CONDITIONS (NOT EXCEEDING POSTED SPEED)
048	OPN DOOR	OPENED DOOR INTO ADJACENT TRAFFIC LANE
049	IMPEDING	IMPEDING TRAFFIC
050	SPEED	DRIVING IN EXCESS OF POSTED SPEED
051	RECKLESS	RECKLESS DRIVING (PER PAR)
052	CARELESS	CARELESS DRIVING (PER PAR)
053	RACING	SPEED RACING (PER PAR)
054	X N/SGNL	CROSSING AT INTERSECTION, NO TRAFFIC SIGNAL PRESENT
055	X W/SGNL	CROSSING AT INTERSECTION, TRAFFIC SIGNAL PRESENT
056	DIAGONAL	CROSSING AT INTERSECTION - DIAGONALLY
057	BTWN INT	CROSSING BETWEEN INTERSECTIONS
059	W/TRAF-S	WALKING, RUNNING, RIDING, ETC., ON SHOULDER WITH TRAFFIC
060	A/TRAF-S	WALKING, RUNNING, RIDING, ETC., ON SHOULDER FACING TRAFFIC
061	W/TRAF-P	WALKING, RUNNING, RIDING, ETC., ON PAVEMENT WITH TRAFFIC
062	A/TRAF-P	WALKING, RUNNING, RIDING, ETC., ON PAVEMENT FACING TRAFFIC
063	PLAYINRD	PLAYING IN STREET OR ROAD
064	PUSH MV	PUSHING OR WORKING ON VEHICLE IN ROAD OR ON SHOULDER
065	WK IN RD	WORKING IN ROADWAY OR ALONG SHOULDER
070	LAYON RD	STANDING OR LYING IN ROADWAY
073	ELUDING	ELUDING
080	FAIL LN	FAILED TO MAINTAIN LANE
081	OFF RD	RAN OFF ROAD
082	NO CLEAR	DRIVER MISJUDGED CLEARANCE
083	OVRSTEER	OVERCORRECTING
084	NOT USED	CODE NOT IN USE
085	OVRLOAD	OVERLOADING OR IMPROPER LOADING OF VEHICLE WITH CARGO OR PASSENGERS
097	UNA DIS TC	UNABLE TO DETERMINE WHICH DRIVER DISREGARDED TRAFFIC CONTROL DEVICE

EVENT CODE TRANSLATION LIST

EVENT CODE	SHORT DESCRIPTION	LONG DESCRIPTION
001	FEL/JUMP	OCCUPANT FELL, JUMPED OR WAS EJECTED FROM MOVING VEHICLE
002	INTERFER	PASSENGER INTERFERED WITH DRIVER
003	BUG INTF	ANIMAL OR INSECT IN VEHICLE INTERFERED WITH DRIVER
004	PED INV	PEDESTRIAN INVOLVED (NON-PEDESTRIAN ACCIDENT)
005	SUB-PED	"SUB-PED": PEDESTRIAN INJURED SUBSEQUENT TO COLLISION, ETC.
006	BIKE INV	TRICYCLE-BICYCLE INVOLVED
007	HITCHIKR	HITCHHIKER (SOLICITING A RIDE)
008	PSNGR TOW	PASSENGER BEING TOWED OR PUSHED ON CONVEYANCE
009	ON/OFF V	GETTING ON OR OFF STOPPED OR PARKED VEHICLE (OCCUPANTS ONLY)
010	SUB OTRN	OVERTURNED AFTER FIRST HARMFUL EVENT
011	MV PUSHD	VEHICLE BEING PUSHED
012	MV TOWED	VEHICLE TOWED OR HAD BEEN TOWING ANOTHER VEHICLE
013	FORCED	VEHICLE FORCED BY IMPACT INTO ANOTHER VEHICLE, PEDALCYCLIST OR PEDESTRIAN
014	SET MOTN	VEHICLE SET IN MOTION BY NON-DRIVER (CHILD RELEASED BRAKES, ETC.)
015	RR ROW	AT OR ON RAILROAD RIGHT-OF-WAY (NOT LIGHT RAIL)
016	LT RL ROW	AT OR ON LIGHT-RAIL RIGHT-OF-WAY
017	RR HIT V	TRAIN STRUCK VEHICLE
018	V HIT RR	VEHICLE STRUCK TRAIN
019	HIT RR CAR	VEHICLE STRUCK RAILROAD CAR ON ROADWAY
020	JACKNIFE	JACKKNIFE; TRAILER OR TOWED VEHICLE STRUCK TOWING VEHICLE
021	TRL OTRN	TRAILER OR TOWED VEHICLE OVERTURNED
022	CN BROKE	TRAILER CONNECTION BROKE
023	DETACH TRL	DETACHED TRAILING OBJECT STRUCK OTHER VEHICLE, NON-MOTORIST, OR OBJECT
024	V DOOR OPN	VEHICLE DOOR OPENED INTO ADJACENT TRAFFIC LANE
025	WHEELOFF	WHEEL CAME OFF
026	HOOD UP	HOOD FLEW UP
028	LOAD SHIFT	LOST LOAD, LOAD MOVED OR SHIFTED
029	TIREFAIL	TIRE FAILURE
030	PET	PET: CAT, DOG AND SIMILAR
031	LVSTOCK	STOCK: COW, CALF, BULL, STEER, SHEEP, ETC.
032	HORSE	HORSE, MULE, OR DONKEY
033	HRSE&RID	HORSE AND RIDER
034	GAME	WILD ANIMAL, GAME (INCLUDES BIRDS; NOT DEER OR ELK)
035	DEER ELK	DEER OR ELK, WAPITI
036	ANML VEH	ANIMAL-DRAWN VEHICLE
037	CULVERT	CULVERT, OPEN LOW OR HIGH MANHOLE
038	ATENUATN	IMPACT ATTENUATOR
039	PK METER	PARKING METER
040	CURB	CURB (ALSO NARROW SIDEWALKS ON BRIDGES)
041	JIGGLE	JIGGLE BARS OR TRAFFIC SNAKE FOR CHANNELIZATION
042	GDRL END	LEADING EDGE OF GUARDRAIL
043	GARDRAIL	GUARD RAIL (NOT METAL MEDIAN BARRIER)
044	BARRIER	MEDIAN BARRIER (RAISED OR METAL)
045	WALL	RETAINING WALL OR TUNNEL WALL
046	BR RAIL	BRIDGE RAILING (ON BRIDGE AND APPROACH)
047	BR ABUT	BRIDGE ABUTMENT (APPROACH ENDS)
048	BR COLMN	BRIDGE PILLAR OR COLUMN (EVEN THOUGH STRUCK PROTECTIVE GUARD RAIL FIRST)
049	BR GIRDR	BRIDGE GIRDER (HORIZONTAL STRUCTURE OVERHEAD)
050	ISLAND	TRAFFIC RAISED ISLAND
051	GORE	GORE
052	POLE UNK	POLE – TYPE UNKNOWN
053	POLE UTL	POLE – POWER OR TELEPHONE
054	ST LIGHT	POLE – STREET LIGHT ONLY
055	TRF SGNL	POLE – TRAFFIC SIGNAL AND PED SIGNAL ONLY
056	SGN BRDG	POLE – SIGN BRIDGE
057	STOPSIGN	STOP OR YIELD SIGN
058	OTH SIGN	OTHER SIGN, INCLUDING STREET SIGNS
059	HYDRANT	HYDRANT

EVENT CODE TRANSLATION LIST

EVENT CODE	SHORT DESCRIPTION	LONG DESCRIPTION
060	MARKER	DELINEATOR OR MARKER (REFLECTOR POSTS)
061	MAILBOX	MAILBOX
062	TREE	TREE, STUMP OR SHRUBS
063	VEG OHED	TREE BRANCH OR OTHER VEGETATION OVERHEAD, ETC.
064	WIRE/CBL	WIRE OR CABLE ACROSS OR OVER THE ROAD
065	TEMP SGN	TEMPORARY SIGN OR BARRICADE IN ROAD, ETC.
066	PERM SGN	PERMANENT SIGN OR BARRICADE IN/OFF ROAD
067	SLIDE	SLIDES, FALLEN OR FALLING ROCKS
068	FRGN OBJ	FOREIGN OBSTRUCTION/DEBRIS IN ROAD (NOT GRAVEL)
069	EQP WORK	EQUIPMENT WORKING IN/OFF ROAD
070	OTH EQP	OTHER EQUIPMENT IN OR OFF ROAD (INCLUDES PARKED TRAILER, BOAT)
071	MAIN EQP	WRECKER, STREET SWEEPER, SNOW PLOW OR SANDING EQUIPMENT
072	OTHER WALL	ROCK, BRICK OR OTHER SOLID WALL
073	IRRGL PVMT	SPEED BUMP, OTHER BUMP, POTHOLE OR PAVEMENT IRREGULARITY (PER PAR)
075	CAVE IN	BRIDGE OR ROAD CAVE IN
076	HI WATER	HIGH WATER
077	SNO BANK	SNOW BANK
078	HOLE	CHUCKHOLE IN ROAD, LOW OR HIGH SHOULDER AT PAVEMENT EDGE
079	DITCH	CUT SLOPE OR DITCH EMBANKMENT
080	OBJ F MV	STRUCK BY ROCK OR OTHER OBJECT SET IN MOTION BY OTHER VEHICLE (INCL. LOST LOADS)
081	FLY-OBJ	STRUCK BY OTHER MOVING OR FLYING OBJECT
082	VEH HID	VEHICLE OBSCURED VIEW
083	VEG HID	VEGETATION OBSCURED VIEW
084	BLDG HID	VIEW OBSCURED BY FENCE, SIGN, PHONE BOOTH, ETC.
085	WIND GUST	WIND GUST
086	IMMERSED	VEHICLE IMMERSED IN BODY OF WATER
087	FIRE/EXP	FIRE OR EXPLOSION
088	FENC/BLD	FENCE OR BUILDING, ETC.
089	OTH ACDT	ACCIDENT RELATED TO ANOTHER SEPARATE ACCIDENT
090	TO 1 SIDE	TWO-WAY TRAFFIC ON DIVIDED ROADWAY ALL ROUTED TO ONE SIDE
092	PHANTOM	OTHER (PHANTOM) NON-CONTACT VEHICLE (ON PAR OR REPORT)
093	CELL-POL	CELL PHONE (ON PAR OR DRIVER IN USE)
094	VIOL GDL	TEENAGE DRIVER IN VIOLATION OF GRADUATED LICENSE PGM
095	GUY WIRE	GUY WIRE
096	BERM	BERM (EARTHEN OR GRAVEL MOUND)
097	GRAVEL	GRAVEL IN ROADWAY
098	ABR EDGE	ABRUPT EDGE
099	CELL-WTN	CELL PHONE USE WITNESSED BY OTHER PARTICIPANT
100	UNK FIXD	UNKNOWN TYPE OF FIXED OBJECT
101	OTHER OBJ	OTHER OR UNKNOWN OBJECT, NOT FIXED
104	OUTSIDE V	PASSENGER RIDING ON VEHICLE EXTERIOR
105	PEDAL PSGR	PASSENGER RIDING ON PEDALCYCLE
106	MAN WHLCHR	PEDESTRIAN IN NON-MOTORIZED WHEELCHAIR
107	MTR WHLCHR	PEDESTRIAN IN MOTORIZED WHEELCHAIR
110	N-MTR	NON-MOTORIST STRUCK VEHICLE
111	S CAR VS V	STREET CAR/TROLLEY (ON RAILS AND/OR OVERHEAD WIRE SYSTEM) STRUCK VEHICLE
112	V VS S CAR	VEHICLE STRUCK STREET CAR/TROLLEY (ON RAILS AND/OR OVERHEAD WIRE SYSTEM)
113	S CAR ROW	AT OR ON STREET CAR/TROLLEY RIGHT-OF-WAY
114	RR EQUIP	VEHICLE STRUCK RAILROAD EQUIPMENT (NOT TRAIN) ON TRACKS
120	WIRE BAR	WIRE OR CABLE MEDIAN BARRIER
124	SLIPPERY	SLIDING OR SWERVING DUE TO WET, ICY, SLIPPERY OR LOOSE SURFACE
125	SHLDR	SHOULDER GAVE WAY

FUNCTIONAL CLASSIFICATION TRANSLATION LIST

FUNC CLASS	DESCRIPTION
01	RURAL PRINCIPAL ARTERIAL - INTERSTATE
02	RURAL PRINCIPAL ARTERIAL - OTHER
06	RURAL MINOR ARTERIAL
07	RURAL MAJOR COLLECTOR
08	RURAL MINOR COLLECTOR
09	RURAL LOCAL
11	URBAN PRINCIPAL ARTERIAL - INTERSTATE
12	URBAN PRINCIPAL ARTERIAL - OTHER FREEWAYS AND EXP
14	URBAN PRINCIPAL ARTERIAL - OTHER
16	URBAN MINOR ARTERIAL
17	URBAN COLLECTOR
19	URBAN LOCAL
78	UNKNOWN RURAL SYSTEM
79	UNKNOWN RURAL NON-SYSTEM
98	UNKNOWN URBAN SYSTEM
99	UNKNOWN URBAN NON-SYSTEM

HIGHWAY COMPONENT TRANSLATION LIST

CODE	DESCRIPTION
0	MAINLINE STATE HIGHWAY
1	COUPLET
3	FRONTAGE ROAD
6	CONNECTION
8	HIGHWAY - OTHER

INJURY SEVERITY CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
1	KILL	FATAL INJURY
2	INJA	INCAPACITATING INJURY - BLEEDING, BROKEN BONES
3	INJB	NON-INCAPACITATING INJURY
4	INJC	POSSIBLE INJURY - COMPLAINT OF PAIN
5	PRI	DIED PRIOR TO CRASH
7	NO<5	NO INJURY - 0 TO 4 YEARS OF AGE

LIGHT CONDITION CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
0	UNK	UNKNOWN
1	DAY	DAYLIGHT
2	DLIT	DARKNESS - WITH STREET LIGHTS
3	DARK	DARKNESS - NO STREET LIGHTS
4	DAWN	DAWN (TWILIGHT)
5	DUSK	DUSK (TWILIGHT)

MEDIAN TYPE CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
0	NONE	NO MEDIAN
1	RSDMD	SOLID MEDIAN BARRIER
2	DIVMD	EARTH, GRASS OR PAVED MEDIAN

MILEAGE TYPE CODE TRANSLATION LIST

CODE	LONG DESCRIPTION
0	REGULAR MILEAGE
T	TEMPORARY
Y	SPUR
Z	OVERLAPPING

MOVEMENT TYPE CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
0	UNK	UNKNOWN
1	STRGHT	STRAIGHT AHEAD
2	TURN-R	TURNING RIGHT
3	TURN-L	TURNING LEFT
4	U-TURN	MAKING A U-TURN
5	BACK	BACKING
6	STOP	STOPPED IN TRAFFIC
7	PRKD-P	PARKED - PROPERLY
8	PRKD-I	PARKED - IMPROPERLY

PEDESTRIAN LOCATION CODE TRANSLATION LIST

CODE	LONG DESCRIPTION
00	AT INTERSECTION - NOT IN ROADWAY
01	AT INTERSECTION - INSIDE CROSSWALK
02	AT INTERSECTION - IN ROADWAY, OUTSIDE CROSSWALK
03	AT INTERSECTION - IN ROADWAY, XWALK AVAIL UNKNWN
04	NOT AT INTERSECTION - IN ROADWAY
05	NOT AT INTERSECTION - ON SHOULDER
06	NOT AT INTERSECTION - ON MEDIAN
07	NOT AT INTERSECTION - WITHIN TRAFFIC RIGHT-OF-WAY
08	NOT AT INTERSECTION - IN BIKE PATH
09	NOT-AT INTERSECTION - ON SIDEWALK
10	OUTSIDE TRAFFICWAY BOUNDARIES
15	NOT AT INTERSECTION - INSIDE MID-BLOCK CROSSWALK
18	OTHER, NOT IN ROADWAY
99	UNKNOWN LOCATION

ROAD CHARACTER CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
0	UNK	UNKNOWN
1	INTER	INTERSECTION
2	ALLEY	DRIVEWAY OR ALLEY
3	STRGHT	STRAIGHT ROADWAY
4	TRANS	TRANSITION
5	CURVE	CURVE (HORIZONTAL CURVE)
6	OPENAC	OPEN ACCESS OR TURNOUT
7	GRADE	GRADE (VERTICAL CURVE)
8	BRIDGE	BRIDGE STRUCTURE
9	TUNNEL	TUNNEL

PARTICIPANT TYPE CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
0	OCC	UNKNOWN OCCUPANT TYPE
1	DRVR	DRIVER
2	PSNG	PASSENGER
3	PED	PEDESTRIAN
4	CONV	PEDESTRIAN USING A PEDESTRIAN CONVEYA
5	PTOW	PEDESTRIAN TOWING OR TRAILERING AN OB
6	BIKE	PEDALCYCLIST
7	BTOW	PEDALCYCLIST TOWING OR TRAILERING AN
8	PRKD	OCCUPANT OF A PARKED MOTOR VEHICLE
9	UNK	UNKNOWN TYPE OF NON-MOTORIST

TRAFFIC CONTROL DEVICE CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
000	NONE	NO CONTROL
001	TRF SIGNAL	TRAFFIC SIGNALS
002	FLASHBCN-R	FLASHING BEACON - RED (STOP)
003	FLASHBCN-A	FLASHING BEACON - AMBER (SLOW)
004	STOP SIGN	STOP SIGN
005	SLOW SIGN	SLOW SIGN
006	REG-SIGN	REGULATORY SIGN
007	YIELD	YIELD SIGN
008	WARNING	WARNING SIGN
009	CURVE	CURVE SIGN
010	SCHL X-ING	SCHOOL CROSSING SIGN OR SPECIAL SIGNAL
011	OFCR/FLAG	POLICE OFFICER, FLAGMAN - SCHOOL PATROL
012	BRDG-GATE	BRIDGE GATE - BARRIER
013	TEMP-BARR	TEMPORARY BARRIER
014	NO-PASS-ZN	NO PASSING ZONE
015	ONE-WAY	ONE-WAY STREET
016	CHANNEL	CHANNELIZATION
017	MEDIAN BAR	MEDIAN BARRIER
018	PILOT CAR	PILOT CAR
019	SP PED SIG	SPECIAL PEDESTRIAN SIGNAL
020	X-BUCK	CROSSBUCK
021	THR-GN-SIG	THROUGH GREEN ARROW OR SIGNAL
022	L-GRN-SIG	LEFT TURN GREEN ARROW, LANE MARKINGS, OR SIGNAL
023	R-GRN-SIG	RIGHT TURN GREEN ARROW, LANE MARKINGS, OR SIGNAL
024	WIGWAG	WIGWAG OR FLASHING LIGHTS W/O DROP-ARM GATE
025	X-BUCK WRN	CROSSBUCK AND ADVANCE WARNING
026	WW W/ GATE	FLASHING LIGHTS WITH DROP-ARM GATES
027	OVRHD SGNL	SUPPLEMENTAL OVERHEAD SIGNAL (RR XING ONLY)
028	SP RR STOP	SPECIAL RR STOP SIGN
029	ILUM GRD X	ILLUMINATED GRADE CROSSING
037	RAMP METER	METERED RAMPS
038	RUMBLE STR	RUMBLE STRIP
090	L-TURN REF	LEFT TURN REFUGE (WHEN REFUGE IS INVOLVED)
091	R-TURN ALL	RIGHT TURN AT ALL TIMES SIGN, ETC.
092	EMR SGN/FL	EMERGENCY SIGNS OR FLARES
093	ACCEL LANE	ACCELERATION OR DECELERATION LANES
094	R-TURN PRO	RIGHT TURN PROHIBITED ON RED AFTER STOPPING

095	BUS STPSGN	BUS STOP SIGN AND RED LIGHTS
099	UNKNOWN	UNKNOWN OR NOT DEFINITE

VEHICLE TYPE CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
01	PSNGR CAR	PASSENGER CAR, PICKUP, ETC.
02	BOBTAIL	TRUCK TRACTOR WITH NO TRAILERS (BOBTAIL)
03	FARM TRCTR	FARM TRACTOR OR SELF-PROPELLED FARM EQUIPMENT
04	SEMI TOW	TRUCK TRACTOR WITH TRAILER/MOBILE HOME IN TOW
05	TRUCK	TRUCK WITH NON-DETACHABLE BED, PANEL, ETC.
06	MOPED	MOPED, MINIBIKE, MOTOR SCOOTER, OR MOTOR BICYCLE
07	SCHL BUS	SCHOOL BUS (INCLUDES VAN)
08	OTH BUS	OTHER BUS
09	MTRCYCLE	MOTORCYCLE
10	OTHER	OTHER: FORKLIFT, BACKHOE, ETC.
11	MOTRHOME	MOTORHOME
12	TROLLEY	MOTORIZED STREET CAR/TROLLEY (NO RAILS/WIRES)
13	ATV	ATV
14	MTRSCTR	MOTORIZED SCOOTER
15	SNOWMOBILE	SNOWMOBILE
99	UNKNOWN	UNKNOWN VEHICLE TYPE

WEATHER CONDITION CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
0	UNK	UNKNOWN
1	CLR	CLEAR
2	CLD	CLOUDY
3	RAIN	RAIN
4	SLT	SLEET
5	FOG	FOG
6	SNOW	SNOW
7	DUST	DUST
8	SMOK	SMOKE
9	ASH	ASH

Appendix D 2013 Existing Traffic Conditions

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	1	0	231	43	0	0	1	0	48	1	41
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Hourly flow rate (vph)	0	1	0	330	61	0	0	1	0	69	1	59
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												1
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	61			1			753	723	1	724	723	61
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	61			1			753	723	1	724	723	61
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.4	7.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.8	4.9	3.3
p0 queue free %	100			79			100	99	100	74	99	94
cM capacity (veh/h)	1555			1602			259	282	1089	260	203	1001

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	1	391	1	129
Volume Left	0	330	0	69
Volume Right	0	0	0	59
cSH	1700	1602	282	475
Volume to Capacity	0.00	0.21	0.01	0.27
Queue Length 95th (ft)	0	19	0	27
Control Delay (s)	0.0	6.9	17.8	17.1
Lane LOS		A	C	C
Approach Delay (s)	0.0	6.9	17.8	17.1
Approach LOS			C	C

Intersection Summary			
Average Delay	9.4		
Intersection Capacity Utilization	37.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	48	0	0	269	13	5	0	45	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
Hourly flow rate (vph)	0	65	0	0	364	18	7	0	61	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)									1			
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	381			65			437	446	65	468	437	372
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	381			65			437	446	65	468	437	372
tC, single (s)	4.1			4.1			7.1	6.5	6.3	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.4	3.5	4.0	3.3
p0 queue free %	100			100			99	100	94	100	100	100
cM capacity (veh/h)	1188			1550			533	510	983	478	516	678

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	65	381	68
Volume Left	0	0	7
Volume Right	0	18	61
cSH	1188	1700	1092
Volume to Capacity	0.00	0.22	0.06
Queue Length 95th (ft)	0	0	5
Control Delay (s)	0.0	0.0	9.2
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.2
Approach LOS			A

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	24.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	42	50	138	276	8	30
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	49	59	162	325	9	35
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			108		699	49
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			108		699	49
tC, single (s)			4.2		6.7	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.8	3.4
p0 queue free %			89		97	96
cM capacity (veh/h)			1458		327	991

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	49	59	162	325	45
Volume Left	0	0	162	0	9
Volume Right	0	59	0	0	35
cSH	1700	1700	1458	1700	1256
Volume to Capacity	0.03	0.03	0.11	0.19	0.04
Queue Length 95th (ft)	0	0	9	0	3
Control Delay (s)	0.0	0.0	7.8	0.0	10.4
Lane LOS			A		B
Approach Delay (s)	0.0		2.6		10.4
Approach LOS					B

Intersection Summary			
Average Delay	2.7		
Intersection Capacity Utilization	24.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	12	14	8	30	36	34
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.61	0.61	0.61	0.61	0.61	0.61
Hourly flow rate (vph)	20	23	13	49	59	56
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	134	59	115			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	134	59	115			
tC, single (s)	6.7	7.0	5.0			
tC, 2 stage (s)						
tF (s)	3.8	4.0	3.0			
p0 queue free %	98	97	99			
cM capacity (veh/h)	787	819	1083			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	43	13	49	59	56
Volume Left	20	13	0	0	0
Volume Right	23	0	0	0	56
cSH	804	1083	1700	1700	1700
Volume to Capacity	0.05	0.01	0.03	0.03	0.03
Queue Length 95th (ft)	4	1	0	0	0
Control Delay (s)	9.7	8.4	0.0	0.0	0.0
Lane LOS	A	A			
Approach Delay (s)	9.7	1.8		0.0	
Approach LOS	A				

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	16.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	17	0	21	16	25	0	0	37	12
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
Hourly flow rate (vph)	0	0	0	26	0	32	24	38	0	0	56	18
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	183	152	65	152	161	38	74			38		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	183	152	65	152	161	38	74			38		
tC, single (s)	7.1	6.5	6.2	7.3	6.5	6.5	4.3			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.7	4.0	3.6	2.4			2.2		
p0 queue free %	100	100	100	97	100	97	98			100		
cM capacity (veh/h)	747	731	1005	766	723	965	1413			1585		

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	58	62	74
Volume Left	26	24	0
Volume Right	32	0	18
cSH	865	1413	1700
Volume to Capacity	0.07	0.02	0.04
Queue Length 95th (ft)	5	1	0
Control Delay (s)	9.5	3.0	0.0
Lane LOS	A	A	
Approach Delay (s)	9.5	3.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	3.8		
Intersection Capacity Utilization	18.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	9	0	15	0	0	0	0	31	19	13	42	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
Hourly flow rate (vph)	12	0	20	0	0	0	0	42	26	18	57	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	147	159	57	167	147	55	57			68		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	147	159	57	167	147	55	57			68		
tC, single (s)	7.7	6.5	6.4	7.1	6.5	6.2	4.1			4.9		
tC, 2 stage (s)												
tF (s)	4.1	4.0	3.5	3.5	4.0	3.3	2.2			2.9		
p0 queue free %	98	100	98	100	100	100	100			98		
cM capacity (veh/h)	695	725	953	776	737	1018	1561			1148		

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	32	68	74
Volume Left	12	0	18
Volume Right	20	26	0
cSH	837	1700	1148
Volume to Capacity	0.04	0.04	0.02
Queue Length 95th (ft)	3	0	1
Control Delay (s)	9.5	0.0	2.0
Lane LOS	A		A
Approach Delay (s)	9.5	0.0	2.0
Approach LOS	A		

Intersection Summary			
Average Delay	2.6		
Intersection Capacity Utilization	19.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	1	0	96	1	0	0	89	13	10	1	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	0	1	0	117	1	0	0	109	16	12	1	1
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												1
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1			1			238	237	1	307	237	1
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1			1			238	237	1	307	237	1
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.5	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.9	4.0	3.3
p0 queue free %	100			93			100	82	99	97	100	100
cM capacity (veh/h)	1635			1602			679	619	1089	461	619	1089

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	1	118	124	15
Volume Left	0	117	0	12
Volume Right	0	0	16	1
cSH	1700	1602	655	518
Volume to Capacity	0.00	0.07	0.19	0.03
Queue Length 95th (ft)	0	6	17	2
Control Delay (s)	0.0	7.4	11.8	12.4
Lane LOS		A	B	B
Approach Delay (s)	0.0	7.4	11.8	12.4
Approach LOS			B	B

Intersection Summary			
Average Delay	9.7		
Intersection Capacity Utilization	26.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	43	57	0	0	97	26	0	0	211	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Hourly flow rate (vph)	56	74	0	0	126	34	0	0	274	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)									1			
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	160			74			329	345	74	466	329	143
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	160			74			329	345	74	466	329	143
tC, single (s)	4.1			4.1			7.1	6.5	6.3	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.4	3.5	4.0	3.3
p0 queue free %	96			100			100	100	72	100	100	100
cM capacity (veh/h)	1413			1538			610	558	974	356	570	910

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	130	160	274
Volume Left	56	0	0
Volume Right	0	34	274
cSH	1413	1700	730
Volume to Capacity	0.04	0.09	0.38
Queue Length 95th (ft)	3	0	44
Control Delay (s)	3.5	0.0	12.9
Lane LOS	A		B
Approach Delay (s)	3.5	0.0	12.9
Approach LOS			B

Intersection Summary			
Average Delay	7.1		
Intersection Capacity Utilization	25.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	255	10	70	107	16	86
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	287	11	79	120	18	97
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			298		564	287
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			298		564	287
tC, single (s)			4.2		6.6	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.7	3.4
p0 queue free %			93		96	87
cM capacity (veh/h)			1193		426	736

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	287	11	79	120	115
Volume Left	0	0	79	0	18
Volume Right	0	11	0	0	97
cSH	1700	1700	1193	1700	873
Volume to Capacity	0.17	0.01	0.07	0.07	0.13
Queue Length 95th (ft)	0	0	5	0	11
Control Delay (s)	0.0	0.0	8.2	0.0	11.1
Lane LOS			A		B
Approach Delay (s)	0.0		3.3		11.1
Approach LOS					B

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	30.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	57	25	31	36	32	55
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	71	31	39	45	40	69
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	162	40	109			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	162	40	109			
tC, single (s)	6.4	6.6	4.7			
tC, 2 stage (s)						
tF (s)	3.5	3.7	2.7			
p0 queue free %	91	97	97			
cM capacity (veh/h)	802	926	1204			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	102	39	45	40	69
Volume Left	71	39	0	0	0
Volume Right	31	0	0	0	69
cSH	836	1204	1700	1700	1700
Volume to Capacity	0.12	0.03	0.03	0.02	0.04
Queue Length 95th (ft)	10	2	0	0	0
Control Delay (s)	9.9	8.1	0.0	0.0	0.0
Lane LOS	A	A			
Approach Delay (s)	9.9	3.7		0.0	
Approach LOS	A				

Intersection Summary			
Average Delay	4.5		
Intersection Capacity Utilization	19.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	8	0	37	22	37	0	0	51	17
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Hourly flow rate (vph)	0	0	0	10	0	47	28	47	0	0	65	22
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	228	180	76	180	191	47	87			47		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	228	180	76	180	191	47	87			47		
tC, single (s)	7.1	6.5	6.2	7.7	6.5	6.7	4.4			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	4.0	4.0	3.8	2.5			2.2		
p0 queue free %	100	100	100	98	100	95	98			100		
cM capacity (veh/h)	682	702	990	664	693	894	1340			1573		

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	58	76	87
Volume Left	10	28	0
Volume Right	47	0	22
cSH	842	1340	1700
Volume to Capacity	0.07	0.02	0.05
Queue Length 95th (ft)	6	2	0
Control Delay (s)	9.6	3.0	0.0
Lane LOS	A	A	
Approach Delay (s)	9.6	3.0	0.0
Approach LOS	A		

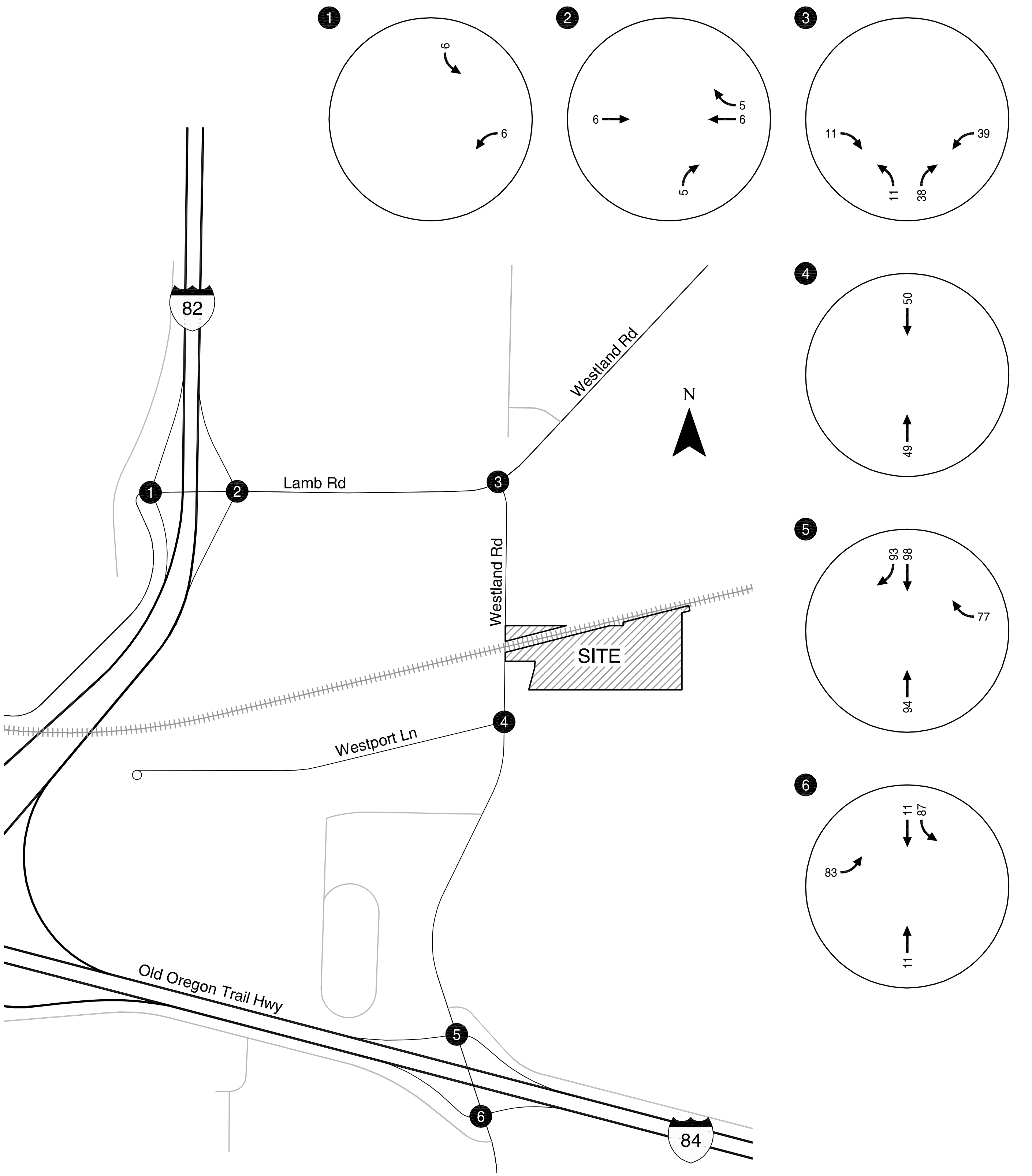
Intersection Summary			
Average Delay	3.5		
Intersection Capacity Utilization	19.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	21	0	28	0	0	0	0	38	19	32	27	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	25	0	33	0	0	0	0	45	23	38	32	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	165	176	32	198	165	57	32			68		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	165	176	32	198	165	57	32			68		
tC, single (s)	7.4	6.5	6.6	7.1	6.5	6.2	4.1			4.4		
tC, 2 stage (s)												
tF (s)	3.8	4.0	3.7	3.5	4.0	3.3	2.2			2.5		
p0 queue free %	97	100	96	100	100	100	100			97		
cM capacity (veh/h)	719	701	938	722	711	1016	1593			1363		

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	58	68	70
Volume Left	25	0	38
Volume Right	33	23	0
cSH	830	1700	1363
Volume to Capacity	0.07	0.04	0.03
Queue Length 95th (ft)	6	0	2
Control Delay (s)	9.7	0.0	4.3
Lane LOS	A		A
Approach Delay (s)	9.7	0.0	4.3
Approach LOS	A		

Intersection Summary			
Average Delay	4.4		
Intersection Capacity Utilization	19.9%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix E In-Process Trips



In-Process Development Trips
Weekday AM Peak Period
Umatilla County, Oregon

Figure
E-1

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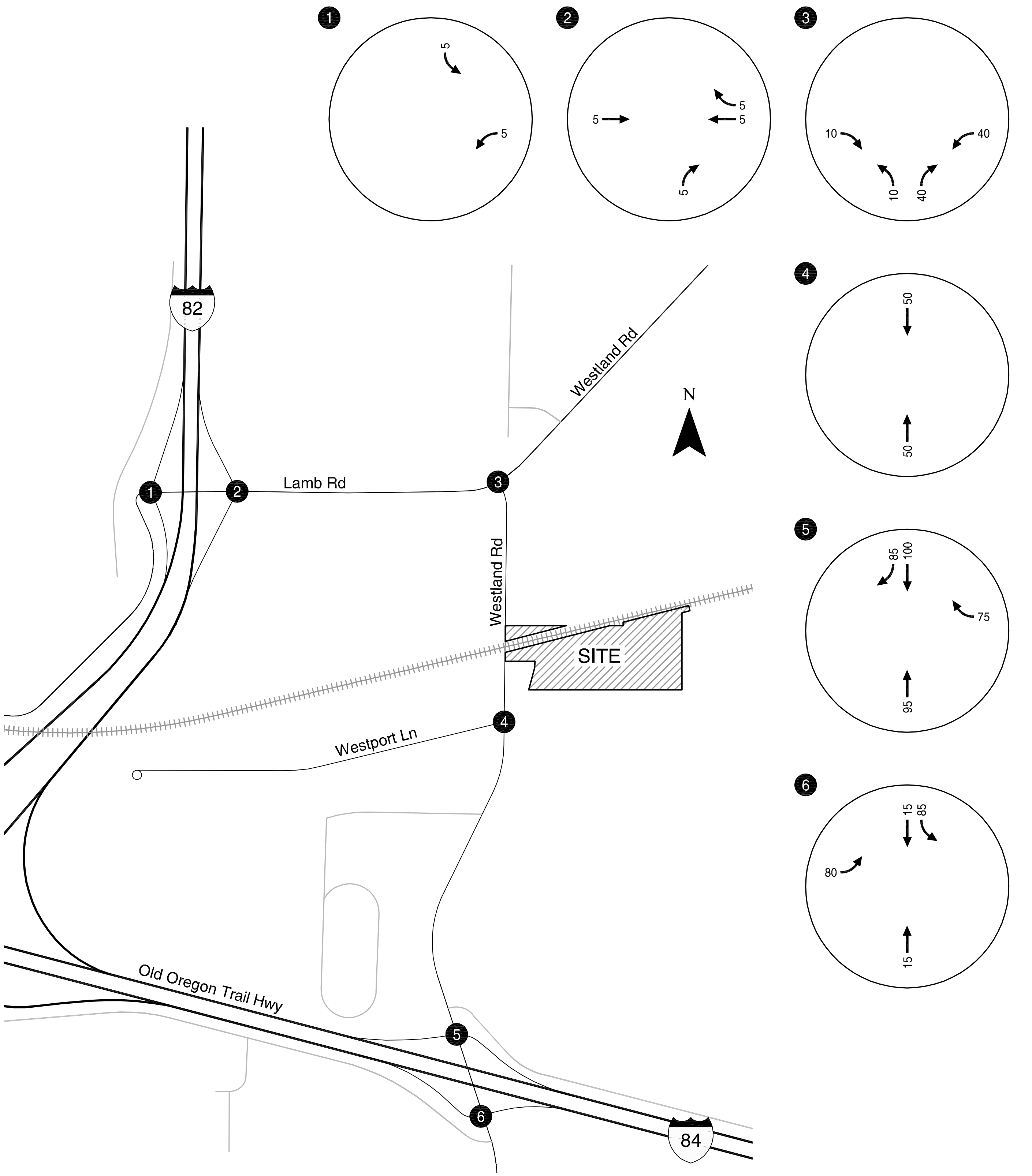

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In-Process Development Trips
Weekday PM Peak Period
Umatilla County, Oregon

Figure
E-2

Appendix F Year 2017 Background Traffic Operations Worksheets

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	1	246	45	0	0	1	0	56	1	42
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Hourly flow rate (vph)	0	0	1	351	64	0	0	1	0	80	1	60
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												1
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	64			1			799	768	1	769	769	64
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	64			1			799	768	1	769	769	64
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.4	7.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.8	4.9	3.3
p0 queue free %	100			78			100	99	100	66	99	94
cM capacity (veh/h)	1551			1602			238	261	1090	239	186	997

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	1	416	1	141
Volume Left	0	351	0	80
Volume Right	1	0	0	60
cSH	1700	1602	261	382
Volume to Capacity	0.00	0.22	0.01	0.37
Queue Length 95th (ft)	0	21	0	42
Control Delay (s)	0.0	6.9	18.9	19.9
Lane LOS		A	C	C
Approach Delay (s)	0.0	6.9	18.9	19.9
Approach LOS			C	C

Intersection Summary			
Average Delay	10.2		
Intersection Capacity Utilization	39.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	55	0	0	286	18	5	0	52	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
Hourly flow rate (vph)	0	74	0	0	386	24	7	0	70	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)									1			
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	411			74			473	485	74	508	473	399
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	411			74			473	485	74	508	473	399
tC, single (s)	4.1			4.1			7.1	6.5	6.3	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.4	3.5	4.0	3.3
p0 queue free %	100			100			99	100	93	100	100	100
cM capacity (veh/h)	1159			1538			505	485	971	444	493	655

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	74	411	77
Volume Left	0	0	7
Volume Right	0	24	70
cSH	1159	1700	1064
Volume to Capacity	0.00	0.24	0.07
Queue Length 95th (ft)	0	0	6
Control Delay (s)	0.0	0.0	9.3
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.3
Approach LOS			A

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	26.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	43	59	182	287	19	70
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	51	69	214	338	22	82
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			120		816	51
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			120		816	51
tC, single (s)			4.2		6.7	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.8	3.4
p0 queue free %			85		92	92
cM capacity (veh/h)			1443		266	990

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	51	69	214	338	105
Volume Left	0	0	214	0	22
Volume Right	0	69	0	0	82
cSH	1700	1700	1443	1700	1245
Volume to Capacity	0.03	0.04	0.15	0.20	0.08
Queue Length 95th (ft)	0	0	13	0	7
Control Delay (s)	0.0	0.0	7.9	0.0	11.3
Lane LOS			A		B
Approach Delay (s)	0.0		3.1		11.3
Approach LOS					B

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	26.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	12	14	8	80	87	34
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.61	0.61	0.61	0.61	0.61	0.61
Hourly flow rate (vph)	20	23	13	131	143	56
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	300	143	198			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	300	143	198			
tC, single (s)	6.7	7.0	5.0			
tC, 2 stage (s)						
tF (s)	3.8	4.0	3.0			
p0 queue free %	97	97	99			
cM capacity (veh/h)	628	729	999			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	43	13	131	143	56
Volume Left	20	13	0	0	0
Volume Right	23	0	0	0	56
cSH	679	999	1700	1700	1700
Volume to Capacity	0.06	0.01	0.08	0.08	0.03
Queue Length 95th (ft)	5	1	0	0	0
Control Delay (s)	10.7	8.7	0.0	0.0	0.0
Lane LOS	B	A			
Approach Delay (s)	10.7	0.8		0.0	
Approach LOS	B				

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	16.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	18	0	99	17	120	0	0	137	105
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
Hourly flow rate (vph)	0	0	0	27	0	150	26	182	0	0	208	159
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	670	520	287	520	600	182	367			182		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	670	520	287	520	600	182	367			182		
tC, single (s)	7.1	6.5	6.2	7.3	6.5	6.5	4.3			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.7	4.0	3.6	2.4			2.2		
p0 queue free %	100	100	100	94	100	81	98			100		
cM capacity (veh/h)	298	452	757	431	408	798	1094			1406		

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	177	208	367
Volume Left	27	26	0
Volume Right	150	0	159
cSH	706	1094	1700
Volume to Capacity	0.25	0.02	0.22
Queue Length 95th (ft)	25	2	0
Control Delay (s)	11.8	1.2	0.0
Lane LOS	B	A	
Approach Delay (s)	11.8	1.2	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	34.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	92	0	16	0	0	0	0	44	19	101	55	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
Hourly flow rate (vph)	124	0	22	0	0	0	0	59	26	136	74	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	420	432	74	441	420	72	74			85		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	420	432	74	441	420	72	74			85		
tC, single (s)	7.7	6.5	6.4	7.1	6.5	6.2	4.1			4.9		
tC, 2 stage (s)												
tF (s)	4.1	4.0	3.5	3.5	4.0	3.3	2.2			2.9		
p0 queue free %	70	100	98	100	100	100	100			88		
cM capacity (veh/h)	411	456	932	470	464	995	1538			1129		

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	146	85	211
Volume Left	124	0	136
Volume Right	22	26	0
cSH	448	1700	1129
Volume to Capacity	0.33	0.05	0.12
Queue Length 95th (ft)	35	0	10
Control Delay (s)	16.9	0.0	6.0
Lane LOS	C		A
Approach Delay (s)	16.9	0.0	6.0
Approach LOS	C		

Intersection Summary			
Average Delay	8.4		
Intersection Capacity Utilization	27.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	1	0	105	1	0	0	14	93	16	1	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	0	1	0	128	1	0	0	17	113	20	1	1
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												1
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1			1			260	259	1	380	259	1
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1			1			260	259	1	380	259	1
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.5	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.9	4.0	3.3
p0 queue free %	100			92			100	97	90	95	100	100
cM capacity (veh/h)	1635			1602			653	597	1089	418	597	1089

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	1	129	130	22
Volume Left	0	128	0	20
Volume Right	0	0	113	1
cSH	1700	1602	983	454
Volume to Capacity	0.00	0.08	0.13	0.05
Queue Length 95th (ft)	0	7	11	4
Control Delay (s)	0.0	7.4	9.2	13.5
Lane LOS		A	A	B
Approach Delay (s)	0.0	7.4	9.2	13.5
Approach LOS			A	B

Intersection Summary			
Average Delay	8.7		
Intersection Capacity Utilization	26.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	45	64	0	0	106	32	0	0	225	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Hourly flow rate (vph)	58	83	0	0	138	42	0	0	292	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)									1			
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	179			83			358	379	83	505	358	158
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	179			83			358	379	83	505	358	158
tC, single (s)	4.1			4.1			7.1	6.5	6.3	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.4	3.5	4.0	3.3
p0 queue free %	96			100			100	100	70	100	100	100
cM capacity (veh/h)	1390			1527			581	533	963	324	547	892

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	142	179	292
Volume Left	58	0	0
Volume Right	0	42	292
cSH	1390	1700	722
Volume to Capacity	0.04	0.11	0.40
Queue Length 95th (ft)	3	0	49
Control Delay (s)	3.4	0.0	13.3
Lane LOS	A		B
Approach Delay (s)	3.4	0.0	13.3
Approach LOS			B

Intersection Summary			
Average Delay	7.1		
Intersection Capacity Utilization	26.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	266	21	112	111	27	129
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	299	24	126	125	30	145
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			322		675	299
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			322		675	299
tC, single (s)			4.2		6.6	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.7	3.4
p0 queue free %			89		91	80
cM capacity (veh/h)			1168		349	724

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	299	24	126	125	175
Volume Left	0	0	126	0	30
Volume Right	0	24	0	0	145
cSH	1700	1700	1168	1700	876
Volume to Capacity	0.18	0.01	0.11	0.07	0.20
Queue Length 95th (ft)	0	0	9	0	19
Control Delay (s)	0.0	0.0	8.5	0.0	12.1
Lane LOS			A		B
Approach Delay (s)	0.0		4.2		12.1
Approach LOS					B

Intersection Summary			
Average Delay	4.3		
Intersection Capacity Utilization	33.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	57	25	31	87	84	55
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	71	31	39	109	105	69
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	291	105	174			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	291	105	174			
tC, single (s)	6.4	6.6	4.7			
tC, 2 stage (s)						
tF (s)	3.5	3.7	2.7			
p0 queue free %	89	96	97			
cM capacity (veh/h)	676	849	1134			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	102	39	109	105	69
Volume Left	71	39	0	0	0
Volume Right	31	0	0	0	69
cSH	720	1134	1700	1700	1700
Volume to Capacity	0.14	0.03	0.06	0.06	0.04
Queue Length 95th (ft)	12	3	0	0	0
Control Delay (s)	10.8	8.3	0.0	0.0	0.0
Lane LOS	B	A			
Approach Delay (s)	10.8	2.2		0.0	
Approach LOS	B				

Intersection Summary			
Average Delay	3.4		
Intersection Capacity Utilization	19.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	8	0	113	23	133	0	0	153	103
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Hourly flow rate (vph)	0	0	0	10	0	145	29	171	0	0	196	132
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	637	492	262	492	558	171	328			171		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	637	492	262	492	558	171	328			171		
tC, single (s)	7.1	6.5	6.2	7.7	6.5	6.7	4.4			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	4.0	4.0	3.8	2.5			2.2		
p0 queue free %	100	100	100	97	100	81	97			100		
cM capacity (veh/h)	311	468	781	400	429	757	1081			1419		

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	155	200	328
Volume Left	10	29	0
Volume Right	145	0	132
cSH	715	1081	1700
Volume to Capacity	0.22	0.03	0.19
Queue Length 95th (ft)	21	2	0
Control Delay (s)	11.4	1.5	0.0
Lane LOS	B	A	
Approach Delay (s)	11.4	1.5	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	40.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	102	0	29	0	0	0	0	54	19	119	43	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	121	0	35	0	0	0	0	64	23	142	51	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	410	421	51	445	410	76	51			87		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	410	421	51	445	410	76	51			87		
tC, single (s)	7.4	6.5	6.6	7.1	6.5	6.2	4.1			4.4		
tC, 2 stage (s)												
tF (s)	3.8	4.0	3.7	3.5	4.0	3.3	2.2			2.5		
p0 queue free %	74	100	96	100	100	100	100			89		
cM capacity (veh/h)	460	471	914	466	478	991	1568			1340		

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	156	87	193
Volume Left	121	0	142
Volume Right	35	23	0
cSH	517	1700	1340
Volume to Capacity	0.30	0.05	0.11
Queue Length 95th (ft)	31	0	9
Control Delay (s)	14.9	0.0	6.1
Lane LOS	B		A
Approach Delay (s)	14.9	0.0	6.1
Approach LOS	B		

Intersection Summary			
Average Delay	8.1		
Intersection Capacity Utilization	29.6%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix G Year 2017 Total Traffic Operations Worksheets & Left-Turn Warrants

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	1	246	45	0	0	1	0	57	1	42
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Hourly flow rate (vph)	0	0	1	351	64	0	0	1	0	81	1	60
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												1
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	64			1			799	768	1	769	769	64
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	64			1			799	768	1	769	769	64
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.4	7.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.8	4.9	3.3
p0 queue free %	100			78			100	99	100	66	99	94
cM capacity (veh/h)	1551			1602			238	261	1090	239	186	997

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	1	416	1	143
Volume Left	0	351	0	81
Volume Right	1	0	0	60
cSH	1700	1602	261	380
Volume to Capacity	0.00	0.22	0.01	0.38
Queue Length 95th (ft)	0	21	0	43
Control Delay (s)	0.0	6.9	18.9	20.1
Lane LOS		A	C	C
Approach Delay (s)	0.0	6.9	18.9	20.1
Approach LOS			C	C

Intersection Summary			
Average Delay	10.3		
Intersection Capacity Utilization	39.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	56	0	0	286	19	5	0	52	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
Hourly flow rate (vph)	0	76	0	0	386	26	7	0	70	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)									1			
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	412			76			475	488	76	510	475	399
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	412			76			475	488	76	510	475	399
tC, single (s)	4.1			4.1			7.1	6.5	6.3	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.4	3.5	4.0	3.3
p0 queue free %	100			100			99	100	93	100	100	100
cM capacity (veh/h)	1158			1536			503	483	969	442	491	655

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	76	412	77
Volume Left	0	0	7
Volume Right	0	26	70
cSH	1158	1700	1062
Volume to Capacity	0.00	0.24	0.07
Queue Length 95th (ft)	0	0	6
Control Delay (s)	0.0	0.0	9.3
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.3
Approach LOS			A

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	26.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	43	60	184	287	20	72
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	51	71	216	338	24	85
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			121		821	51
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			121		821	51
tC, single (s)			4.2		6.7	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.8	3.4
p0 queue free %			85		91	91
cM capacity (veh/h)			1442		263	990

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	51	71	216	338	108
Volume Left	0	0	216	0	24
Volume Right	0	71	0	0	85
cSH	1700	1700	1442	1700	1212
Volume to Capacity	0.03	0.04	0.15	0.20	0.09
Queue Length 95th (ft)	0	0	13	0	7
Control Delay (s)	0.0	0.0	7.9	0.0	11.4
Lane LOS			A		B
Approach Delay (s)	0.0		3.1		11.4
Approach LOS					B

Intersection Summary			
Average Delay	3.8		
Intersection Capacity Utilization	26.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	12	14	8	81	88	34
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.61	0.61	0.61	0.61	0.61	0.61
Hourly flow rate (vph)	20	23	13	133	144	56
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	303	144	200			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	303	144	200			
tC, single (s)	6.7	7.0	5.0			
tC, 2 stage (s)						
tF (s)	3.8	4.0	3.0			
p0 queue free %	97	97	99			
cM capacity (veh/h)	625	727	997			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	43	13	133	144	56
Volume Left	20	13	0	0	0
Volume Right	23	0	0	0	56
cSH	676	997	1700	1700	1700
Volume to Capacity	0.06	0.01	0.08	0.08	0.03
Queue Length 95th (ft)	5	1	0	0	0
Control Delay (s)	10.7	8.7	0.0	0.0	0.0
Lane LOS	B	A			
Approach Delay (s)	10.7	0.8		0.0	
Approach LOS	B				

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	16.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	18	0	100	17	120	0	0	138	105
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
Hourly flow rate (vph)	0	0	0	27	0	152	26	182	0	0	209	159
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	673	522	289	522	602	182	368			182		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	673	522	289	522	602	182	368			182		
tC, single (s)	7.1	6.5	6.2	7.3	6.5	6.5	4.3			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.7	4.0	3.6	2.4			2.2		
p0 queue free %	100	100	100	94	100	81	98			100		
cM capacity (veh/h)	295	451	755	430	407	798	1093			1406		

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	179	208	368
Volume Left	27	26	0
Volume Right	152	0	159
cSH	706	1093	1700
Volume to Capacity	0.25	0.02	0.22
Queue Length 95th (ft)	25	2	0
Control Delay (s)	11.8	1.2	0.0
Lane LOS	B	A	
Approach Delay (s)	11.8	1.2	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	34.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	92	0	16	0	0	0	0	44	19	102	55	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
Hourly flow rate (vph)	124	0	22	0	0	0	0	59	26	138	74	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	422	435	74	444	422	72	74			85		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	422	435	74	444	422	72	74			85		
tC, single (s)	7.7	6.5	6.4	7.1	6.5	6.2	4.1			4.9		
tC, 2 stage (s)												
tF (s)	4.1	4.0	3.5	3.5	4.0	3.3	2.2			2.9		
p0 queue free %	70	100	98	100	100	100	100			88		
cM capacity (veh/h)	409	454	932	467	462	995	1538			1129		

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	146	85	212
Volume Left	124	0	138
Volume Right	22	26	0
cSH	446	1700	1129
Volume to Capacity	0.33	0.05	0.12
Queue Length 95th (ft)	35	0	10
Control Delay (s)	17.0	0.0	6.0
Lane LOS	C		A
Approach Delay (s)	17.0	0.0	6.0
Approach LOS	C		

Intersection Summary			
Average Delay	8.5		
Intersection Capacity Utilization	27.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	1	3	92	1	4	121
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	3	100	1	4	132
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	241	101			101	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	241	101			101	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	745	955			1491	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	4	101	136
Volume Left	1	0	4
Volume Right	3	1	0
cSH	892	1700	1491
Volume to Capacity	0.00	0.06	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	9.1	0.0	0.3
Lane LOS	A		A
Approach Delay (s)	9.1	0.0	0.3
Approach LOS	A		

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	19.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	1	0	105	1	0	0	93	14	17	1	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	0	1	0	128	1	0	0	113	17	21	1	1
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												1
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1			1			260	259	1	332	259	1
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1			1			260	259	1	332	259	1
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.5	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.9	4.0	3.3
p0 queue free %	100			92			100	81	98	95	100	100
cM capacity (veh/h)	1635			1602			653	597	1089	434	597	1089

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	1	129	130	23
Volume Left	0	128	0	21
Volume Right	0	0	17	1
cSH	1700	1602	635	467
Volume to Capacity	0.00	0.08	0.21	0.05
Queue Length 95th (ft)	0	7	19	4
Control Delay (s)	0.0	7.4	12.1	13.3
Lane LOS		A	B	B
Approach Delay (s)	0.0	7.4	12.1	13.3
Approach LOS			B	B

Intersection Summary			
Average Delay	10.0		
Intersection Capacity Utilization	26.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	45	65	0	0	106	34	0	0	225	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Hourly flow rate (vph)	58	84	0	0	138	44	0	0	292	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)									1			
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	182			84			361	383	84	507	361	160
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	182			84			361	383	84	507	361	160
tC, single (s)	4.1			4.1			7.1	6.5	6.3	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.4	3.5	4.0	3.3
p0 queue free %	96			100			100	100	70	100	100	100
cM capacity (veh/h)	1387			1525			579	530	961	323	545	891

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	143	182	292
Volume Left	58	0	0
Volume Right	0	44	292
cSH	1387	1700	721
Volume to Capacity	0.04	0.11	0.41
Queue Length 95th (ft)	3	0	49
Control Delay (s)	3.4	0.0	13.4
Lane LOS	A		B
Approach Delay (s)	3.4	0.0	13.4
Approach LOS			B

Intersection Summary			
Average Delay	7.1		
Intersection Capacity Utilization	26.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	266	22	114	111	29	133
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	299	25	128	125	33	149
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			324		680	299
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			324		680	299
tC, single (s)			4.2		6.6	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.7	3.4
p0 queue free %			89		91	79
cM capacity (veh/h)			1167		346	724

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	299	25	128	125	182
Volume Left	0	0	128	0	33
Volume Right	0	25	0	0	149
cSH	1700	1700	1167	1700	882
Volume to Capacity	0.18	0.01	0.11	0.07	0.21
Queue Length 95th (ft)	0	0	9	0	19
Control Delay (s)	0.0	0.0	8.5	0.0	12.2
Lane LOS			A		B
Approach Delay (s)	0.0		4.3		12.2
Approach LOS					B

Intersection Summary			
Average Delay	4.4		
Intersection Capacity Utilization	33.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	57	25	31	88	86	55
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	71	31	39	110	108	69
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	295	108	176			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	295	108	176			
tC, single (s)	6.4	6.6	4.7			
tC, 2 stage (s)						
tF (s)	3.5	3.7	2.7			
p0 queue free %	89	96	97			
cM capacity (veh/h)	672	846	1131			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	102	39	110	108	69
Volume Left	71	39	0	0	0
Volume Right	31	0	0	0	69
cSH	717	1131	1700	1700	1700
Volume to Capacity	0.14	0.03	0.06	0.06	0.04
Queue Length 95th (ft)	12	3	0	0	0
Control Delay (s)	10.9	8.3	0.0	0.0	0.0
Lane LOS	B	A			
Approach Delay (s)	10.9	2.2		0.0	
Approach LOS	B				

Intersection Summary			
Average Delay	3.4		
Intersection Capacity Utilization	19.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	8	0	114	23	133	0	0	155	103
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Hourly flow rate (vph)	0	0	0	10	0	146	29	171	0	0	199	132
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	640	494	265	494	560	171	331			171		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	640	494	265	494	560	171	331			171		
tC, single (s)	7.1	6.5	6.2	7.7	6.5	6.7	4.4			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	4.0	4.0	3.8	2.5			2.2		
p0 queue free %	100	100	100	97	100	81	97			100		
cM capacity (veh/h)	309	466	779	399	428	757	1078			1419		

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	156	200	331
Volume Left	10	29	0
Volume Right	146	0	132
cSH	715	1078	1700
Volume to Capacity	0.22	0.03	0.19
Queue Length 95th (ft)	21	2	0
Control Delay (s)	11.4	1.5	0.0
Lane LOS	B	A	
Approach Delay (s)	11.4	1.5	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	40.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	97	0	29	0	0	0	0	54	19	121	43	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	115	0	35	0	0	0	0	64	23	144	51	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	415	426	51	449	415	76	51			87		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	415	426	51	449	415	76	51			87		
tC, single (s)	7.4	6.5	6.6	7.1	6.5	6.2	4.1			4.4		
tC, 2 stage (s)												
tF (s)	3.8	4.0	3.7	3.5	4.0	3.3	2.2			2.5		
p0 queue free %	75	100	96	100	100	100	100			89		
cM capacity (veh/h)	456	467	914	462	474	991	1568			1340		

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	150	87	195
Volume Left	115	0	144
Volume Right	35	23	0
cSH	516	1700	1340
Volume to Capacity	0.29	0.05	0.11
Queue Length 95th (ft)	30	0	9
Control Delay (s)	14.8	0.0	6.1
Lane LOS	B		A
Approach Delay (s)	14.8	0.0	6.1
Approach LOS	B		

Intersection Summary			
Average Delay	7.9		
Intersection Capacity Utilization	29.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	2	6	144	1	3	138
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	7	157	1	3	150
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	314	157			158	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	314	157			158	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	99			100	
cM capacity (veh/h)	678	888			1422	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	9	158	153
Volume Left	2	0	3
Volume Right	7	1	0
cSH	824	1700	1422
Volume to Capacity	0.01	0.09	0.00
Queue Length 95th (ft)	1	0	0
Control Delay (s)	9.4	0.0	0.2
Lane LOS	A		A
Approach Delay (s)	9.4	0.0	0.2
Approach LOS	A		

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	19.7%	ICU Level of Service	A
Analysis Period (min)	15		

Left-Turn Lane Warrant Analysis

KITTELSON & ASSOCIATES, INC.
610 SW Alder, Suite 700
Portland, Oregon 97205
(503) 228-5230
Fax: (503) 273-8169

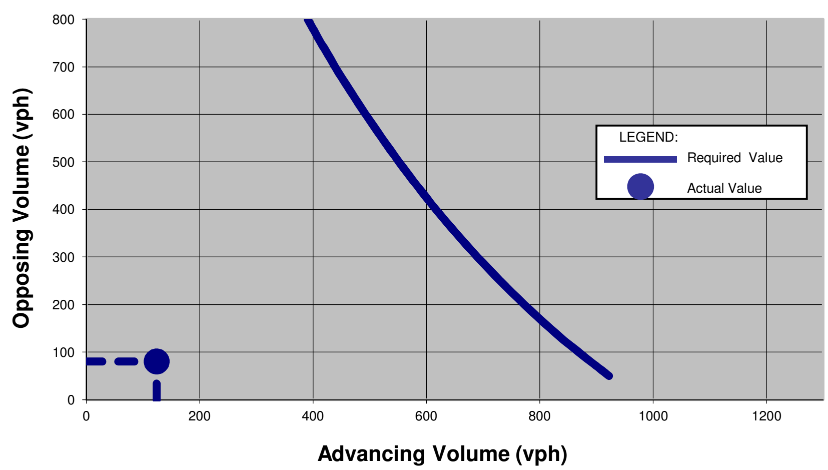
Project #:	13954
Project Name:	Perennial Wind Chaser Station
Analyst:	AXM
Intersection:	Site Access
Scenario:	2017 Total AM Peak
Date:	12/9/2013
File:	C:\Users\amalinge\Desktop\13954 - Perennial Wind Chaser Station\excel\[LT Warrant_2017ttam.xls]Main

Input Data:

Advancing Volume (vph) =	124	
Left-turning Vehicles (vph) =	3	
Opposing Volume (vph) =	80	
Speed (mph) =	45	
Number of Approach Lanes =	1	(not applicable for two lanes)

% Left-Turning Vehicles	2%
Critical Gap (sec) =	5
Maneuver Time (sec) =	3
Exit Time (sec) =	1.9
Utilization Factor =	0.015

Left-Turn Lane Warrant Analysis Results



* Based on *Volume Warrants for Left-Turn Storage Lanes at Unsignalized Grade Intersections* (D. Harmelink)

Left-Turn Lane Warrant Analysis

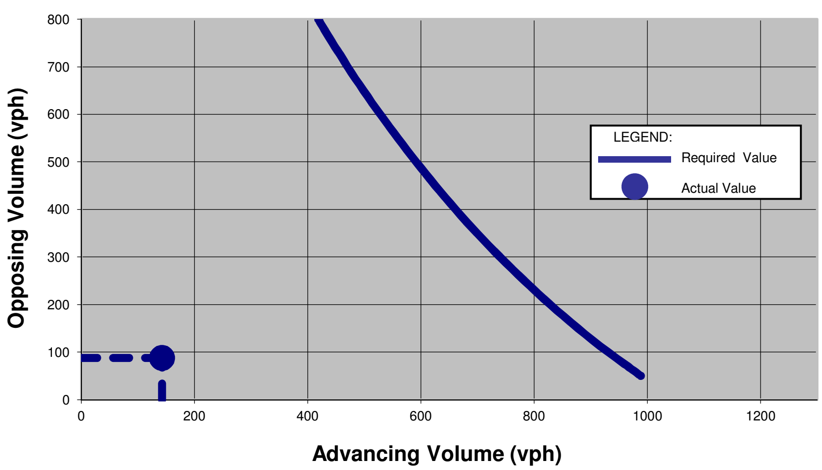
Project #:	13954
Project Name:	Perennial Wind Chaser Station
Analyst:	AXM
Intersection:	Site Access
Scenario:	2017 Total PM Peak
Date:	12/9/2013
File:	C:\Users\amalinge\Desktop\13954 - Perennial Wind Chaser Station\excel\[LT Warrant_2017ttpm.xls]Main

KITTELSON & ASSOCIATES, INC.
610 SW Alder, Suite 700
Portland, Oregon 97205
(503) 228-5230
Fax: (503) 273-8169

Input Data:

Advancing Volume (vph) =	143	
Left-turning Vehicles (vph) =	3	
Opposing Volume (vph) =	88	
Speed (mph) =	45	
Number of Approach Lanes =	1	(not applicable for two lanes)
% Left-Turning Vehicles	2%	
Critical Gap (sec) =	5	
Maneuver Time (sec) =	3	
Exit Time (sec) =	1.9	
Utilization Factor =	0.015	

Left-Turn Lane Warrant Analysis Results



* Based on *Volume Warrants for Left-Turn Storage Lanes at Unsignalized Grade Intersections* (D. Harmelink)

Appendix H Year 2016 Total Traffic Operations Worksheets

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	1	244	44	0	0	1	0	132	1	42
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Hourly flow rate (vph)	0	0	1	349	63	0	0	1	0	189	1	60
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												1
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	63			1			791	761	1	761	761	63
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	63			1			791	761	1	761	761	63
tC, single (s)	4.1			4.1			7.1	7.5	6.2	7.2	7.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.9	3.3	3.6	4.9	3.3
p0 queue free %	100			78			100	99	100	26	99	94
cM capacity (veh/h)	1553			1602			241	189	1090	256	189	999

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	1	411	1	250
Volume Left	0	349	0	189
Volume Right	1	0	0	60
cSH	1700	1602	189	318
Volume to Capacity	0.00	0.22	0.01	0.79
Queue Length 95th (ft)	0	21	1	158
Control Delay (s)	0.0	6.9	24.2	47.8
Lane LOS		A	C	E
Approach Delay (s)	0.0	6.9	24.2	47.8
Approach LOS			C	E

Intersection Summary			
Average Delay	22.4		
Intersection Capacity Utilization	45.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	132	0	0	283	20	5	0	56	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
Hourly flow rate (vph)	0	178	0	0	382	27	7	0	76	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)									1			
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	409			178			574	588	178	612	574	396
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	409			178			574	588	178	612	574	396
tC, single (s)	4.1			4.1			7.1	6.5	6.3	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.4	3.5	4.0	3.3
p0 queue free %	100			100			98	100	91	100	100	100
cM capacity (veh/h)	1160			1410			432	424	849	372	432	658

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	178	409	82
Volume Left	0	0	7
Volume Right	0	27	76
cSH	1160	1700	925
Volume to Capacity	0.00	0.24	0.09
Queue Length 95th (ft)	0	0	7
Control Delay (s)	0.0	0.0	10.0
Lane LOS			A
Approach Delay (s)	0.0	0.0	10.0
Approach LOS			A

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	26.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	43	140	258	285	21	71
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	51	165	304	335	25	84
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			215		993	51
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			215		993	51
tC, single (s)			4.2		6.7	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.8	3.4
p0 queue free %			77		87	92
cM capacity (veh/h)			1331		188	990

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	51	165	304	335	108
Volume Left	0	0	304	0	25
Volume Right	0	165	0	0	84
cSH	1700	1700	1331	1700	822
Volume to Capacity	0.03	0.10	0.23	0.20	0.13
Queue Length 95th (ft)	0	0	22	0	11
Control Delay (s)	0.0	0.0	8.5	0.0	13.1
Lane LOS			A		B
Approach Delay (s)	0.0		4.0		13.1
Approach LOS					B

Intersection Summary			
Average Delay	4.2		
Intersection Capacity Utilization	31.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	12	14	8	114	87	34
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.61	0.61	0.61	0.61	0.61	0.61
Hourly flow rate (vph)	20	23	13	187	143	56
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	356	143	198			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	356	143	198			
tC, single (s)	6.7	7.0	5.0			
tC, 2 stage (s)						
tF (s)	3.8	4.0	3.0			
p0 queue free %	97	97	99			
cM capacity (veh/h)	582	729	999			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	43	13	187	143	56
Volume Left	20	13	0	0	0
Volume Right	23	0	0	0	56
cSH	653	999	1700	1700	1700
Volume to Capacity	0.07	0.01	0.11	0.08	0.03
Queue Length 95th (ft)	5	1	0	0	0
Control Delay (s)	10.9	8.7	0.0	0.0	0.0
Lane LOS	B	A			
Approach Delay (s)	10.9	0.6		0.0	
Approach LOS	B				

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	16.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	18	0	127	17	124	0	0	136	105
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
Hourly flow rate (vph)	0	0	0	27	0	192	26	188	0	0	206	159
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	717	525	286	525	605	188	365			188		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	717	525	286	525	605	188	365			188		
tC, single (s)	7.1	6.5	6.2	7.3	6.5	6.4	4.3			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.7	4.0	3.5	2.4			2.2		
p0 queue free %	100	100	100	94	100	76	98			100		
cM capacity (veh/h)	259	450	758	428	405	805	1096			1398		

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	220	214	365
Volume Left	27	26	0
Volume Right	192	0	159
cSH	726	1096	1700
Volume to Capacity	0.30	0.02	0.21
Queue Length 95th (ft)	32	2	0
Control Delay (s)	12.1	1.2	0.0
Lane LOS	B	A	
Approach Delay (s)	12.1	1.2	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	3.6		
Intersection Capacity Utilization	36.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	97	0	16	0	0	0	0	43	19	100	54	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
Hourly flow rate (vph)	131	0	22	0	0	0	0	58	26	135	73	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	414	427	73	436	414	71	73			84		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	414	427	73	436	414	71	73			84		
tC, single (s)	7.7	6.5	6.4	7.1	6.5	6.2	4.1			4.9		
tC, 2 stage (s)												
tF (s)	4.1	4.0	3.5	3.5	4.0	3.3	2.2			2.9		
p0 queue free %	68	100	98	100	100	100	100			88		
cM capacity (veh/h)	415	460	933	474	468	997	1540			1131		

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	153	84	208
Volume Left	131	0	135
Volume Right	22	26	0
cSH	450	1700	1131
Volume to Capacity	0.34	0.05	0.12
Queue Length 95th (ft)	37	0	10
Control Delay (s)	17.0	0.0	6.0
Lane LOS	C		A
Approach Delay (s)	17.0	0.0	6.0
Approach LOS	C		

Intersection Summary			
Average Delay	8.6		
Intersection Capacity Utilization	28.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	4	92	34	158	121
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	4	100	37	172	132
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	593	118			137	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	593	118			137	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			88	
cM capacity (veh/h)	412	933			1447	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	4	137	303
Volume Left	0	0	172
Volume Right	4	37	0
cSH	933	1700	1447
Volume to Capacity	0.00	0.08	0.12
Queue Length 95th (ft)	0	0	10
Control Delay (s)	8.9	0.0	4.9
Lane LOS	A		A
Approach Delay (s)	8.9	0.0	4.9
Approach LOS	A		

Intersection Summary			
Average Delay	3.4		
Intersection Capacity Utilization	35.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	1	0	104	1	0	0	13	92	17	1	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	0	1	0	127	1	0	0	16	112	21	1	1
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												1
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1			1			257	256	1	376	256	1
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1			1			257	256	1	376	256	1
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.5	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.9	4.0	3.3
p0 queue free %	100			92			100	97	90	95	100	100
cM capacity (veh/h)	1635			1602			656	600	1089	422	600	1089

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	1	128	128	23
Volume Left	0	127	0	21
Volume Right	0	0	112	1
cSH	1700	1602	989	456
Volume to Capacity	0.00	0.08	0.13	0.05
Queue Length 95th (ft)	0	6	11	4
Control Delay (s)	0.0	7.4	9.2	13.5
Lane LOS		A	A	B
Approach Delay (s)	0.0	7.4	9.2	13.5
Approach LOS			A	B

Intersection Summary			
Average Delay	8.7		
Intersection Capacity Utilization	26.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	44	65	0	5	105	108	0	0	223	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Hourly flow rate (vph)	57	84	0	6	136	140	0	0	290	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)									1			
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	277			84			418	488	84	563	418	206
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	277			84			418	488	84	563	418	206
tC, single (s)	4.1			4.1			7.1	6.5	6.3	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.4	3.5	4.0	3.3
p0 queue free %	96			100			100	100	70	100	100	100
cM capacity (veh/h)	1281			1525			528	459	961	296	503	839

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	142	283	290
Volume Left	57	6	0
Volume Right	0	140	290
cSH	1281	1525	721
Volume to Capacity	0.04	0.00	0.40
Queue Length 95th (ft)	3	0	49
Control Delay (s)	3.4	0.2	13.3
Lane LOS	A	A	B
Approach Delay (s)	3.4	0.2	13.3
Approach LOS			B

Intersection Summary			
Average Delay	6.2		
Intersection Capacity Utilization	26.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	263	22	113	110	108	205
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	296	25	127	124	121	230
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			320		673	296
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			320		673	296
tC, single (s)			4.2		6.4	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.5	3.4
p0 queue free %			89		67	69
cM capacity (veh/h)			1170		371	734

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	296	25	127	124	352
Volume Left	0	0	127	0	121
Volume Right	0	25	0	0	230
cSH	1700	1700	1170	1700	812
Volume to Capacity	0.17	0.01	0.11	0.07	0.43
Queue Length 95th (ft)	0	0	9	0	55
Control Delay (s)	0.0	0.0	8.5	0.0	12.8
Lane LOS			A		B
Approach Delay (s)	0.0		4.3		12.8
Approach LOS					B

Intersection Summary			
Average Delay	6.0		
Intersection Capacity Utilization	36.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	57	25	31	87	117	55
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	71	31	39	109	146	69
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	332	146	215			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	332	146	215			
tC, single (s)	6.4	6.6	4.7			
tC, 2 stage (s)						
tF (s)	3.5	3.7	2.7			
p0 queue free %	89	96	96			
cM capacity (veh/h)	639	803	1092			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	102	39	109	146	69
Volume Left	71	39	0	0	0
Volume Right	31	0	0	0	69
cSH	681	1092	1700	1700	1700
Volume to Capacity	0.15	0.04	0.06	0.09	0.04
Queue Length 95th (ft)	13	3	0	0	0
Control Delay (s)	11.2	8.4	0.0	0.0	0.0
Lane LOS	B	A			
Approach Delay (s)	11.2	2.2		0.0	
Approach LOS	B				

Intersection Summary			
Average Delay	3.2		
Intersection Capacity Utilization	19.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	8	0	113	23	133	0	0	181	107
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Hourly flow rate (vph)	0	0	0	10	0	145	29	171	0	0	232	137
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	675	530	301	530	599	171	369			171		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	675	530	301	530	599	171	369			171		
tC, single (s)	7.1	6.5	6.2	7.7	6.5	6.7	4.4			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	4.0	4.0	3.8	2.5			2.2		
p0 queue free %	100	100	100	97	100	81	97			100		
cM capacity (veh/h)	293	444	744	376	406	757	1042			1419		

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	155	200	369
Volume Left	10	29	0
Volume Right	145	0	137
cSH	709	1042	1700
Volume to Capacity	0.22	0.03	0.22
Queue Length 95th (ft)	21	2	0
Control Delay (s)	11.5	1.5	0.0
Lane LOS	B	A	
Approach Delay (s)	11.5	1.5	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	40.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	102	0	29	0	0	0	0	54	19	147	43	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	121	0	35	0	0	0	0	64	23	175	51	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	477	488	51	511	477	76	51			87		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	477	488	51	511	477	76	51			87		
tC, single (s)	7.4	6.5	6.6	7.1	6.5	6.2	4.1			4.4		
tC, 2 stage (s)												
tF (s)	3.8	4.0	3.7	3.5	4.0	3.3	2.2			2.5		
p0 queue free %	70	100	96	100	100	100	100			87		
cM capacity (veh/h)	406	420	914	412	426	991	1568			1340		

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	156	87	226
Volume Left	121	0	175
Volume Right	35	23	0
cSH	463	1700	1340
Volume to Capacity	0.34	0.05	0.13
Queue Length 95th (ft)	37	0	11
Control Delay (s)	16.7	0.0	6.5
Lane LOS	C		A
Approach Delay (s)	16.7	0.0	6.5
Approach LOS	C		

Intersection Summary			
Average Delay	8.7		
Intersection Capacity Utilization	31.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	34	158	144	0	4	138
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	37	172	157	0	4	150
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	315	157			157	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	315	157			157	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	95	81			100	
cM capacity (veh/h)	676	889			1423	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	209	157	154
Volume Left	37	0	4
Volume Right	172	0	0
cSH	842	1700	1423
Volume to Capacity	0.25	0.09	0.00
Queue Length 95th (ft)	24	0	0
Control Delay (s)	10.7	0.0	0.2
Lane LOS	B		A
Approach Delay (s)	10.7	0.0	0.2
Approach LOS	B		

Intersection Summary			
Average Delay	4.4		
Intersection Capacity Utilization	28.8%	ICU Level of Service	A
Analysis Period (min)	15		

EXHIBIT V

SOLID WASTE AND WASTEWATER

TABLES

FIGURES

APPENDICES

V.1 INTRODUCTION

OAR 345-021-0010(1)(v) *Information about the applicant's plans to minimize the generation of solid waste and wastewater and to recycle or reuse solid waste and wastewater, providing evidence to support a finding by the Council as required by OAR 345-022-0120.*

Response: The Oregon Energy Facility Siting Council (Council) standards to which this exhibit relates to are found in Oregon Administrative Rules (OAR) 345-022-0120 (1)(a) and (b).

OAR 345-022-0120 (1)(a) and (b) provides:

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.

This exhibit identifies the estimated volumes and types of waste that will be produced during construction, operation, and retirement of the Perennial Wind Chaser Station (Project); the structures and systems Perennial-WindChaser LLC (Perennial) will operate to handle the wastes; how Perennial will reduce, recycle, and reuse waste; and how Perennial will mitigate adverse impacts. Exhibit O – Water Use contains information regarding water uses, losses, and water use permits. Refer to Exhibit B – Project Information for a description of the Project; refer to Exhibit C – Location for a description of the location of the Project.

The Project is dependent upon the third party permits of the Hermiston Generating Plant (HGP) and the Lamb Weston, Hermiston Plant (Lamb Weston) with regard to managing its wastewaters. Lamb Weston's Water Pollution Control Facilities (WPCF) Permit allows Lamb Weston to manage and utilize the HGP's reclaimed water, along with its 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 approved by the Oregon Department of Environmental Quality (DEQ). Lamb Weston's permit is currently being renewed by DEQ. 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 is eventually able to accept reclaimed water from the HGP that has come from the Perennial Wind Chaser Station (Station), then Perennial would like to have the necessary process and approvals in place to do so. This exhibit details how the Project will comply with any applicable Council standards under this option. Should Lamb Weston not be able to accept reclaimed water from the HGP that has come from the Station, then Perennial would install a zero liquid discharge (ZLD) system. A complete description of the ZLD system and structures is included in Exhibit B – Project Description. Because the ZLD option is a potential alternative, the management of waste using a ZLD system is reviewed separately in Appendix V-1. This appendix also details how the Project would comply with any applicable Council standards if it were to use a ZLD system.

V.2 SUMMARY

The Station will produce both liquid and solid waste. All process wastewater produced during facility operations will be reclaimed and sent to the HGP as makeup water for its energy generating systems. The HGP reclaims its wastewater by providing it to Lamb Weston for reuse in its washing systems and/or sending it directly for land application under Lamb-Weston's WPCF Permit 48780.

Project construction and retirement are anticipated to produce larger quantities of solid waste than facility operation. Solid waste will be recycled or reused as much as practicable, with the balance disposed of in a solid waste landfill. None of the waste disposal practices employed during construction, operation, or retirement of the Project will have a significant impact on the environment. This exhibit addresses potential impacts on the environment and the area around the Station; Exhibit U – Public Services contains information regarding potential impacts of solid waste and wastewater to specific public service providers.

V.3 TYPES OF WASTE

OAR 345-021-0010(1)(v)(A) *A description of the major types of solid waste and wastewater that construction, operation and retirement of the facility are likely to generate, including an estimate of the amount of solid waste and wastewater.*

V.3.1 Solid Waste

Solid Waste Produced During Construction

Response: Construction of the Project will generate a variety of non-hazardous, inert wastes. Solid waste will consist of domestic refuse; office waste; packaging materials (e.g., pallets, cardboard, packing paper, steel banding); steel cut-offs; and construction materials (e.g., concrete waste, wood, plastic, glass, erosion control materials, and miscellaneous debris). It is estimated that the Project will produce about 2.5 tons per month of solid waste during significant construction. Significant construction, which, involves construction of the Station and related facilities is estimated to be conducted for approximately 18 months. Potential hazardous waste could include oil rags, spent batteries, and equipment maintenance solvents, paints, and oils. Hazardous waste is expected to be generated at a rate that is less than 220 pounds per month, which qualifies the Facility as a Conditionally Exempt Small Quantity (CESQ) Generator of hazardous waste per Title 40 Code of Federal Regulations Part 261.5. Furthermore, the Station will store less than 2,200 pounds of hazardous waste at a time. Perennial will develop a Hazardous Materials Management Plan for management of hazardous wastes and hazardous materials generated and used during construction of the Project. The hazardous waste will be collected in sealable drums or containers in a secure onsite location. The construction contractor will be responsible for implementing the recycling programs to minimize waste and proper disposal of solid waste.

Startup, testing, and commissioning will occur for about four months after construction is complete. Solid waste generated during this period will be similar to that generated during operations, except for wastewater, which will be used for testing of equipment and piping.

Solid Waste Produced During Operation

Approximately 10 tons per year of refuse will be produced at the Station during normal operation. Solid waste will consist of office and maintenance waste. Hazardous waste may include oil rags, spent batteries, fluorescent lights and equipment, maintenance solvents, and oils. It is expected that the Station will be classified as a CESQ Generator of hazardous waste, as most power plants are classified. Perennial will develop a Hazardous Materials Management Plan to manage hazardous wastes and hazardous materials generated and used during operation of the Station. The hazardous waste will be collected in sealable drums or containers in a secure onsite location.

In addition to the domestic solid waste, additional solid waste may be generated from the Station’s water pretreatment system. The primary source of the solid waste will be silt from the raw water supply. These solids, if generated, are not expected to be hazardous and will be included in the normal maintenance waste.

Solid Waste Produced By Retirement

Project retirement and restoration is expected to result in scrap metal, piping, concrete, fence materials, power lines, and equipment. Exhibit W – Facility Retirement provides an estimate of quantities of materials that would be removed from the site during retirement. Perennial will develop a Hazardous Materials Management Plan to manage hazardous wastes and hazardous materials generated and used during the retirement of the Project. The hazardous waste will be collected in sealable drums or containers in a secure onsite location.

V.3.2 Wastewater

Wastewater Produced During Construction

During construction of the Project, wastewater is expected to result from sanitary waste, stormwater, testing and commissioning of water supply systems, hydrostatic testing, flushing of the water supply pipelines, washing equipment and vehicles, and washing concrete trucks after delivery of concrete loads. The amount of wastewater produced will vary depending on the number of construction workers and weather conditions (which may generate stormwater). Section V.4.2 addresses disposal of wastewater produced during construction. The construction contractor will be responsible for implementing the wastewater recycling programs and proper disposal of wastewater.

Wastewater Produced During Operation

During operation, the Station will produce sanitary sewage, cooling tower blowdown, demineralized water production wastes (from the reverse osmosis unit and neutralization tank), combustion turbine water wash wastes, plant and equipment drain wastes, service water, evaporative cooling, multimedia filtration backwash, and stormwater. Table V-1 provides estimates of the amount of wastewater anticipated to be produced from each source for annual average conditions and summer conditions during operation of the Station.

Amounts of wastewater shown in Table V-1 are based on the volumes shown in Figures O-1 and O-2 of Exhibit O – Water Use, except for the sump cleanouts and turbine wash waste, which are based upon operating experience at the HGP. All estimates are based on a permanent staff of approximately six to eight people and 100 percent electrical load generation. The Station is scheduled to operate at varying load conditions; thus, at any time the quantities of wastewater could range from zero to the amounts stated in the table. The volume of stormwater would depend on weather conditions. Table V-1 also provides information regarding disposal structures and systems, which are discussed in Section V.4.2.

Table V-1 Anticipated Wastewater Volumes

Source of Wastewater	Under Annual Average Conditions gpm	Under Summer Conditions (gpm)	Disposal Systems and Structures
Sanitary Sewage	1	1	Routed by pipe to new onsite leach field
Cooling Tower Blowdown	98	117	Routed by pipe to Hermiston Generating Plant cooling tower basins

Table V-1 Anticipated Wastewater Volumes

Source of Wastewater	Under Annual Average Conditions gpm	Under Summer Conditions (gpm)	Disposal Systems and Structures
RO Wastewater from Demineralized Production	72	67	Routed by pipe to Hermiston Generating Plant cooling tower basins
Evaporative Cooler Blowdown	0	68	Routed by pipe to Hermiston Generating Plant cooling tower basins
Multi-media Filtration Backwash	38	48	Routed by pipe to Hermiston Generating Plant cooling tower basins
Service Water/Plant and Equipment Drains	15	15	Routed by pipe to Hermiston Generating Plant cooling tower basins
Sump Cleanouts	2,000 gallons per cleaning. Twice per year	2,000 gallons per cleaning. Twice per year	Trucked offsite for processing and disposal
Combustion Turbine Water Wash Wastes	2,000 gallons per cleaning. Twice per year	2,000 gallons per cleaning. Twice per year	Trucked offsite for processing and disposal

Key:
gpm gallons per minute
RO reverse osmosis

Cooling tower blowdown is required to maintain the proper water chemistry in the cooling water that circulates between the gas turbine intercooler system and the cooling tower. The evaporation of water in the cooling process leaves behind any solids such as minerals or metals or other constituents of the water that do not evaporate, and a small blowdown stream is used to remove some of the water with a higher concentration of solids and replace it with water with lower concentrations of solids. Tolerance for solids build-up in the intercooler system is low; thus, the cooling tower blowdown from the Station will be a higher grade of wastewater in terms of total dissolved solids (TDS) and can be used for other purposes. Perennial proposes to reclaim the cooling tower blowdown along with other suitable wastewater streams and route it to the HGP's cooling tower basins as makeup water for the cooling towers. This system will enable reuse of wastewater and will also decrease the need for cooling tower chemicals and makeup water at the HGP.

To maintain combustion turbine generator (CTG) efficiency, the compressor section of the CTG will be periodically water-washed to remove any fouling of the compressor blades. Off-line water washing occurs when the CTG is not in operation and the water from the wash is collected in a holding tank. The wash water will contain a detergent used to aid in cleaning any substances washed from the compressor blades. The wash water waste will be tested to determine constituent concentrations and trucked offsite for processing and disposal in an approved facility. Normally, the wastewater would be deemed to be nonhazardous, and a wastewater vendor such as Cowlitz Clean Sweep, Inc. of Longview Washington (CCS) will be contacted to transport the wastewater over to Oil Re-Refining Company, Inc. of Portland Oregon (ORRCO) for treatment and disposal. If the wastewater is deemed hazardous, then CCS will send it to the Chemical Waste Management (CWM) facility in Arlington Oregon or to a similar facility.

Periodically, the Station's process sumps and oil/water separator will be cleaned out. This wastewater is deemed to be nonhazardous, and wastewater vendors such as CCS will be contacted to transport the wastewater to ORRCO for treatment and disposal.

Stormwater from building roofs and other impervious surfaces within the Station will be collected in a stormwater detention basin and allowed to evaporate and percolate. Any stormwater that could be contaminated with oil will first pass through an oil/water separator to remove the oil before routing to the basin.

Wastewater Produced by Retirement

Wastewater produced by retirement of the Project will include stormwater, sanitary waste, and washing equipment and vehicles. The Station will be emptied of all process wastewater by pumping the waters to the HGP cooling tower basins. Sump cleanouts will be sent to ORRCO for treatment and disposal. Once the septic system is decommissioned, portable toilets will be used and managed for the remaining period of retirement operations, and wastewaters will be transported by a contractor to a licensed sewage treatment plant. The stormwater detention basin will be one of the last structures retired. Perennial will obtain a National Pollution Discharge Elimination System (NPDES) Stormwater Discharge General Permit #1200-C to manage the stormwater during decommissioning of the Project.

V.4 DESCRIPTION OF STRUCTURES AND SYSTEMS

OAR 345-021-0010(1)(v)(B) *A description of any structures, systems and equipment for management and disposal of solid waste, wastewater and storm water.*

V.4.1 Structures and Systems for Solid Waste

Construction

Response: During construction, solid waste that cannot be recycled will be collected in roll-off bins and trucked to an approved landfill. The closest landfill is Finley Buttes Regional Landfill, located approximately 14 miles southwest of the Station site; the location of this landfill is shown in Exhibit U – Public Services, Figure U-1. During construction, workers will keep recyclable material separated from the solid waste stream. Recyclable material will be stored and delivered periodically by a contractor to an appropriate recycling facility such as R.S Davis Recycling of Hermiston, Oregon or other recyclers serving the Hermiston area. It is not expected that any special disposal permits will be required during construction. Generation of construction waste will be minimized through use of detailed estimates of material needed and efficient construction practices.

Hazardous waste will be collected in sealable drums or containers in a secure onsite location. A vendor such as CCS will be contacted to remove and will send the hazardous waste to CWM or to a similar facility. Used oil would be collected by vendors such as Heller and Sons' Distributing. Scrap metal would be collected by vendors such as R.S. Davis Recycling.

Operation

During operation, refuse will be collected in a roll-off bin and picked up weekly by a contractor. Ultimate disposal of refuse will take place at a solid waste landfill; the closest landfill is Finley Buttes Regional Landfill. Recyclable material will be separated from the solid waste stream following a developed waste minimization plan, stored, and delivered periodically to a recycling facility. Used oil, lead-acid, nickel-cadmium batteries, and other hazardous waste will be collected in sealable drums or containers in a secure onsite location. A vendor such as CCS will be contacted to remove and will send the hazardous waste to CWM or to a similar facility. Used oil would be collected by vendors such as Heller and Sons' Distributing. Scrap metal would be collected by vendors such as R.S. Davis Recycling.

A Waste Management Procedure (Procedure), which includes a waste minimization plan, will be developed once the facility begins commercial operation, and will cover all generated wastes streams. The Procedure will detail: 1) Program Goals; 2) Responsibilities; 3) Waste Determinations, which includes characterization of the waste streams as hazardous, nonhazardous and recyclable; 4) Storage and Handling Requirements; 5) Recordkeeping Requirements; 6) Training Requirements; and 7) Ongoing Evaluations/Waste Minimization Plan. The Procedure is designed to ensure that the identification and proper management of hazardous waste streams occurs at the Station. Once these requirements are in place, the ongoing evaluations will primarily minimize the waste streams occurring by recycling. All the waste streams that are expected at the Station are common to the waste streams that occur at power plants throughout the state. Best engineering practice has taken this effort to a level where almost all power plants are conditionally exempt small quantity generators of hazardous waste and significant waste minimization efforts have already been established. The Station is expected to be a conditionally exempt small quantity generator, like the HGP. Being able to use the experience and established procedures at the HGP will be the greatest advantage with regard to waste minimization measures. Further waste minimization will be ensured by close attention to future developments in best engineering practices. These practices are usually broadcast in trade journals, trade conventions, and networking with other power personnel. Thus, the primary measures of the waste minimization plan will be implemented with the commencement of commercial operation and by utilizing the experience of the HGP and maintaining best engineering practice in waste management by continued education by way of trade journals, trade conventions, and networking.

Retirement

Waste produced during retirement of the Project will result from disassembling all major plant components and removing them from the site for reuse, scrap material, or disposal at an approved facility. Perennial proposes to recycle solid waste to the greatest extent practicable to minimize the amount requiring landfill disposal. Materials not suitable for recycling or for on-site disposal will be transported to the Finley Buttes Regional Landfill.

V.4.2 Structures and Systems for Wastewater and Storm Water

Construction

Portable toilets will be used during construction of the Project, and sanitary sewage will be managed and transported to a licensed sewage treatment plant by a contractor. The American National Standards Institute specifies one portable toilet per 10 workers for a 40-hour work week. For a peak construction crew of approximately 225 workers, approximately 25 portable toilets would be required.

Wastewater generated during washing equipment and vehicles, and washing concrete trucks after delivery of concrete loads will be treated with an oil/water separator and routed to the stormwater detention basin. Wastewater generated during testing and commissioning of the water supply systems, hydrostatic testing, and flushing of the water lines will be tested (dependent upon its use) to determine the concentrations of the constituents present and then either trucked offsite for processing and disposal by CCS or routed to the HGP to supplement its cooling tower makeup water demand. Significant amounts of construction wastewater will not be generated until later phases of construction to support testing and commissioning activities; therefore, the wastewater generated will be scheduled with the HGP so that the water can be effectively reclaimed. An estimate of construction water demand is provided in Section O.2.1 of Exhibit O – Water Use. The estimated demand becomes essentially the wastewater amounts. Scheduling is necessary because the reclaimed water may come in large quantities. The HGP can reduce its makeup water demand, thus lowering the water levels in the cooling tower basins to compensate for these larger quantities of water. This water will be piped to the HGP utilizing the new piping arrangement with HGP.

Perennial will manage stormwater and other surface water discharges in conformance with the NPDES Stormwater Discharge General Permit #1200-C. A copy of the permit application is included in Exhibit I – Soils.

Operation

The structures and systems for managing wastewater, the sanitary system, and stormwater are the HGP reclaim wastewater system, sanitary septic system, and stormwater detention basin, respectively. Each system is discussed in subsequent sections.

HGP Reclaim Wastewater System

The HGP currently utilizes a system in which permitted wastewaters are routed to Lamb Weston for reuse in its facility for washdowns and similar purposes and/or directly to land applications by Lamb Weston for irrigation purposes. The HGP has a contract in place with Lamb Weston that places conditions on the quality and quantity of reclaimed water that can be routed to Lamb Weston. The HGP also has obtained the approval of the Council in the Second and Third Amended Site Certificates for its own system of reclaiming its wastewaters; however, the HGP has not utilized this system in many years and has no plans to do so except in emergencies. Lamb Weston has been issued a WPCF Permit by DEQ approving the acceptance of reclaimed water from the HGP. This permit is currently up for renewal. No concerns or notices of noncompliance have been issued to Lamb Weston regarding this permit in the past five years. Nor have there been any quality or quantity issues with Lamb Weston regarding the reclaimed water coming from the HGP.

The Project's Notice of Intent stated that Perennial would route the Station's wastewaters to Lamb Weston, in the same manner as the HGP wastewater. However, upon further review, it became apparent that there were several differences between the wastewater generated by the HGP and the Station. First, the Station will generate a higher quality of wastewater. Cooling water at the Station will be used internally in the turbine equipment, which requires high water quality specifications. Cooling water at the HGP is used mainly for condensation of the steam turbine, which is not as sensitive with regard to water quality as is a combustion turbine.

Second, the amount of wastewater generated by the Station will be highly variable. The Station is being permitted for 4,400 hours per year, so wastewater rates from 0 to 100 percent load are expected. Water demand and wastewater generation at the HGP are more stable. Thus, there is both an economic and environmental benefit in routing the Station's wastewater to the HGP for process water makeup instead of directly to Lamb Weston. Water provided by the Station will reduce the amount of fresh water that the HGP needs from the Port of Umatilla, as well as the HGPs need for cooling tower chemicals. The reclaimed water routed to Lamb Weston will be within the parameters of the current agreement between the HGP and Lamb Weston. Figures V-1 and V-2 provide the water mass balance for summer (worst case) and annual average conditions for the HGP utilizing reclaimed water from the Station. Note that these figures are identical to the water balances presented in Exhibit O – Water Use. Table V-2 provides information regarding the quality and quantity of the anticipated wastewater streams.

Table V-2 Anticipated Quality and Quantity of Wastewaters

		Discharge Annual Average		Discharge Summer Maximum	
	River Water Makeup	Wind Chaser Discharge	HGP Discharge	Wind Chaser Discharge	HGP Discharge
Flow Rate, gpm	NA	223	187	315	200
Ca, mg/L (as $CaCO_3$)	43.5	261	689	229	784
Mg, mg/L (as $CaCO_3$)	20.2	118	313	104	356
Na, mg/L (as $CaCO_3$)	13.7	92	249	80	281
K, mg/L	0	0	0	0	0
M-Alkalinity, mg/L	64	158	150	145	150
SO_4, mg/L (as $CaCO_3$)	11.2	263	962	224	1115
Cl, mg/L (as $CaCO_3$)	5.2	38	107	33	121
NO_3, mg/L	0	0	0	0	0
CO_2, mg/L	10	10	10	12	10
SiO_2, mg/L	8.1	48	127	42	145
TDS, mg/L	124	695	1777	611	2015

Key:

Ca	calcium	mg/L	milligrams per liter
Cl	chlorine	Na	sodium
CO_2	carbon dioxide	NA	not applicable
gpm	gallons per minute	NO_3	nitrate
HGP	Hermiston Generating Plant	SiO_2	silicon dioxide
K	potassium	SO_4	sulfate
Mg	magnesium	TDS	total dissolved solids

Note that in Table V-2, the constituent levels are lower during a summer peak episode when compared to the annual average due to the use of the evaporative cooler during the summer time. When in service, the evaporative cooler will operate at two cycles of concentration, and the blowdown quality will be a better quality than the cooling tower blowdown, which operates at 10 cycles of concentration. When blended together, in the summer case, the resultant plant discharge is of a better quality than the annual average case.

Table V-3 shows the changes that Lamb Weston would expect in the combined HGP and Station reclaimed waters compared to a two-year average of the historical flow rates and solids in the reclaimed waters sent from the HGP to Lamb Weston.

Table V-3 Anticipated Changes to the Reclaimed Waters Routed to Lamb Weston

Historical Flow Rates	109 gpm	Just HGP to LW
Proposed Flow Rates	148 gpm[1]	HGP+Station to LW
Percent Change	36%	
Historical Solids	403 tpy[2]	Just HGP to LW
Proposed Solids	566 tpy[3]	HGP+Station to LW
Percent Change	40%	

Notes:

1 An annual average would be the HGP's historical gpm flow rate of 109 gpm for 4,360 hours and HGP+Station proposed 187 gpm for 4,400 hours or equivalent to a 148 gpm annual average flow rate.

2 HGP measures conductivity of the reclaimed water. These measurements were converted to TDS concentrations by a factor of 0.67. Solids were calculated based on the 109 gpm flow rate and an annual average TDS level of 1,690 ppm for 8,760 hours per year.

3 Solids were calculated based on a 109 gpm flow rate and an annual average TDS level of 1,690 ppm for 4,360 hours per year (the HGP's historical flow rate) and a 187-gpm flow rate with a TDS level of 1,777 ppm for 4,400 hours per year (the combined HGP and Station flow rate).

Key:

gpm gallons per minute
HGP Hermiston Generating Plant
LW Lamb Weston
ppm parts per million
TDS total dissolved solids
tpy tons per year

Thus the Project will add 36 percent more water that can be used for irrigation purposes from the HGP, but the proposed solids generated will increase by 40 percent. The increase of 163 tons of solids per year due to the addition of the Station is not expected to cause a significant impact related to reclaiming the water for irrigation purposes.

Sanitary Septic System

Perennial will construct a new sanitary septic leach field onsite for the six to eight employees at the Station. Appendix V-2 contains details of the proposed sanitary system and demonstrates the Project's compliance with DEQ rules regarding septic systems.

Stormwater Detention Basin

Perennial will construct the Station in a manner that prevents stormwater from leaving the site. This will be achieved by grading the site, installing stormwater detention soil berms around the Station, and installing a stormwater detention basin.

It is proposed that the basin be designed for a 100-year return period 24-hour storm event plus another 50 percent capacity. Appendix V-3 contains details of the proposed stormwater detention basin and provides data and calculations used to determine the most efficient size and location. A 100-year return period 24-hour storm event is expected to generate 2.25 inches of precipitation or about 132,780 cubic feet of stormwater. The basin will be sized for about 199,163 cubic feet of stormwater. Annual average precipitation is about 10.4 inches or about 613,717 cubic feet of stormwater per year, with January receiving the most rainfall, averaging about 1.5 inches. The International Station Meteorological Climate Summary shows the maximum recorded annual rainfall at the nearby city of Pendleton to be 17.8 inches per year, which would amount to approximately 1,050,400 cubic feet of stormwater per year. It should be noted that the HGP also has a stormwater detention basin and this system has worked very well for that facility. A WPCF Permit is not expected to be necessary for the basin for the following reasons: 1) the Station will be designed and operated to meet the "No Exposure" conditional exclusion as outlined in the United States Environmental Protection Agency's "Guidance Manual for Conditional Exclusion from Stormwater Permitting Based on "No Exposure" of Industrial Activities to Stormwater (EPA 833-B-00-001, June 2000)"; and 2) the design and operation of the Station will follow the intent of the guidance in the DEQ's 2013 "Industrial Stormwater Best Management Practices Manual."

Retirement

Wastewater produced by retirement of the Project will include stormwater, sanitary waste, and washing equipment and vehicles. The Station will be emptied of all process wastewater by pumping the waters to the HGP cooling tower basins. Sump cleanouts will be sent to ORRCO for treatment and disposal. Once the septic system is decommissioned, portable toilets will be used and managed for the remaining period of retirement operations, and wastewaters will be transported by a contractor to a licensed sewage treatment plant. The stormwater detention basin will be one of the last structures retired. Perennial will obtain a NPDES Stormwater Discharge General Permit #1200-C to manage the stormwater during decommissioning of the Project.

V.5 CONSUMPTIVE WATER USE REDUCTION

OAR 345-021-0010(1)(v)(C) *A description of any actions or restrictions proposed by the applicant to reduce consumptive water use during construction and operation of the facility.*

Response: Consumptive water uses of the Project will include cooling tower evaporation and drift, sanitary wastewater discharge, a nitrogen oxide water system, and evaporative coolers. Perennial proposes to reduce the amount of consumptive water use by sending cooling tower blowdown, plant and equipment drain wastewater, and multimedia filtration backwash to the HGP, where it would be used as process makeup water. Under daily conditions, the amount of reclaimed water sent to the HGP could vary from approximately 315 to 0 gallons per minute (gpm). In addition, the cooling tower will be equipped with drift eliminators located below the fans and above the cooling media to capture water particles and reduce drift to levels that are commercially feasible.

The National Renewable Energy Laboratory estimates that in the western United States, consumptive water use for thermoelectric plants is 0.38 gallons per kilowatt hour (Torcellini et al.). Based on a net electrical output of 415 megawatt hours and an assumed water loss of 1,096 gpm (refer to Table O.2 of Exhibit O – Water Use) under annual average ambient conditions, the consumptive water use of the Station would be 0.16 gallons per kilowatt hour. The consumptive water use at the Station is anticipated to be below industry standards.

V.6 PLANS FOR RECYCLING AND REUSE

OAR 345-021-0010(1)(v)(D) *The applicant's plans to minimize, recycle or reuse the solid waste and wastewater described in OAR 345-021-0010(1)(v)(A).*

Response:

V.6.1 Recycling During Construction

Recyclable materials will be separated from the solid waste stream produced during construction of the Project. Recyclable materials will likely include scrap metals, lumber, batteries, mercury-containing lights, used oil, paper, cardboard, and other packing materials. Recyclable materials will be stored onsite until sufficient quantities exist to make recycling economic, and then sent or sold for recycling. Used oil will be recycled through one of several specialist firms providing this service in Oregon or Washington, such as Heller and Sons' Distributing. Scrap metal, aluminum cans, glass bottles, and office waste paper will be recycled using a local disposal services in the area, such as R.S. Davis Recycling or other recyclers serving the Hermiston area. As stated in Section V.4.1, generation of construction waste will be minimized through the use of detailed estimates of material needs and efficient construction practices.

Perennial's ability to reuse or recycle wastewater will depend on the chemical characteristics of the wastewater. Non-contaminated wastewater generated from hydrostatic testing, stormwater, and flushing of lines may be collected and used as dust suppression or sent to the HGP for process water makeup.

V.6.2 Recycling During Operations

Aqueous streams will be recycled internally to increase water use efficiency at the Station. The Station will be equipped with a recirculating cooling system. Water will be recycled approximately 10 times in the cooling system before being discharged. Wastewater from various processes such as reject water from the demineralized water reverse osmosis unit and the evaporative coolers will be combined with the cooling tower blowdown and sent to the HGP for reuse as process cooling tower makeup water. Note that when the HGP is not fully operating, reclaimed water from the Station will still be routed to the cooling tower basins of the HGP, which will then route the blowdown to Lamb Weston.

Recyclable materials will be separated from the solid waste stream produced during operation. Recyclable materials will likely include aluminum cans, bottles, waste paper, used oil, mercury-containing lamps, and lead-acid and nickel-cadmium batteries. Operation of the Station is not expected to produce significant quantities of scrap metal, lumber, or cardboard. Recyclable material will be separated from the solid waste stream, stored, and delivered periodically to a recycling facility such as R.S. Davis Recycling or other recyclers serving the Hermiston area. Perennial will contract with a firm for recycling its waste oil and lead-acid batteries such as Heller and Sons' Distributing. Aluminum cans, bottles, and office waste paper will be recycled by the local disposal service.

V.6.3 Recycling During Retirement

Wastes produced during retirement will either be disposed of or recycled using approved methods and technologies used at that time and in accordance with a retirement plan approved by the Council.

V.7 ADVERSE IMPACTS OF WASTE DISPOSAL AND EVIDENCE THAT ADVERSE IMPACTS WOULD BE MINIMAL

OAR 345-021-0010(1)(v)(E) *A description of any adverse impact on surrounding and adjacent areas from the accumulation, storage, disposal and transportation of solid waste, wastewater and stormwater during construction and operation of the facility.*

OAR 345-021-0010(1)(v)(F) *Evidence that adverse impacts described in OAR 345-021-0010(i)(v)(E) are likely to be minimal, taking into account any measures the applicant proposes to avoid, reduce or otherwise mitigate the impacts.*

V.7.1 Impacts During Project Construction

Response: The majority of sanitary sewage from the Project construction site will be trucked to a sewage treatment plant. The sanitary sewage will be treated together with municipal domestic wastewater and discharged in accordance with the treatment plant's discharge permit conditions. Since no sanitary waste will remain onsite, and it will be treated in accordance with treatment plant permits, adverse impacts will be minimal. Solid waste that cannot be recycled will be trucked to a landfill. Trucking waste to the landfill during construction is expected to cause a temporary increase in truck traffic; however, because this increase in traffic is temporary and will use existing roads, the adverse impacts are expected to be minimal. Stormwater run-off during construction will be managed in conformance with its NPDES Stormwater Discharge General Permit #1200-C. A variety of erosion and sediment control measures and good housekeeping practices to avoid, reduce, or mitigate impacts on surrounding or adjacent lands, as a result of stormwater, will be implemented during construction. Potential erosion and sediment controls include silt fences, aggregate entrances, natural buffer strips, and revegetation of affected areas. Good housekeeping practices include keeping hazardous materials and waste in a secure area, minimizing material releases, and the cleanup of any releases. Perennial will develop a Hazardous Materials Management Plan to manage hazardous wastes and hazardous materials generated and used during construction of the Project. No significant adverse environmental impacts will occur as a result of stormwater runoff from the Project construction site.

V.7.2 Impacts During Project Operation

Sanitary sewage from the Station will be routed to a new onsite sanitary sewage system. The system will be regulated by DEQ; therefore, sanitary waste is expected to have no adverse impacts on surrounding or adjacent areas or groundwater quality.

The Station's reclaimed water will be routed to the HGP for reuse and eventual land application. As the land application will be conducted under an existing WPCF Permit issued by DEQ, no adverse impacts on surrounding or adjacent areas or groundwater quality are expected. Perennial will implement a series of best management practices, including containment of materials, use of oil-water separators, covering areas to limit exposure of materials, spill prevention and response procedures, preventative maintenance, and employee education. A Spill Prevention Control and Countermeasure (SPCC) Plan will be developed prior to the start of operation, including having spill kits on site. Given the small amount of waste (approximately 10 tons per year), transportation of these wastes to landfills or recycling facilities is expected to have limited impact on surrounding and adjacent areas. The adverse environmental effects of solid waste disposal at a properly designed and permitted landfill will be minimal. Moreover, given the small amount of hazardous waste (less than 220 pounds per month), transportation of these wastes to treatment or recycling facilities is expected to have limited impact on surrounding and adjacent areas.

V.7.3 Impacts During Project Retirement

Perennial proposes to recycle solid waste to the greatest extent practicable to minimize the amount requiring landfill disposal. Materials not suitable for recycling or for onsite disposal will be transported to the Finley Buttes Regional Landfill.

Wastewater produced by retirement of the Project will include stormwater, sanitary waste, and washing equipment and vehicles. The Station will be emptied of all process wastewater by pumping the waters to the HGP cooling tower basins. Sump cleanouts will be sent to ORRCO for treatment and disposal. Once the septic system is decommissioned, portable toilets will be used and managed for the remaining period of retirement operations, and wastewaters will be transported by a contractor to a licensed sewage treatment plant. The stormwater detention basin will be one of the last structures retired. Perennial will obtain a NPDES Stormwater Discharge General Permit #1200-C to manage the stormwater during decommissioning of the Project.

Thus, Perennial has procedures in place to minimize any potential impacts during Project retirement.

V.8 PROPOSED MONITORING PROGRAM

OAR 345-021-0010(1)(v)(G) *The applicant's proposed monitoring program, if any, for minimization of solid waste and wastewater impacts.*

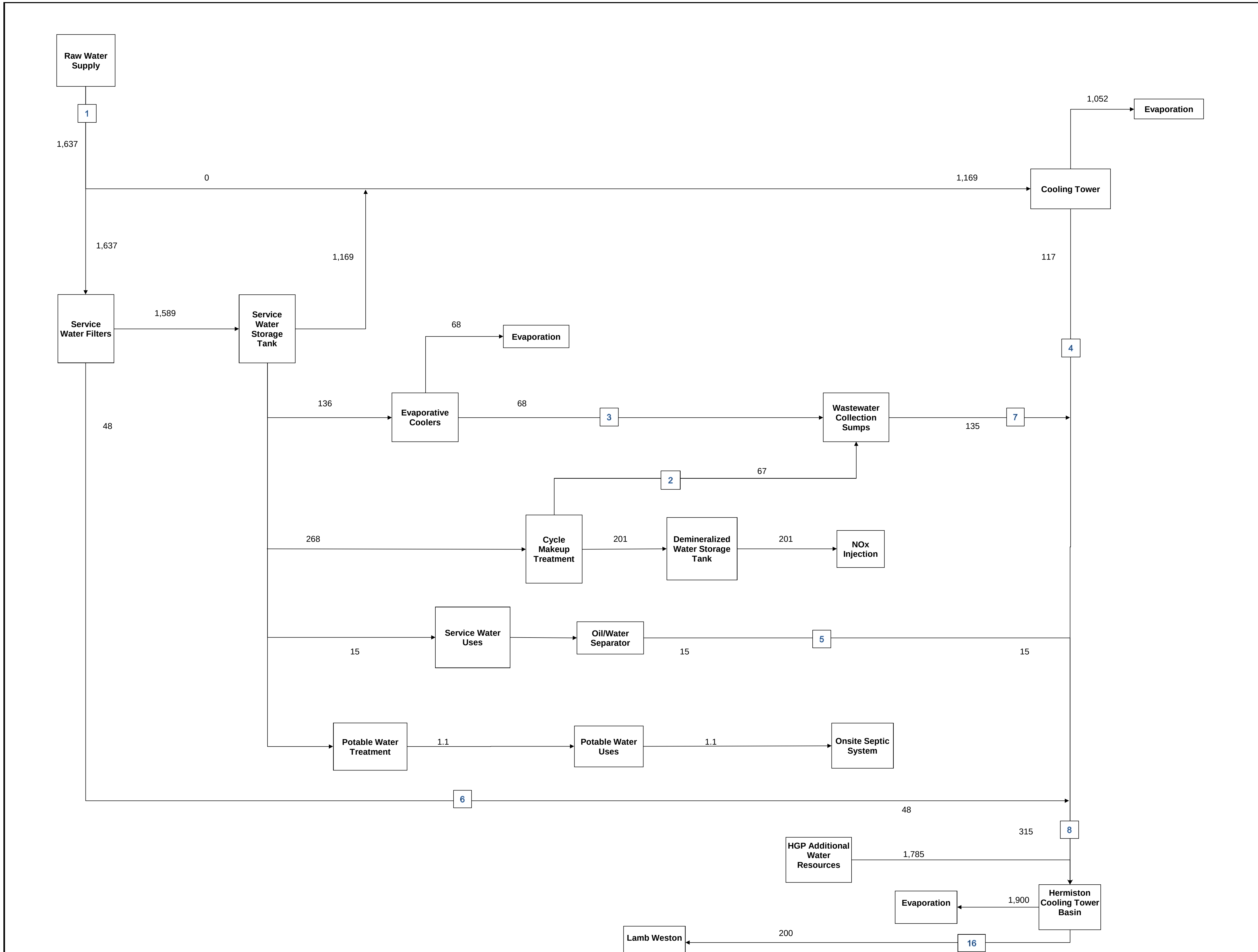
The construction contractor will be responsible for implementing the recycling programs to minimize waste and proper disposal of solid waste. In addition, the NPDES Stormwater Discharge General Permit #1200-C requires regular inspection of the site during Project construction. These inspections are integral to maintaining compliance with the permit and to prevent sediment or sediment laden stormwater from leaving the site.

Perennial will implement an operational SPCC Plan during Project construction and operation. The SPCC Plan will outline the secondary containment requirements associated with the petroleum containing tanks and equipment. The aqueous ammonia tank and other chemical storage tanks will be placed in adequate secondary containment. The integrity of the tanks will be regularly inspected and documented according to the SPCC Plan. The SPCC Plan will also outline the steps for reporting and cleaning up of any oil releases. As noted above, Perennial will also develop Hazardous Materials Management Plans to manage hazardous wastes and hazardous materials generated and used during the construction, operation, and retirement of the Project. Inspections and monitoring of these materials will be documented.

The discharge of reclaimed water to the HGP will be actively tracked and monitored in accordance with the requirements of the agreement between the Station and the HGP. The discharge of reclaimed water from the HGP to Lamb Weston will be monitored in accordance with the requirements of the agreement between the HGP and Lamb Weston, as is currently done, to assess specific conductivity and reclaimed water flow rates. Sanitary waste disposal at the Station will be monitored with a flow meter at the potable water supply system. Disposal of solid waste from the Station will be monitored to track the waste streams. Hazardous waste storage and disposal will be monitored in compliance with state and federal rules, i.e., weekly inspections of storage areas and maintaining disposal documents for at least three years.

V.9 REFERENCES

Torcellini, P., N. Long, and R. Judkoff. 2003. Consumptive Use for U.S. Power Production. National Renewable Energy Laboratory. Golden, Colorado. Contract No. DE-AC36-99-GO10337



no.	date	by	ckd	description
A	3/6/13	das	drg	Initial Issue
B	10/10/13	tms	das	ZLD
C	2/26/14	das	tms	Revised WCS Discharge

NOTES:

1. FLOWS ARE SHOWN IN GALLONS PER MINUTE ROUNDED TO THE NEAREST GPM.

DESIGN CRITERIA:

COOLING TOWER CYCLES	10

Burns & McDonnell SINCE 1898

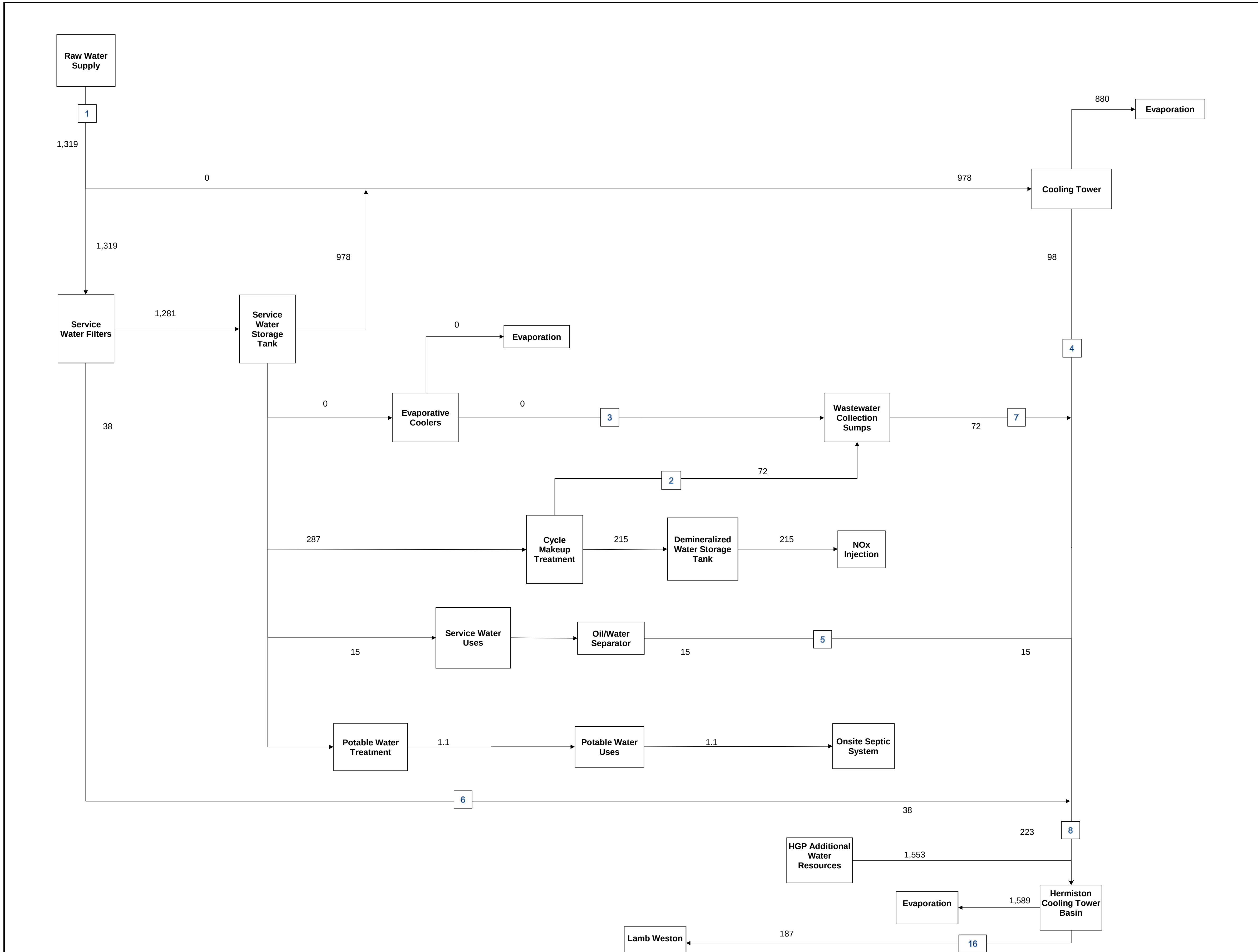
date 3/6/2013	detailed D. Schilling
designed D. Schilling	checked P. Scroggin

Perennial Wind Chaser Station

FIGURE V-1
WATER MASS BALANCE

Summer Conditions
89 F Dry Bulb/27% RH

project 70595	contract
drawing **WMB - 05**	--- rev. **C**
sheet	of sheets
file	



no.	date	by	ckd	description
A	3/6/13	das	drg	Initial Issue
B	10/10/13	tms	das	ZLD
C	2/26/14	das	tms	Revised WCS Discharge

NOTES:

1. FLOWS ARE SHOWN IN GALLONS PER MINUTE ROUNDED TO THE NEAREST GPM.

DESIGN CRITERIA:

COOLING TOWER CYCLES	10

Burns & McDonnell SINCE 1898

date 3/6/2013	detailed D. Schilling
designed D. Schilling	checked P. Scroggin

Perennial Wind Chaser Station

FIGURE V-2
WATER MASS BALANCE

Annual Average Conditions
53 F Dry Bulb/65% RH

project 70595	contract	
drawing **WMB - 06**	**---**	rev. **C**
sheet	of	sheets
file		

APPENDIX V-1

Project Review with a Zero Liquid Discharge System

1 INTRODUCTION

This section reviews waste management issues should a zero liquid discharge (ZLD) system be installed by Perennial-WindChaser LLC (Perennial) as part of the Perennial Wind Chaser Station project (Project). This appendix identifies the estimated volumes and types of waste that would be produced during construction, operation, and retirement of the Project; the structures and systems Perennial would operate to handle the wastes; how Perennial would reduce, recycle, and reuse waste; and how Perennial would mitigate adverse impacts, under the ZLD option.

The Perennial Wind Chaser Station (Station) would produce both liquid and solid waste. All process wastewater produced during facility operations would be reclaimed as makeup water for the cooling tower to the maximum extent possible by the ZLD system. The remaining wastewater would be routed to a crystallizer and converted to a solid waste. These solids would be transported offsite to a landfill.

Project construction and retirement would produce larger quantities of solid waste than operation of the Station. Solid waste would be recycled or reused as much as practicable, with the balance disposed of in a solid waste landfill. None of the waste disposal practices employed during construction, operation, or retirement of the Project would have a significant adverse impact on the environment. Exhibit U – Public Services contains information regarding potential adverse impacts of solid waste and wastewater to specific public service providers. This appendix follows the same presentation as Exhibit V.

2 TYPES OF WASTE

2.1 Solid Waste

Solid Waste Produced During Construction

No changes to the solid waste produced during construction are expected with a ZLD system installed. Refer to Section V.3.1 for details.

General Solid Waste Produced During Operation

Approximately 10 tons per year of general refuse would be produced at the Station during normal operation. Solid waste would consist of office and maintenance waste. Hazardous waste could include oil rags, spent batteries, fluorescent lights and equipment, and vehicle maintenance solvents and oils. It is expected that the Station would be classified as a Conditionally Exempt Small Quantity (CESQ) Generator of hazardous waste, as most power plants are classified. Perennial will develop a Hazardous Materials Management Plan to manage hazardous wastes and hazardous materials generated and used during operation of the Station. The hazardous waste will be collected in sealable drums or containers in a secure onsite location.

In addition to the domestic solid waste, additional solid waste may be generated from the Station's water pretreatment system. The primary source of the solid waste would be silt from the raw water supply. These solids, if generated, are not expected to be hazardous and will be included in the normal maintenance waste.

ZLD Solid Waste Produced During Operation

The ZLD system that the Station would use is designed to reclaim or recycle all available water for make-up to the cooling tower and reduce the resultant wastewater to a solid waste. This solid waste consists of the total dissolved solids in the Columbia River water, along with the substances used for water treatment of the cooling tower and to clarify and crystallize the wastewater. At full load, 700 pounds of solids are expected to be generated per hour under annual average conditions, as shown in Table 1. Under annual average conditions, that amounts to an annual average of 1,540 tons per year generated based on 4,400 hours per year of operation. The solid waste is expected to be non-hazardous and transported to a landfill. The closest landfill is Finley Buttes Regional Landfill, located approximately 14 miles southwest of the proposed Station. The solid waste would be placed in sealable roll-off bins that can be transported.

Table-1 Anticipated Solid Waste Volumes

Source of Solid Waste	**Under Annual Average Conditions [lb/hr]**
Solids From Filter Press	157.5
Solids From Crystallizer	542.5
Total Solids	700.0

Key:
lb/hr pounds per hour

Solid Waste Produced By Retirement

Project retirement and restoration would result in scrap metal, piping, concrete, fence materials, power lines, and equipment. Refer to Section V.3.1 for details. Exhibit W – Facility Retirement Appendix W-2, provides an estimate of quantities of materials that would be removed from the site during retirement with a ZLD system.

3.2 Wastewater

Wastewater Produced During Construction

No changes to the wastewater produced during construction are expected with a ZLD system installed. Refer to Section V.3.2 for details.

Wastewater Produced During Operation

During operation, the Station would produce sanitary sewage, combustion turbine water wash wastes and stormwater. Table 2 provides estimates of the amount of wastewater produced from each source for annual average conditions and summer conditions during operation of the Station. Figures 1 and 2 provide a water balance with a ZLD system. Note that these figures are identical to Figures O-3 and O-4 in Exhibit O – Water Use.

Amounts of wastewater shown in Table 2 are based on general estimates, and the volume of stormwater would depend on weather conditions. Table 2 also provides information regarding disposal structures and systems, which are discussed in Section V.4.2.

Table 2 Anticipated Wastewater Volumes

Source of Waste Water	Under Annual Average Conditions gpm	Under Summer Conditions (gpm)	Disposal Systems and Structures
Sanitary Sewage	1	1	Routed by pipe to new onsite leach field
Sump Cleanouts	2,000 gallons per cleaning. Twice per year	2,000 gallons per cleaning. Twice per year	Trucked offsite for processing and disposal
Combustion Turbine Water Wash Wastes	2,000 gallons per cleaning. Twice per year	2,000 gallons per cleaning. Twice per year	Trucked off site for processing and disposal

Key:
gpm gallons per minute

The sanitary sewage, combustion turbine water wash wastes, sump cleanouts, and stormwater waste streams are discussed in Section V.3.2. No changes to these waste streams are expected due to the ZLD system.

Wastewater Produced by Retirement

Wastewater produced by retirement of the Project would include stormwater, sanitary waste, and washing equipment and vehicles. Refer to Section V.3.2 for details.

4 DESCRIPTION OF STRUCTURES AND SYSTEMS

4.1 Structures and Systems for Solid Waste

Construction

No changes to structures and systems for solid waste produced during construction are expected with a ZLD system installed. Refer to Section V.4.1 for details.

Operation

Other than the ZLD system, which is discussed below, no changes are expected. Refer to Section V.4.1 for details.

Operation of ZLD System

The components of a ZLD system are described below:

The purpose of the high efficiency reverse osmosis (HERO) process that would be used in this system is to recover and recycle most of the cooling tower blowdown back into the plant. Cooling tower blowdown and miscellaneous plant drains are routed to a clarifier. The clarifier removes the suspended solids, which, after running the clarifier waste through a filter press, will be disposed of as a solid waste. The clarifier effluent will be routed to the HERO process, which involves a weak acid cation exchanger, removal of carbon dioxide, and a reverse osmosis (RO) system. The weak acid cation exchanger is used to completely soften the water. In order to ensure complete hardness removal, the hardness-to-alkalinity ratio may need to be adjusted by injecting sodium hydroxide (caustic) before entering the weak acid cation exchanger. The weak acid cation exchanger removes the hardness and produces carbonic acid that is dissolved in the effluent. Acid is added to the weak acid cation exchanger effluent to remove any remaining alkalinity in the water.

The next step is to remove the carbon dioxide in the weak acid cation effluent. This is done either by a forced/induced draft decarbonator or in a vacuum degasifier. After the carbon dioxide is removed, the pH of the water is adjusted. The desired pH of the influent to the RO is 10 or higher; sodium hydroxide (caustic) can be injected to increase the pH to the desired limit. Sodium bisulfite and antiscalant are used at the inlet of the RO. The RO product water is recycled back to the plant and used as the cooling tower makeup. The RO reject water is sent to a crystallizer for complete crystallization and precipitation of solids with an electric steam boiler.

The solids are transported offsite to a landfill. See Exhibit U – Public Services, Section U.4.4, for further details concerning disposal of solid waste produced by the ZLD system.

A building will be required to house all HERO process equipment. Chemicals used for the treatment of process water are listed in Table G-1 of Exhibit G – Materials Analysis. These will be delivered and stored in bulk or semi-bulk tanks, totes, drums, or bags. The tanks, totes, drums, and bags will be stored within the structure housing the ZLD system, the details for which will be determined during the design phase of the Project.

Retirement

Waste produced during retirement of the Project would result from disassembling all major plant components and removing them from the site for reuse, scrap material, or disposal at an approved facility. Perennial proposes to recycle solid waste to the greatest extent practicable to minimize the amount requiring landfill disposal. Materials not suitable for recycling or for onsite disposal would be transported to the Finley Buttes Regional Landfill.

4.2 Structures and Systems for Wastewater and Storm Water

Construction

No changes to structures and systems for wastewater and stormwater produced during construction are expected with a ZLD system installed. Refer to Section V.4.2 for details.

Operation

Structures and systems for wastewater and stormwater include a septic leach field system and a stormwater detention basin. No changes to these structures and systems during operation are expected with a ZLD system installed. Refer to Section V.4.2 for details.

Retirement

No changes to structures and systems for waste water produced during retirement are expected with a ZLD system installed. Refer to Section V.4.2 for details.

5 CONSUMPTIVE WATER USE REDUCTION

Consumptive water uses of the Project would include cooling tower evaporation and drift, sanitary wastewater discharge, nitrogen oxide water system, and evaporative coolers. Perennial proposes to reduce the amount of consumptive water use by reclaiming or recycling the wastewater to the maximum extent possible. In addition, the cooling tower would be provided with drift eliminators located below the fans and above the cooling media to capture water particles and reduce drift to levels that are commercially feasible.

The National Renewable Energy Laboratory estimates that in the western United States, consumptive water use for thermoelectric plants is 0.38 gallons per kilowatt hour (Torcellini et al.). Based on a net electrical output of 411.9 megawatt hours and an assumed water loss of 1,096 gallons per minute (refer to Table O.4 of Exhibit O – Water Use) under annual average ambient conditions, the consumptive water use of the Station would be 0.16 gallons per kilowatt hour. The consumptive water use at the Station is anticipated to be below industry standards.

6 PLANS FOR RECYCLING AND REUSE

6.1 Recycling During Construction

No changes to recycling during construction are expected with a ZLD system installed. Refer to Section V.6.1 for details.

6.2 Recycling During Operations

Perennial proposes to reclaim or recycle the wastewater to the maximum extent possible with a ZLD system. Use of a ZLD system decreases water demand by 223 gallons per minute (gpm).

No other changes to recycling during operations are expected with a ZLD system installed. Refer to Section V.6.2 for details.

6.3 Recycling During Retirement

No changes to recycling during retirement are expected with a ZLD system installed. Refer to Section V.6.3 for details.

7 ADVERSE IMPACTS OF WASTE DISPOSAL AND EVIDENCE THAT ADVERSE IMPACTS WOULD BE MINIMAL

7.1 Impacts During Project Construction

No changes to impacts during construction are expected with a ZLD system installed. Refer to Section V.7.1 for details.

7.2 Impacts During Project Operation

Generation of solid waste would increase with the installation of a ZLD system, while water demand would decrease. At full load, 700 pounds of solids, is expected to be generated per hour under annual average conditions, as shown in Table 1. Under annual average conditions, that amounts to an annual average of 1,540 tons per year. The solid waste is expected to be non-hazardous and transported to a landfill. The closest landfill is Finley Buttes Regional Landfill. This generation of solid waste is not expected to have an impact on the regional landfill. Water demand would decrease by 223 gpm annual average. Over an annual period of 4,400 hours, demand would be expected to decrease by over 58 million gallons with a ZLD system in place.

No other changes to impacts during operation are expected with a ZLD system installed. Refer to Section V.7.2 for details.

7.3 Impacts During Project Retirement

No changes to impacts during retirement are expected with a ZLD system installed. Refer to Section V.7.3 for details.

8 PROPOSED MONITORING PROGRAM

The quantities of solid waste generated by the ZLD system would be monitored in accordance with the requirements of the landfill and general record keeping requirements for the Station. The Project would follow the remaining monitoring programs detailed in Section V.8.

9 REFERENCES

Torcellini, P., N. Long, and R. Judkoff. 2003. Consumptive Use for U.S. Power Production. National Renewable Energy Laboratory. Golden, Colorado. Contract No. DE-AC36-99-GO10337

no.	date	by	ckd	description
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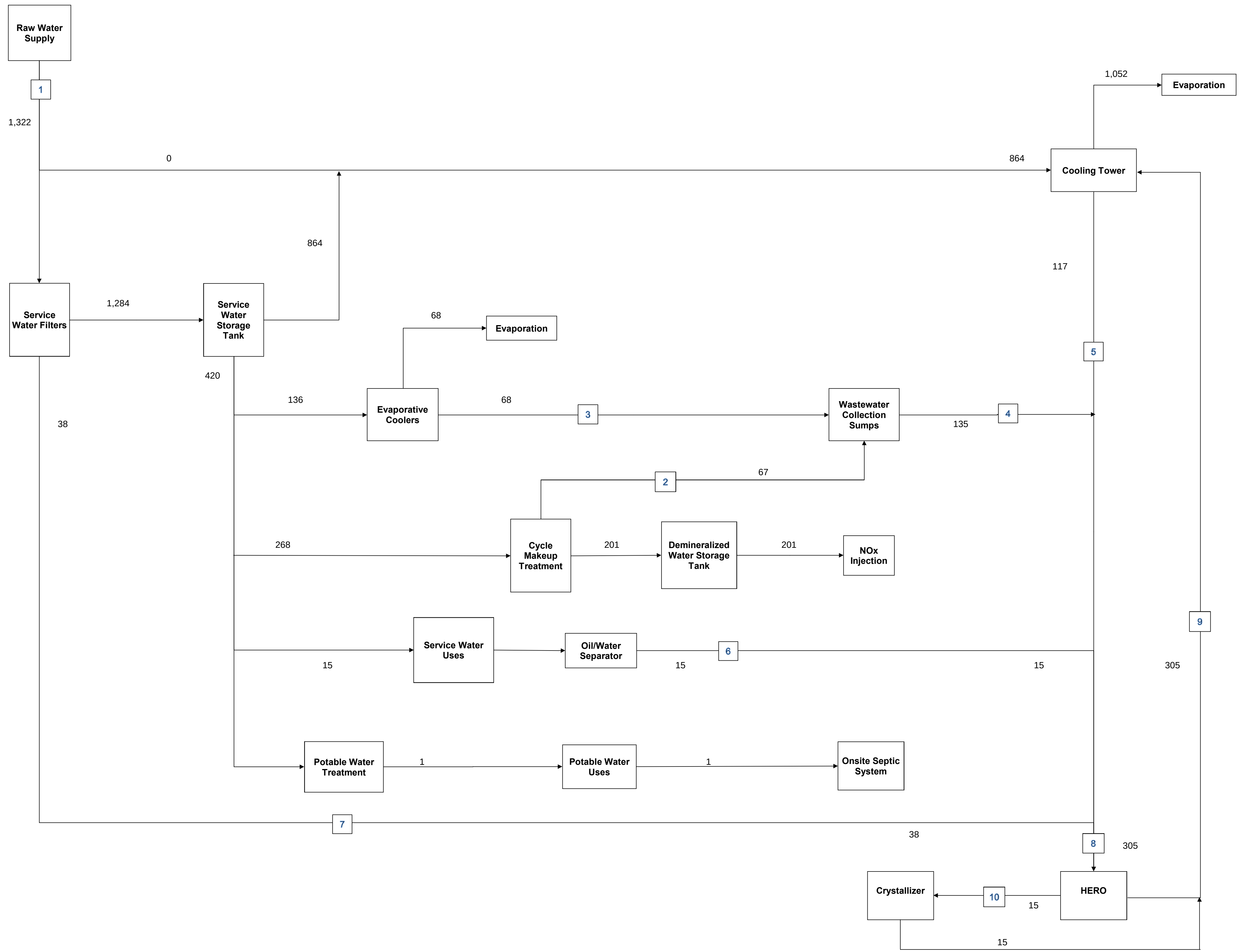
B	10/10/13	tms	das	ZLD
C	2/26/14	das	tms	Revised WCS Discharge



NOTES:

1. FLOWS ARE SHOWN IN GALLONS PER MINUTE ROUNDED TO THE NEAREST GPM.

DESIGN CRITERIA:

COOLING TOWER CYCLES	10.0

Burns & McDonnell SINCE 1898

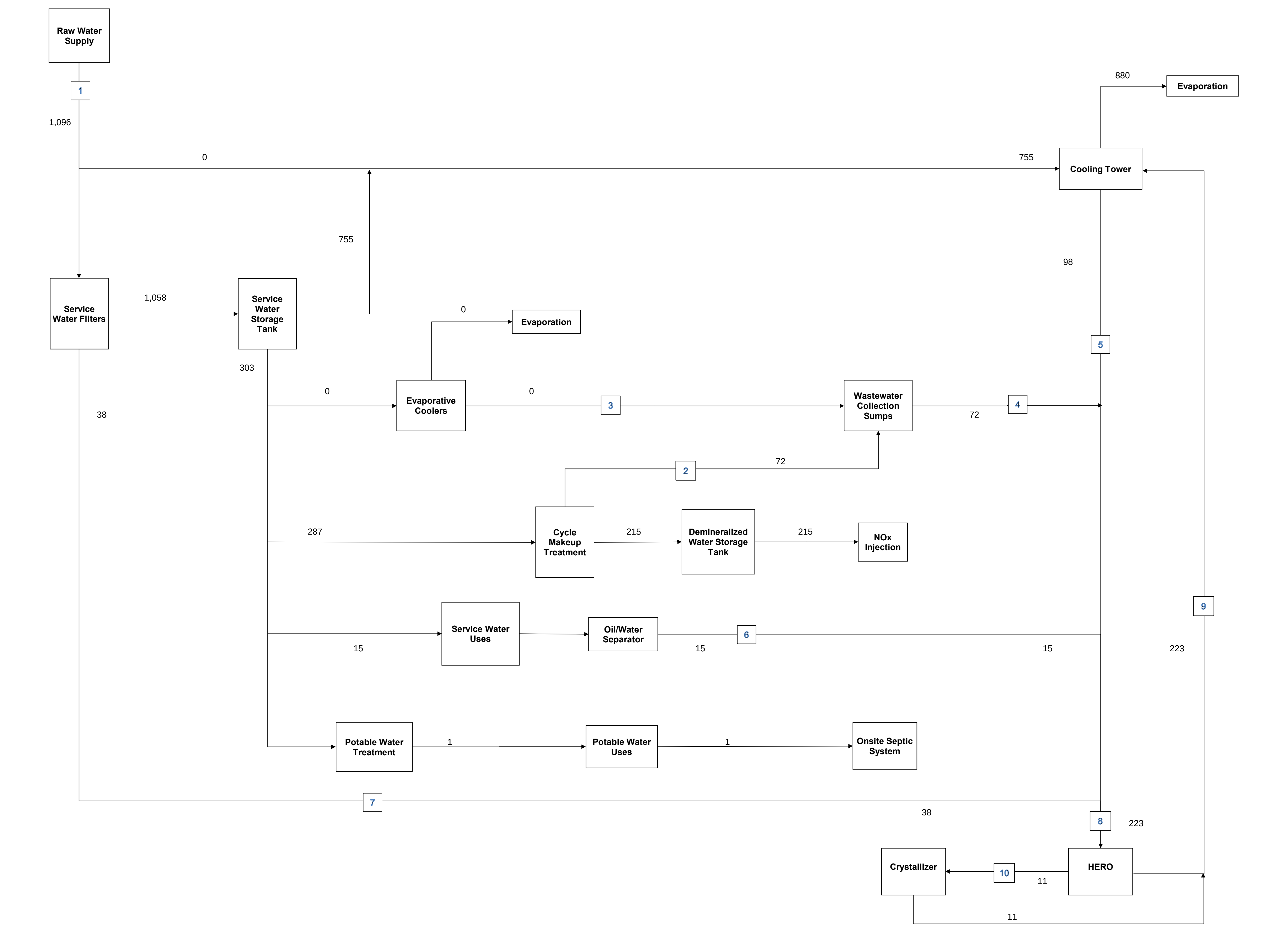
date 3/6/2013	detailed D. Schilling
designed D. Schilling	checked P. Scroggin

Perennial Wind Chaser Station

FIGURE 1
WATER MASS BALANCE

Summer Conditions
89 F Dry Bulb/27% RH

project 70595	contract
drawing **WMB - 05** ---	rev. **C**
sheet	of sheets
file	



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A	3/6/13	das	drg	Initial Issue
B	10/10/13	tms	das	ZLD
C	2/26/14	das	tms	Revised WCS Discharge

NOTES:

1. FLOWS ARE SHOWN IN GALLONS PER MINUTE ROUNDED TO THE NEAREST GPM.

DESIGN CRITERIA:

COOLING TOWER CYCLES	10.0

Burns & McDonnell
SINCE 1898

date 3/6/2013	detailed D. Schilling
designed D. Schilling	checked P. Scroggin

Perennial Wind Chaser Station

FIGURE 2
WATER MASS BALANCE

Annual Average Conditions
53 F Dry Bulb/65% RH

project 70595	contract	
drawing **WMB - 06**	---	rev. **C**
sheet	of	sheets
file		

APPENDIX V-2

Septic System Details

Septic System Details

Onsite Wastewater Treatment

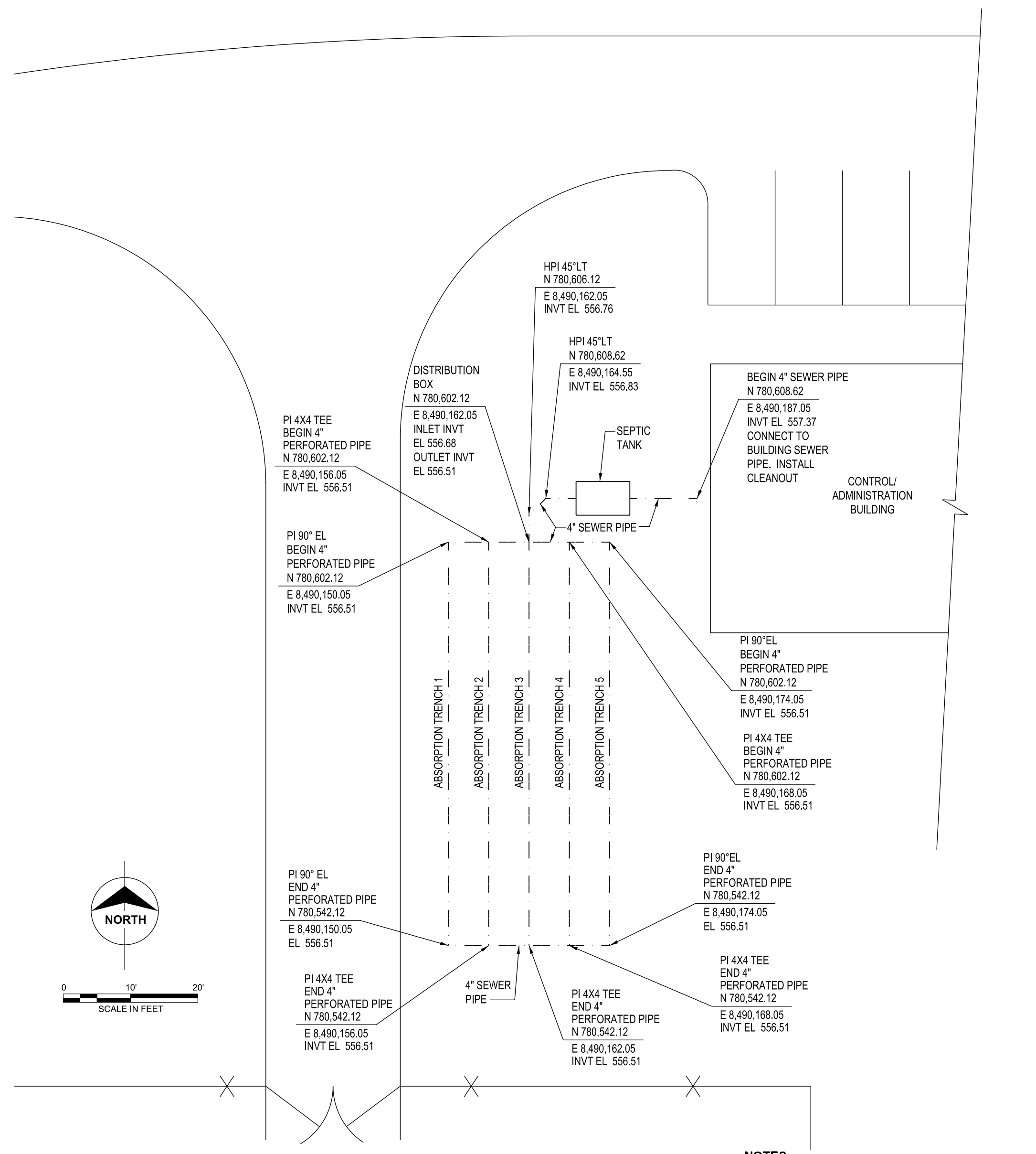
The onsite wastewater treatment system will be designed and constructed in accordance with Oregon Administrative Rules (OAR) Chapter 340. The system will be sized for 10 employees per day, seven days per week, with half of the employees showering each day and half not showering. From OAR Chapter 340, Division 071-0220 Table 2, the quantity of sewage from a factory generated each day per employee showering is 35 gallons; for each employee not showering, it is 15 gallons. The daily sewage flow is estimated to be 250 gallons. However, as Table 2 also lists the minimum gallons per day for a factory with showers as 300 gallons, a daily sewage flow of 300 gallons will be assumed.

The septic tank will be sized to accommodate twice the minimum daily sewage flow, 600 gallons, and will be designed and constructed in accordance with the requirements of OAR Chapter 340, Division 073.

According to the Preliminary Geotechnical Engineering Report for the Perennial Wind Chaser Station by Shannon & Wilson, Inc. dated November 19, 2013, the top 5 feet of soil in the area of the lateral field is silty sand and sand-silt mixture, and the water table is about 25 feet below the ground surface (see Exhibit H, Appendix H-1, Attachment H1). Per OAR Chapter 340, Division 071 Tables 4 and 5, the soil category for this project is Soil Group B, and the minimum length of absorption trench required for a Soil Group B, with effective soil depth greater than 48 inches and depth to temporary ground water greater than 48 inches, is 75 feet per 150 gallons of projected daily sewage flow. For a projected daily flow of 300 gallons, 150 feet of absorption trench would be required. Assuming a safety factor of two for the absorption trench length, a total of 300 feet of trench would be required.

The absorption trench would be approximately two feet wide and two feet deep with 4-inch diameter perforated pipe backfilled with washed gravel or crushed rock ranging from ¾ to 1½ inches in diameter. There will be a total of three trenches, each 100 feet in length, constructed on 6-foot centers.

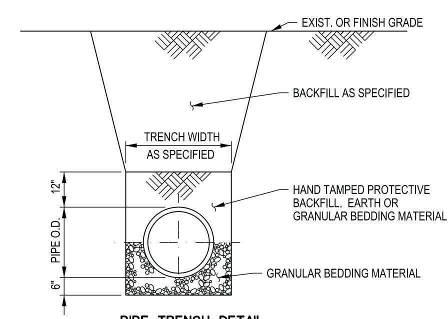
The following drawing provides a typical onsite wastewater treatment plan and details for the system.



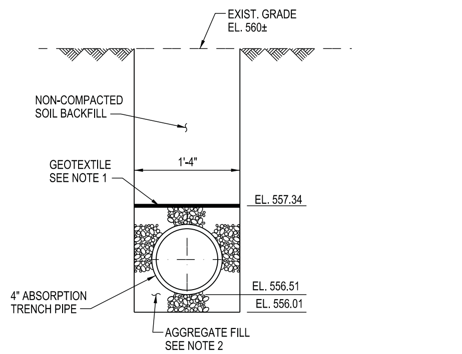
SEPTIC TANK AND ABOSRPTION FIELD PLAN
NOT TO SCALE

NOTES:

1. 4" SEWER PIPE SHALL BE SCHEDULE 40 PVC SOLID WALL PIPE.
2. ANY POTENTIAL WELLS WILL BE LOCATED A MINIMUM OF 100' FROM SUBSURFACE ABSORPTION AREAS AND 50' FROM SEPTIC TANKS AND OTHER TREATMENT UNITS PER OAR 340-071-0220 TABLE 1.



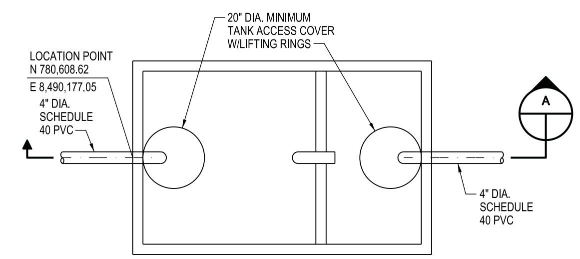
PIPE TRENCH DETAIL
NOT TO SCALE



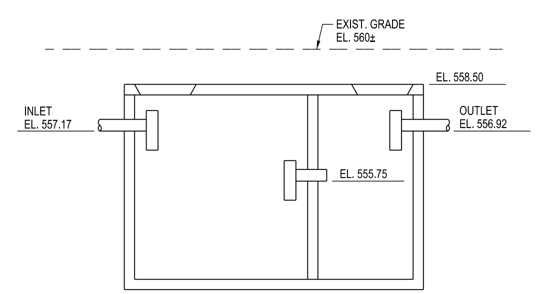
ABSORPTION TRENCH DETAIL
NOT TO SCALE

NOTES:

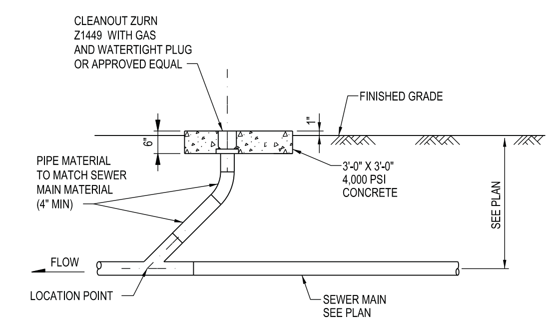
1. GEOTEXTILE SHALL BE CONTECH CONSTRUCTION PRODUCTS INC. C-70NW OR ENGINEER-APPROVED EQUAL. INSTALL PER ENGINEER-APPROVED MANUFACTURER'S RECOMMENDATIONS.
2. AGGREGATE FILL FOR ABSORPTION TRENCH SHALL MEET THE REQUIREMENTS FOR NO. 4 COARSE AGGREGATE OREGON DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR CONSTRUCTION, SECTION 00430, 3/4" - 1/2".
3. ABSORPTION TRENCH PIPE SHALL BE SCHEDULE 40 PVC PERFORATED PIPE.



SEPTIC TANK PLAN
NOT TO SCALE



SECTION
NOT TO SCALE



SEWER CLEANOUT DETAIL
NOT TO SCALE

PRELIMINARY - NOT FOR CONSTRUCTION

no.	date	by	ckd	description

Burns & McDonnell SINCE 1898

date JANUARY 15, 2014	detailed R. SEDLACEK
designed R. SEDLACEK	checked

PERENNIAL WIND CHASER STATION

UMATILLA COUNTY, OREGON

ONSITE WASTEWATER TREATMENT PLAN AND DETAILS

project 55745	contract
drawing **CS041**	rev. **-**
sheet	of sheets

file 55745CS041.DGN

Scale For Microfilming
Millimeters
Inches

APPENDIX V-3

Stormwater Detention Basin Details

Burns & McDonnell SINCE 1898

041111 Form GCO-29

Client PERENNIAL POWER Page 1 of

Project 55745 Date 10/10/13 Made By SEDLACEK

WIND CHASER STORMWATER POND Checked By

Preliminary ✓ Final

PER PERENNIAL POWER STORMWATER POND IS TO HOLD 100-YEAR RETURN PERIOD 24-HOUR RAINFALL PLUS 50%

FROM WESTERN US PRECIPITATION FREQUENCY MAPS (SEE ATTACHED) THE 100-YEAR RETURN PERIOD 24-HOUR RAINFALL IS ABOUT 2.25 INCHES

DRAINAGE AREA IS APPROXIMATELY 708,135 SF

REQUIRED STORMWATER POND VOLUME:

V = 708,135 SF (2.25 in × 1.5) 1/12 in/ft

= 199,163 CF

EXISTING TOPO FROM USGS 7.5 MINUTE HERMISTON QUAD MAP SHOWS THE SITE SLOPES FROM WEST TO EAST WITH ABOUT 6' OF DROP ACROSS THE SITE.

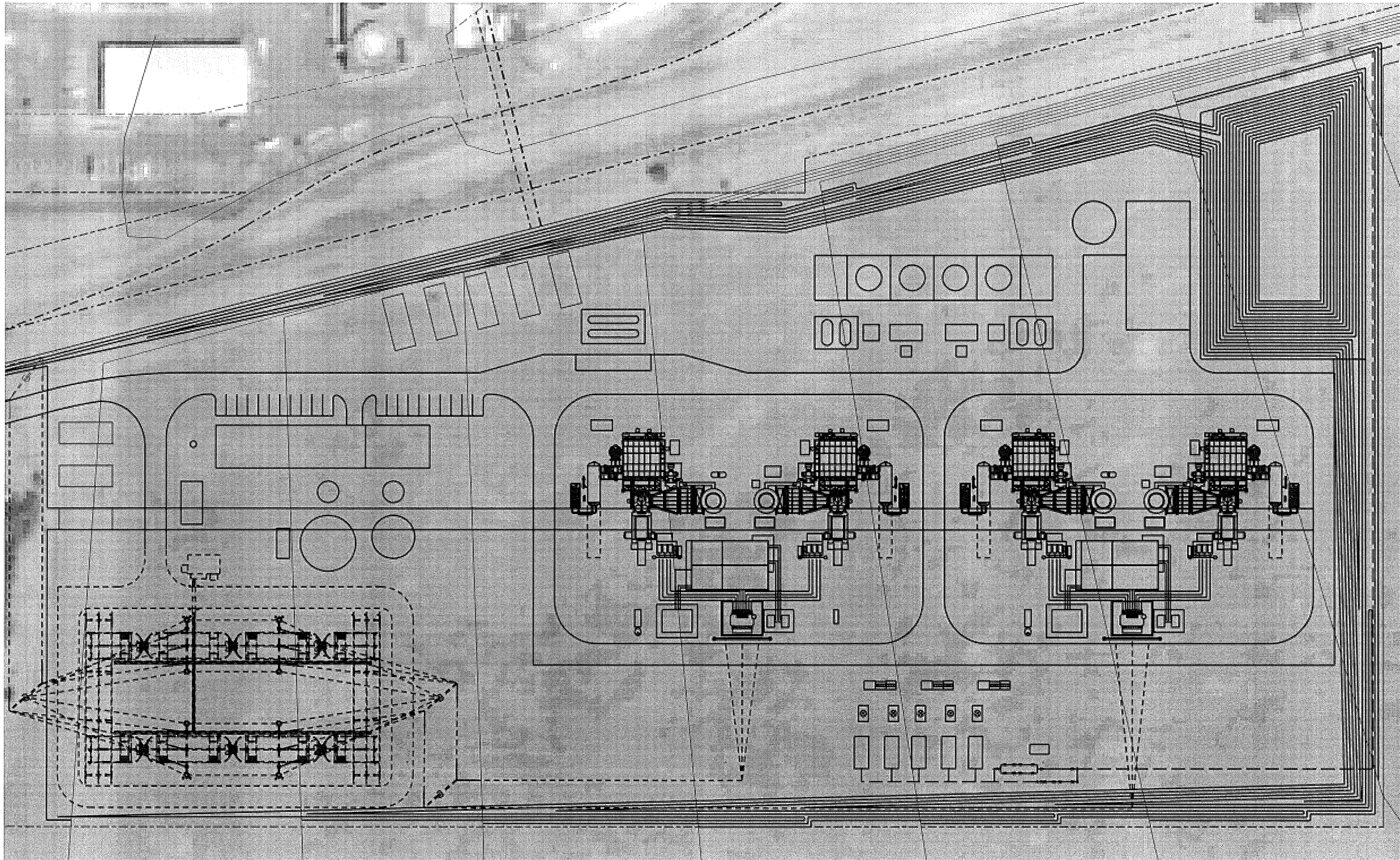
SEE ATTACHED SKETCH FOR ROUGH GRADING/DRAINAGE PLAN. ASSUME FINISH GRADE AT WEST END OF SITE IS 560± AND THE PERIMETER DITCHES TO THE STORMWATER POND START AT EL 559. PRELIMINARY POND ARRANGEMENT BASED ON POND STORAGE FROM EL 552 TO EL 541. THE SOUTH PERIMETER DITCH SLOPE IS 0.43% AND THE NORTH PERIMETER DITCH SLOPE IS 0.59%.

BY TRIAL AND ERROR POND AREAS: EL 552 – 27,378 SF

EL 541 – 8,901 SF

V = 1/2 (8,901 SF + 27,378 SF) 11

= 199,535 SF > 199,163 SF OK



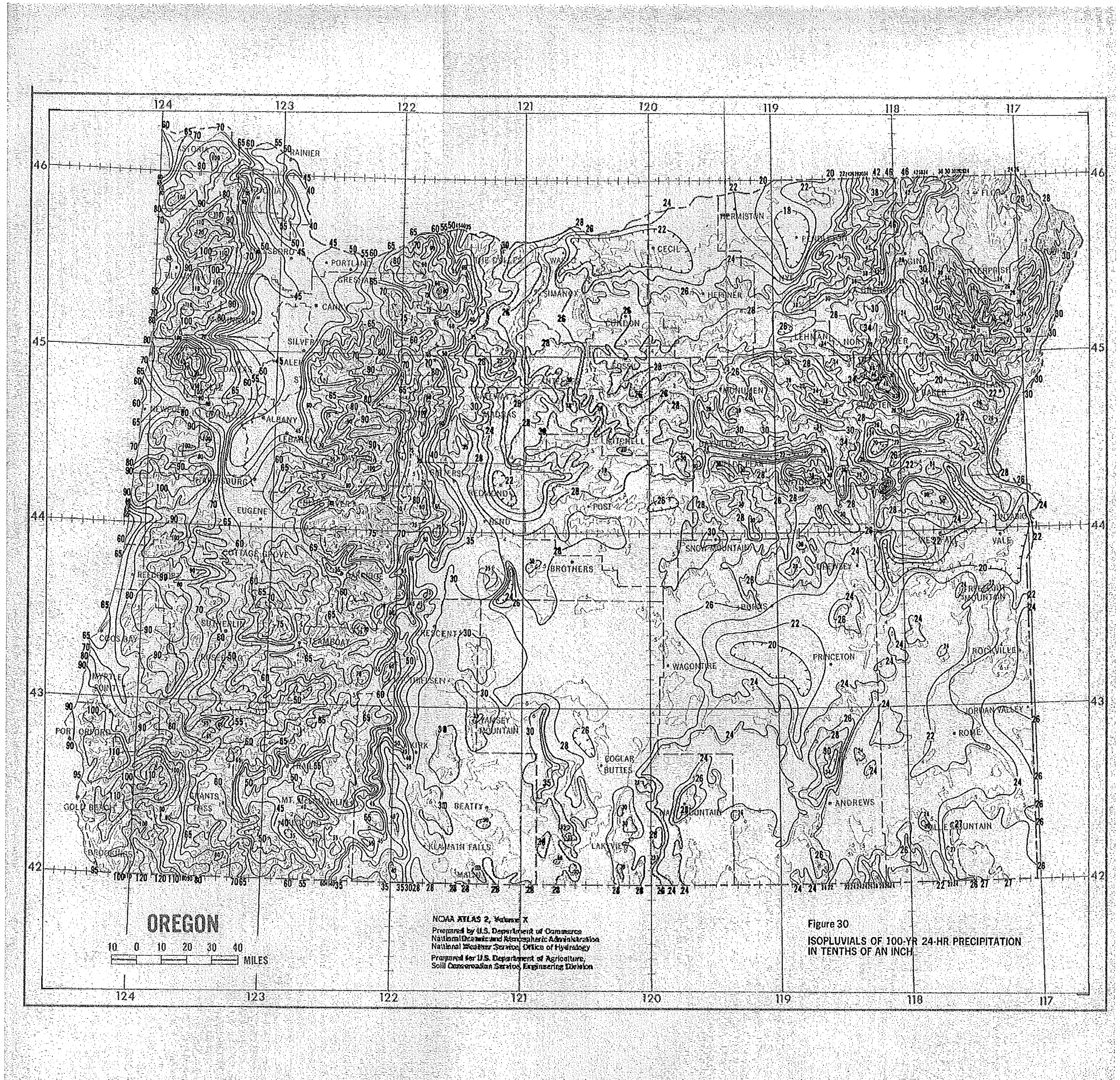


Figure 30

ISOPLUVIALS OF 100-YR 24-HR PRECIPITATION IN TENTHS OF AN INCH

PLANT SITE
45.8008°N
119.3671°W

EXHIBIT W

FACILITY RETIREMENT
OAR 345-021-0010(1)(w)

TABLE OF CONTENTS

TABLES

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 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, and provides an estimate of the total and unit costs of restoring the site based on the Oregon Department of Energy's *First Revised Cost Guide for Decommissioning Oregon Energy Facilities (Cost Guide).* This exhibit also explains how 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 Perennial Wind Chaser Station (Station) 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 $4.560 million, expressed in 2013 dollars.

The Station is dependent upon the third party permits of both the Hermiston Generating Plant (HGP) and Lamb Weston Hermiston Plant with regard to managing its wastewaters. The Lamb Weston plant's Water Pollution Control Facilities Permit allows the plant to manage and dispose of the HGP's wastewater, along with its own reclaimed waters, by land application for beneficial use on the North Farm and the Madison Farm in accordance with the Department of Environmental Quality–approved Operations, Monitoring, and Management Plan. The Lamb Weston plant's permit is currently being renewed. Since its permit is under review, Lamb Weston has not been able to consent to the Project sending reclaimed water to the HGP. It is expected that Lamb Weston will be successful in renewing its wastewater permit and will be eventually able to accept reclaimed water from the HGP that has come from the Station. This exhibit details how the Project will comply with any Council standards that apply for this option.

In the unlikely event that Lamb Weston is not able to accept reclaimed water from the HGP that has come from the Station, then Perennial would install a zero liquid discharge (ZLD) system at the Station. Since this option is a potential alternative that would affect the restoration cost estimate, this exhibit also addresses compliance with OAR 345-022-0050(1) as an alternative scenario. The cost of site restoration is expected to be $4.621 million, expressed in 2013 dollars, if a ZLD system is required.

W.3 USEFUL LIFE

OAR 345-021-0010(1)(w)(A) *The estimated useful life of the proposed facility.*

Response: Perennial-WindChaser LLC (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 Station is 30 years. When it is determined that there is no future market for the electrical energy produced by the Station, 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 Station 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 the 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 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 Station, a site restoration plan will be developed and submitted to the Council for approval.

[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).

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.*

Response: The costs to retire and restore the site are estimated to be $4.560 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 $4.621 million. The final costs to restore the site will depend on the nature of the zoning regulations and the approved retirement plan.

The estimate was developed by following the guidelines of the Oregon Department of Energy's *Cost Guide*. 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 quantities were then applied to the unit costs outlined in the Cost Guide.

The following assumptions are included in this determination of the retirement costs for the Project:

1. Cost estimates are presented in 2013 dollars.
2. Labor costs are developed using unit rates in the *Cost Guide* with order-of-magnitude quantities developed by Burns & McDonnell. Pricing of the *Cost Guide* was based on second quarter 2010 with a gross domestic product (GDP) Index of 110.67. Therefore, the subtotal of the costs (excluding performance bond, overhead, and contingencies) is escalated to second quarter 2013 using the GDP index of 116.68.
3. Project-related indirect costs are included at 10 percent for overhead, 10 percent for profit, and 3 percent for insurance cost, according to the *Cost Guide*.

4. Contingencies are included at 10 percent for administration and project management and 20 percent for future developments of escalated costs, as well as $500,000 for hazardous materials management in the estimates to cover unknown costs.
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 and water treatment building, and any other ancillary buildings. Any spare parts, tools, inventory, or equipment in the buildings will be transferred to another facility or sold prior to decommissioning activities commencing, the value of which is excluded from the estimates.
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, 500-kV step-up substation, and 11-mile transmission line are included in the demolition scope. However, the transmission towers between the tie-in to the 230-kV system and the 500-kV step-up substation are not included because it is assumed that the towers will be required for continued operation of the HGP.
9. 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.
10. 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.
11. Site areas will be graded to achieve suitable site drainage to natural drainage patterns, but grading will be minimized to the greatest extent possible.
12. Cost for offsite disposal is included for all materials, including debris and concrete.
13. 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.
14. 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.
15. Since no asbestos, underground storage tanks, or lead paint are expected onsite, inspection costs for these items are not included.
16. 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.
17. Owner’s costs are not included.

18. Disturbed site areas will be seeded after they are graded to provide suitable ground cover to prevent soil erosion.
19. Salvage value for equipment and scrap values are not included in the cost estimates.

Table W-1 Retirement Cost Estimate

General Costs			
A. PERMITS			$2,660
B. MOBILIZATION			$31,260
C. ENGINEERING			$48,468
D. PROJECT OVERHEAD			$328,035
E. HAZARDOUS MATERIALS INSPECTIONS			$0
F. PROTECTION			$6,230
G. UTILITY DISCONNECTS			$2,310
General Costs Subtotal			**$418,963**
Site Construction			
A. PRELIMINARY WORK			$21,143
B. SITE GRADING			$696,442
C. UNDERGROUND UTILITY REMOVAL			$73,070
Site Construction Subtotal			**$790,655**
Concrete Wrecking			
A. REINFORCED CONCRETE			$175,453
B. NON-REINFORCED CONCRETE			$0
Concrete Wrecking Subtotal			**$175,453**
Building Wrecking			$64,121
Steel Wrecking			$12,865
Timber Wrecking			$0
Thermal Protection/Liners Wrecking			$53,612
Equipment Wrecking			$206,888
Mechanical Wrecking			$93,203
Electrical Wrecking			$263,400
Load & Haul			$270,691
Costs Subtotal			$2,349,851
Overhead @	10%		$234,985
Profit @	10%		$258,484
Insurance @	3%		$85,300
Specialty Contracts (subcontracted work)			$0
Subtotal			**$2,928,620**
Subtotal Adjusted to Current Dollars	**2Q 2013**		**$3,092,396**
Performance Bond @	1%		$30,924
Gross Cost (Adjusted)			**$3,123,320**
Administration and Project Management @		10%	$312,332
Future Developments Contingency @		20%	$624,664
Hazardous Materials Management Contingency			$500,000
Total Site Restoration Cost (current dollars)			**$4,560,316**
Total Site Restoration Cost (rounded to nearest $1,000)			**$4,560,000**

Table W-2 Retirement Cost Estimate Alternative Scenario with Zero Liquid Discharge

General Costs			
A. PERMITS			$2,660
B. MOBILIZATION			$31,260
C. ENGINEERING			$48,468
D. PROJECT OVERHEAD			$328,035
E. HAZARDOUS MATERIALS INSPECTIONS			$0
F. PROTECTION			$6,230
G. UTILITY DISCONNECTS			$2,310
General Costs Subtotal			**$418,963**
Site Construction			
A. PRELIMINARY WORK			$21,143
B. SITE GRADING			$696,863
C. UNDERGROUND UTILITY REMOVAL			$73,070
Site Construction Subtotal			**$791,076**
Concrete Wrecking			
A. REINFORCED CONCRETE			$176,173
B. NON-REINFORCED CONCRETE			$0
Concrete Wrecking Subtotal			**$176,173**
Building Wrecking			$80,969
Steel Wrecking			$12,865
Timber Wrecking			$0
Thermal Protection/Liners Wrecking			$53,612
Equipment Wrecking			$208,258
Mechanical Wrecking			$93,884
Electrical Wrecking			$263,400
Load & Haul			$285,915
Costs Subtotal			$2,385,116
Overhead @	10%		$238,512
Profit @	10%		$262,363
Insurance @	3%		$86,580
Specialty Contracts (subcontracted work)			$0
Subtotal			**$2,972,571**
Subtotal Adjusted to Current Dollars	**2Q 2013**		**$3,138,805**
Performance Bond @	1%		$31,388
Gross Cost (Adjusted)			**$3,170,193**
Administration and Project Management @		10%	$317,019
Future Developments Contingency @		20%	$634,039
Hazardous Materials Management Contingency			$500,000
Total Site Restoration Cost (current dollars)			**$4,621,250**
Total Site Restoration Cost (rounded to nearest $1,000)			**$4,621,000**

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.

APPENDIX W-1

Detailed Cost Estimate Spreadsheet

Appendix W-1 - Detailed Cost Estimate Spreadsheet

Task Description	Unit	Quantity	Unit Cost	Total	Comments	Methods/Assumptions
			FACILITY NAME:		**Windchaser 4xLMS100**	**Windchaser 4xLMS100**
1. GENERAL COSTS						
A. PERMITS						
1. DEMOLITION	EA	1	$120.00	$120		Permit required by local jurisdiction. Assumed cost: $120/each.
3. UTILITIES	EA	1	$230.00	$230		Permit required by local jurisdiction. Assumed cost: $230/each.
4. EPA ASBESTOS NOTICE	EA	1	$2,310.00	$2,310		Assumed cost: $2,310/each.
Task Subtotal				$2,660		
B. MOBILIZATION						
1. TRUCKING ON/OFF	TR	10	$1,479.00	$14,790	5 round trips mobilization and 5 trips demobilization.	18-wheel tractor and flat-bed trailer, 80,000 pound capacity @ $123.25/hour; 4 hours load/unload time plus 8 hour round trip for unit cost of $1,479/trip.
2. SUBCONTRACTOR	EA	1	$11,540.00	$11,540	Crane only, blaster mobilization included in subcontracted cost.	One time charges for subcontractor mobilizations. Assumed cost: $11,540 for each mobilization for each subcontractor.
4. HAND TOOLS & EQUIPMENT	TR	2	$2,465.00	$4,930		Assemble tools at contractor's yard, load tools onto truck, trucking to the site, unload site tools. Assumed cost: 20 hours/trip at $123.25/hour. Quantity must include one trip in and one trip out per contractor.
Task Subtotal				$31,260		
C. ENGINEERING						
1. ENGINEERING	LS	4	$5,770.00	$23,080	Four gas turbines	Engineering allowance for critical lift plans. Assumed lump sum cost: 40 hours @ $144.25/hour.
2. LAYOUT / TESTING	LS	1	$2,308.00	$2,308		Engineering allowance for site survey of existing site conditions. Assumed lump sum cost: 16 hours @ $144.25/hour.
3. CUSTOM TOOLS & EQUIP	LS	4	$5,770.00	$23,080	Four gas turbines	Custom tool allowance for critical lifts. Assumed lump sum cost of $5,770 to purchase special tools (not included below under "F. Protection" item 9, "Tools and Consumables").
Task Subtotal				$48,468		

Task Description	Unit	Quantity	Unit Cost	Total	Comments	Methods/Assumptions
			FACILITY NAME:		**Windchaser 4xLMS100**	**Windchaser 4xLMS100**
D. PROJECT OVERHEAD						
1. SUPERVISION	HR	1056	$94.48	$99,771	6 man months [calculation based on 22-day man-month: 22 x 8 x6 =1056 hours]	Site management wages/vehicle/communication tools. Assumes $86.48/hr fully burdened wages, $5/hr vehicle cost and $3/hr computer/cell/radio cost.
2. FOREMAN	HR	1056	$84.79	$89,538	6 man months [calculation based on 22-day man-month: 22 x 8 x6 =1056 hours]	Site supervision wages/vehicle/communication tools. Assumes $76.79/hr fully burden wages, $5/hr vehicle cost, $3/hr communication tools cost.
3. GUARD SERVICE	WK	24	$2,310.00	$55,440	Assume 7 months of guard service from starts to finish. 4.5 weeks per month	3rd party guard service to protect salvage items while on the ground in stockpiles while contractor prepares to load scrap into delivery trailers or containers; assumes night and weekend service at $2,310/week.
4. CLERICAL	HR	1056	$24.00	$25,344	6 man months [calculation based on 22-day man-month: 22 x 8 x6 =1056 hours]	Office staff assistant wages and communication tools. Assumes $22/hr fully burden wages and $2/hr computer cost.
5. JOBSITE OFFICE	WK	4	$140.00	$560		Jobsite office to house temporary demolition services personnel. Assumed 3rd party rental cost: $140/week.
6. TEMP. UTILITIES	WK	16	$60.00	$960	assume utilities will be in place during the first 2 months.	Jobsite temporary utilities during decommissioning. Assumed cost: $60/wk.
7. SPECIAL INSURANCE	LS	1	$1,150.00	$1,150		Special liability insurance if required by jurisdiction in addition to normal liability coverage. Assumed lump sum cost: $1,150.
8. SUBSISTENCE	WK	24	$2,303.00	$55,272	24 weeks total	Temporary living expenses for 7 man crew at $329/man week, 4-day work week per man.
Task Subtotal				$328,035		
E. HAZARDOUS MATERIALS INSPECTIONS						
Task Subtotal				$0		No asbestos, underground tank or lead paint onsite.
F. PROTECTION						
1. SIGNS	EA	2	$230.00	$460		Install, maintain and remove on-site demolition signs required for local notification. Assumed cost: $100 for material plus $130 labor for each sign.
9. TOOLS AND CONSUMABLES	LS	1	$5,770.00	$5,770		Tool/consumable allowance for the site. Assumed lump sum cost: $5,770 for small crew.
Task Subtotal				$6,230		
G. UTILITY DISCONNECTS						
1. POWER	EA	1	$580.00	$580		Utility company support cost for disconnecting the site from the local utility system.
3. GAS	EA	1	$1,730.00	$1,730		Utility company support cost for disconnecting the site from the local utility system.
Task Subtotal				$2,310		
2. SITE CONSTRUCTION						
A. PRELIMINARY WORK						
1. CUT & CAP LINES	EA	8	$590.53	$4,724	Natural gas lines. 8 locations of UG/AG connections	Cut and cap lines to be left in place below grade. Assumes 8 crew hours @ $41.34/hr plus materials.
2. FENCE/GATE REMOVAL	LF	6900	$0.89	$6,141		Remove existing facility fencing and gates.
3. SAW CUTTING, ETC.	LF	500	$3.30	$1,650		Sawcutting at site battery limits connecting to public roadways. Assumes cutting 6" of asphalt/concrete paving estimated at $0.55/inch per linear foot.
5. DRAIN TANKS/SYSTEMS	LS	1	$8,628.00	$8,628		Prepare facility for decommissioning by shutting off systems, draining tanks, purging lines and similar activities. Assumes a crew of 5 men for one week at $41.34/hr/man.
Task Subtotal				$21,143		

Task Description	Unit	Quantity	Unit Cost	Total	Comments	Methods/Assumptions
			FACILITY NAME:		**Windchaser 4xLMS100**	**Windchaser 4xLMS100**
B. SITE GRADING						
1. ROADWAY REMOVAL (ASPHALT)	SY	10800	$0.77	$8,316		Remove and load existing asphalt/concrete paving 6" thick in a 10 cy end dump truck. Assumes crew production rate of 300 cy/day (300 Excavator and 1 Laborer).
2. ROADWAY REMOVAL (GRAVEL)	SY	62,150	$0.57	$35,426	This value includes all quantities as provided in Table B-2 (totalling 63,955 sq. yd) minus the ZLD access area (740 sq. yd.) -- as the ZLD is not included in this scenario -- and the gravel used to upgrade Brownell Ditch Rd. (1,065 sq. yd.), which will not be removed upon retirement of the facility.	Remove and load existing gravel pavement 6" thick in a 10 cy end dump truck. Assumes crew production rate of 400 cy/day (300 Excavator and 1 Laborer).
3. SITE PREPARATION (TOPSOIL)	SY	143,264	$2.74	$392,543	Includes 23.48 acres of permanently disturbed areas (the gas line metering facility is existing and will not be removed upon facility retirement) and 6.12 acres of temporarily disturbed areas including the underground 500-kV cable, the T-line initial tie-in, and the construction laydown area, as listed in Exhibit C Table C-2. All other areas listed as temporarily disturbed in Table C-2, except for the substation road upgrade, will be graded and seeded after construction but will not require grading and seeding upon retirement of the facility.	Spread and grade 6" topsoil material imported at the cost of $1.86/sy. Assumes crew production rate of 400 cy/day (300 Excavator and 1 Laborer).
4. SEEDING	AC	29.6	$2,726.29	$80,698	Same areas listed in Site Preparation (Topsoil)	Hydroseed areas that received topsoil.
5. MASS EXCAVATION ONSITE	CY	2000	$2.34	$4,680		Excavate and stockpile site materials for reuse as backfill materials. Assumes crew production rate of 100 cy/hr (400 Excavator and 1 Laborer).
6. MASS BACKFILL ONSITE	CY	8200	$4.95	$40,590		Backfill site materials from stockpiles onsite into excavations. Assumes crew production rate of 80 cy/hr (400 Excavator, Roller/Compactor, Dozer and 1 Laborer).
6A. MASS BACKFILL IMPORT	CY	4100	$14.03	$57,523		Backfill with imported materials costing $9.03/cy into mass site excavations. Assumes crew production rate of 80 cy/hr (400 Excavator, Roller/Compactor, Dozer and 1 Laborer).
7. POND RECLAMATION	CY	15972	$4.80	$76,666		Remove pond embankments, fill pond swale area and grade area. Assumes crew production rate of 50 cy/hour (Dozer, Compactor and 1 Laborer).
Task Subtotal				$696,442		
C. UNDERGROUND UTILITY REMOVAL						
1. FIREWATER LINES	LF	4500	$5.45	$24,525		Remove and backfill underground fireline utilities to 3 ft below finished grade. Assumes crew production rate of 400 lf/day (300 Excavator, Compactor and 1 Laborer).
2. SEWER LINES	LF	200	$7.27	$1,454		Remove and backfill underground sewer lines to 3 ft below finished grade. Assumes crew production rate of 300 ft/day (300 Excavator Compactor and 1 Laborer).
3. GAS LINES	LF	300	$6.23	$1,869		Remove and backfill underground gas lines to 3 ft below finished grade. Assumes crew production rate of 350 ft/day (300 Excavator Compactor and 1 Laborer).
4. ELECTRICAL DUCTBANK	LF	3550	$10.91	$38,731	From cost estimate	Remove and backfill electrical ductbanks to 3 feet below finished grade. Assume crew production of 200 ft/day (300 Excavator, Roller/Compactor and 1 Laborer).
5. MANHOLE/CATCH BASIN/VAULT REMOVAL	EA	10	$649.12	$6,491		Remove and backfill unit to 3 feet below finished grade. Assumes 2 crew hours/each (300 Excavator, Roller/Compactor and 1 Laborer).
Task Subtotal				$73,070		

Task Description	Unit	Quantity	Unit Cost	Total	Comments	Methods/Assumptions
			FACILITY NAME:		**Windchaser 4xLMS100**	**Windchaser 4xLMS100**
3. CONCRETE WRECKING						
A. REINFORCED CONCRETE						
1. SLAB ON GRADE	CY	335	$5.54	$1,856		[Quantity imported from Tab 03] Remove and stockpile 6" thick concrete slab on grade for on-site recycling. Assumes crew production of 300 cy/day (300 Excavator and1 Laborer).
2. MINOR FOOTINGS	CY	900	$9.74	$8,766		[Quantity imported from Tab 03] Remove and stockpile minor concrete footings for on-site concrete recycling. Assumes crew production of 175 cy/day (400 Excavator and 1 Laborer).
3. MASS FOUNDATIONS	CY	6207	$23.89	$148,285		[Quantity imported from Tab 03] Break, remove and stockpile on-site concrete foundations for recycling. Assumes crew production of 150 cy/day (400 Excavator/hammer, 300 Excavator and1 Laborer).
5. WALLS	CY	1062	$15.58	$16,546		[Quantity imported from Tab 03] Break up concrete walls, remove and deliver to stockpile. Assumes crew production rate of 150 cy/day (400 Excavator, Shear and 1 Laborer).
Task Subtotal				$175,453		
B. NON-REINFORCED CONCRETE/OTHER						
3. CONCRETE RECYCLE	CY	0	$10.39	$0		[Quantity imported from Tab 03] Using mobile on-site concrete recycle equipment, load concrete rubble from stockpile into crusher jaw, crush concrete, sort rebar, and stockpile material for on-site backfill and metal scrap iron stockpile. Assume $10.39/cy for mobile plant operation. All concrete is hauled off site for disposal, no onsite recycle included.
Task Subtotal				$0		
4. BUILDING WRECKING (All building wrecking assumes the structure is knocked down and put into stockpile for sorting.)						
1. ADMINISTRATION/CONTROL/WATER TREATMENT BUILDING	SF	8,000	$2.40	$19,200		Remove building roof, walls and floors to on-site debris stockpile. Assume crew production of 100 sf/hr (300 Excavator and 1 Laborer).
2. ELECTRICAL/MCC	SF	7,550	$3.89	$29,370	Turbine Control & Main Power Distribution Centers, 5	Remove block building roofing and floors to on-site debris stockpile. Assume crew production of 62 sf/hr (300 Excavator and 1 Laborer).
3. WEATHER PROTECTION	SF	2,925	$0.65	$1,901	CT Chem Feed, Diesel Fire Pump, FG compressor lube oil skids	Assume crew production rate of 370 sf/hr (300 Excavator and 1 Laborer).
4. CEMS	SF	300	$2.60	$780		Assume crew production rate of 93 sf/hr (300 Excavator and 1 Laborer).
5. WATER TREATMENT/ DE-MINERALIZATION	SF	0	$2.34	$0	7,200 SF ZLD System Building	Assume crew production rate of 103 sf/hr (300 Excavator and 1 Laborer).
6. COOLING WATER/TOWER STRUCTURE	SF	6,600	$1.95	$12,870	Cooling Tower	Assume crew production rate of 123 sf/hr (300 Excavator and 1 Laborer).
7. SHOPS AND WAREHOUSE	SF		$2.21	$0	No warehouse.	Remove small building roofing, walls and flooring to on-site debris stockpile. Assume crew production of 110 sf/hr (300 Excavator and 1 Laborer).
8. TURBINE BUILDING	SF		$3.89	$0	The turbine enclosure is integral to the turbine and is not considered as a separate structure requiring demolition.	Assumes crew production rate of 62 sf/hr (300 Excavator and 1 Laborer).
Task Subtotal				$64,121		
5. STEEL WRECKING (All steel wrecking assumes material is knocked down and put into stockpile for sorting.)						
1. SUPERSTRUCTURE	TN	174	$58.42	$10,188		[Quantity imported from Tab 05] Wreck superstructure steel. Assume unit cost of $58.42/ton (400 Excavator/Shear and 1 Laborer).
2. MISCELLANEOUS METALS	TN	10	$84.39	$844		[Quantity imported from Tab 05] Remove miscellaneous steel materials such as ladders and handrail to stockpile. Assume unit cost of $84.39 per ton (400 Excavator/shear and 1 Laborer).
3. SOFT INTERIOR	SF	3,900	$0.47	$1,833		[Quantity imported from Tab 05] Wreck soft interior materials from within structures at the rate of $0.47/sf (5 Laborers and 2 Bobcat loaders).
Task Subtotal				$12,865		

Task Description	Unit	Quantity	Unit Cost	Total	Comments	Methods/Assumptions
			FACILITY NAME:		**Windchaser 4xLMS100**	**Windchaser 4xLMS100**
6. TIMBER WRECKING (All timber wrecking assumes material is knocked down and put into stockpile for sorting).						
Task Subtotal				$0		No timber wrecking expected.
7. THERMAL PROTECTION WRECKING						
2. INSULATION	SF	75,510	$0.71	$53,612		[Quantity imported from Tab 07] Remove insulation materials from equipment or facilities and deposit into on-site debris stockpile. Assume crew production of 466 sf/day (1 Laborer).
Task Subtotal				$53,612		
8. EQUIPMENT WRECKING (All equipment is assumed to be stripped of all piping, housing, insulation, electrical and other prior to the equipment being knocked down and placed into stockpile).						
1. COMBUSTION TURBINE /GENERATOR	EA	4	$15,353.89	$61,416		Wreck components of the turbine/generator equipment and place them into the stockpile. Assumes a crew duration of 5 days to complete the wrecking (5 Laborers and a $150/hr crane).
2. INLET AIR EVAP COOLERS	EA	4	$2,740.08	$10,960		Wreck and place into stockpile. Assume crew duration of 1 day (3 Laborers and a Shear).
3. INLET AIR FOGGERS/FILTERS	EA	4	$1,370.04	$5,480		Wreck and place into stockpile. Assume crew duration of 1/2 day (3 Laborers and a Shear).
6. TURBINE EXHAUST STACKS	EA	4	$23,621.37	$94,485		Wreck stacks assuming a unit cost of $100/Ton.
11. CONDENSATE PUMPS	EA	8	$590.53	$4,724	Intercooler water pumps (2 per unit)	Wreck and place into stockpile. Assumes crew duration of 1/3 day (3 Laborers and a Carry Deck).
12. MISCELLANEOUS PUMPS	EA	25	$354.32	$8,858		Wreck and place into stockpile. Assumes crew duration of 1/4 day (3 Laborers and a Carry Deck).
13. AIR COMPRESSORS	EA	4	$354.32	$1,417		Wreck and place into stockpile. Assumes crew duration of 1/4 day (3 Laborers and a Carry Deck).
14. STANDBY DIESEL/FIRE PUMP GENE	EA	1	$590.53	$591		Wreck and place into stockpile. Assumes crew duration of 1/3 day (3 Laborers and a Carry Deck).
15. GAS COMPRESSORS	EA	5	$590.53	$2,953		Wreck and place into stockpile. Assumes crew duration of 1/3 day (3 Laborers and a Carry Deck).
16. GAS METERING STATION	EA	1	$1,370.04	$1,370		Wreck and place into stockpile. Assumes crew duration of 1/2 day (3 Laborers and a Shear).
17. OIL TANKS	EA	10	$915.33	$9,153	GT lube oil and mineral oil tank, diesel firepump tank and emergency generator oil tank	Wreck and place into stockpile (assumes a 40 ft diameter, 16 ft tall tank). Assumes crew duration of 1/3 day (3 Laborers and a Shear).
18. RAW WATER TANKS	EA	2	$1,370.04	$2,740		Wreck and place into stockpile (assumes a 40 ft diameter, 16 ft tall tank). Assumes crew duration of 1/2 day (3 Laborers and a Shear).
19. DEMINERALIZED WATER TANKS	EA	2	$1,370.04	$2,740		Wreck and place into stockpile (assumes a 40 ft diameter, 16 ft tall tank). Assumes crew duration of 1/2 day (3 Laborers and a Shear).
20. FRESH WATER/WASTEWATER TANI	EA	0	$1,370.04	$0		Wreck and place into stockpile (assumes a 40 ft diameter, 16 ft tall tank). Assumes crew duration of 1/2 day (3 Laborers and a Shear).
21. CO/SCR CATALYST	CF	4	$0.09	$0		Remove material prior to equipment wrecking and place in a stockpile assuming a unit cost of $0.09 per cubic foot (laborers and a crane).
Task Subtotal				$206,888		
9. MECHANICAL WRECKING (All Mechanical materials are assumed to be stripped of other materials in other tasks. This task assumes wrecking the pipe and valves only.)						
1. COOLING WATER PIPING	LF	3,300	$4.54	$14,982		[Quantity imported from Tab 15] Remove piping material to stockpile. Assume crew production rate of 0.014 man-hrs/lf (Shear).
2. GAS PIPING	LF	2,160	$5.19	$11,210		[Quantity imported from Tab 15] Remove piping material to stockpile. Assume crew production rate of 0.016 man-hrs/lf (Shear).
4. RAW WATER PIPING	LF	8,660	$4.54	$39,316		[Quantity imported from Tab 15] Remove piping material to stockpile. Assumes crew production rate of 0.014 man-hrs/lf (shear).
5. FRESH WATER PIPING	LF	6,100	$4.54	$27,694		[Quantity imported from Tab 15] Remove piping material to stockpile. Assumes crew production rate of 0.014 man-hrs/lf (shear).
Task Subtotal				$93,203		

Task Description	Unit	Quantity	Unit Cost	Total	Comments	Methods/Assumptions
			FACILITY NAME:		**Windchaser 4xLMS100**	**Windchaser 4xLMS100**
10. ELECTRICAL WRECKING						
1. TRANSFORMERS	EA	2	$2,007.82	$4,016		[Quantity imported from Tab 16] Drain systems, unhook utilities, preserve transformers for future use. Assumes 5 crew hours per transformer (boom truck and 4 Laborers).
2. MOTOR CONTROL CENTER	EA	6	$882.80	$5,297		[Quantity imported from Tab 16] Wreck motor control centers. Assume crew production of 4 hours/MCC (300 Excavator and 1 Laborer).
3. WIRING	LF	947,000	$0.06	$56,820		[Quantity imported from Tab 16] Remove wiring from equipment/poles or within towers. Assume crew production of 3,000 ft/hr (300 Excavator and 1 Laborer).
4. SWITCH YARD	SF	264,800	$0.40	$105,920		[Quantity imported from Tab 16] Wreck equipment and small structures in switch yards to stockpile. Assume crew production of 600 sf/hr (300 Excavator and 1 Laborer).
5. TOWERS	EA	49	$1,765.60	$86,514		[Quantity imported from Tab 16] Wreck and stockpile electrical tower. Assume crew production rate of 3 hrs/each tower (300 Excavator and 1 laborer).
6. GROUNDING	LF	19,250	$0.06	$1,155		[Quantity imported from Tab 16] Remove grounding from underground facilities around equipment. Assume crew production rate of 3,000 ft/hr (300 Excavator).
7. TRANSMISSION LINE WIRING	MI	11	$194.73	$2,142		[Quantity imported from Tab 16] Remove and reel up transmission line wire. Assume crew production rate of 1 mile/hour (line truck, driver and spotter).
8. BREAKER/INSULATORS/MISC	EA	260	$5.91	$1,537		[Quantity imported from Tab 16] Remove and place into stockpile. Assume 7 each/hr (1 Laborer).
Task Subtotal				$263,400		

Task Description	Unit	Quantity	Unit Cost	Total	Comments	Methods/Assumptions
11. LOAD & HAUL						
1. LOAD & HAUL - DEBRIS	LD	20	$616.26	$12,146		[Quantity imported from "4. Building Wrecking" above] Load debris from stockpile into 80,000 lb, 12 cy side dump truck (300 Excavator and 1 Laborer). Haul debris to disposal site. Assumes 2 hr truck time for each load at $116.85/hr.
2. DISPOSAL - DEBRIS	LD	20	$1,479.03	$29,150		[Quantity imported from "4. Building Wrecking" above] Tipping fees at disposal site for accepting debris hauled from site.
3. LOAD & HAUL CONCRETE	LD	709	$233.70	$165,615		Haul concrete to disposal site in a 12 cy side dump truck. Assumes 2 hr truck time at $116.85/hr.
4. DISPOSAL - CONCRETE	LD	709	$90.00	$63,780		Tipping fees at disposal site for accepting concrete hauled from site.
Task Subtotal				$270,691		

Task Description	Unit Quantity	Unit Cost	Total	Comments	Methods/Assumptions
		FACILITY NAME:		**Windchaser 4xLMS100**	**Windchaser 4xLMS100**
12. COST SUBTOTAL			$2,349,851		Sum of all task subtotals.
OVERHEAD @	10.0%		$234,985		Home office overhead and support @ 10% of Cost Subtotal.
COSTS + OVERHEAD			$2,584,836		
PROFIT @	10.0%		$258,484		Contractor fee @ 10% of Cost Subtotal + Overhead
COSTS + OVERHEAD + PROFIT			$2,843,320		
INSURANCE @	3.0%		$85,300		Industrial insurance @ 3% of Cost Subtotal + Overhead + Profit Subtotal
COSTS + OVERHEAD + PROFIT + INSURANCE			$2,928,620		
13. SCRAP CREDIT (Currently not allowed by EFSC.)			$0		[Imported from Tab 18]
SUBTOTAL (after deduction for scrap credit)			$2,928,620	Currently not allowed by EFSC.	
14. SEPARATE SPECIALTY CONTRACTS			$0		[Imported from Tab 19]
SUBTOTAL (including specialty contracts)			$2,928,620		

APPENDIX W-2

Detailed Cost Estimate Spreadsheet Alternative Scenario with Zero Liquid Discharge

Gas-Fired Energy Facility

Appendix W-2 - Detailed Cost Estimate Spreadsheet Alternative Scenario with ZLD

Task Description	Unit	Quantity	Unit Cost	Total	Comments	Methods/Assumptions
			FACILITY NAME:		**Windchaser 4xLMS100**	**Windchaser 4xLMS100**
1. GENERAL COSTS						
A. PERMITS						
1. DEMOLITION	EA	1	$120.00	$120		Permit required by local jurisdiction. Assumed cost: $120/each.
3. UTILITIES	EA	1	$230.00	$230		Permit required by local jurisdiction. Assumed cost: $230/each.
4. EPA ASBESTOS NOTICE	EA	1	$2,310.00	$2,310		Assumed cost: $2,310/each.
Task Subtotal				$2,660		
B. MOBILIZATION						
1. TRUCKING ON/OFF	TR	10	$1,479.00	$14,790	5 round trips mobilization and 5 trips demobilization.	18-wheel tractor and flat-bed trailer, 80,000 pound capacity @ $123.25/hour; 4 hours load/unload time plus 8 hour round trip for unit cost of $1,479/trip.
2. SUBCONTRACTOR	EA	1	$11,540.00	$11,540	Crane only, blaster mobilization included in subcontracted cost.	One time charges for subcontractor mobilizations. Assumed cost: $11,540 for each mobilization for each subcontractor.
4. HAND TOOLS & EQUIPMENT	TR	2	$2,465.00	$4,930		Assemble tools at contractor's yard, load tools onto truck, trucking to the site, unload site tools. Assumed cost: 20 hours/trip at $123.25/hour. Quantity must include one trip in and one trip out per contractor.
Task Subtotal				$31,260		
C. ENGINEERING						
1. ENGINEERING	LS	4	$5,770.00	$23,080	Four gas turbines	Engineering allowance for critical lift plans. Assumed lump sum cost: 40 hours @ $144.25/hour.
2. LAYOUT / TESTING	LS	1	$2,308.00	$2,308		Engineering allowance for site survey of existing site conditions. Assumed lump sum cost: 16 hours @ $144.25/hour.
3. CUSTOM TOOLS & EQUIP	LS	4	$5,770.00	$23,080	Four gas turbines	Custom tool allowance for critical lifts. Assumed lump sum cost of $5,770 to purchase special tools (not included below under "F. Protection" item 9, "Tools and Consumables").
Task Subtotal				$48,468		

Task Description	Unit	Quantity	Unit Cost	Total	Comments	Methods/Assumptions
			FACILITY NAME:		**Windchaser 4xLMS100**	**Windchaser 4xLMS100**
D. PROJECT OVERHEAD						
1. SUPERVISION	HR	1056	$94.48	$99,771	6 man months [calculation based on 22-day man-month: 22 x 8 x6 =1056 hours]	Site management wages/vehicle/communication tools. Assumes $86.48/hr fully burdened wages, $5/hr vehicle cost and $3/hr computer/cell/radio cost.
2. FOREMAN	HR	1056	$84.79	$89,538	6 man months [calculation based on 22-day man-month: 22 x 8 x6 =1056 hours]	Site supervision wages/vehicle/communication tools. Assumes $76.79/hr fully burden wages, $5/hr vehicle cost, $3/hr communication tools cost.
3. GUARD SERVICE	WK	24	$2,310.00	$55,440	Assume 7 months of guard service from starts to finish. 4.5 weeks per month	3rd party guard service to protect salvage items while on the ground in stockpiles while contractor prepares to load scrap into delivery trailers or containers; assumes night and weekend service at $2,310/week.
4. CLERICAL	HR	1056	$24.00	$25,344	6 man months [calculation based on 22-day man-month: 22 x 8 x6 =1056 hours]	Office staff assistant wages and communication tools. Assumes $22/hr fully burden wages and $2/hr computer cost.
5. JOBSITE OFFICE	WK	4	$140.00	$560		Jobsite office to house temporary demolition services personnel. Assumed 3rd party rental cost: $140/week.
6. TEMP. UTILITIES	WK	16	$60.00	$960	assume utilities will be in place during the first 2 months.	Jobsite temporary utilities during decommissioning. Assumed cost: $60/wk.
7. SPECIAL INSURANCE	LS	1	$1,150.00	$1,150		Special liability insurance if required by jurisdiction in addition to normal liability coverage. Assumed lump sum cost: $1,150.
8. SUBSISTENCE	WK	24	$2,303.00	$55,272	24 weeks total	Temporary living expenses for 7 man crew at $329/man week, 4-day work week per man.
Task Subtotal				$328,035		
E. HAZARDOUS MATERIALS INSPECTIONS						
Task Subtotal				$0		No asbestos, underground tank or lead paint onsite.
F. PROTECTION						
1. SIGNS	EA	2	$230.00	$460		Install, maintain and remove on-site demolition signs required for local notification. Assumed cost: $100 for material plus $130 labor for each sign.
9. TOOLS AND CONSUMABLES	LS	1	$5,770.00	$5,770		Tool/consumable allowance for the site. Assumed lump sum cost: $5,770 for small crew.
Task Subtotal				$6,230		
G. UTILITY DISCONNECTS						
1. POWER	EA	1	$580.00	$580		Utility company support cost for disconnecting the site from the local utility system.
3. GAS	EA	1	$1,730.00	$1,730		Utility company support cost for disconnecting the site from the local utility system.
Task Subtotal				$2,310		
2. SITE CONSTRUCTION						
A. PRELIMINARY WORK						
1. CUT & CAP LINES	EA	8	$590.53	$4,724	Natural gas lines. 8 locations of UG/AG connections	Cut and cap lines to be left in place below grade. Assumes 8 crew hours @ $41.34/hr plus materials.
2. FENCE/GATE REMOVAL	LF	6900	$0.89	$6,141		Remove existing facility fencing and gates.
3. SAW CUTTING, ETC.	LF	500	$3.30	$1,650		Sawcutting at site battery limits connecting to public roadways. Assumes cutting 6" of asphalt/concrete paving estimated at $0.55/inch per linear foot.
5. DRAIN TANKS/SYSTEMS	LS	1	$8,628.00	$8,628		Prepare facility for decommissioning by shutting off systems, draining tanks, purging lines and similar activities. Assumes a crew of 5 men for one week at $41.34/hr/man.
Task Subtotal				$21,143		

Task Description	Unit	Quantity	Unit Cost	Total	Comments	Methods/Assumptions
			FACILITY NAME:		**Windchaser 4xLMS100**	**Windchaser 4xLMS100**
B. SITE GRADING						
1. ROADWAY REMOVAL (ASPHALT)	SY	10800	$0.77	$8,316		Remove and load existing asphalt/concrete paving 6" thick in a 10 cy end dump truck. Assumes crew production rate of 300 cy/day (300 Excavator and 1 Laborer).
2. ROADWAY REMOVAL (GRAVEL)	SY	62890	$0.57	$35,847	This value includes all quantities as provided in Table B-2 (totalling 63,955 sq. yd) minus the gravel used to upgrade Brownell Ditch Rd. (1,065 sq. yd.), which will not be removed upon retirement of the facility.	Remove and load existing gravel pavement 6" thick in a 10 cy end dump truck. Assumes crew production rate of 400 cy/day (300 Excavator and 1 Laborer).
3. SITE PREPARATION (TOPSOIL)	SY	143,264	$2.74	$392,543	Includes 23.48 acres of permanently disturbed areas (the gas line metering facility is existing and will not be removed upon facility retirement) and 6.12 acres of temporarily disturbed areas including the underground 500-kV cable, the T-line initial tie-in, and the construction laydown area, as listed in Exhibit C Table C-2. All other areas listed as temporarily disturbed in Table C-2, except for the substation road upgrade, will be graded and seeded after construction but will not require grading and seeding upon retirement of the facility.	Spread and grade 6" topsoil material imported at the cost of $1.86/sy. Assumes crew production rate of 400 cy/day (300 Excavator and 1 Laborer).
4. SEEDING	AC	29.6	$2,726.29	$80,698	Same areas listed in Site Preparation (Topsoil)	Hydroseed areas that received topsoil.
5. MASS EXCAVATION ONSITE	CY	2000	$2.34	$4,680		Excavate and stockpile site materials for reuse as backfill materials. Assumes crew production rate of 100 cy/hr (400 Excavator and 1 Laborer).
6. MASS BACKFILL ONSITE	CY	8200	$4.95	$40,590		Backfill site materials from stockpiles onsite into excavations. Assumes crew production rate of 80 cy/hr (400 Excavator, Roller/Compactor, Dozer and 1 Laborer).
6A. MASS BACKFILL IMPORT	CY	4100	$14.03	$57,523		Backfill with imported materials costing $9.03/cy into mass site excavations. Assumes crew production rate of 80 cy/hr (400 Excavator, Roller/Compactor, Dozer and 1 Laborer).
7. POND RECLAMATION	CY	15972	$4.80	$76,666		Remove pond embankments, fill pond swale area and grade area. Assumes crew production rate of 50 cy/hour (Dozer, Compactor and 1 Laborer).
Task Subtotal				$696,863		
C. UNDERGROUND UTILITY REMOVAL						
1. FIREWATER LINES	LF	4500	$5.45	$24,525		Remove and backfill underground fireline utilities to 3 ft below finished grade. Assumes crew production rate of 400 lf/day (300 Excavator, Compactor and 1 Laborer).
2. SEWER LINES	LF	200	$7.27	$1,454		Remove and backfill underground sewer lines to 3 ft below finished grade. Assumes crew production rate of 300 ft/day (300 Excavator Compactor and 1 Laborer).
3. GAS LINES	LF	300	$6.23	$1,869		Remove and backfill underground gas lines to 3 ft below finished grade. Assumes crew production rate of 350 ft/day (300 Excavator Compactor and 1 Laborer).
4. ELECTRICAL DUCTBANK	LF	3550	$10.91	$38,731	From cost estimate	Remove and backfill electrical ductbanks to 3 feet below finished grade. Assume crew production of 200 ft/day (300 Excavator, Roller/Compactor and 1 Laborer).
5. MANHOLE/CATCH BASIN/VAULT REMOVAL	EA	10	$649.12	$6,491		Remove and backfill unit to 3 feet below finished grade. Assumes 2 crew hours/each (300 Excavator, Roller/Compactor and 1 Laborer).
Task Subtotal				$73,070		

Task Description	Unit	Quantity	Unit Cost	Total	Comments	Methods/Assumptions
			FACILITY NAME:		**Windchaser 4xLMS100**	**Windchaser 4xLMS100**
3. CONCRETE WRECKING						
A. REINFORCED CONCRETE						
1. SLAB ON GRADE	CY	465	$5.54	$2,576		[Quantity imported from Tab 03] Remove and stockpile 6" thick concrete slab on grade for on-site recycling. Assumes crew production of 300 cy/day (300 Excavator and1 Laborer).
2. MINOR FOOTINGS	CY	900	$9.74	$8,766		[Quantity imported from Tab 03] Remove and stockpile minor concrete footings for on-site concrete recycling. Assumes crew production of 175 cy/day (400 Excavator and 1 Laborer).
3. MASS FOUNDATIONS	CY	6207	$23.89	$148,285		[Quantity imported from Tab 03] Break, remove and stockpile on-site concrete foundations for recycling. Assumes crew production of 150 cy/day (400 Excavator/hammer, 300 Excavator and1 Laborer).
5. WALLS	CY	1062	$15.58	$16,546		[Quantity imported from Tab 03] Break up concrete walls, remove and deliver to stockpile. Assumes crew production rate of 150 cy/day (400 Excavator, Shear and 1 Laborer).
Task Subtotal				$176,173		
B. NON-REINFORCED CONCRETE/OTHER						
3. CONCRETE RECYCLE	CY	0	$10.39	$0		[Quantity imported from Tab 03] Using mobile on-site concrete recycle equipment, load concrete rubble from stockpile into crusher jaw, crush concrete, sort rebar, and stockpile material for on-site backfill and metal scrap iron stockpile. Assume $10.39/cy for mobile plant operation. All concrete is hauled off site for disposal, no onsite recycle included.
Task Subtotal				$0		
4. BUILDING WRECKING (All building wrecking assumes the structure is knocked down and put into stockpile for sorting.)						
1. ADMINISTRATION/CONTROL	SF	8,000	$2.40	$19,200		Remove building roof, walls and floors to on-site debris stockpile. Assume crew production of 100 sf/hr (300 Excavator and 1 Laborer).
2. ELECTRICAL/MCC	SF	7,550	$3.89	$29,370	Turbine Control & Main Power Distribution Centers, 5	Remove block building roofing and floors to on-site debris stockpile. Assume crew production of 62 sf/hr (300 Excavator and 1 Laborer).
3. WEATHER PROTECTION	SF	2,925	$0.65	$1,901	CT Chem Feed, Diesel Fire Pump, FG compressor lube oil skids	Assume crew production rate of 370 sf/hr (300 Excavator and 1 Laborer).
4. CEMS	SF	300	$2.60	$780		Assume crew production rate of 93 sf/hr (300 Excavator and 1 Laborer).
5. WATER TREATMENT/ DE-MINERALIZATION	SF	7,200	$2.34	$16,848	7,200 SF ZLD System Building	Assume crew production rate of 103 sf/hr (300 Excavator and 1 Laborer).
6. COOLING WATER/TOWER STRUCTURE	SF	6,600	$1.95	$12,870	Cooling Tower	Assume crew production rate of 123 sf/hr (300 Excavator and 1 Laborer).
7. SHOPS AND WAREHOUSE	SF		$2.21	$0	No warehouse.	Remove small building roofing, walls and flooring to on-site debris stockpile. Assume crew production of 110 sf/hr (300 Excavator and 1 Laborer).
8. TURBINE BUILDING	SF		$3.89	$0	The turbine enclosure is integral to the turbine and is not considered as a separate structure requiring demolition.	Assumes crew production rate of 62 sf/hr (300 Excavator and 1 Laborer).
Task Subtotal				$80,969		
5. STEEL WRECKING (All steel wrecking assumes material is knocked down and put into stockpile for sorting.)						
1. SUPERSTRUCTURE	TN	174	$58.42	$10,188		[Quantity imported from Tab 05] Wreck superstructure steel. Assume unit cost of $58.42/ton (400 Excavator/Shear and 1 Laborer).
2. MISCELLANEOUS METALS	TN	10	$84.39	$844		[Quantity imported from Tab 05] Remove miscellaneous steel materials such as ladders and handrail to stockpile. Assume unit cost of $84.39 per ton (400 Excavator/shear and 1 Laborer).
3. SOFT INTERIOR	SF	3,900	$0.47	$1,833		[Quantity imported from Tab 05] Wreck soft interior materials from within structures at the rate of $0.47/sf (5 Laborers and 2 Bobcat loaders).
Task Subtotal				$12,865		

Task Description	Unit	Quantity	Unit Cost	Total	Comments	Methods/Assumptions
			FACILITY NAME:		**Windchaser 4xLMS100**	**Windchaser 4xLMS100**
6. TIMBER WRECKING (All timber wrecking assumes material is knocked down and put into stockpile for sorting).						
Task Subtotal				$0		No timber wrecking expected.
7. THERMAL PROTECTION WRECKING						
2. INSULATION	SF	75,510	$0.71	$53,612		[Quantity imported from Tab 07] Remove insulation materials from equipment or facilities and deposit into on-site debris stockpile. Assume crew production of 466 sf/day (1 Laborer).
Task Subtotal				$53,612		
8. EQUIPMENT WRECKING (All equipment is assumed to be stripped of all piping, housing, insulation, electrical and other prior to the equipment being knocked down and placed into stockpile).						
1. COMBUSTION TURBINE /GENERATOR	EA	4	$15,353.89	$61,416		Wreck components of the turbine/generator equipment and place them into the stockpile. Assumes a crew duration of 5 days to complete the wrecking (5 Laborers and a $150/hr crane).
2. INLET AIR EVAP COOLERS	EA	4	$2,740.08	$10,960		Wreck and place into stockpile. Assume crew duration of 1 day (3 Laborers and a Shear).
3. INLET AIR FOGGERS/FILTERS	EA	4	$1,370.04	$5,480		Wreck and place into stockpile. Assume crew duration of 1/2 day (3 Laborers and a Shear).
6. TURBINE EXHAUST STACKS	EA	4	$23,621.37	$94,485		Wreck stacks assuming a unit cost of $100/Ton.
11. CONDENSATE PUMPS	EA	8	$590.53	$4,724	Intercooler water pumps (2 per unit)	Wreck and place into stockpile. Assumes crew duration of 1/3 day (3 Laborers and a Carry Deck).
12. MISCELLANEOUS PUMPS	EA	25	$354.32	$8,858		Wreck and place into stockpile. Assumes crew duration of 1/4 day (3 Laborers and a Carry Deck).
13. AIR COMPRESSORS	EA	4	$354.32	$1,417		Wreck and place into stockpile. Assumes crew duration of 1/4 day (3 Laborers and a Carry Deck).
14. STANDBY DIESEL/FIRE PUMP GENE	EA	1	$590.53	$591		Wreck and place into stockpile. Assumes crew duration of 1/3 day (3 Laborers and a Carry Deck).
15. GAS COMPRESSORS	EA	5	$590.53	$2,953		Wreck and place into stockpile. Assumes crew duration of 1/3 day (3 Laborers and a Carry Deck).
16. GAS METERING STATION	EA	1	$1,370.04	$1,370		Wreck and place into stockpile. Assumes crew duration of 1/2 day (3 Laborers and a Shear).
17. OIL TANKS	EA	10	$915.33	$9,153	GT lube oil and mineral oil tank, diesel firepump tank and emergency generator oil tank	Wreck and place into stockpile (assumes a 40 ft diameter, 16 ft tall tank). Assumes crew duration of 1/3 day (3 Laborers and a Shear).
18. RAW WATER TANKS	EA	2	$1,370.04	$2,740		Wreck and place into stockpile (assumes a 40 ft diameter, 16 ft tall tank). Assumes crew duration of 1/2 day (3 Laborers and a Shear).
19. DEMINERALIZED WATER TANKS	EA	2	$1,370.04	$2,740		Wreck and place into stockpile (assumes a 40 ft diameter, 16 ft tall tank). Assumes crew duration of 1/2 day (3 Laborers and a Shear).
20. FRESH WATER/WASTEWATER TANKS	EA	1	$1,370.04	$1,370		Wreck and place into stockpile (assumes a 40 ft diameter, 16 ft tall tank). Assumes crew duration of 1/2 day (3 Laborers and a Shear).
21. CO/SCR CATALYST	CF	4	$0.09	$0		Remove material prior to equipment wrecking and place in a stockpile assuming a unit cost of $0.09 per cubic foot (laborers and a crane).
Task Subtotal				$208,258		
9. MECHANICAL WRECKING (All Mechanical materials are assumed to be stripped of other materials in other tasks. This task assumes wrecking the pipe and valves only.)						
1. COOLING WATER PIPING	LF	3,450	$4.54	$15,663		[Quantity imported from Tab 15] Remove piping material to stockpile. Assume crew production rate of 0.014 man-hrs/lf (Shear).
2. GAS PIPING	LF	2,160	$5.19	$11,210		[Quantity imported from Tab 15] Remove piping material to stockpile. Assume crew production rate of 0.016 man-hrs/lf (Shear).
4. RAW WATER PIPING	LF	8,660	$4.54	$39,316		[Quantity imported from Tab 15] Remove piping material to stockpile. Assumes crew production rate of 0.014 man-hrs/lf (shear).
5. FRESH WATER PIPING	LF	6,100	$4.54	$27,694		[Quantity imported from Tab 15] Remove piping material to stockpile. Assumes crew production rate of 0.014 man-hrs/lf (shear).
Task Subtotal				$93,884		

Task Description	Unit	Quantity	Unit Cost	Total	Comments	Methods/Assumptions
			FACILITY NAME:		**Windchaser 4xLMS100**	**Windchaser 4xLMS100**
10. ELECTRICAL WRECKING						
1. TRANSFORMERS	EA	2	$2,007.82	$4,016		[Quantity imported from Tab 16] Drain systems, unhook utilities, preserve transformers for future use. Assumes 5 crew hours per transformer (boom truck and 4 Laborers).
2. MOTOR CONTROL CENTER	EA	6	$882.80	$5,297		[Quantity imported from Tab 16] Wreck motor control centers. Assume crew production of 4 hours/MCC (300 Excavator and 1 Laborer).
3. WIRING	LF	947,000	$0.06	$56,820		[Quantity imported from Tab 16] Remove wiring from equipment/poles or within towers. Assume crew production of 3,000 ft/hr (300 Excavator and 1 Laborer).
4. SWITCH YARD	SF	264,800	$0.40	$105,920		[Quantity imported from Tab 16] Wreck equipment and small structures in switch yards to stockpile. Assume crew production of 600 sf/hr (300 Excavator and 1 Laborer).
5. TOWERS	EA	49	$1,765.60	$86,514		[Quantity imported from Tab 16] Wreck and stockpile electrical tower. Assume crew production rate of 3 hrs/each tower (300 Excavator and 1 laborer).
6. GROUNDING	LF	19,250	$0.06	$1,155		[Quantity imported from Tab 16] Remove grounding from underground facilities around equipment. Assume crew production rate of 3,000 ft/hr (300 Excavator).
7. TRANSMISSION LINE WIRING	MI	11	$194.73	$2,142		[Quantity imported from Tab 16] Remove and reel up transmission line wire. Assume crew production rate of 1 mile/hour (line truck, driver and spotter).
8. BREAKER/INSULATORS/MISC	EA	260	$5.91	$1,537		[Quantity imported from Tab 16] Remove and place into stockpile. Assume 7 each/hr (1 Laborer).
Task Subtotal				$263,400		
11. LOAD & HAUL						
1. LOAD & HAUL - DEBRIS	LD	25	$616.26	$15,592		[Quantity imported from "4. Building Wrecking" above] Load debris from stockpile into 80,000 lb, 12 cy side dump truck (300 Excavator and 1 Laborer). Haul debris to disposal site. Assumes 2 hr truck time for each load at $116.85/hr.
2. DISPOSAL - DEBRIS	LD	25	$1,479.03	$37,421		[Quantity imported from "4. Building Wrecking" above] Tipping fees at disposal site for accepting debris hauled from site.
3. LOAD & HAUL CONCRETE	LD	720	$233.70	$168,147		Haul concrete to disposal site in a 12 cy side dump truck. Assumes 2 hr truck time at $116.85/hr.
4. DISPOSAL - CONCRETE	LD	720	$90.00	$64,755		Tipping fees at disposal site for accepting concrete hauled from site.
Task Subtotal				$285,915		

Task Description	Unit	Quantity	Unit Cost	Total	Comments	Methods/Assumptions
			FACILITY NAME:		Windchaser 4xLMS100	Windchaser 4xLMS100
12. COST SUBTOTAL				$2,385,116		Sum of all task subtotals.
OVERHEAD @	10.0%			$238,512		Home office overhead and support @ 10% of Cost Subtotal.
COSTS + OVERHEAD				$2,623,628		
PROFIT @	10.0%			$262,363		Contractor fee @ 10% of Cost Subtotal + Overhead
COSTS + OVERHEAD + PROFIT				$2,885,991		
INSURANCE @	3.0%			$86,580		Industrial insurance @ 3% of Cost Subtotal + Overhead + Profit Subtotal
COSTS + OVERHEAD + PROFIT + INSURANCE				$2,972,571		
13. SCRAP CREDIT (Currently not allowed by EFSC.)				$0		[Imported from Tab 18]
SUBTOTAL (after deduction for scrap credit)				$2,972,571	Currently not allowed by EFSC.	
14. SEPARATE SPECIALTY CONTRACTS				$0		[Imported from Tab 19]
SUBTOTAL (including specialty contracts)				$2,972,571		

APPENDIX W-3

Concrete Quantity Assumptions

Gas-Fired Energy Facility

Tab 03 - Concrete Wrecking

A. Reinforced Concrete

1	Slab on Grade (CY)	
	Work Item	Quantity
1	Admin/WT Building	100
2	CEMS Building	30
3	Electrical Building	170
4	Area Paving	35
5	ZLD Building & Equipment	130
	Total	465

2	Minor Footings (CY)	
	Work Item	Quantity
1	Pump Bases	160
2	Transformer	190
3	Onsite Switchyard	90
4	Misc. Equipment	370
5	500-kV Switchyard	90
	Total	900

3	Mass Foundations (CY)	
	Work Item	Quantity
1	CTGs	2920
2	Tempering Air Fans	120
3	Evap Cooler	60
4	Fuel Gas Compressors	400
5	Cooling Tower	1568
6	SCR/CO Catalyst	830
7	Demin Tanks	46
8	Raw Water Tanks	143
9	Ammonia Storage Tanks	120
	Total	6207

4	Superstructure (CY)	
	Work Item	Quantity
1		
2		
3		
4		
5		
	Total	0

5	Walls (CY)	
	Work Item	Quantity
1	GSU Transformer Firewall	300
2	Cooling Tower Basin and Pump Pit	762
3		
4		
5		
	Total	1062

B. Non-Reinforced Concrete

1	Dead Men (CY)	
	Work Item	Quantity
1		
2		
3		
4		
5		
	Total	0

2	Security Rails (LF)	
	Work Item	Quantity
1		
2		
3		
4		
5		
	Total	0

3	Piling (EA)	
	Work Item	Quantity
1		
2		
3		
4		
5		
	Total	0

C. Concrete Recycle

3	Concrete Recycle (CY)	
	Work Item	Quantity
1	SOG	465
2	Minor	900
3	Mass	6207
4	Super	0
5	Walls	1062
	Total	8634

EXHIBIT X

NOISE
OAR 345-021-0010(1)(x)

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TABLES

FIGURES

APPENDICES

X.1 INTRODUCTION

OAR 345-021-0010(1)(x) *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 Oregon Department of Environmental Quality's noise control standards in OAR 340-035-0035.*

Response: Perennial-WindChaser LLC (Perennial) proposes to construct and operate a natural gas–fired power plant and related facilities, to be called the Perennial Wind Chaser Station project (Project), located near Hermiston, Oregon. The gas-fired energy facility, or Station, will produce up to approximately 415 megawatts (MW) of electric power. The Project also includes a new step-up substation, located next to the Bonneville Power Administration (BPA) McNary Substation in Umatilla County near the City of Umatilla.

X.2 SUMMARY

Three noise sources have been identified regarding the operation of the Project: 1) station noise in generating electrical power, 2) transformer noise at the step-up substation, and 3) electrical transmission line noise. Each noise source is evaluated in detail in the exhibit. In addition, background noise levels were measured at the nearest noise sensitive properties that may be impacted by the identified noise sources.

Noise sources at the proposed Station will include combustion turbines, ancillary equipment, cooling towers, and stack exhaust. For this noise analysis, noise level measurements were collected at two noise-sensitive properties located near the Station to characterize current background noise levels in the area. These properties were located at 77935 Cottonwood Bend Road (also known as Underpass Road) (2,970 feet to the southeast of the center point between power block 2 and power block 3) and 78401 Cottonwood Bend Road (3,300 feet to the northeast of the center point between power block 2 and power block 3). Noise sources at the Station were then modeled to estimate noise level increase with the Station in full operation. Due to the Station's distance from the residential receptors, and the noise control measures to be installed, the noise level will not increase more than 10 A-weighted decibels (dBA) above the lowest-measured background hourly L_{50}[1] for each noise-sensitive property. The operation of the Station will comply with all applicable requirements of the Oregon Department of Environmental Quality (DEQ) regulations contained in Oregon Administrative Rule (OAR) 340-035-0035.

[1] L_{50} indicates that a sound level is exceeded 50 percent of the time. This notation is also used with other numbers to indicate the percentage of time a sound level was exceeded, such as L_{10} and L_1.

The noise sources at the step-up substation located adjacent to the existing BPA McNary Substation will include three single-phase step-up transformers. Noise levels at the nearest potential noise-sensitive property, a vacant residential structure located at 30221 Scapelhorn Road (958 feet to the east), were monitored to characterize current background noise levels. The step-up substation noise was then modeled to estimate the increase in noise level due to the operation of the transformer. A noise level increase of about 2.3 dBA was calculated. The operation of the step-up substation will comply with all applicable requirements contained in OAR 340-035-0035.

An analysis was performed to determine the electrical effects (including corona noise) of replacing the present 115-kilovolt (kV) transmission line with a 230-kV transmission line on the double circuit configured Hermiston to McNary transmission infrastructure. Due to the low level of corona noise (39.3 dBA within 25 feet of the right-of-way [ROW] centerline) estimated for the transmission lines, an insignificant increase in noise levels is expected. The operation of the transmission line will comply with all applicable requirements contained in OAR 340-035-0035.

Four noise sources have been identified regarding the construction of the Project: 1) construction of the Station, 2) construction of the step-up substation, 3) construction of the new gas pipeline, and 4) reconductoring the existing transmission line. Each noise source is evaluated in detail in this exhibit. Because of their short-term nature, construction activities are listed as exempt from the rules of OAR 340-035-0035(1) by OAR 340-035-0035(5)(g).

X.3 PREDICTED NOISE LEVELS

OAR 345-021-0010(1)(x)(A) *Predicted noise levels resulting from construction and operation of the proposed facility.*

Response: The predicted noise levels are presented in three subsections below, existing background noise, construction noise levels, and operation noise levels.

X.3.1 Existing Background Noise

To evaluate the noise levels resulting from operation of the Project and determine compliance with DEQ noise standards, it is necessary to characterize existing background noise levels. Ecology and Environment, Inc. (E & E) conducted a noise survey on June 27–29, 2013, of the following areas of the Project:

1. Two noise-sensitive properties that may be impacted by the Station's operation. They are private residences located at 77935 Cottonwood Bend Road (also known as Underpass Road) (2,970 feet to the southeast of the center point between power block 2 and power block 3) and at 78401 Cottonwood Bend Road (3,300 feet to the northeast of the center point between power block 2 and power block 3).

2. One noise-sensitive property that may be impacted by the step-up substation's operation. It is located at 30221 Scapelhorn Road (958 feet to the southeast of the center of the substation site). This is the nearest potential noise-sensitive property, an unoccupied residential property recently purchased by BPA that it is expected to remain unoccupied.
3. Three residential locations along the transmission line.

E & E also evaluated noise for a third receptor location to evaluate impacts from the Station's operations, but did not measure ambient noise at that location. A building located at 78319 Walker Road on the same tax lot parcel as AmeriCold Logistics LLC (approximately 2,800 feet north of the Energy Facility Site boundary) appeared at the time of the survey to be for commercial use. It was later learned that the building is currently rented as residential use. The Walker Road residence and LT-2 (located to the northeast of the Station) are approximately equidistant to the midpoint of the planned turbines in the Station (center point between LMS100 turbine unit 2 and turbine unit 3). Potential noise impacts at this site are discussed below in Sections X.3.3.1 and X.4.2.1.

The results of these surveys are included in Appendix X-1, Environmental Noise Assessment Report. Table X-1 presents the lowest ambient hourly average L_{50} for each of the surveyed areas.

Table X-1 Lowest Measured Ambient Hourly Average L_{50}

Property Location	Lowest Ambient Hourly Average L_{50}
77935 Cottonwood Bend Road – LT-1	39.3
78401 Cottonwood Bend Road – LT-2	40.1
30221 Scapelhorn Road – LT-3	39.8
Residences along the transmission line	38.7

Appendix X-1, Environmental Noise Assessment Report, presents graphs showing the hourly noise levels versus the Hermiston Generating Plant's (HGP's) operational load. The noise survey data showed that noise levels were higher at night than during the day for LT1 through LT3. A review of the HGP's operational load during the survey period was conducted to determine if the power plant was contributing to the nighttime noise levels. This review showed that the HGP was not operating during the peak noise periods at night. While conducting the noise survey, E & E staff noted higher than expected traffic on Cottonwood Bend Road (a gravel road) and distant trains passing. These activities may contribute to the higher noise levels measured during nighttime hours.

X.3.2 Construction

Although noises originating from construction sites are exempt from the DEQ Noise Control Regulations (OAR 340, Division 35), for informational purposes, construction sound levels were estimated for the planned construction activities and included in the following sections.

X.3.2.1 Station Construction

The noise-sensitive property nearest to the Station will be approximately 3,000 feet away from the center of the site; at this distance, the maximum composite noise contribution due to construction is estimated to be approximately 54.4 dBA. Complete details regarding estimated sound levels and methodology used to determine the noise impact to the nearest sensitive property are contained in Section 6.4 of Appendix X-1, Environmental Noise Assessment Report.

X.3.2.2 Step-up Substation Construction

The noise-sensitive property nearest to the step-up substation will be approximately 958 feet away; at this distance, the maximum composite noise contribution due to construction is estimated to be approximately 63.9 dBA during step-up station construction. Complete details regarding estimated sound pressure levels and methodology used to determine the noise impact to the nearest sensitive property are contained in Section 6.4 of Appendix X-1, Environmental Noise Assessment Report.

X.3.2.3 Natural Gas Pipeline Construction

The maximum composite noise level due to construction of the natural gas pipeline is estimated to be approximately 91 dBA at 50 feet. Noise from onsite construction activities that may occur near a noise-sensitive property along the natural gas pipeline ROW may be intermittent or continuous but will be limited to short durations over a period of three to four weeks at any single location. Complete details regarding estimated sound pressure levels and methodology used to determine the noise impact at the estimated distance are contained in Section 6.4 of Appendix X-1, Environmental Noise Assessment Report.

X.3.2.4 Reconductoring Transmission Line Activities

The maximum composite noise level due to the transmission line activities is estimated to be approximately 94 dBA at 50 feet. Complete details regarding estimated sound pressure levels and methodology used to determine the noise impact at the estimated distance are contained in Section 6.4 of Appendix X-1, Environmental Noise Assessment Report.

X.3.3 Operation

X.3.3.1 Station Operation

Primary operational noise sources at the Station are provided in Table X-2 and include equipment associated with the turbines and generators, as well as ancillary equipment.

Acoustic noise modeling of the major Station-related sources was conducted using the Computer Aided Design for Noise Abatement (CadnaA) Modeling software for the Station and substation. The CadnaA program is a scaled, three-dimensional program that takes into account air absorption, terrain, ground absorption, and reflections for each piece of noise-emitting equipment and predicts downwind sound pressure levels. Complete details regarding estimated sound pressure levels and methodology used to determine the noise impact at the estimated distance are contained in Section 5.0 of Appendix X-1, Environmental Noise Assessment Report. Because there will be times when the variable bleed valves (VBVs) do not operate at all, a second operational scenario was modeled: "No VBV." In this scenario, the VBVs were assumed to have zero impact. This holds true for most normal operational scenarios and is expected to represent the typical Station sound level impacts. Table X-3 summarizes the noise levels associated with operation of the Station.

Table X-2 Primary Operational Noise Sources at the Station

Source Type	Name	Quantity	Overall PWL	
			dBA	dB
Points	Auxiliary Transformers	2	96.0	101.2
	Chemical Feed Skids	2	102.6	105.5
	Condensate Pumps	2	102.0	107.6
	Cooling Tower Transformers	2	96.0	101.2
	Gas Compressor Transformers	3	96.0	101.2
	Gas Metering Area	1	101.0	103.0
	Generator Air Exhausts	8	94.5	106.8
	Secondary Unit Sub Transformers	4	96.0	101.2
	Sumps	4	106.7	112.0
	Turbine Enclosure Vents	4	99.5	104.9
	Turbine Stacks	4	110.5	127.8
	Variable Bleed Valve Stacks	4	109.5	136.2
	Variable Bleed Valve Stack Bases	4	95.8	108.6
	Water pumps/sumps	10	106.7	112.0
Areas	Air Intakes	4	76.3	101.7
	Auxiliary Skids	4	98.1	103.9
	Cooling Tower Outlet	1	115.1	120.7
	Expansion Joints	4	75.2	110.1
	Fuel Gas Filter Separators	4	101.0	103.0
	Gas Compressors	5	107.0	107.5
	Generators	4	87.3	99.9
	Generator Enclosure Vent Inlets/Exhausts	4	91.6	106.9

Table X-2 Primary Operational Noise Sources at the Station

Source Type	Name	Quantity	Overall PWL	
			dBA	dB
	Intercoolers	4	87.8	100.8
	LMS100s	4	91.6	106.9
	Gas Compressor Lube Oil Skids	5	101.9	115.4
	SCRs	4	95.2	106.7
	SCR Skids	4	95.2	106.7
	Transformers	2	106.8	114.3
	VBV Silencers	8	110.6	111.6
Vertical Areas	Air Intakes	4	81.5	102.8
	Auxiliary Skids	4	98.1	103.9
	Cooling Tower Outlet	1	115.1	120.7
	Expansion Joints	4	75.2	110.1
	Fuel Gas Filter Separators	4	101.0	103.0
	Gas Compressors	5	107.0	107.5
	Generators	4	87.3	99.9
	Generator Enclosure Vent Inlets/Exhausts	4	91.6	106.9
	Intercoolers	4	87.8	100.8
	LMS100s	4	91.6	106.9
	Gas Compressor Lube Oil Skids	5	101.9	115.4
	SCRs	4	95.2	106.7
	SCR Skids	4	95.2	106.7
	Stack Structures	4	88.1	100.2
	Transformers	2	106.8	114.3
	VBV Silencers	8	110.6	111.6

Key:
dB decibels
dBA A-weighted decibels
PWL sound power level
SCR selective catalytic reduction
VBV variable bleed valves

It should be noted that the sound power level is a calculated measure, expressed in terms of watts that is primarily used for acoustical modeling and design analyses. It is a function of both the sound pressure level produced by a source at a particular distance and the effective radiating area or physical size of the source. Sound pressure level, on the other hand, is the familiar quantity measured by instruments and perceived by the ear and is always tied to the distance to the sound source.

Table X-3 Estimated Station Operating Noise Levels

Operational Scenario	Location	Lowest Hourly Measured L_{50} (dBA)	OAR Standard L_{50} + 10 (dBA)	Model Predicted Sound Level (dBA)	Ambient Plus Station Contribution (dBA)
All Sources	LT-1	39.3	49.3	47.1	47.8
	LT-2	40.1	50.1	44.5	45.8
No VBV	LT-1	39.3	49.3	46.3	47.1
	LT-2	40.1	50.1	44.1	45.6

Key:
dBA A-weighted decibels
L_{50} sound level exceeded 50% of the time
OAR Oregon Administrative Rules
VBV variable bleed valves

As presented in Table X-3, due to the distance from the Station to the noise sensitive properties (2,970 feet for LT-1 and 3,300 feet for LT-2), the estimated contribution to the existing ambient noise level from the operation of the Station with all equipment operating simultaneously under its loudest conditions is 47.1 dBA at 77935 Cottonwood Bend (LT-1) and 44.5 at 78401 Cottonwood Bend Road (LT-2) (46.3 dBA and 44.1 dBA without the VBVs operating). Combining the sound level estimated for the Station with all sources operating and the lowest measured background L_{50} for each property resulted in a level of 47.8 dBA at 77935 Cottonwood Bend Road (LT-1) and 45.8 at 78401 Cottonwood Bend Road (LT-2).

The Walker Road receptor and LT-2 (receptor to the northeast of the Station) are approximately equidistant to the midpoint of the planned turbines in the Station (center point between LMS100 turbine unit 2 and turbine unit 3). However, the Walker Road residence is located closer to the HGP (2,000 feet versus 2,600 feet) and other commercial operations than receptor LT-2 is. This being the case, the current background L_{50} sound level would likely be greater than that measured for LT-2. With an equal distance from the Station, and the higher existing background L_{50} noise level, the operation of the Station would not be expected to result in an increase at the Walker Road residence in the existing L_{50} exceeding 10 dBA, or a noise level exceeding the OAR 340-035-0035 Table 8 L_{50} standard of 50 dBA during the nighttime. As such, it was concluded that the two monitoring sites (LT-1 and LT-2) were sufficient for the analysis, and the Walker residence was omitted.

X.3.3.2 Step-up Substation Operation

Acoustic noise modeling of the major step-up substation-related sources was conducted using the CadnaA modeling software. The Project includes installing three single-phase step-up transformers adjacent to the existing BPA McNary Substation. Based on the distance from the Station to the nearest noise-sensitive property, a residence at 30221 Scapelhorn Road (958 feet to the east), the model-predicted sound level resulting from the operation of the step-up substation will be 38.3 dBA. The lowest ambient hourly average L_{50} sound level was 39.8 dBA at the nearest noise-sensitive property. Ambient sound combined with the step-up substation noise contribution generated a value of 42.1 dBA. Complete details regarding estimated sound pressure levels and methodology used to determine the noise impact at the estimated distance are contained in Section 6.3 of Appendix X-1, Environmental Noise Assessment Report and also Exhibit AA – Electric Magnetic Fields, Section 5.0 of Appendix AA-1.

X.3.3.3 Transmission Line Operation

An analysis was performed to determine the electrical effects of replacing the present 115-kV transmission line with a 230-kV transmission line on the double circuit configured Hermiston to McNary transmission infrastructure. The results of this analysis are based upon the algorithms in the BPA Corona & Field Effects Program software developed by the BPA. The audible noise strengths were calculated at 25 feet from the ROW centerline at 6.6 feet above ground level. The resulting ROW boundary audible noise strength was 39.3 dBA, during wet weather conditions, including rain and fog. The lowest measured ambient L_{50} in the transmission line area was 38.7 dBA at about 25 feet from the transmission line center line. Ambient sound combined with the transmission line noise contribution generated a value of 42.0 dBA.

X.4 COMPLIANCE WITH APPLICABLE REGULATIONS

OAR 345-021-0010(1)(x)(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.*

The following noise regulations in OAR 340-035-0035 potentially apply to the Project:

OAR 340-035-0035(1)(b)(A) New Sources Located on Previously Used Sites:

No person owning or controlling a new industrial or commercial noise source located on a previously used industrial or commercial site shall cause or permit the operation of that noise source if the statistical noise levels generated by that new source and measured at an appropriate measurement point, specified in subsection (3)(b) of this rule, exceed the levels specified in Table 8, except as otherwise provided in these rules.

OAR 340-035-0035(1)(b)(B) New Sources Located on Previously Unused Site:

(i) No person owning or controlling a new industrial or commercial noise source located on a previously unused industrial or commercial site shall cause or permit the operation of that noise source if the noise levels generated or indirectly caused by that noise source increase the ambient statistical noise levels, L_{10} or L_{50}, by more than 10 dBA in any one hour, or exceed the levels specified in Table 8, as measured at an appropriate measurement point, as specified in subsection (3)(b) of this rule, except as specified in subparagraph (1)(b)(B)(iii).

(ii) The ambient statistical noise level of a new industrial or commercial noise source on a previously unused industrial or commercial site shall include all noises generated or indirectly caused by or attributable to that source including all of its related activities. Sources exempted from the requirements of section (1) of this rule, which are identified in subsections (5)(b) - (f), (j), and (k) of this rule, shall not be excluded from this ambient measurement.

OAR 340-035-0035(1)(d) Impulse Sound.

(d) Impulse Sound. Notwithstanding the noise rules in Tables 7 through 9, no person owning or controlling an industrial or commercial noise source shall cause or permit the operation of that noise source if an impulsive sound is emitted in air by that source which exceeds the sound pressure levels specified below, as measured at an appropriate measurement point, as specified in subsection (3)(b) of this rule:

(A) Blasting. 98 dBC, slow response, between the hours of 7 a.m. and 10 p.m. and 93 dBC, slow response, between the hours of 10 p.m. and 7 a.m.

(B) All Other Impulse Sounds. 100 db, peak response, between the hours of 7 a.m. and 10 p.m. and 80 dB, peak response, between the hours of 10 p.m. and 7 a.m.

OAR 340-035-0035(3) Measurement:

(a) Sound measurements procedures shall conform to those procedures which are adopted by the Commission and set forth in Sound Measurement Procedures Manual (NPCS-1), or to such other procedures as are approved in writing by the Department;

(b) Unless otherwise specified, the appropriate measurement point shall be that point on the noise sensitive property, described below, which is further from the noise source:

(A) 25 feet (7.6 meters) toward the noise source from that point on the noise sensitive building nearest the noise source;

(B) That point on the noise sensitive property line nearest the noise source.

OAR 340-035-0035(5) Exemptions: Except as otherwise provided in subparagraph (1)(b)(B)(ii) of this rule, the rules in section (1) of this rule shall not apply to:

(g) Sounds that originate on construction sites.

<u>Response</u>: Compliance with applicable regulations is presented in Sections X.41 and X.42, below.

X.4.1 General Regulatory Review (performed in reverse order):

As noted above, noises originating from construction sites are exempt from the DEQ Noise Regulations; thus, the four construction noise sources identified as part of the Project do not need to be reviewed in this section.

All measurements, analyses, and surveys were conducted in compliance with OAR 340-035-0035(3) Measurement, and with NPCS-1 including NPCS-2.

The Project will be designed and operated to be in compliance with OAR 340-035-0035(1)(d) Impulse Sound. No equipment at the three operational noise sources will emit such impulse sounds.

Section X.4.2 addresses the compliance of the three operational noise sources with Table 8 of OAR 340-035-0035(1)(b)(B) New Industrial and Commercial Noise Sources. Table 8 is presented below as Table X-4.

Table X-4 Standards for New Industrial and Commercial Noise Sources

Statistical Descriptor	Daytime (7 a.m. – 10 p.m.) (dBA)	Nighttime (10 p.m. – 7 a.m.) (dBA)
L_{50}	55	50
L_{10}	60	55
L_1	75	60

Source: OAR 340-0035, Table 8. http://arcweb.sos.state.or.us/pages/rules/oars_300/oar_340/340_035.html

Key:

dBA A-weighted decibels
L_{50} sound level exceeded 50% of the time
L_{10} sound level exceeded 10% of the time
L_1 sound level exceeded 1% of the time

X.4.2 Specific Regulatory Review

X.4.2.1 Station Operation

The Station will comply with the applicable noise limits established by the DEQ in OAR-340-035-0035(1)(b)(B) for new sources located on a previously unused industrial or commercial site. A previously unused industrial or commercial site is defined in OAR 340-035-0035-0015(47) as a site that has not been used by any industrial or commercial noise source during the 20 years immediately preceding the commencement of construction of a new industrial or commercial source on that property. The Energy Facility Site has previously been in agricultural use and qualifies as a “previously unused” site.

New sources on previously unused sites shall not increase ambient statistical noise levels, L_{10} or L_{50}, by more than 10 dBA in any single hour or exceed the levels specified in Table 8 of OAR 340-035-0035 for new sources located on previously unused sites. The Station could typically operate 24 hours each day; therefore, the nighttime noise limits (10:00 p.m. to 7:00 a.m.) for new sources located on previously unused sites would apply. Nighttime limits for L_{50}, L_{10}, and L_1 are 50, 55, and 60 dBA, respectively.

DEQ regulations require that compliance with the noise standard be measured pursuant to OAR 340-035-0035(3) on “noise-sensitive property.” The regulations define “noise sensitive property” as “real property normally used for sleeping, or normally used as schools, churches, hospitals or public libraries. Property used for industrial or agricultural activities is not noise sensitive property unless it meets the above criteria in more than an incidental manner” (OAR 345-035-0015[38]). The noise-sensitive properties closest to the Station are two private residences located at 77935 Cottonwood Bend Road (LT-1) and 78401 Cottonwood Bend Road (LT-2). The locations of the residences are shown on Figure X-1 as LT-1 and LT- 2.

Noise measurement was conducted at the two locations starting on June 27, 2013, and continuing 24 hours a day over three days, until June 29, 2013. The lowest hourly average L_{50} ambient sound level measured at the 77935 Cottonwood Bend Road was 39.3 dBA from 2:43 to 3:43 p.m. on June 28, 2013, and at 78401 Cottonwood Bend Road, 40.1 dBA from 8:37 to 9:37 a.m. on June 28, 2013.

The Station noise contribution was modeled at two residential receptors. The model estimated that operation of the Station will contribute 47.1 dBA to the existing ambient noise level at 77935 Cottonwood Bend Road and 44.5 dBA at 78401 Cottonwood Bend Road. Combining the sound level estimated for the Station and the lowest measured background L_{50} for each property resulted in an increase of about 8.5 dBA and 5.7 dBA, respectively. Therefore, the Station will comply with DEQ noise standards. Figure X-2 presents the projected noise levels from the operation of the Station.

The Station noise contribution at a third receptor (Walker Road rental residence) to the north of the Energy Facility Site would be expected to be equal to or less than the contribution at 78401 Cottonwood Bend Road (LT-2). This is because the Walker Road house and LT-2 are equidistant from the center of the turbines on the Energy Facility Site, but the Walker Road house is closer to the HGP and other commercial operations, resulting in greater existing L_{50} noise level than that measured at receptor LT2. Therefore, the operation of the Station would not be expected to result in an increase at the Walker Road residence in the existing L_{50} exceeding 10 dBA, or a noise level exceeding the OAR 340-035-0035 Table 8 L_{50} standard of 50 dBA during the nighttime at this receptor location.

Section 5 of Appendix X-1, Environmental Noise Assessment Report provides detailed information regarding the modeling methodology used to predict noise produced during operation of the Station. In summary, modeling of the major Project-related sources was conducted using the CadnaA model version 4.3.143. The modeling was conservative in that it predicted the Station operation with all power blocks under full load conditions. All equipment sound power levels entered in the model for most equipment were determined by using vendor data from a similar project. While it is anticipated that the equipment sound data used in modeling will be the same or very similar to that of the equipment implemented for the Project, an analysis will be performed to compare the currently modeled data to those for the chosen equipment prior to construction. If the chosen vendor's data show sound levels higher than those currently being modeled, Perennial will re-run the noise model using the noise characteristics of the equipment that has been selected to confirm compliance before beginning construction. Ambient sound levels were established following procedures adopted and set forth in the Oregon Department of Environmental Quality Sound Measurement Procedures Manual (NPCS-1). Field sheets and calibration information can be found in Appendix X-2; raw data in the form of Excel spreadsheets are available upon request.

X.4.2.2 Step-up Substation Operation

The model-predicted noise level at the noise-sensitive property nearest to the step-up substation—a residence at 30221 Scapelhorn Road (958 feet to the east)—is 38.3 dBA. Combining this level with the lowest hourly L_{50} measured at 30221 Scapelhorn Road (39.8 dBA) would produce a total noise level of 42.1 dBA, an increase of 2.3 dBA. Therefore, the operation of the step-up substation will comply with the DEQ noise standards.

X.4.2.3 Transmission Line Operation

An analysis was performed to determine the electrical effects of replacing the present 115-kV with a 230-kV transmission line on the double circuit configured Hermiston to McNary transmission infrastructure. The results of the analysis are based on the algorithms in the BPA Corona & Field Effects Program software developed by the BPA. The audible noise strengths were calculated within 200 feet of the ROW centerline at 6.6 feet above ground level. The resulting ROW boundary audible noise strength was 39.3 dBA, during wet weather conditions, including rain and fog that result in the highest corona noise levels for high voltage alternating current lines. Since the ROW contains an existing 230/115 kV transmission line, it would be considered a previously used industrial or commercial site. Based on the calculated audible noise strength, the operation of transmission line will comply with the L_{50} limit of 55 dBA during the hours from 7 a.m. to 10 p.m. and 50 dBA during the hours from10 p.m. to 7 a.m. included in Table 8 of the DEQ Noise Control Standards for new sources located on a previously used industrial or commercial site (OAR 340-035-0035(1)(b)(A)). Additional information is provided in Exhibit AA – Electric Magnetic Fields, Section 5.0 of Appendix AA-1.

X.5 MEASURES DESIGNED TO REDUCE NOISE

OAR 345-021-0010(1)(x)(C) *Any measures the applicant proposes to reduce noise levels or noise impacts or to address public complaints about noise from the facility.*

Response: In order to reduce noise levels or noise impacts at the nearest noise receptor locations, noise control measures were included in the acoustic modeling for the Station. Vendor-provided noise reduction values were included in the model for standard silencers to be installed in the combustion turbine inlet and exhaust, inlet filter house surfaces, and the VBV; pulse media and acoustic improvements at the combustion inlet filter; internal lining and external cladding applied to combustion air inlet duct walls; and lagging applied to the combustion exhaust stacks, expansion joints, catalyst sections and intercooler ducts, transitions, and expansion joints. These components serve as physical barriers to either attenuate or redirect noise generated by the equipment.

In the event of any noise-related complaints occurring during construction, such complaint(s) will be reported to and addressed by the construction manager's office. A noise complaint program will be in place prior to the start of construction.

X.6 MEASURES TO MONITOR NOISE

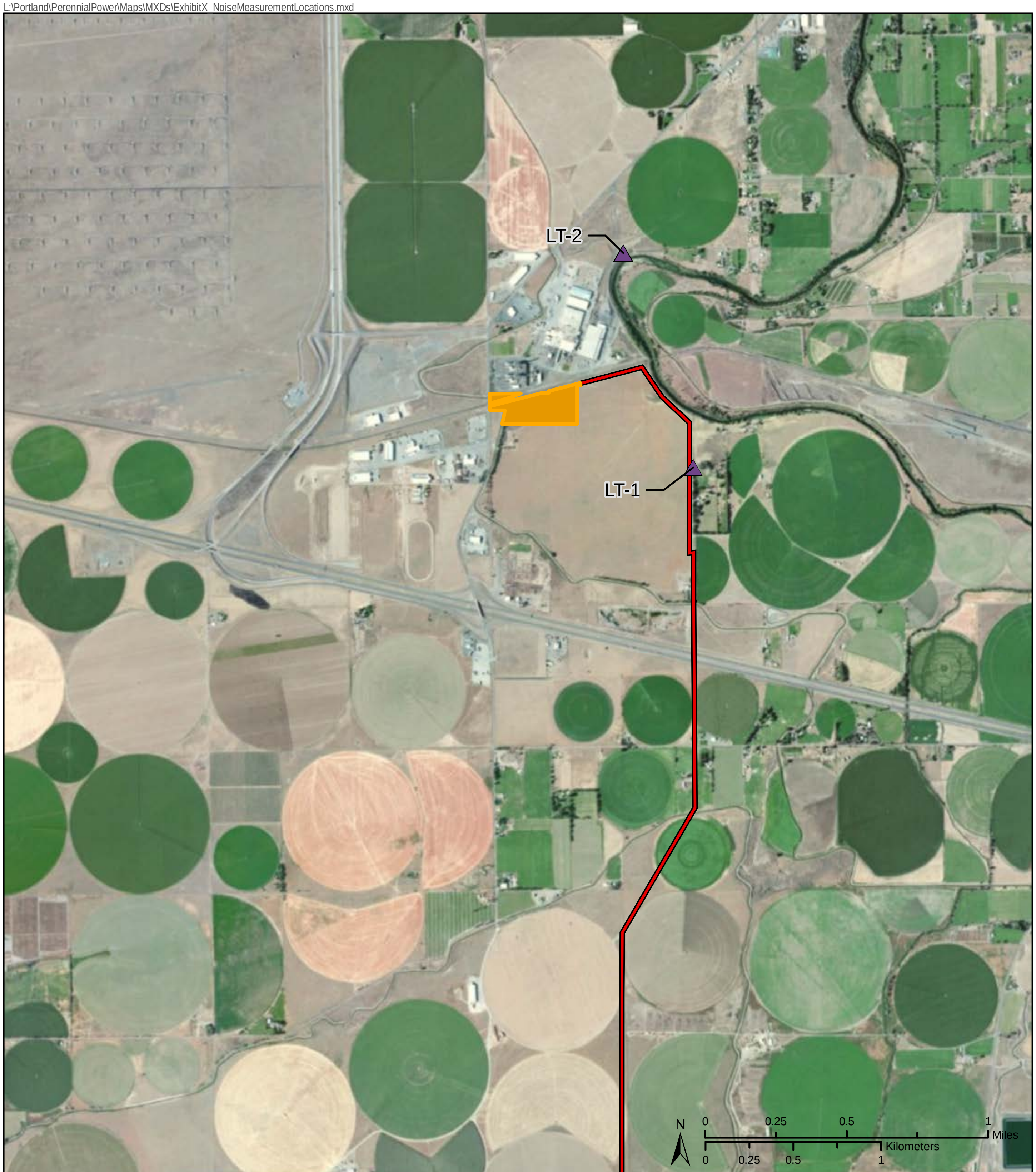
OAR 345-021-0010(1)(x)(D) *Any measures the applicant proposes to monitor noise generated by operation of the facility.*

Response: 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 L_{50} for each noise-sensitive property. Should a noise-related complaint arise, Perennial will conduct a noise review to investigate any complaint of noise related to the operation of the Station. A noise complaint program will be in place for the operation of the project.

X.7 NOISE-SENSITIVE PROPERTIES

OAR 345-021-0010(1)(x)(E) *A list of 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: A list of names and the addresses of all owners of noise-sensitive property within 1 mile of the energy facility site boundary is included as Appendix X-3.



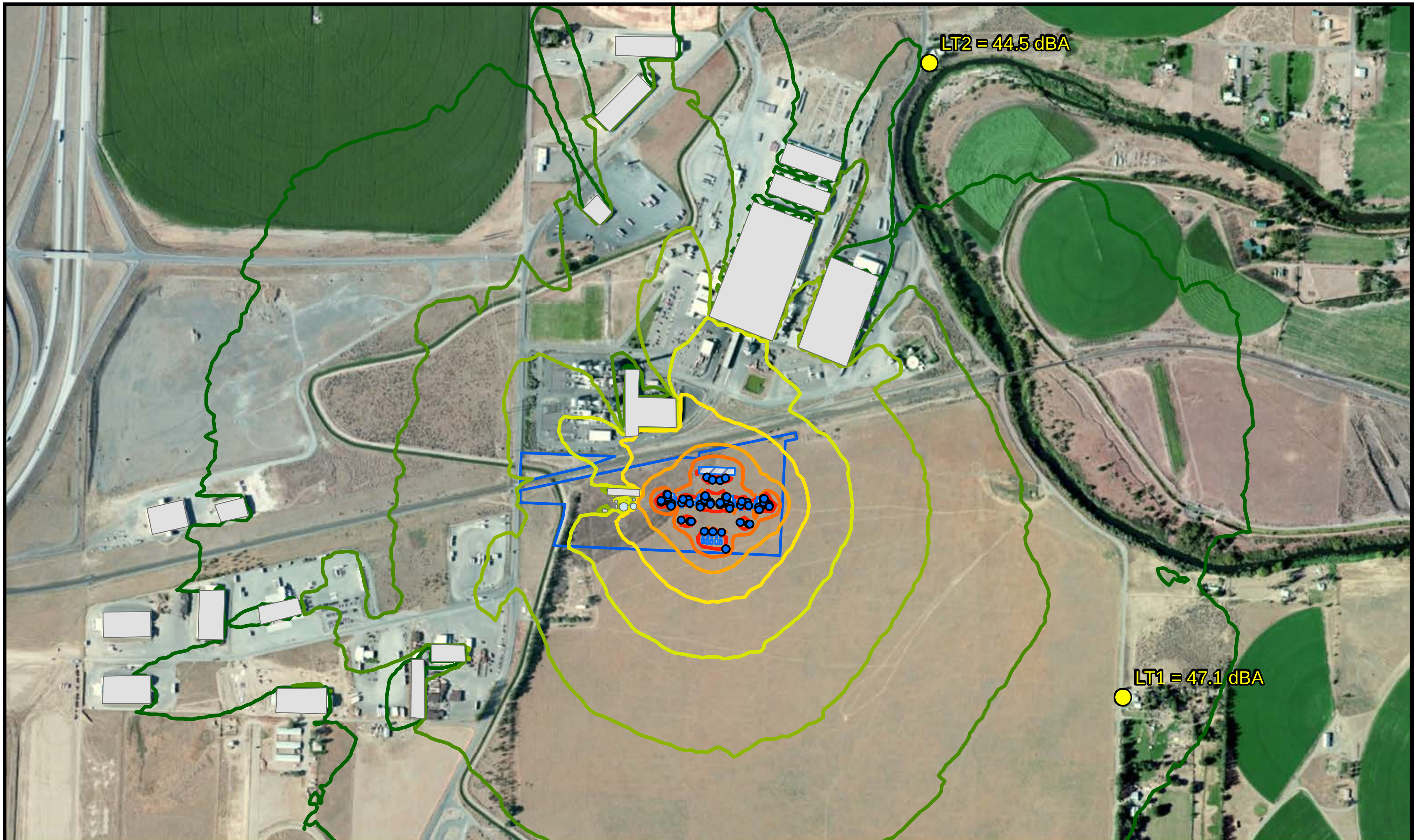
Natural Gas Pipeline
Station
Noise Monitoring Location
Long Term Monitoring

Figure X-1

Noise Measurement Locations

Perennial Wind Chaser Station

Path: G:\Projects\Air-Noise Dept\Project Files\Perennial\55745\Figures 1-8-14\Perennial Wind Chaser Noise Contour - X-2.mxd cakelly 1/8/2014



NORTH

0 420 840 Feet

Scale: 1 Inch = 500 Feet

Sound Pressure Levels (dBA)

45 55 65 75
50 60 70 80

Burns & McDonnell SINCE 1898

Figure X-2
Wind Chaser Station
Noise Contours
All Sources

Source: Umatilla Co. (2011), ORMAP (2012); USDA (2012); ESRI (2013) ; and Burns & McDonnell (2014)

Issued: 1/8/2014

APPENDIX X-1

Environmental Noise Assessment Report

ENVIRONMENTAL NOISE ASSESSMENT REPORT

Perennial Wind Chaser Station

Umatilla County, Oregon

July 2014

Prepared for:

Perennial-WindChaser LLC
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New York, New York 10017

Prepared by:

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1.0 INTRODUCTION

Perennial-WindChaser LLC (Perennial) proposes to construct and operate up to four General Electric LMS100 (or equivalent) natural gas–fired turbines in open cycle, which will produce up to approximately 415 megawatts of electric power. The Perennial Wind Chaser Station project (Project) site is located in the northwest quarter of Section 30, Township 4 North, Range 28 East in Umatilla County, Oregon. The Perennial Wind Chaser Station (Station), which is the generating facility portion of the Project, will be sited in an area of slightly less than 20 acres, referred to as the “Energy Facility Site,” located adjacent to the Hermiston Generating Plant (HGP). Power generated at the Station will be distributed to customers by an approximately 12-mile, 230-kilovolt (kV) transmission line that will connect the Station to the Bonneville Power Administration (BPA) McNary Substation. This will require replacing the 115-kV conductors on one side of the transmission line with 230-kV conductors for almost the entire route. The Project route will separate from the existing line near the McNary Substation and connect to a new 3-acre step-up substation, then interconnect to the McNary Substation by a 477-foot underground transmission cable. Perennial also proposes to construct a new 4.63-mile natural gas pipeline lateral within the existing 50-foot natural gas pipeline right-of-way (ROW) that serves the HGP. The new lateral will interconnect with the Gas Transmission Northwest interstate natural gas system.

This report summarizes the noise impact assessment conducted for the construction and operation of the Project, which includes the Station, step-up substation, transmission line, and natural gas pipeline.

2.0 SOUND FUNDAMENTALS

Noise is defined as any unwanted sound. Sound is defined as any pressure variation that the human ear can detect. Humans can detect a wide range of sound pressures, but only the pressure variations occurring within a particular set of frequencies are experienced as sound. However, the acuity of human hearing is not the same at all frequencies. Humans are less sensitive to low frequencies than to mid-frequencies, so noise measurements are often adjusted (or weighted) to account for human perception and sensitivities. The unit of noise measurement is a decibel (dB). The most common weighting scale used is the A-weighted scale, which was developed to allow sound-level meters to simulate the frequency sensitivity of human hearing. Sound levels measured using this weighting are noted as A-weighted decibels (dBA). (“A” indicates that the sound has been filtered to reduce the strength of very low and very high frequency sounds, much as the human ear does.) The A-weighted scale is logarithmic, so an increase of 10 dB actually represents a sound that is 10 times louder. However, humans do not perceive the 10-dBA increase as 10 times louder but as only twice as loud.

The following is typical of human responses to changes in noise level:

- A 3-dBA change is the threshold of change detectable by the human ear.
- A 5-dBA change is readily noticeable.
- A 10-dBA change is perceived as a doubling (or halving) of noise level.

Table 2-1 lists typical sources and levels of noise and corresponding human responses to the noise.

Table 2-1 Decibel Level of Some Common Sounds

Sound Source	dB(A)	Perception/Response
	150	
Carrier Deck Jet Operation	140	
	130	Painfully Loud Limit
Jet Takeoff (200 feet) Discotheque	120	
Auto Horn (3 feet) Riveting Machine	110	
Jet Takeoff (2,000 feet) shout (0.5 feet)	100	
N.Y. Subway Station Heavy Truck (50 feet)	90	Very Annoying Hearing Damage (8 hours, continuous exposure)
Pneumatic Drill (50 feet)	80	Annoying
Freight Train (50 feet) Freeway Traffic (50 feet)	70	Telephone Use Difficult Intrusive
Air Conditioning Unit (20 feet)	60	
Light Auto Traffic (50 feet)	50	Quiet
Living Room Bedroom	40	
Library Soft Whisper (15 feet)	30	Very Quiet
Broadcasting Studio	20	
	10	Just Audible
	0	Threshold of Hearing

Source: New York State Department of Environmental Conservation 2001

Noise sources that affect the environment can be mobile sources such as automobiles, buses, trucks, aircraft, and trains, or stationary sources such as machinery or mechanical equipment associated with industrial and manufacturing operations or building heating, ventilating, and air-conditioning systems. Sources of construction noise are both mobile sources (e.g., trucks, bulldozers, etc.) and stationary sources (e.g., compressors, pile drivers, power tools, etc.).

The sound pressure level (SPL) that humans experience typically varies from moment to moment. Therefore, various descriptors are used to evaluate sound levels over time. Some typical descriptors are defined below.

- L_{eq} is the continuous equivalent sound level. The sound energy from the fluctuating SPLs is averaged over time to create a single number to describe the mean energy, or intensity, level. The duration of the measurement would be shown as L_{eq}(n). A 24-hour measurement would be shown as L_{eq}(24). The L_{eq} has an advantage over other descriptors because L_{eq} values from various sound sources can be combined to determine cumulative sound levels
- L_n is the SPL exceeded for n percent of the time. In other words, for n percent of the time, the fluctuating SPLs are higher than the L_n level. L_n can be obtained by analyzing a given noise by statistical means. L_{50} is the level exceeded for 50 percent of the time. It is statistically the mid-point of the noise readings. It represents the median of the fluctuating noise levels. L_{10} is the level exceeded for 10 percent of the time. For 10 percent of the time, the sound or noise has an SPL above L_{10}. For the rest of the time, the sound or noise has an SPL at or below L_{10}. These higher SPLs are probably due to sporadic or intermittent events. L_{90} is the level exceeded for 90 percent of the time. For 90 percent of the time, the noise level is above this level. It is generally considered to be representing the background or ambient level of a noise environment.
- L_{dn} is equivalent to a 24-hour L_{eq}, but with a 10-dBA penalty added to nighttime noise levels (10:00 p.m. and 7:00 a.m.) to reflect the greater intrusiveness of noise experienced during this time.

3.0 ASSESSMENT CRITERIA

To identify any potential noise impacts, the Project's operational sound levels were predicted for the Project site using an acoustical noise model and then compared to applicable noises regulations or guidance. An acoustical analysis of the Station and the step-up substation was conducted to estimate the noise levels at the closest noise sensitive areas using the Computer Aided Design for Noise Abatement CadnaA noise modeling software developed by DataKustik GmbH. Sound power levels for the major noise-producing equipment at the Station were entered into the model. The acoustic modeling software simulates the outdoor three-dimensional propagation of sound from each noise source and accounts for sound wave divergence, atmospheric and ground sound absorption, and sound attenuation due to interceding barriers and topography based on ISO Standard 9613 (ISO 1996).

In order to evaluate compliance with noise limits for new industrial or commercial noise sources under Oregon Administrative Rule (OAR) 340-035-0035(1), a background ambient noise level must be measured. This information is used to determine whether the new noise source will cause the ambient statistical noise levels L_{10} and L_{50} to be increased by more than 10 dBA in any single hour or will exceed the levels specified in Table 3-1 at the OAR appropriate measurement point on the noise sensitive property.

Table 3-1 Oregon's "Table 8 Limits": Maximum Permissible Levels for New Industrial and Commercial Noise Sources

Statistical Descriptor	Daytime (7 a.m. – 10 p.m.) (dBA)	Nighttime (10 p.m. – 7 a.m.) (dBA)
L_{50}	55	50
L_{10}	60	55
L_1	75	60

Source: OAR 340-35-035
Key:
dBA A-weighted decibels
L_1 sound pressure level exceeded for 1 percent of the time
L_{10} sound pressure level exceeded for 10 percent of the time
L_{50} sound pressure level exceeded for 50 percent of the time
OAR Oregon Administrative Rules

4.0 EXISTING AMBIENT NOISE

Ambient baseline, or background, sound levels are a function of such things as local traffic, farm machinery, barking dogs, birds, insects, lawnmowers, children playing, and the interaction of the wind with ground cover, buildings, trees, shrubs, power lines, etc. The sound levels vary with time of day, wind speed and direction, and level of human activity.

Long-term Measurements

For the Project noise survey, continuous long-term sound levels were measured statistically in consecutive 1-hour intervals at three noise sensitive property locations (two locations nearest to the Station and one location nearest to the step-up substation) in the area. Three Rion NL series ANSI Type I integrating sound level meters were used to conduct the survey. Each of these instruments is intended for use as a long-term environmental sound level data logging instrument measuring the A-weighted sound level. All of the meters were set to continuously record a number of statistical parameters in consecutive 1-hour intervals, including the average $L_{eq,}$ L_{10}, and L_{50} sound levels. The survey period began on June 27, 2013, and continued over three days, until June 29, 2013. Due to premature battery failure, the noise measurements at LT-3 ended on June 28, 2013.

The microphones used in the survey were protected from rain and self-induced wind noise by high-density foam windscreens designed for long-term outdoor service. In order to further minimize self-induced wind noise, all microphones were located at approximately 1 meter above local grade. Wind speed is a function of elevation and rapidly diminishes near the ground.

The minimum recorded hourly L_{50} ambient noise level ranged from 39.3 to 40.1 dBA. Figures 4-1, 4-2, and 4-3 provide charts of the ambient noise measurements. Since the HGP is located adjacent to the Station site, the ambient noise level in the area are expected to vary with the operational load of the HGP. In order to assess the effect of the HGP on the ambient noise, the percent megawatt load recorded at the HGP during the noise measurement collection was plotted against the measured noise level in Figures 4-1 and 4-2. As the figures show, there does not appear to be a correlation between the HGP % load and the ambient sound level.

The location of the long-term noise measurement stations can be seen in Photographs 4-1, 4-2, and 4-3 and in Figures 4-4a and 4-4b.

Figure 4-1 L_{50} Ambient Noise Level 77935 Underpass Road

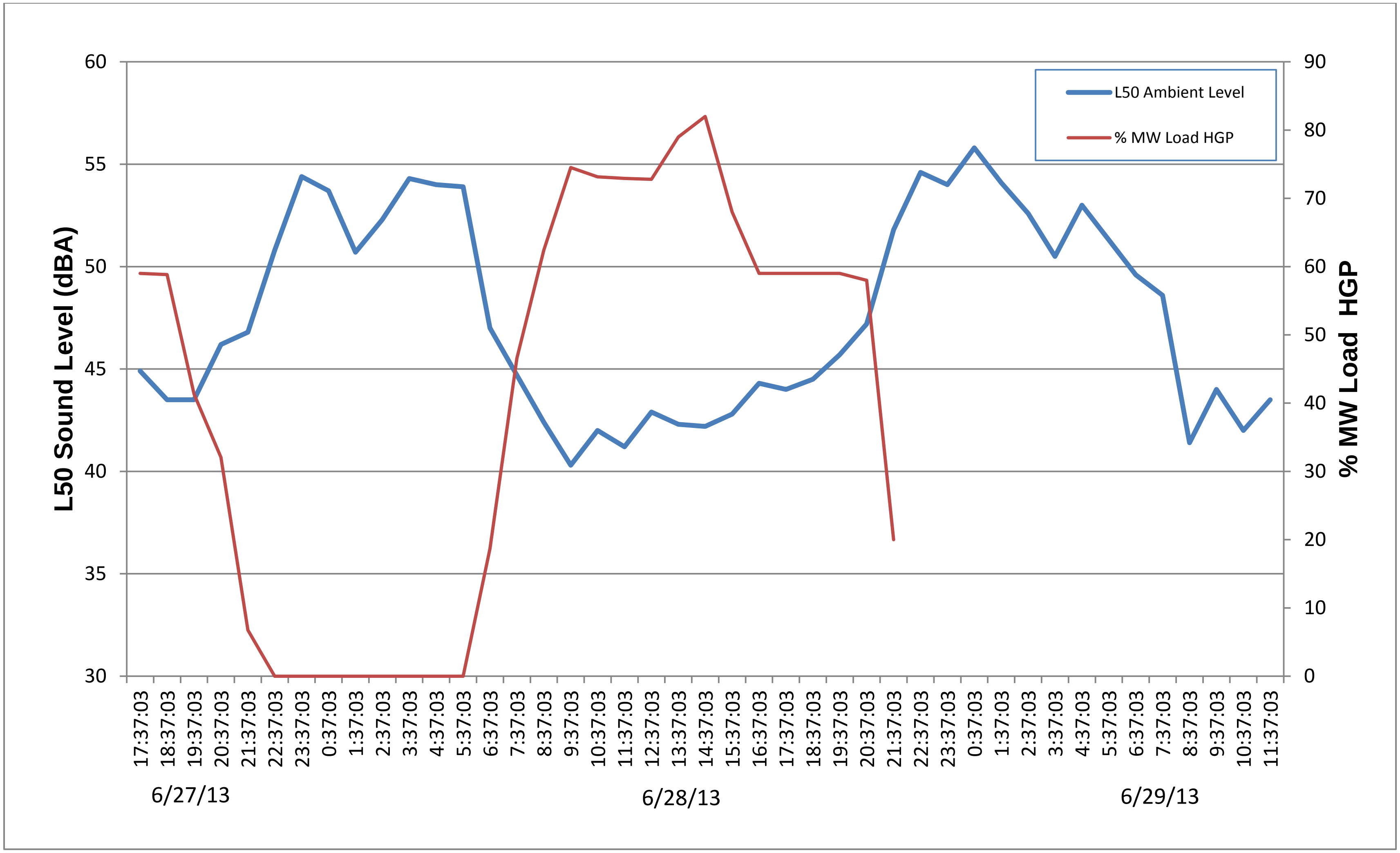

Figure 4-2 L_{50} Ambient Noise Level 78401 Underpass Road

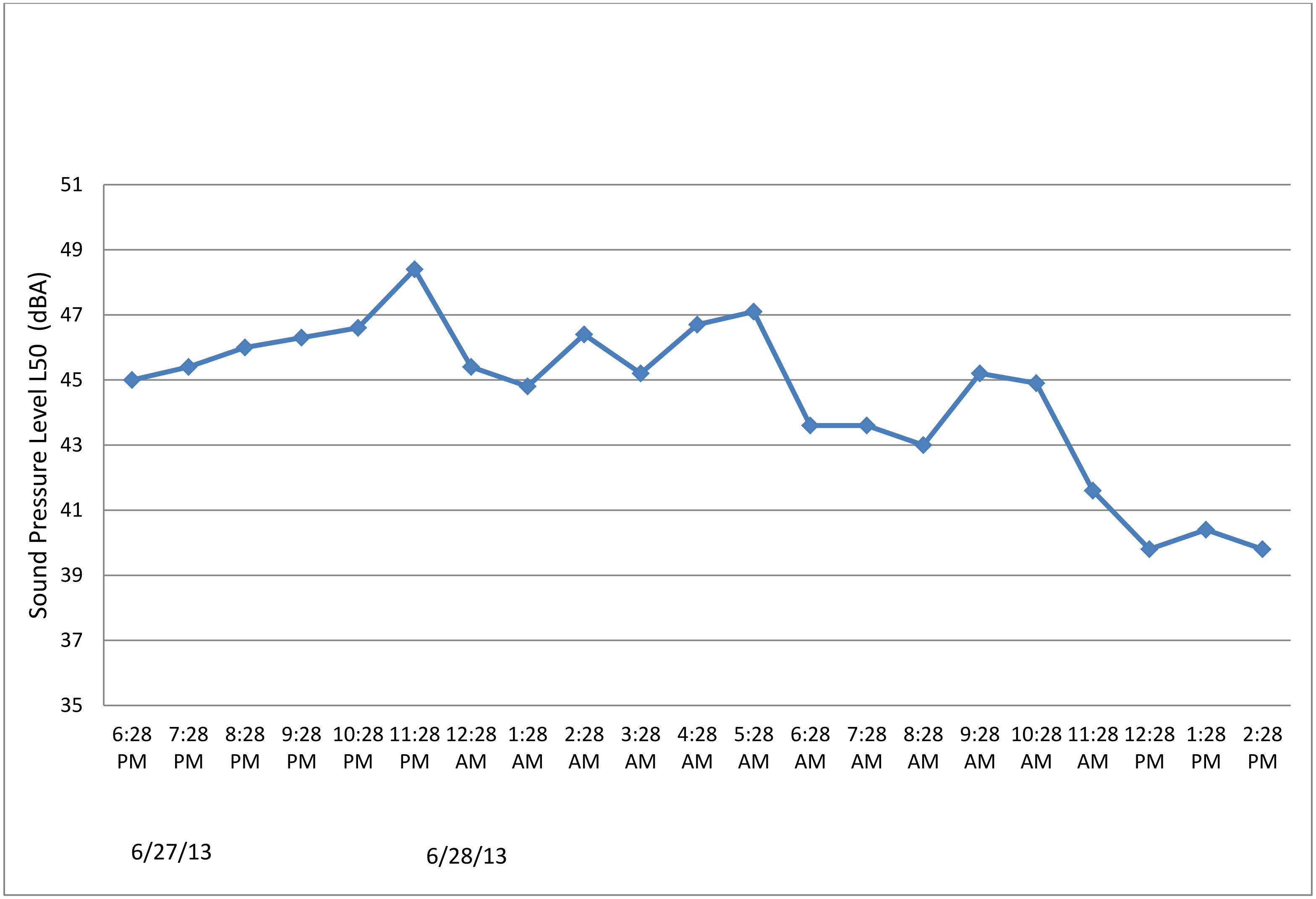

Figure 4-3 L_{50} Ambient Noise Level30221 Scapelhorn Road

Short-term Measurements

To supplement the long-term noise measurements and further characterize the noise environment in the Project area, short-term noise measurements were collected at the representative noise sensitive properties in the area surrounding the proposed Station and step-up substation and along the transmission pipeline ROW using a Bruel & Kjaer Model 2260 Observer, an ANSI Type I logging noise analyzer with one-third octave band filter capability, and a type 4189 microphone. The analyzer was tripod-mounted and equipped with a windscreen to eliminate noise associated with wind blowing across the microphone. Noise measurements were taken only when wind speeds were less than 12 miles per hour. The analyzer and microphone were factory-calibrated and field-calibrated with a Bruel & Kjaer Model 4231 sound-level calibrator before and after each series of measurements. The analyzer was configured for community noise with a 3-dB exchange rate, "A" weighting, and using the "slow response" mode. The survey collected 10-minute L_{eq} measurements at each location during daytime and nighttime on June 28 and June 29, 2013. Table 4-2 presents the results of the short-term sound level measurements.

Sources of ambient noise observed during the noise survey included traffic along local roads, trains, bird calls, dogs barking, wind effect on vegetation and structures, lawn mowers, and children playing. Table 4-1 presents industrial and commercial sites in the study area around LT-1 and LT-2 that may have contributed to the existing noise level. While these sources listed in Table 4-1 contribute to the ambient noise levels, truck traffic is associated with all of these sources except for HGP, and not enough information is available to provide an accurate estimate of how much each of these sources contributed to the ambient noise levels (L_{50}) values shown in Table 4-2 and Figures 4-1 and 4-2. The hourly L_{50} contribution due to truck traffic would vary depending on the distance from the truck and the volume of truck traffic. But for reference, a heavy truck passing at 50 feet can contribute 84 dBA. Also, the data available does not appear to provide a means to estimate HGP's noise contribution to the existing ambient noise level.

Table 4-1 Contributing Industrial Noise Sources

Facility	Operation Type	Noise Source
AmeriCold Logistics	Cold Storage	Truck traffic
Northwest Equipment Sales	Truck Dealer	Truck traffic and automotive repair
Hermiston Generating Plant	Natural Gas Fired Combustion Turbine Facility	Combustion turbine generator; Heat recovery steam generator; Steam turbine; and Cooling tower
Con Agra Lamb-Weston	Agricultural products processing	Truck traffic and process machinery
FedEx Regional distribution Center	Package shipping	Truck traffic

Table 4-2 Short-Term Sound Level Measurements

Site	Location	Local Project Component	Date	Time	Measured L_{50} (dBA)	Comments - Noise Sources
ST-1	Powerline Road & Eagle Avenue	Transmission line	6/28/2013	8:15	38.7	Traffic along Powerline Road, birds
			6/28/2013	18:34	45.8	Traffic along Powerline Road, birds, distant lawn mower
			6/28/2013	23:58	47.5	Sparse traffic, dogs barking
			6/29/2013	9:02	41.6	Traffic along Powerline Road, birds
ST-2	Powerline Road & Sparrow Avenue	Transmission line	6/28/2013	8:26	47.5	Traffic along Powerline Road, birds, dog barking distant
			6/28/2013	18:48	47.2	Traffic along Powerline Road
			6/29/2013	0:14	53.5	Traffic along Powerline Road
			6/29/2013	9:19	43.9	Traffic along Powerline Road, birds
ST-3	Powerline Road & Pine Tree Lane	Transmission line	6/28/2013	8:54	45.2	Traffic along Powerline Road, birds, mowing
			6/28/2013	19:04	50.7	Traffic along Powerline Road, air conditioner, talking on roadside
			6/29/2013	0:30	48.0	Traffic along Powerline Road, air conditioner, dogs
			6/29/2013	9:34	42.5	Traffic along Powerline Road, Birds, mowing, dogs barking

Key:
dBA A-weighted decibels
ST short term

Photograph 4-1 77935 Underpass Road

Photograph 4-2 78401 Underpass Road

Photograph 4-3 30221 Scapelhorn Road

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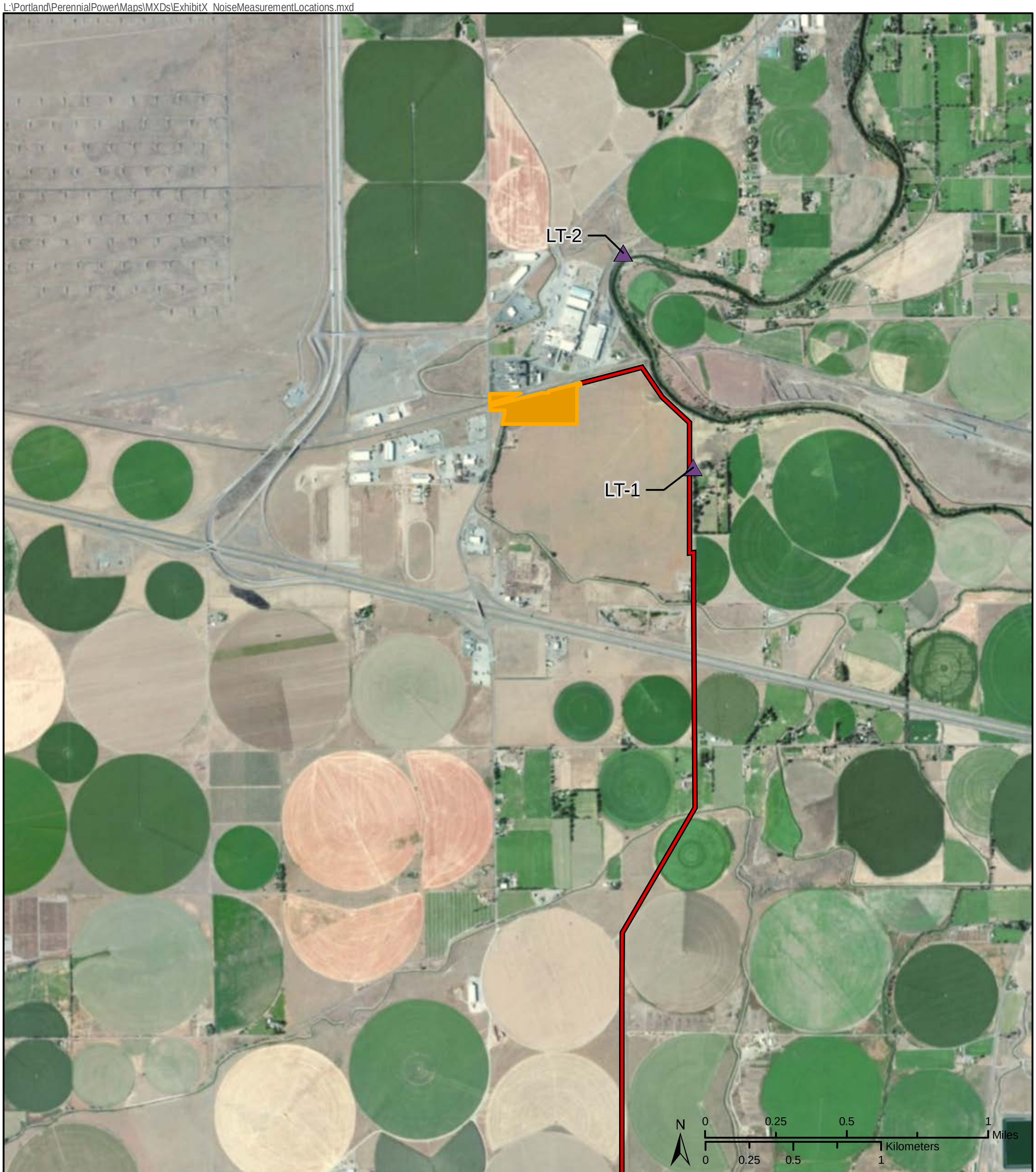

Natural Gas Pipeline

Station

Noise Monitoring Location

Long Term Monitoring

Figure 4-4a

Noise Measurement Locations

Perennial Wind Chaser Station

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Underground Transmission Line
McNary Substation
Step-up Substation
Riser Structure

Noise Monitoring Location
Long Term Monitoring
Short Term Monitoring

Figure 4-4b

Noise Measurement Locations

Perennial Wind Chaser Station

Ambient Sound Level Variation

For practical purposes, the ambient noise measurements were a snapshot of the continuously-changing acoustical environment. The measurements can be considered representative of the ambient noise levels at the noise sensitive receptors at nighttime because the measurements were either continuous (long-term) or taken at night (short-term) at each of the measurement locations. Ambient sound levels would be expected to vary with weather conditions (wind and rain) and seasonal changes such as tree-leaf off conditions, snow cover, and insect and animal activity. Farming activities such as hay harvesting are also less likely in winter. In addition, the noise contribution from the intermittent operation of the HGP would create additional variation in the ambient noise levels at receptors adjacent to the facility. However, collecting measurements during the summer season, when people would be outside and most affected by the new facility, would be appropriate.

Weather Conditions

The weather conditions during the survey period were generally clear with light winds, and temperatures ranged from 70 to 90 degrees Fahrenheit.

Perennial Wind Chaser Station Ambient Noise Levels

Oregon Department of Environmental Quality (DEQ) rules require that compliance with the noise standard be measured pursuant to OAR 340-035-0035(3) on “noise sensitive property.” The rules define “Noise sensitive property” as “real property normally used for sleeping, or normally used as schools, churches, hospitals, or public libraries. Property used in industrial or agricultural activities is not noise-sensitive property unless it meets the above criteria in more than an incidental manner” (OAR 345-035-0015[38]). The noise-sensitive properties closest to the Station are two private residences located at 77935 Underpass Road (LT-1) and 78401 Underpass Road (LT-2). The locations of the residences are shown on Figure 4-4a. The 77935 Underpass Road location is a private residence located on a graveled road approximately 2,970 feet southeast of the proposed Station (from the center point between LMS100 turbine unit 2 and turbine unit 3). The 78401 Underpass Road location is a private residence located on a paved road approximately 3,300 feet northeast of the proposed Station (from the center point between LMS100 turbine unit 2 and turbine unit 3). Sources of ambient noise at the Underpass Road locations included barking dogs, traffic on the roads and driveways surrounding the residence, farm equipment, birds, and weather-induced noises. Factory operations west of the residences were audible.

The lowest hourly average L_{50} sound level measured at the 77935 Underpass Road was 39.3 dBA from 2:43 to 3:43 p.m. on June 28, 2013; at 78401 Underpass Road, it was 40.1

dBA from 8:37 to 9:37 a.m. on June 28, 2013. Therefore, the maximum permissible level for the private residence at 77935 is 49.3 dBA (existing minimum L_{50} plus 10 dBA), and for the residence at 78401 Underpass Road, the maximum permissible L_{50} level is 50.1 dBA.

Transmission Line Ambient Noise Levels

Short-term noise measurements were taken in three residential areas along the transmission line ROW: the intersection of Powerline Road and Eagle Avenue (ST-1), Powerline Road and Sparrow Avenue (ST-2), and Powerline Road and Pine Tree Lane (ST-3). The statistical noise measurement data collected at these three locations are presented in Table 4-1. During the measurement periods, noise sources included birds chirping, dogs barking, and traffic along Powerline Road.

Step-up Substation Ambient Noise Levels

The location selected as the noise-sensitive property nearest to the proposed step-up substation was the residence at 30221 Scapelhorn Road (LT-3). This is an unoccupied residence located on a graveled road approximately 958 feet southeast of the center of the step-up substation site.

Sources of ambient noise at the Scapelhorn Road location included barking dogs, traffic on the roads surrounding the residence, farm equipment, birds, and weather-induced noises. Utility and factory operations northeast and northwest of the location were audible.

The lowest hourly average L_{50} sound level measured at 30221 Scapelhorn Road was 39.8 dBA from 1:28 to 2:28 p.m. on June 28, 2013. Therefore, the maximum permissible level is 49.8 dBA (existing minimum L_{50} plus 10 dBA) for the private residence at 30221 Scapelhorn Road.

5.0 MODELING METHODOLOGY

Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell) modeled predicted sound levels using industry-accepted sound modeling software. Burns & McDonnell modeled both the Station and step-up substation with CadnaA, Version 4.3.143, published by DataKustik, GmbH, Munich, Germany. The CadnaA program is a scaled, three-dimensional program that takes into account air absorption, terrain, ground absorption, and reflections for each piece of noise-emitting equipment and predicts downwind SPLs. The model calculates sound propagation based on ISO 9613-2:1996, General Method of Calculation. ISO 9613, and therefore CadnaA, assesses the SPLs based on the octave-band center frequency range from 31.5 to 8,000 hertz. CadnaA calculates SPLs using omni-directional downwind sound propagation and worst-case directivity factors. Modeling was conducted using the proposed layout for the Station and the step-up substation (see Figures 5-1and 5-4, respectively, in Attachment A).

The following assumptions were made to maintain the inherent conservativeness of the model:

- Attenuation was not included for sound propagation through wooded areas, existing barriers, and shielding.
- Some areas of the ground were considered to be highly reflective.
- All equipment was assumed to be operating at maximum power output (and therefore, maximum sound levels) at all times to represent worst-case noise impacts from the Station and substation as a whole.

Terrain and Vegetation

Terrain and attenuation from ground absorption can have a significant impact on sound transmission. United States Geological Survey National Elevation Dataset contours were imported into the model to account for topographic variations around the Project. The terrain around the Project is primarily rural, with few minor changes in elevation. The land is primarily used for agricultural purposes. As such, vegetation is mostly low-lying, with some small areas of trees. Ground attenuation is expected to be fairly high due to the soft ground and vegetation surrounding each location. CadnaA uses a value of 1.0 as the default scalar for soft ground. However, ground absorption in the model was reduced to maintain a conservative approach to the modeling. Areas with buildings or roads were given a scalar value of 0.0, meaning that no ground absorption was considered there (i.e., the ground was 100 percent reflective). Areas with gravel were given a value of 0.5, and everywhere else was given an average value of 0.75. This approach is designed to conservatively predict SPLs at distance.

Atmospheric Conditions

Atmospheric conditions were based on program defaults. Layers in the atmosphere often form where temperature increases with height (temperature inversions). CadnaA calculates the downwind sound in a manner favorable for propagation by assuming a well-developed moderate ground-based temperature inversion such as can occur at night.

Additional detail regarding the acoustic modeling and sound assessment methodology for the Station and step-up station can be found in the Sound Assessment Study in Attachment A.

Generating Station Noise Sources

To achieve accurate acoustical modeling results for the entire facility, equipment parameters and acoustical power output levels were entered into the model. The overall sound power level estimates for most equipment were determined by using vendor data from a similar project and presented in Table 5-1. This table also includes the type and quantity of each source.

Table 5-1 Station Sound Power Levels

Source Type	Name	Quantity	Overall PWL dBA	Overall PWL dB
Points	Auxiliary Transformers	2	96.0	101.2
	Chemical Feed Skids	2	102.6	105.5
	Condensate Pumps	2	102.0	107.6
	Cooling Tower Transformers	2	96.0	101.2
	Gas Compressor Transformers	3	96.0	101.2
	Gas Metering Area	1	101.0	103.0
	Generator Air Exhausts	8	94.5	106.8
	Secondary Unit Sub Transformers	4	96.0	101.2
	Sumps	4	106.7	112.0
	Turbine Enclosure Vents	4	99.5	104.9
	Turbine Stacks	4	110.5	127.8
	Variable Bleed Valve Stacks	4	109.5	136.2
	Variable Bleed Valve Stack Bases	4	95.8	108.6
	Water pumps/sumps	10	106.7	112.0
Areas	Air Intakes	4	76.3	101.7
	Auxiliary Skids	4	98.1	103.9
	Cooling Tower Outlet	1	115.1	120.7
	Expansion Joints	4	75.2	110.1
	Fuel Gas Filter Separators	4	101.0	103.0
	Gas Compressors	5	107.0	107.5
	Generators	4	87.3	99.9
	Generator Enclosure Vent Inlets/Exhausts	4	91.6	106.9
	Intercoolers	4	87.8	100.8
	LMS100s	4	91.6	106.9
	Gas Compressor Lube Oil Skids	5	101.9	115.4
	SCRs	4	95.2	106.7
	SCR Skids	4	95.2	106.7
	Transformers	2	106.8	114.3
	VBV Silencers	8	110.6	111.6
Vertical Areas	Air Intakes	4	81.5	102.8
	Auxiliary Skids	4	98.1	103.9
	Cooling Tower Outlet	1	115.1	120.7
	Expansion Joints	4	75.2	110.1
	Fuel Gas Filter Separators	4	101.0	103.0
	Gas Compressors	5	107.0	107.5
	Generators	4	87.3	99.9
	Generator Enclosure Vent Inlets/Exhausts	4	91.6	106.9
	Intercoolers	4	87.8	100.8
	LMS100s	4	91.6	106.9
	Gas Compressor Lube Oil Skids	5	101.9	115.4
	SCRs	4	95.2	106.7
	SCR Skids	4	95.2	106.7
	Stack Structures	4	88.1	100.2
	Transformers	2	106.8	114.3
	VBV Silencers	8	110.6	111.6

Source: Burns & McDonnell 2013

Key:

dBA A-weighted decibels
PWL sound power level
SCR selective catalytic reduction
VBV variable bleed valves

Some of the sources emanate sound in a certain direction or manner. Stacks were given the appropriate stack flow rates. For sources near walls, the reflective potential was increased to account for the walls' effect. Other factors come into play as well, such as operational availability. Some of the louder sources for this type of installation are variable bleed valves (VBVs). The VBVs for the Project were included in an "All Sources" operational scenario even though they will only operate when the facility is in startup, shutdown, or stall conditions, when most sources are not operating at maximum noise levels. Additionally, when the other sources are operating at maximum noise levels, the VBVs will not be operating. Therefore, the VBVs were given an operational restriction in the model. This restriction reduced the operational timeframe of the VBVs to 10 minutes per any given hour. Since the model calculates equivalent sound levels over a specific time period—1 hour in this case—the impact of each VBV is slightly reduced compared to if it operated continuously. This is a more realistic prediction of the expected impacts during any given hour of operation.

Because there will be times when the VBVs do not operate at all, a second operational scenario is provided: "No VBV." In this scenario, the VBVs were assumed to have zero impact. This holds true for most normal operational scenarios and is expected to represent the typical Station sound level impacts.

Step-up Substation Modeling

The Project includes installing three single-phase step-up transformers adjacent to the existing BPA McNary Substation. Appropriate sound generation was applied for all sound radiating surfaces, and reflections were considered when sound encountered a physical structure. Figure 5-4 in Attachment A shows the areas with designated ground absorption factors of 0.5 (for gravel).

Step-up Substation Noise Sources

Burns & McDonnell used frequency data from similarly-sized equipment and estimated an SPL of 76 dBA to conduct acoustical modeling for the step-up substation. The overall sound power level estimates for the equipment are shown in Table 5-2. This table also shows the type and quantity of each source.

Table 5-2 Step-up Substation Sound Power Levels

Source Type	Name	Quantity	Overall PWL	
			dBA	dB
Areas	Transformers, including fans	3	95.7	104.3
Vertical Areas	Transformers, including fans	3	95.7	104.3

Source: Burns & McDonnell 2013

Key:

dB decibels

dBA A-weighted decibels

PWL sound power level

6.0 PREDICTED OPERATING NOISE

6.1 Station Noise

Table 6-1 presents the maximum model-predicted L_{eq} SPLs at LT-1 and LT-2 (the total expected impact for every piece of equipment at the Station) for both operational scenarios. These values represent only the noise emitted by the Station and do not include any extraneous noises (vehicular traffic, birds, etc.) that could be present during physical noise measurements. Since the “All Sources” scenario models all equipment as simultaneously operating under its loudest conditions, it is appropriate to assume that the CadnaA-predicted values overestimate the maximum SPLs that should be expected under actual operating conditions. As presented in Table 6-1, due to the distance from the Station to the noise-sensitive properties, the estimated contribution to the existing ambient noise level from the operation of the Station, with all equipment operating simultaneously under its loudest conditions, is 47.1 dBA at 77935 Underpass Road and 44.5 at 78401 Underpass Road (46.3 dBA and 44.1 dBA without the VBVs operating). Combining the sound level estimated for the Station and the lowest measured background L_{50} for each property resulted in an increase not exceeding 10 dBA, and an ambient noise level not exceeding the OAR 340-035-0035 Table 8 L_{50} standard of 50 dBA during the nighttime. Therefore, noise levels resulting from the operation of the Station are not anticipated to result in noise levels above DEQ limits.

Figure 5-2 in Attachment A provides a graphical representation of the expected SPLs generated by simultaneous operation of all sources at the Station. This figure shows contours of sound levels in 5-dBA increments overlaid onto an aerial map to demonstrate how sound is expected to propagate. Figure 5-3 also shows sound level contours in 5-dBA increments but does not include noise contribution from the VBVs.

Table 6-1 LT-1 and LT-2 Modeling Results

Operational Scenario	Location	Lowest Hourly Measured L_{50} (dBA)	OAR Standard L_{50} + 10 (dBA)	Model Predicted Sound Level (dBA)	Ambient Plus Station Contribution (dBA)
All Sources	LT-1	39.3	49.3	47.1	47.8
	LT-2	40.1	50.1	44.5	45.8
No VBV	LT-1	39.3	49.3	46.3	47.1
	LT-2	40.1	50.1	44.1	45.6

Source: Burns & McDonnell 2013

Key:

dBA A-weighted decibels
L_{50} sound pressure level exceeded for 50% of the time
OAR Oregon Administrative Rules
VBV variable bleed valve

A receptor location (approximately 2,800 feet north of the Energy Facility Site) that initially appeared to the survey team to have a commercial use was found to be currently rented out for residential use. E & E evaluated noise for this receptor location, to evaluate impacts from the Station's operations, but did not measure ambient noise at this location. The house is located at 78319 Walker Road on the same tax lot parcel as AmeriCold Logistics LLC and is surrounded by industrial and commercial activities near a major intersection. The Walker Road receptor and LT-2 (receptor to the northeast) are approximately equidistant from the midpoint of the planned turbines in the Station (center point between LMS100 turbine unit 2 and turbine unit 3). However, the Walker Road residence is located closer to the HGP (2,000 feet versus 2,600 feet) and other commercial operations than receptor LT-2 is. Therefore, the current background L_{50} sound level at the Walker Road residence would likely be greater than that measured for LT-2. This being the case, the operation of the Station would not likely increase the existing L_{50} at the Walker Road residence by more than 10 dBA, or a noise level exceeding the OAR 340-035-0035 Table 8 nighttime standard. As such, it was concluded that the two monitoring sites (LT-1 and LT-2) were sufficient for the analysis, and the Walker residence was omitted.

Once the Station is in operation, Perennial will conduct noise studies to investigate any complaints of noise generated by the operation of the Station.

6.2 Step-up Substation Noise

Table 6-2 presents the ambient sound levels, applicable noise limits, model-predicted SPLs due to only the substation's operation at LT-3, and overall expected sound levels.

As presented in Table 6-2, the maximum model-predicted L_{eq} SPL expected at LT-3 would be 38.3 dBA. Combining this level with the lowest hourly L_{50} (39.8 dBA) measured at LT-3, 30221 Scapelhorn Road, would produce a total noise level of 42.1 dBA, an increase of 2.3 dBA. This increase is well within the DEQ limit (greater than 10 dBA increase in the lowest hourly ambient L_{50} level).

Table 6-2 LT-3 Modeling Results

Measurement Point	Lowest Hourly Measured L_{50} (dBA)	OAR Standard L_{50} + 10 (dBA)	Model-Predicted Sound Level (dBA)	Ambient Plus Station Contribution (dBA)
LT-3	39.8	49.8	38.3	42.1

Key:
dBA A-weighted decibels
L_{50} sound pressure level exceeded for 50% of the time
OAR Oregon Administrative Rules

The modeling used a conservative approach by assuming that all equipment at the step-up substation is operating simultaneously and under maximum operating conditions. Extraneous sounds (vehicular traffic, dogs barking, etc.) may make the overall sound level higher than the OAR standards during some occasions, but the substation alone will not cause that to happen.

Figure 5-5 in Attachment A provides a graphical representation of the expected sound pressure levels generated by simultaneous operation of all sources at the step-up substation. This figure shows contours of sound levels in 5-dBA increments overlaid onto an aerial map to demonstrate how sound is expected to propagate.

6.3 Transmission Line Corona Noise

An analysis was performed to determine the electrical effects of replacing the present 115-kV transmission line with a 230-kV transmission line on the double circuit configured Hermiston to McNary transmission infrastructure. The results of the analysis are based upon the algorithms in the BPA Corona & Field Effects Program software developed by the BPA. The audible noise strengths were calculated within 25 feet of the ROW centerline at 6.6 feet above ground level. The resulting ROW boundary audible noise strength was 38 dBA, during wet weather conditions. Combining this level with the lowest short-term background level of 52 dBA results in an increase of less than 1 dBA. This increase is well within the DEQ limit.

6.4 Construction Noise

Generating Station

Construction of the Station will involve clearing and grading, placement of fill, and excavation for foundations for the turbine, generator and ancillary equipment, piping, and structures. Construction of the Station is expected to take 22 months and begin during the third quarter of 2014.

As part of this analysis, acoustic noise modeling was conducted to estimate the construction noise levels at noise-sensitive properties around the Station site. The algorithm used in the model considered the construction equipment type, numbers of each type, equipment noise emission data, usage factors, and relative distances of the noise sensitive property to the source of noise.

The following logarithmic equation was used to compute projected noise levels:

L_{eq} (equip) = E.L. +10_{Log}(U.F.) – 20_{log}(D/50) – 10G $_{log}$(D/50)

where:

L_{eq} (equip) is the L_{eq} at a receiver resulting from the operation of a single piece of equipment over a specified time period.

E.L. is the noise emission level of the particular piece of equipment at the reference distance of 50 feet (USDOT 2006, Table 9.1).

U.F. is a usage factor that accounts for the fraction of time that the equipment is in use over the specified time period.

D is the distance from the receiver to the piece of equipment.

G is a constant that accounts for topography, natural and man-made barriers, and ground effects.

In this case, as a conservative measure, ground effects were ignored and therefore G was equal to 0.

The construction noise modeling was conservative in that it did not include credits for atmospheric absorption, ground attenuation, or the noise-reducing effect of the terrain.

Typical power station construction equipment types were used in the noise calculations for the Project. Noise emission levels were gathered from equipment manufacturers and government agency references. The usage factors were selected from the *FHWA*

Highway Construction Noise Handbook (USDOT 2006). Usage factors are used to account for the intermittent use of construction equipment throughout the course of a normal workday.

Once the average noise level adjusted for usage and quantity for an equipment type was calculated, the contributions of all major noise-producing equipment onsite were combined to provide a composite noise level at each noise sensitive property using the following formula:

$$Leq_{total} = 10\log\left(10^{\frac{Leq_1}{10}} + 10^{\frac{Leq_2}{10}} + 10^{\frac{Leq_3}{10}} ...etc.\right)$$

Table 6-3 presents typical SPLs at various distances for construction equipment representative of the equipment that may be operating during Station and step-up substation construction. Since the noise sensitive property nearest to the Station site is approximately 3,000 feet from the approximate center of the site, the estimated noise level due to Station construction at that distance is 54.4 dBA. The estimated noise level due to substation construction at the nearest noise sensitive property approximately 958 feet from the approximate center of the site is 63.9 dBA. These levels might occur temporarily over the course of the Station construction and would sometimes be audible at the nearest noise-sensitive properties.

Table 6-3 Sound Pressure Levels for Typical Station Construction

Equipment	Reference dBA at 50 feet[1]	Number of Devices	Usage Factor (%)[1]	Estimated Maximum Noise Level (dBA) at the Specified Distance from the Source (feet)				
				50 (adjusted)[2]	100	250	500	1,000
Pickup Truck	55	6	40	59	53	45	39	33
Welding Truck, 1-ton	55	8	40	60	54	46	40	34
Welding Machine	73	8	40	78	72	64	58	52
Backhoe	80	1	40	76	70	62	56	50
Trac-Hoe	85	1	40	81	75	67	61	55
Skid-Steer Loader	80	1	40	76	70	62	56	50
Fork Lift	80	1	40	76	70	62	56	50
JLG Lift	85	1	20	78	72	64	58	52
80- and 40-ton Picker	85	2	16	80	74	66	60	54
185 Air Compressor	80	1	40	76	70	62	56	50
Generator	82	2	50	82	76	68	62	56
Loader	80	1	40	76	70	62	56	50
Dump Truck	84	1	40	80	74	66	60	54
Hydrovac Unit	85	1	40	81	75	67	61	55
Total Composite Result				**90**	**84**	**76**	**70**	**64**

[1]Source: USDOT 2006
[2]Adjusted to usage factor and equipment quantity
Key:
dBA A-weighted decibels

Transmission Line

As part of the Project, Perennial will replace the 115-kV lines on the existing HGP to McNary Substation route with the 230-kV lines. Transmission line construction activities will cause short-term impacts in the surrounding area. Noise levels are expected to result from the operation of construction equipment and vehicles traveling to and from the site. Construction equipment representative of the equipment that may be used in wire-stringing operations is presented in Table 6-3, along with expected SPLs calculated at various distances using the algorithm discussed above.

Table 6-3 Construction Noise from Transmission Line Wire Stringing

Construction Equipment	Quantity	Usage Factor %	L_{max} SPL @ 50 Feet (dBA)	Distance in Feet/SPL (dBA)				
				50 (adjusted)[1]	250	500	1,000	1,500
3-drum puller (heavy)	2	50	80	80	66	60	54	50
3-drum puller (medium)	2	50	80	80	66	60	54	50
Bulldozer	2	40	82	81	67	61	55	51
Crane (20-ton)	2	16	85	80	66	60	54	51
Crane (30-ton)	1	16	85	77	63	57	51	47
Double bull-wheel tensioner (heavy)	1	25	82	76	62	56	50	46
Double bull-wheel tensioner (light)	1	25	82	76	62	56	50	46
Helicopter (small)	1	20	97	90	76	70	64	60
Pick-up truck	4	40	55	57	43	37	31	27
Single-drum puller (large)	1	50	80	77	63	57	51	47
Splicing truck	2	40	55	54	40	34	28	24
Truck (5-ton)	4	40	85	87	73	67	61	57
Wire reel trailer	6	20	85	86	72	66	60	56
Composite Noise Level				**94**	**80**	**74**	**68**	**64**

Source: USDOT 2006
[1]Adjusted to usage factor and equipment quantity
Key:
dBA A-weighted decibels
L_{max} A-weighted maximum sound level
SPL Sound Pressure Level

The transmission pipeline construction activities may result in minor noise disturbances at the receptors nearest to the transmission pipeline, but this would only occur as the construction progresses through a given area and would therefore be temporary in nature.

Natural Gas Pipeline

Construction of the natural gas pipeline is expected to cause temporary increases in ambient noise levels in the immediate vicinity of the construction sites. Onsite construction noise will occur mainly from heavy-duty construction equipment (e.g., trucks, backhoes, excavators, loaders, cranes, and drill rigs). The trench for installation of the gas pipeline may be excavated with a rotary trenching machine, a track-mounted backhoe, or similar equipment. Typical pipeline construction equipment (both mobile and stationary) and corresponding noise emission levels are presented in Table 6-4. As indicated in this table, the composite noise level for the construction of the gas pipeline would be 91 dBA at 50 feet. The composite noise level is derived by assuming that all of the construction equipment listed in Table 6-4 is contributing and combining its adjusted SPLs logarithmically. Noise from onsite construction activities that may occur near a noise sensitive property along the natural gas pipeline ROW may be intermittent or continuous but will be limited to short durations over a period of three to four weeks at any single location.

Table 6-4 Estimated Construction Noise from Gas Pipeline Construction Equipment Activities

Construction Equipment	Quantity	Usage Factor %	L_{max} SPL at 50 Feet (dBA)	Distance in Feet/SPL (dBA)(L_{eq})				
				50 (adjusted)[1]	250	500	1,000	1,500
Water pumps	1	50	81	78	64	58	52	48
Generator	1	50	81	78	64	58	52	48
Air compressor	1	40	78	74	60	54	48	44
Sandblasting machine	1	20	96	89	75	69	63	59
Gators	1	40	59	55	41	35	29	25
Backhoe	1	40	78	74	60	54	48	44
Crane	1	16	81	73	59	53	47	43
Welding machines	1	40	74	70	56	50	44	40
RT hoe	1	40	74	70	56	50	44	40
Dozer	1	40	82	78	64	58	52	48
Front end loader	1	40	79	75	61	55	49	45
Side boom	2	16	85	80	66	60	54	51
Motor grader	1	40	85	81	67	61	55	51
Heavy truck	4	40	76	78	64	58	52	48
Composite Noise Level				**91**	**77**	**71**	**65**	**61**

Source: USDOT 2006.
[1]Adjusted to usage factor and equipment quantity
Key:

dBA	A-weighted decibel	RT	Rotary Trencher
L_{eq}	continuous equivalent sound level	SPL	Sound Pressure Level
L_{max}	A-weighted maximum sound level		

Although clearly audible at the nearest noise-sensitive properties, the construction noise will be short term in nature and will diminish as the natural gas pipeline construction activity moves on along the route and away from the noise-sensitive areas.

7.0 REFERENCES

Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell). December 2013. *Sound Assessment Study on the Perennial Wind Chaser Station.*

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USDOT (U.S. Department of Transportation). August 2006. *FHWA Highway Construction Noise Handbook.*

ATTACHMENT A

SOUND ASSESSMENT STUDY

Sound Assessment Study

on the

Perennial Wind Chaser Station
Umatilla County, OR

Prepared for

Perennial-WindChaser LLC

Revision 1
July 2014

Sound Assessment Study

on the

Perennial Wind Chaser Station
Umatilla County, OR

Revision 1
July 2014

Project No. 55745

prepared by

Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri

EXECUTIVE SUMMARY

Perennial- WindChaser LLC (Perennial) is proposing to construct and operate the Perennial Wind Chaser Station (Station) in western Umatilla County, Oregon. The Station will consist of up to four natural gas-fired combustion turbines in an open cycle, producing up to 415 megawatts of electrical power (Project). The proposed Project location is adjacent to the existing Hermiston Generating Plant. Another aspect of the Project includes the installation of a step-up substation. Power generated at the Station will be distributed to customers by a 230-kilovolt (kV) transmission line that will connect the Station, via the step-up substation, to the Bonneville Power Administration (BPA) McNary Substation. This sound assessment was completed to determine if Perennial could expect to be in compliance with any applicable noise regulations once the Project is in operation.

Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell) conducted an environmental sound assessment study for the proposed Project. There were several objectives in this study, which included:

- Identification of any applicable county, city, state, or federal noise ordinances and other applicable noise guidelines
- Analysis of the ambient sound surveys performed in October 2013 by Environment & Ecology, Inc. (E&E) in areas surrounding both Project locations
- Estimation of the operational noise levels from the proposed Project using the industry-accepted three-dimensional noise modeling program CadnaA, and
- Determination if Perennial can expect operation of the Project to be in compliance with the identified applicable regulatory noise standards

The Oregon Department of Environmental Quality (DEQ) has noise regulations for new industrial or commercial noise sources contained in the Oregon Administrative Rule (OAR) 340-035-0035(1). The rule limits noise levels during the daytime and nighttime. The rule, as it applies to this Project, establishes an overriding limit of either 50.0 dBA or the ambient baseline increased by 10 dBA at each surrounding noise sensitive property in any one-hour period.

E&E performed ambient measurements in June, 2013 around both Project sites to establish existing ambient baselines. Long-term measurements were taken at two residences near the Station, one to the east (LT-1) and one to the northeast (LT-2). The OAR standard determined from the ambient measurements is 49.3 dBA at LT-1 and 50.0 dBA at LT-2. A long-term measurement was also taken to the east of the substation (LT-3) to quantify ambient noise surrounding that site. The resulting OAR standard from LT-3 is 49.8 dBA. These standards will be used for comparison to the logarithmic combination of the model-predicted sound levels and the ambient baseline at each location to determine expected compliance for the Project.

The Project sites were each modeled with equipment-specific sound power levels. Sound pressure levels were predicted within and surrounding the Project areas. A number of conservative assumptions were applied to predict future sound pressure levels at the noise-sensitive areas. Those results were then logarithmically added to the established ambient baseline sound levels for the area. The highest-predicted, cumulative noise level at either receiver nearest the Station is 47.8 dBA. The highest-predicted, cumulative noise level at the noise-sensitive area nearest the substation (LT-3) is 42.5 dBA. These modeling results demonstrate that the Project should not generate noise which causes adverse health impacts in the nearby noise-sensitive areas.

The current assessment shows that the sound levels generated by the operation of the Station and substation at nearby sensitive receivers, are predicted to satisfy the requirements of the Oregon Administrative Rules. Therefore, it is anticipated that Perennial can build and operate the Wind Chaser Station and step-up substation without adversely affecting nearby noise sensitive properties.

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1.0 INTRODUCTION

Perennial- WindChaser LLC (Perennial) is proposing to construct and operate the Perennial Wind Chaser Station (Station) in western Umatilla County, Oregon. The Station will consist of up to four natural gas-fired combustion turbines in an open cycle, producing up to 415 megawatts of electrical power (Project). The proposed Project location is adjacent to the existing Hermiston Generating Plant. Another aspect of the Project includes the installation of a step-up substation. Power generated at the Station will be distributed to customers by a 230-kilovolt (kV) transmission line that will connect the Station to the Bonneville Power Administration (BPA) McNary Substation, located in Umatilla County near the City of Umatilla. This sound assessment was completed to determine if Perennial could expect to be in compliance with any applicable noise regulations once the Project is in operation.

Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell) conducted an environmental sound assessment study for the proposed Project. There were several objectives in this study, which included:

- Identification of any applicable county, city, state, or federal noise ordinances and other applicable noise guidelines
- Analysis of the ambient sound surveys performed in October 2013 by Environment & Ecology, Inc. (E&E) in areas surrounding both Project locations
- Estimation of the operational noise levels from the proposed Project using the industry-accepted three-dimensional noise modeling program CadnaA, and
- Determination if Perennial can expect operation of the Project to be in compliance with the identified applicable regulatory noise standards

The following sections describe the project approach, methodology for modeling noise, and results.

* * * * *

2.0 ACOUSTICAL TERMINOLOGY

The term “sound level” is often used to describe two different sound characteristics called sound power and sound pressure. Every source that produces sound has a sound power level (L_w). The sound power level is the acoustical energy emitted by a sound source and is an absolute number that is not affected by the environment. The acoustical energy produced by a source propagates through the air as air pressure fluctuations. These pressure fluctuations, also called sound pressure (L_p), are what human ears hear and microphones measure.

Sound energy is physically characterized by amplitude and frequency. Sound amplitude is measured in decibels (dB) as the logarithmic ratio of a sound pressure to a reference sound pressure (20 microPascals). The reference sound pressure corresponds to the typical threshold of human hearing. A three (3) dB change in a continuous broadband noise is generally considered “just barely perceptible” to the average listener. A six (6) dB change is generally considered “clearly noticeable” and a 10 dB change is generally considered a doubling (or halving) of the apparent loudness.

Frequency is measured in hertz (Hz), which is the number of cycles per second. The typical human ear can hear frequencies ranging from approximately 20 to 20,000 Hz. Normally, the human ear is most sensitive to sounds in the middle frequencies (1,000 to 8,000 Hz) and is less sensitive to sounds in the low and high frequencies. As such, the A-weighting scale was developed to simulate the frequency response of the human ear to sounds at typical environmental levels. The A-weighting scale emphasizes sounds in the middle frequencies and de-emphasizes sounds in the low and high frequencies. Any sound level to which the A-weighting scale has been applied is expressed in A-weighted decibels or dBA. For reference, the A-weighted sound pressure level and subjective loudness associated with some common noise sources are listed in Table 2-1.

Table 2-1: Typical Sound Pressure Levels Associated with Common Noise Sources

Sound Source	dB(A)	Perception/Response
	150	
Carrier Deck Jet Operation	140	
	130	Painfully Loud Limit
Jet Takeoff (200 feet)	120	
Discotheque		
Auto Horn (3 feet)	110	
Riveting Machine		
Jet Takeoff (2,000 feet)	100	
Shout (0.5 feet)		
N.Y. Subway Station	90	Very Annoying
Heavy Truck (50 feet)		Hearing Damage (8 hours, continuous exposure)
Pneumatic Drill (50 feet)	80	Annoying
Freight Train (50 feet)	70	Telephone Use Difficult
Freeway Traffic (50 feet)		Intrusive
Air Conditioning Unit (20 feet)	60	
Light Auto Traffic (50 feet)	50	Quiet
Living Room	40	
Bedroom		
Soft Whisper (15 feet)		
Broadcasting Studio	20	
	10	Just Audible
	0	Threshold of Hearing

Source: New York State Department of Environmental Conservation 2001

Noise in the environment is constantly fluctuating; examples could be when a car drives by, a dog barks, or a plane passes overhead. Therefore, sound metrics have been developed to quantify fluctuating environmental sound levels. These metrics include the exceedance sound levels. The exceedance sound level, L_x, is the sound level exceeded "x" percent of the sampling period and is referred to as a statistical sound level. The most common L_x values are L_{eq}, L_{90}, L_{50}, and L_{10}. The L_{90} is the sound level exceeded 90 percent of the sampling period. The L_{90} represents the sound level without the influence of loud, transient noise sources. The L_{50} is the sound level exceeded 50 percent of the sampling period. The L_{10} represents the occasional louder sounds and is often referred to as the intrusive sound level. The variation between the L_{90}, L_{50}, and L_{10} sound levels can provide an indication of the variability of the acoustical environment. If the acoustical environment is perfectly steady, all values are identical. A large variation between the values indicates highly fluctuating sound levels. For instance, measurements near a roadway with infrequent passing vehicles may cause a large variation in the statistical sound levels. The average sound level for a specific time period is called the L_{eq}. L_{50} and L_{eq} are the metrics used in this analysis to represent the ambient sound levels and predicted sound levels, respectively. The cumulative sound levels – the logarithmic addition of the ambient L_{50} and model-predicted L_{eq} sound levels – will be directly compared to the OAR Standards for noise.

* * * * *

3.0 NOISE REGULATIONS AND GUIDELINES

Burns & McDonnell reviewed applicable state, county, city, and federal noise regulations for the project sites. The State of Oregon, specifically the Oregon Department of Environmental Quality, has a state-wide program of noise control to protect the health, safety, and welfare of Oregon citizens, contained in the Oregon Administrative Rules. Section 340-035-0035 is specific to noise within industrial and commercial areas. The following is an excerpt from the "New Noise Sources" section (340-035-0035(1)(b):

> *(B) New Sources Located on Previously Unused Site:*
>
> > *(i) No person owning or controlling a new industrial or commercial noise source located on a previously unused industrial or commercial site shall cause or permit the operation of that noise source if the noise levels generated or indirectly caused by that noise source increase the ambient statistical noise levels, L10 or L50, by more than 10 dBA in any one hour, or exceed the levels specified in Table 8, as measured at an appropriate measurement point, as specified in subsection (3)(b) of this rule, except as specified in subparagraph (1)(b)(B)(iii).*
> >
> > *(ii) The ambient statistical noise level of a new industrial or commercial noise source on a previously unused industrial or commercial site shall include all noise generated or indirectly caused by or attributable to that source including all of its related activities. Sources exempted from the requirements of section (1) of this rule, which are identified in subsection (5)(b)-(f), (j), and (k) of this rule, shall not be excluded from this ambient measurement.*

A previously unused industrial or commercial site is defined as a site that has not been used by any industrial or commercial noise source during the 20 years immediately preceding the commencement of construction of a new industrial or commercial source on that property. The site of the proposed Station has previously been used for agricultural purposes and qualifies as a "previously unused" site. Table 8 referenced in Section 340-035-0035(1)(b)(B)(i) is contained in Table 3-1 below.

Table 3-1: New Industrial and Commercial Noise Source Standards

Sound Level Metric	Allowable Statistical Noise Levels in Any One Hour	
	Daytime (7am – 10pm)	Nighttime (10pm – 7am)
L_{50}	55	50
L_{10}	60	55
L_1	75	60

The Station may operate 24 hours per day and will be subject to both the daytime and nighttime limits. These limits are to be complied with on "noise sensitive property." The regulations define noise sensitive property as "real property normally used for sleeping, or normally used as schools, churches, hospitals, or public libraries. Property used for industrial or agricultural activities is not noise sensitive property unless it meets the above criteria in more than an incidental manner." There are two noise sensitive properties close to the proposed Station, and one noise sensitive property nearby the substation, whose locations are further described in Section 4.0.

The OAR also specify requirements for octave bands and audible discrete tones when the Director has reasonable cause to believe that the requirements outlined above do not adequately protect the health, safety, or welfare of the public. A generating facility such as the proposed Wind Chaser Station produces sound of a broadband nature. A substation does have the potential to emit tonal sounds, but concerns can be alleviated through detailed design. It is therefore not anticipated that the Project will create tonal noise that would cause impacts that adversely affect health, safety, or welfare of the public.

The overriding limits for this Project are those listed in Table 3-1 or an increase in L_{10} or L_{50} sound levels by more than 10 dBA in any one hour. It is assumed that the lower of the two limits will apply.

** * * *

4.0 EXISTING SOUND ENVIRONMENT

An existing sound assessment study was conducted by E&E for the Wind Chaser Station and substation on June 27 – 29, 2013. The weather conditions were ideal for conducting ambient measurements, with generally clear skies, light winds, and temperatures ranging from 70 to 90 degrees Fahrenheit. Below is Burns & McDonnell's interpretation and analysis of those results.

4.1 Perennial Wind Chaser Station Ambient Noise Levels

The proposed site of the Perennial Wind Chaser Station is in Umatilla County, near the intersection of Interstates 82 and 84. The land use immediately surrounding the project is industrial, residential, and agricultural. There were two locations in which long-term measurements were taken to establish an ambient baseline for the area around this Project location.

There are two noise sensitive properties near the Station site, one private residence located at 77935 Underpass Road (LT-1) and a second private residence at 78401 Underpass Road (LT-2). Both locations are shown in Figure 4-1. Continuous long-term sound levels were measured in consecutive 1-hour intervals. Measurements were made in decibels (dB) using Rion NL series ANSI Type I integrating sound level meters, each equipped with a windscreen to protect from rain and wind noise. These types of meters are intended for use as a long-term environmental sound level data logging instruments. Each meter was set to continuously record preset statistical sound levels.

The survey period began on June 27, 2013 and continued over three days, until June 29, 2013. Sources of ambient noise at both of these locations included barking dogs, vehicular traffic, farm equipment, birds, and weather-induced noises. Factory operations west of the residences were also audible. The lowest ambient hourly L_{50} at LT-1 was 39.3 dBA from 2:43 to 3:43 P.M. on June 28, 2013. The lowest hourly L_{50} at LT-2 was 40.1 dBA from 8:37 to 9:37 A.M., also on June 28. 2013. Table 4-1 contains the quietest, hourly L_{50} sound level at each long-term measurement point, the calculated OAR standards, and the nighttime OAR standards from Table 3-1.

Table 4-1: Ambient Measurements at LT-1 and LT-2

Measurement Point	Lowest Hourly Measured L_{50} (dBA)	OAR Standard L_{50} + 10 dBA	OAR 340-035-0035 Nighttime L_{50} Limit
LT-1	39.3	49.3	50.0
LT-2	40.1	50.1	50.0

It was assumed that the lower of the OAR sound levels in Table 4-1 will be the limits for the proposed Project. Therefore, the sound level limits for LT-1 and LT-2 are 49.3 dBA and 50.0 dBA, respectively.

4.2 Step-Up Substation Ambient Noise Levels

The existing BPA McNary Substation is located near the intersection of I-82 and Columbia River Highway in Umatilla, Oregon. The land use immediately surrounding the substation is industrial, residential, and agricultural. There is one noise sensitive property to the east of the substation at which a long-term measurement was taken.

A private residence located at 30221 Scapelhorn Road was the location of the third long-term measurement (LT-3). This residence is currently unoccupied, but was analyzed in case of future inhabitants. The location of LT-3 is shown in Figure 4-2. The same type of meter and sound metrics were used for the long-term measurements at the substation as at the Station, described in Section 4.1.

The survey period began on June 27, 2013 and continued over three days, until June 29, 2013. Sources of ambient noise at this location included barking dogs, vehicular traffic, farm equipment, birds, and weather-induced noises. Utility and factory operations northeast and northwest of the LT-3 location were also audible. The lowest ambient hourly L_{50} at LT-3 was 39.8 dBA from 1:28 p.m. to 2:28 P.M. on June 28, 2013. Therefore, the maximum permissible L_{50} level is 49.8 dBA at LT-3. Table 4-2 contains the quietest, hourly L_{50} sound level at LT-3, calculated OAR standard, and the nighttime OAR standard listed in Table 3-1.

Table 4-2: Ambient Measurements at LT-3

Measurement Point	Lowest Hourly Measured L_{50} (dBA)	OAR Standard L_{50} + 10 dBA	OAR 340-035-0035 Nighttime L_{50} Limit
LT-3	39.8	49.8	50.0

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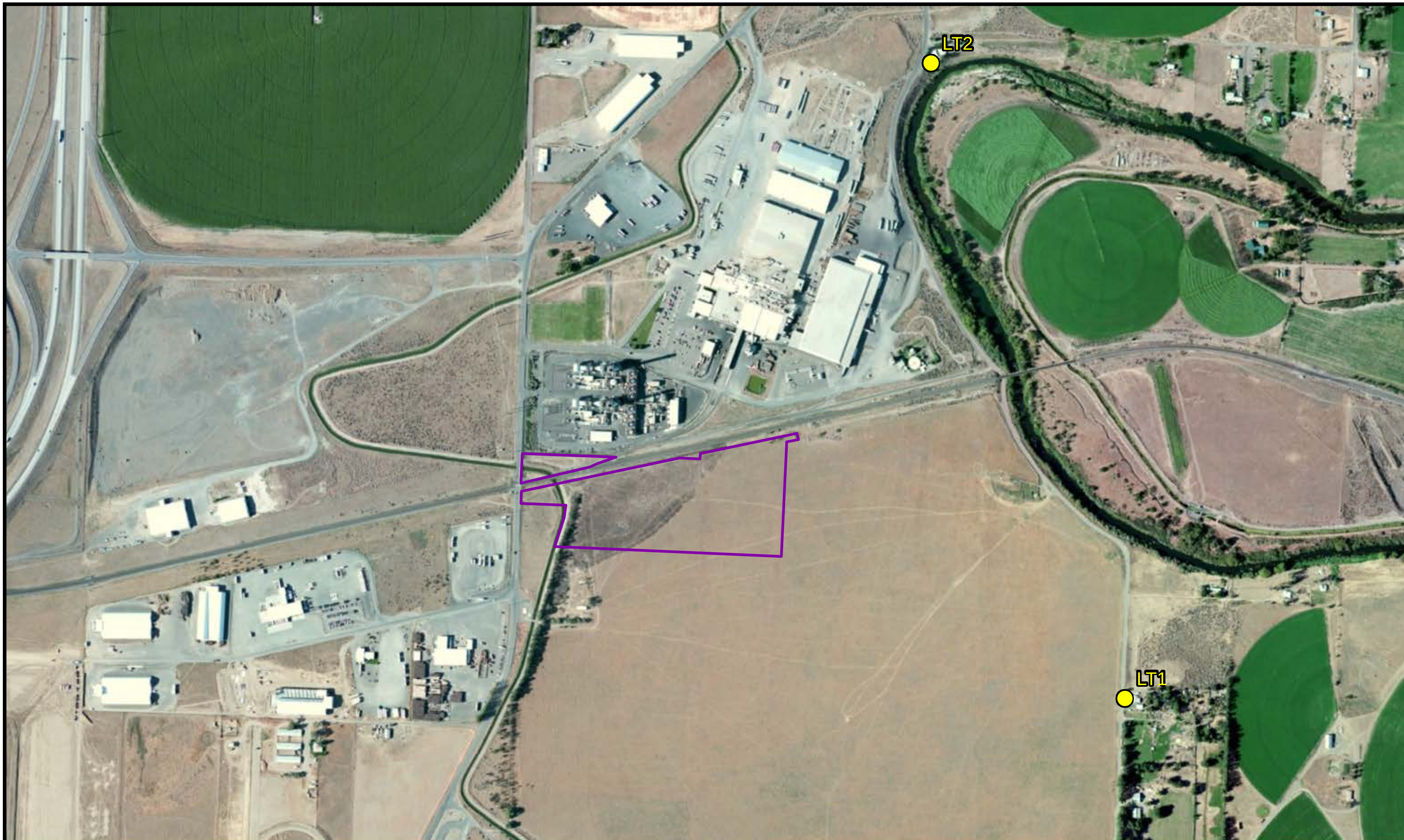

NORTH

0 420 840
Feet

Scale: 1 Inch = 500 Feet

Energy Facility Site

Long-Term Measurement Points

Burns & McDonnell SINCE 1898

Figure 4-1
Ambient Noise Measurement Points near Station

Source: Umatilla Co. (2011), ORMAP (2012); USDA (2012); ESRI (2013) ; and Burns & McDonnell (2014)

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NORTH

0 210 420
Feet

Scale: 1 Inch = 500 Feet

Step-up Substation

McNary Substation

Long-Term Measurement Points

Burns & McDonnell SINCE 1898

Figure 4-2
Ambient Noise Measurmente Point near Substation

Source: Umatilla Co. (2011), ORMAP (2012); USDA (2012); ESRI (2013) ; and Burns & McDonnell (2014)

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Since the OAR Standards found by taking the lowest, measured hourly L_{50} noise measurement plus 10 dBA are less than or equal to the OAR Standards contained in 340-035-0035, the L_{50} plus 10 dBA limit (i.e., 49.8 dBA) will be used as the overriding limit with which to compare the Project substation's model-predicted sound levels.

**** * * ***

5.0 ACOUSTICAL MODELING

5.1 Generating Station and Transformer Sound Characteristics

Noise sources at the proposed Station will include equipment associated with the power generation, cooling towers, gas compressors, transformers, and other ancillary equipment. Because the proposed Station will have a significant quantity of sound sources with each source making a different type of noise, the overall sound associated with the Station would be considered broadband in nature. Broadband sources blend in better to the existing environment than sources that produce a distinct sound signature.

The sound commonly associated with a transformer is described as a hum. This hum is created by the expansion and contraction of the core when the unit is energized (known as magnetostriction). The expansion and contraction occurs at roughly twice per alternating-current cycle. The cycle for the proposed transformers is 60 times per second, or 60 Hertz (Hz). The transformers therefore oscillate at a frequency of approximately 120 Hz. Historical field work has demonstrated that transformer noise mostly occurs in the 1st, 3rd, 5th, and 7th harmonics (120, 360, 600, and 840 Hz). A large component of sound in the 5th and 7th harmonics would typically indicate an underlying problem within the system that requires corrective action. Therefore, those sounds would be short-lived, if they are experienced at all. In addition, the transformers will likely have cooling fans that will create noise at various times. These fans create noise in two ways: 1) the mechanical noise of each fan's motor, and 2) the blades disrupting the air. Transformer vendors include total noise (transformer and fans) in their specification sheets and often provide sound guarantees. Therefore, detailed design can alleviate tonal concerns for nearby residences.

5.2 Model Inputs and Settings

Predicted sound levels were modeled using industry-accepted sound modeling software. The program used to model both the Station and substation was the Computer Aided Design for Noise Abatement (CadnaA), Version 4.3.143, published by DataKustik, Ltd., Munich, Germany. The CadnaA program is a scaled, three-dimensional program that takes into account air absorption, terrain, ground absorption, and reflections for each piece of noise-emitting equipment and predicts downwind sound pressure levels. The model calculates sound propagation based on ISO 9613-2:1996, General Method of Calculation. ISO 9613, and therefore CadnaA, assesses the sound pressure levels based on the octave-band center-frequency range from 31.5 to 8,000 Hz. CadnaA calculates sound pressure levels using omni-directional downwind sound propagation and worst-case directivity factors.

The following assumptions were made to maintain the inherent conservativeness of the model:

- Attenuation was not included for sound propagation through wooded areas, existing barriers, and shielding
- Some areas of the ground were considered to be highly reflective
- All equipment was assumed to be operating at maximum power output (and therefore, maximum sound levels) at all times to represent worst-case noise impacts from the Station and substation as a whole

Terrain and Vegetation

Terrain and attenuation from ground absorption can have a significant impact on sound transmission. United States Geological Survey (USGS) National Elevation Dataset (NED) contours were imported into the model to account for topographic variations around the Project. The contours were overlaid onto high resolution, digital orthoimagery to visually ensure proper contour positioning. The terrain around the proposed Project is mostly rural with few minor changes in elevation.

The land is primarily used for agricultural purposes. As such, vegetation is mostly low-lying with some small areas of trees. Ground attenuation is expected to be fairly high due to the soft ground and vegetation surrounding each location. CadnaA uses a value of 1.0 as the default scalar for soft ground. However, ground absorption in the model was reduced to maintain a conservative approach to the modeling. Areas with buildings or roads were given a scalar value of 0.0, meaning that no ground absorption was considered there (i.e., the ground was 100% reflective). Areas with gravel were given a value of 0.5, and everywhere else was given an average value of 0.75. This approach should conservatively predict sound pressure levels at distance.

Atmospheric Conditions

Atmospheric conditions were based on program defaults. Layers in the atmosphere often form where temperature increases with height (temperature inversions). Sound waves can reflect off of the temperature inversion layer and return to the surface of the earth. This process can increase sound levels at the surface, especially if the height of the inversion begins near the surface of the earth. Temperature inversions tend to occur mainly at night when winds are light or calm. CadnaA calculates the downwind sound in a manner which is favorable for propagation by assuming a well-developed moderate ground-based temperature inversion such as can occur at night. At worst, modeling in this manner should predict sound levels that are “typical” of what would actually occur.

The atmosphere does not flow smoothly and tends to have swirls and eddies, also known as turbulence. Turbulence is basically formed by two processes: thermal turbulence and mechanical turbulence. Thermal turbulence is caused by the interaction of heated air rapidly rising from the heated earth's surface with cooler air descending from the atmosphere. Mechanical turbulence is caused as moving air interacts with objects such as trees, buildings, and other structures. Turbulent eddies generated by objects can cause sound waves to scatter, which in turn, provides sound attenuation between the sound sources and the receivers. The acoustical model assumes laminar air flow which minimizes sound attenuation that would occur in a realistic inhomogeneous atmosphere. This assumption can cause the predicted sound levels to be higher than would actually occur.

A printout of the octave-band attenuation factors between all sources and LT1 and LT2 used in the modeling study was provided separately as it is approximately 1800 pages.

5.3 Perennial Wind Chaser Station Model and Results

Project Layout

Modeling was conducted using the proposed layout for the Wind Chaser Station (see Figure 4-1). Appropriate sound generation was applied for all sound radiating surfaces and points, and reflections were considered when sound encountered a physical structure. Also included on Figure 5-1 are the areas with designated ground absorption factors of either 0.0 (for concrete) or 0.5 (for gravel).

Sound Emission Data

The general sound level for any equipment at the Station is expected to be 85 dBA or less on average when measured 3 feet from the source envelope. Some exceptions to this will need to be made based on what the vendors can provide. This is typical for this type of installation. However, to achieve accurate acoustical modeling results for the entire facility, equipment parameters and acoustical power output levels were input into the model. The overall sound power level estimates for most equipment were determined by using vendor data from a similar project and are shown in Table 5-1. Also shown are the type and quantity of each source. The octave-band center-frequency data of each source is provided in Appendix A.

Source Types

There were three types of sources used in the modeling: 1) Points, 2) Areas, and 3) Vertical Areas. Point sources are noise sources whose dimensions are small in comparison to the distance to a receiver. Examples are vents, pumps, motors, and stack tip exhausts. Areas sources are the horizontal surfaces of a source radiating sound. Area sources can represent the roof of a building that encloses several sources, the air outlet of a cooling tower, etc. Vertical area sources are the vertical surfaces of a source radiating sound. Often the horizontal and vertical surfaces of a source radiate the same sound power level. However, an example of one source that does not is the air inlet filter face. The filter face will have a higher sound level than the solid top surface of the filter house (which would be represented by an area source in the modeling). Table 5-1 (and Appendix A) also lists the source type.

Table 5-1: Station Sound Power Levels

Source Type	Name	Quantity	Overall PWL dBA	Overall PWL dB
Points	Auxiliary Transformers	2	96.0	101.2
	Chemical Feed Skids	2	102.6	105.5
	Condensate Pumps	2	102.0	107.6
	Cooling Tower Transformers	2	96.0	101.2
	Gas Compressor Transformers	3	96.0	101.2
	Gas Metering Area	1	101.0	103.0
	Generator Air Exhausts	8	94.5	106.8
	Secondary Unit Sub Transformers	4	96.0	101.2
	Sumps	4	106.7	112.0
	Turbine Enclosure Vents	4	99.5	104.9
	Turbine Stacks	4	110.5	127.8
	Variable Bleed Valve Stacks	4	109.5	136.2
	Variable Bleed Valve Stack Bases	4	95.8	108.6
	Water pumps/sumps	10	106.7	112.0
Areas	Air Intakes	4	76.3	101.7
	Auxiliary Skids	4	98.1	103.9
	Cooling Tower Outlet	1	115.1	120.7
	Expansion Joints	4	75.2	110.1
	Fuel Gas Filter Separators	4	101.0	103.0
	Gas Compressors	5	107.0	107.5
	Generators	4	87.3	99.9
	Generator Enclosure Vent Inlets/Exhausts	4	91.6	106.9
	Intercoolers	4	87.8	100.8
	LMS100s	4	91.6	106.9
	Gas Compressor Lube Oil Skids	5	101.9	115.4
	SCRs	4	95.2	106.7
	SCR Skids	4	95.2	106.7
	Transformers	2	106.8	114.3
	VBV Silencers	8	110.6	111.6
Vertical Areas	Air Intakes	4	81.5	102.8
	Auxiliary Skids	4	98.1	103.9
	Cooling Tower Inlet	1	115.1	120.7
	Expansion Joints	4	75.2	110.1
	Fuel Gas Filter Separators	4	101.0	103.0
	Gas Compressors	5	107.0	107.5
	Generators	4	87.3	99.9
	Generator Enclosure Vent Inlets/Exhausts	4	91.6	106.9
	Intercoolers	4	87.8	100.8
	LMS100s	4	91.6	106.9
	Gas Compressor Lube Oil Skids	5	101.9	115.4
	SCRs	4	95.2	106.7
	SCR Skids	4	95.2	106.7
	Stack Structures	4	88.1	100.2
	Transformers	2	106.8	114.3
	VBV Silencers	8	110.6	111.6

Some of the sources emanate sound in a certain direction or manner. Stacks were given the appropriate stack flow rates. Sources up against walls were penalized by increasing their reflective potential. Other factors come into play as well, such as operational availability. Some of the louder sources for this type of installation are variable bleed valves (VBV). The VBV were included in an "All Sources" operational scenario even though they only operate when the facility would be in startup, shutdown, or stall conditions. Obviously, during those times, most sources are not operating at maximum noise levels. Additionally, when the other sources are operating at maximum noise levels, the VBV will not be operating. Therefore, the VBV were given an operational restriction in the model. This restriction reduced the operational timeframe of the VBV to 10 minutes per any given hour. Since the model is calculating equivalent sound levels over a specific time period – one hour in this case – the impact of the VBV is slightly reduced compared to if it operated all the time. This is a more realistic prediction of the expected impacts during any given hour of operation.

Because there will be times when the VBV do not operate at all, a second operational scenario is provided: "No VBV." In this scenario, the VBV were assumed to have zero impact. This holds true for most normal operational scenarios and is expected to represent the typical Station sound level impacts.

Acoustical Modeling Results

Discrete sound pressure levels were predicted at LT-1 and LT-2 for both operational scenarios. A 10-by-10 meter grid was used to calculate sound pressure levels for all areas immediately surrounding the Station site. CadnaA modeling results have been demonstrated in previous studies to conservatively approximate real-life, measured noise from a source when extraneous noises are not present.

The maximum model-predicted L_{eq} sound pressure levels at LT-1 and LT-2 (the total expected impact for every piece of equipment at the Station) are included in Table 5-2. These values represent only the noise emitted by the Station and do not include any extraneous noises (vehicular traffic, birds, etc.) that could be present during physical noise measurements. Since the "All Sources" scenario has all equipment modeled as simultaneously operating under their loudest conditions, it is appropriate to assume that the CadnaA-predicted values overestimate the maximum sound pressure levels that should be expected under actual operating conditions.

As previously mentioned, decibels are a logarithmic ratio of a sound pressure to a reference sound pressure. Therefore, they must be logarithmically added to determine a cumulative impact (i.e., logarithmically adding 50 dBA and 50 dBA results in 53 dBA). The ambient sound levels, applicable noise limits, model-predicted sound pressure levels due to only the Station's operation at both measurement locations, and the overall expected sound levels are contained in Table 5-2.

Table 5-2: LT-1 and LT-2 Model-Predicted Results

Operational Scenario	Measurement Point	Lowest Hourly Measured L_{50} (dBA)	OAR Standard L_{50} + 10 dBA	Model-Predicted Sound Level (dBA)	Ambient Plus Station Contribution (dBA)
All Sources	LT-1	39.3	49.3	47.1	47.8
	LT-2	40.1	50.1	44.5	45.8
No VBV	LT-1	39.3	49.3	46.3	47.1
	LT-2	40.1	50.1	44.1	45.6

As Table 5-2 shows, overall predicted sound pressure levels at both noise sensitive properties, during either operational scenario, are expected to be below the OAR Standard. Even though a conservative approach to the modeling was taken during the modeling, extraneous sounds (vehicular traffic, dogs barking, etc.) may make the overall sound level higher than the OAR Standards during some occasions, but the Station alone will not cause that to happen.

Figure 5-2 provides a graphical representation of the expected sound pressure levels generated by simultaneous operation of all sources at the Station. This figure shows contours of sound levels in 5-dBA increments overlaid onto an aerial to demonstrate how sound is expected to propagate. Figure 5-3 shows sound level contours in 5-dBA increments, but does not include the VBV's.

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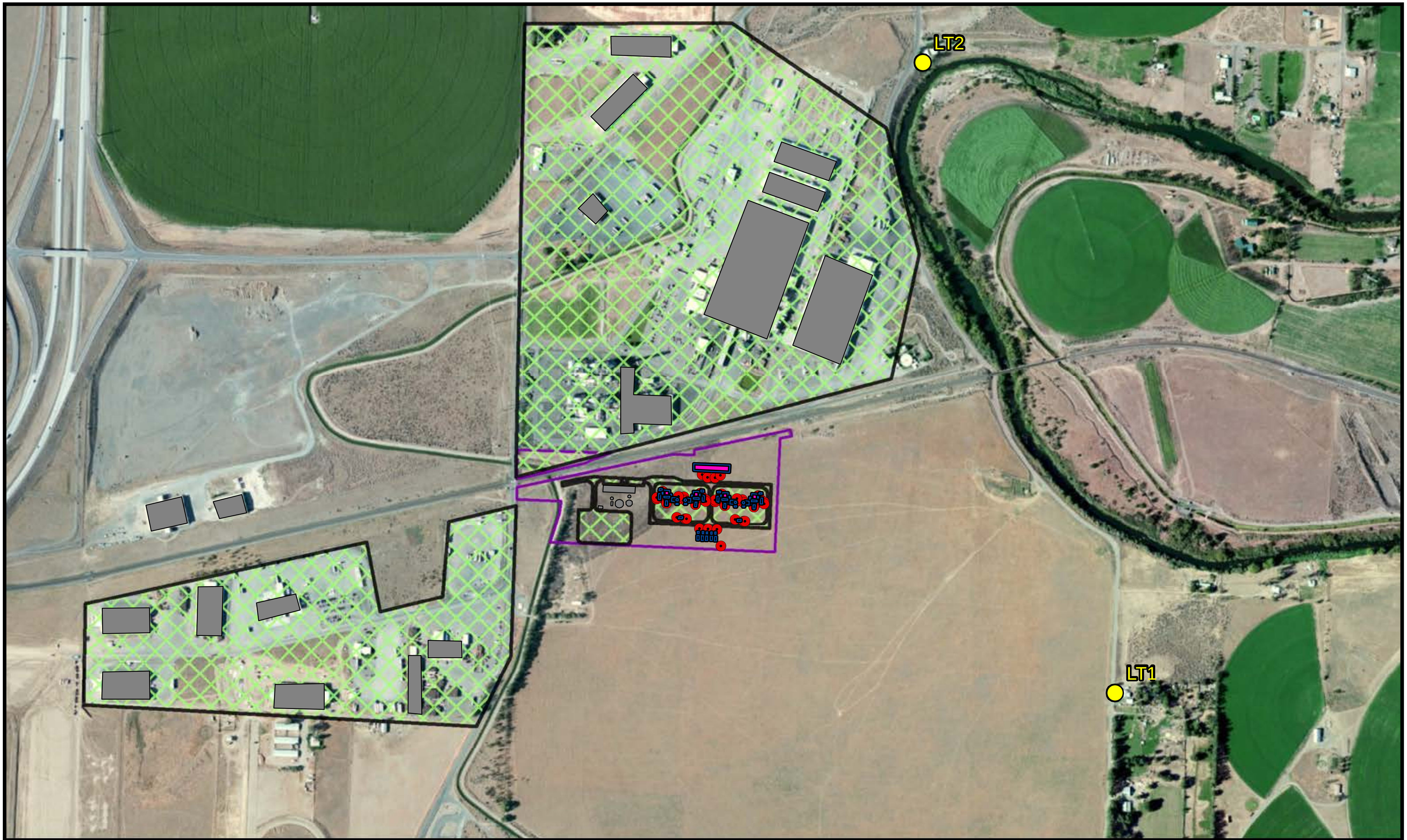

NORTH

0 420 840 Feet

Scale: 1 Inch = 500 Feet

Energy Facility Site
Structures
Ground Absorption Area
Point Sources
Area Sources
Vert. Area Sources

Burns & McDonnell SINCE 1898

Figure 5-1
Wind Chaser Station
Noise Modeling Layout

Source: Umatilla Co. (2011), ORMAP (2012); USDA (2012); ESRI (2013) ; and Burns & McDonnell (2014)

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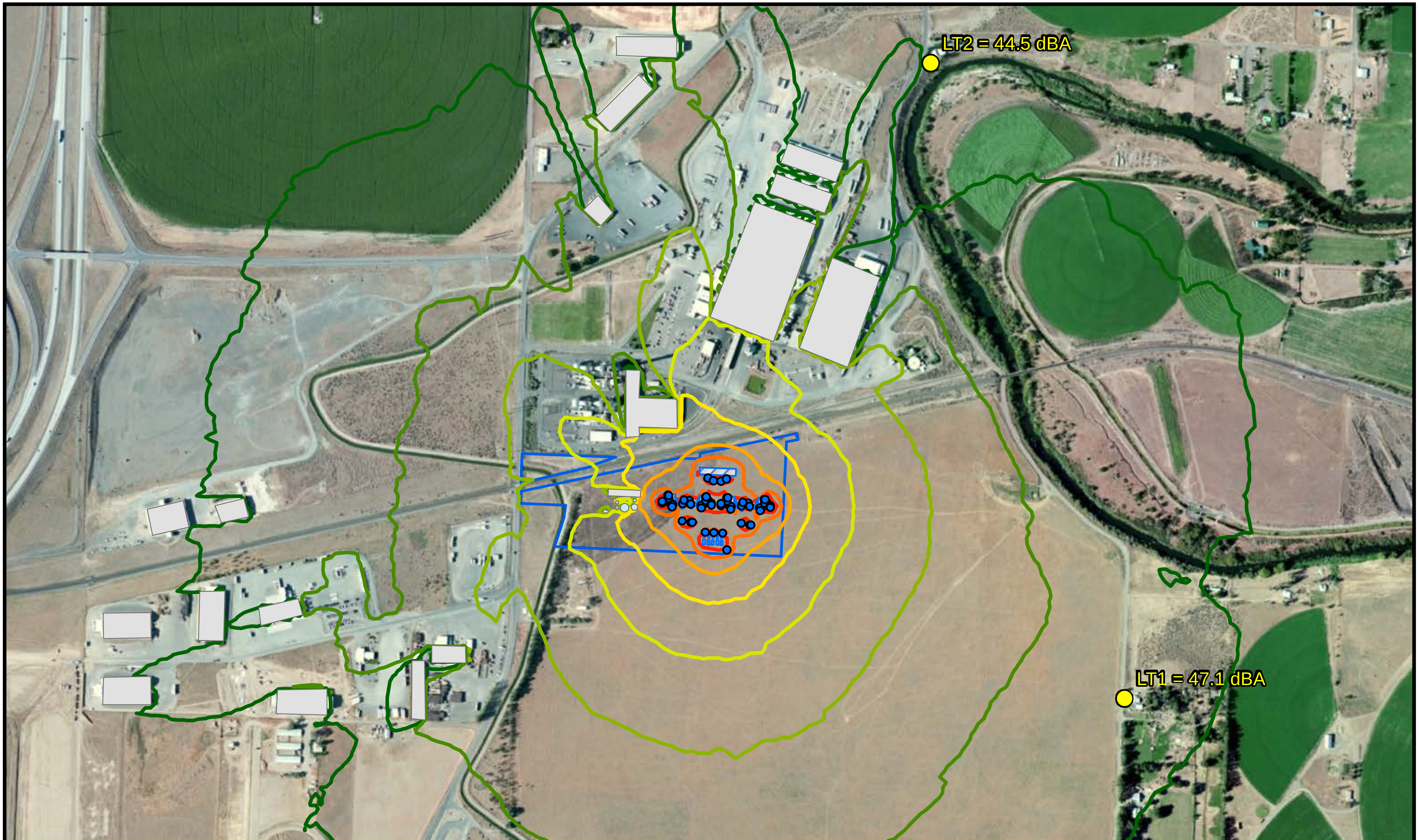

NORTH

0 420 840 Feet

Scale: 1 Inch = 500 Feet

Sound Pressure Levels (dBA)

45, 50, 55, 60, 65, 70, 75, 80

Burns & McDonnell SINCE 1898

Figure 5-2
Wind Chaser Station
Noise Contours
All Sources

Source: Umatilla Co. (2011), ORMAP (2012); USDA (2012); ESRI (2013) ; and Burns & McDonnell (2014)

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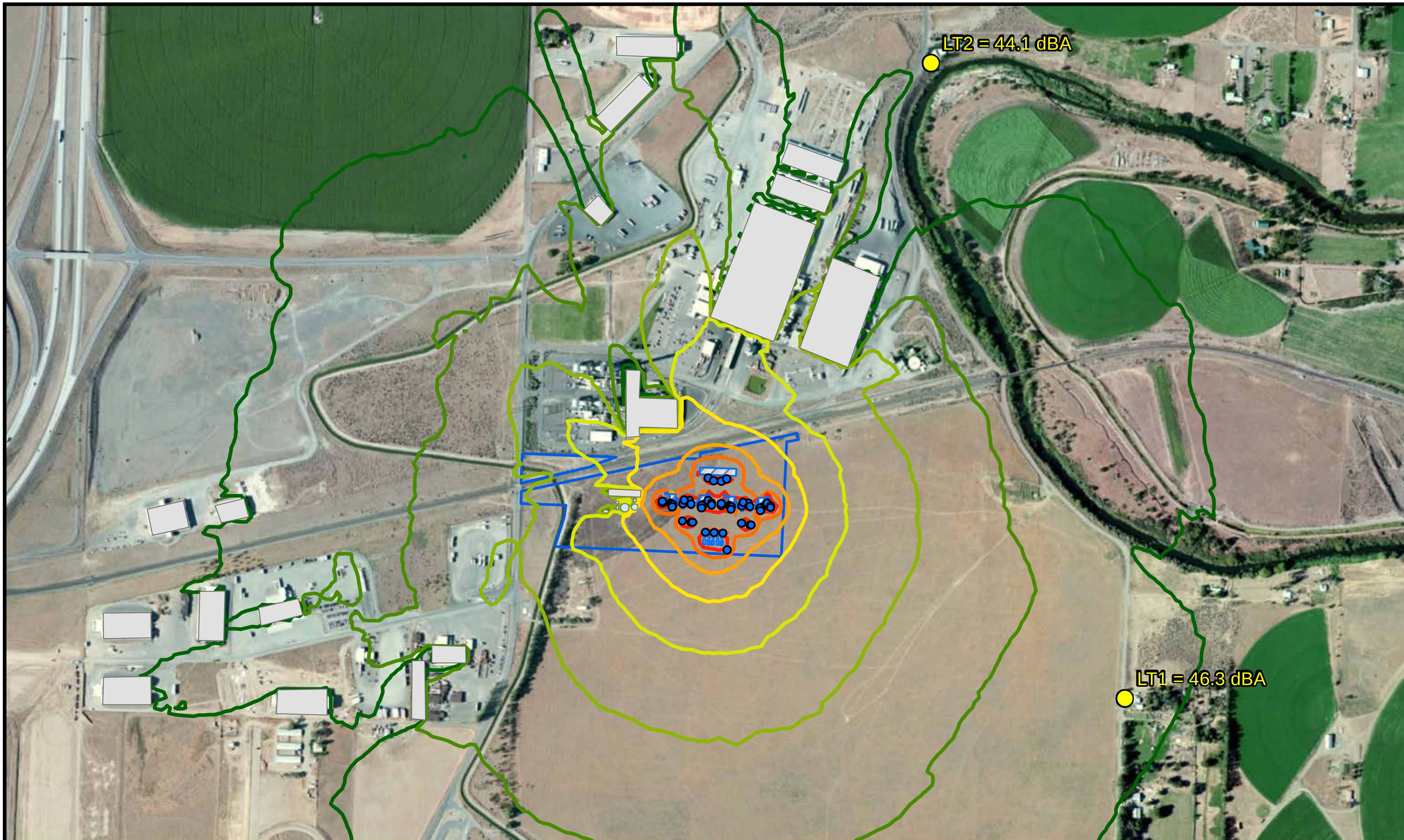

NORTH

0 420 840 Feet

Scale: 1 Inch = 500 Feet

Sound Pressure Levels (dBA)

45 55 65 75

50 60 70 80

Burns & McDonnell SINCE 1898

Figure 5-3
Wind Chaser Station
Noise Contours
No VBVs

Source: Umatilla Co. (2011), ORMAP (2012); USDA (2012); ESRI (2013) ; and Burns & McDonnell (2014)

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5.4 Substation Model and Results

Project Layout

Modeling was conducted using the proposed layout for the step-up substation (see Figure 5-4). The Project includes installing three single-phase step-up transformers adjacent to the existing BPA McNary Substation. Appropriate sound generation was applied for all sound radiating surfaces and reflections were considered when sound encountered a physical structure. Also included on Figure 5-4 are the areas with designated ground absorption factors of 0.5 (for gravel).

Sound Emission Data

Transformers are a very mature technology and literature is therefore available to estimate the sound profiles for the step-up substation. Using frequency data from similarly-sized equipment and estimating a sound pressure level of 76 dBA per IEEE C57.12.90, acoustical modeling was conducted for the new substation. The overall sound power level estimates for the equipment are shown in Table 5-3, as well as the source type used for each source, as previously described. Also shown are the type and quantity of each source. The octave-band center-frequency data of each source is provided in Appendix A.

Table 5-3: Substation Sound Power Levels

Source Type	Name	Quantity	Overall PWL	
			dBA	dB
Areas	Transformers, including fans	3	95.7	104.3
Vertical Areas	Transformers, including fans	3	95.7	104.3

Acoustical Modeling Results

Discrete sound pressure levels were predicted at LT-3 for all three single-phase transformers. A 10-by-10 meter grid was used to calculate sound pressure levels for all areas immediately surrounding the Station site. CadnaA modeling results have been demonstrated in previous studies to conservatively approximate real-life, measured noise from a source when extraneous noises are not present.

The maximum model-predicted L_{eq} sound pressure level at LT-3 (the total expected impact for the step-up substation) is included in Table 5-4. This value represents only the noise emitted by the substation and does not include any extraneous noises (vehicular traffic, birds, etc.) that could be present during physical noise measurements. Since all equipment was modeled as simultaneously operating under their loudest conditions, it is appropriate to assume that the CadnaA-predicted values overestimate the maximum sound pressure levels that should be expected under actual operating conditions.

The ambient sound levels, applicable noise limits, model-predicted sound pressure levels due to only the substation's operation at LT-3, and the overall expected sound levels are contained in Table 5-4.

Table 5-4: LT-3 Model-Predicted Results

Measurement Point	Lowest Hourly Measured L_{50} (dBA)	OAR Standard L_{50} + 10 dBA	Model-Predicted Sound Level (dBA)	Ambient Plus Station Contribution (dBA)
LT-1	39.8	49.8	38.3	42.1

As Table 5-4 shows, overall sound levels at the noise sensitive property are expected to be below the OAR Standard. A conservative approach to the modeling was taken by assuming that all equipment at the substation is operating simultaneously and under maximum operating conditions. Extraneous sounds (vehicular traffic, dogs barking, etc.) may make the overall sound level higher than the OAR Standards during some occasions, but the substation alone will not cause that to happen.

Table 5-5 provides a graphical representation of the expected sound pressure levels generated by simultaneous operation of all sources at the substation. This figure shows contours of sound levels in 5-dBA increments overlaid onto an aerial to demonstrate how sound is expected to propagate.

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Burns & McDonnell SINCE 1898

Figure 5-4
Substation
Noise Modeling Layout

Source: Umatilla Co. (2011), ORMAP (2012); USDA (2012); ESRI (2013) ; and Burns & McDonnell (2014)

Issued: 1/8/2014

Path: G:\Projects\Air-Noise Dept\Project Files\Perennial\55745\Perennial Wind Chaser Noise Contour - Substation.mxd cakelly 1/8/2014

NORTH

0 210 420 Feet

Scale: 1 Inch = 500 Feet

Sound Pressure Levels (dBA)

35 45 55 65

40 50 60 70

Burns & McDonnell SINCE 1898

Figure 5-5
Substation
Noise Contours

Source: Umatilla Co. (2011), ORMAP (2012); USDA (2012); ESRI (2013) ; and Burns & McDonnell (2014)

Issued: 1/8/2014

6.0 CONCLUSION

A noise assessment was performed for the proposed Perennial Wind Chaser Station and step-up substation in Umatilla County, Oregon. This noise assessment was completed to determine if Perennial could expect to comply with applicable noise limits during maximum operating conditions of the proposed Project.

The Oregon DEQ has put forth noise regulations for Industrial and Commercial facilities in the OAR Section 340-035-0035. The rules for new sources state that sound levels after operation of the facility cannot exceed 10 dBA over the pre-construction, minimum hourly L_{50} ambient measurement, or the values in Table 8 of that section; whichever is lower.

Ambient sound levels were measured by E&E in 2013 and were determined to be common for rural, agricultural areas. The lowest, hourly measured L_{50} sound levels were used to determine the noise standards at noise sensitive receivers surrounding both Project sites. The lowest, hourly L_{50} for LT-1, LT-2, and LT-3 were 39.3 dBA, 40.1 dBA, and 39.8 dBA, respectively. This results in noise limits of 49.3 dBA, 50.0 dBA, and 49.8 dBA for LT-1, LT-2, and LT-3, respectively.

Manufacturer or industry literature was reviewed to determine sound power levels for each piece of equipment. CadnaA noise modeling was performed and sound pressure levels were predicted for the nearby noise sensitive properties within and surrounding the Project sites. A number of conservative assumptions were applied to provide conservative sound pressure level predictions. Those results were then logarithmically added to the established, baseline ambient sound levels for each noise sensitive property. The conservatively-predicted sound pressure levels at each noise sensitive property were all below their respective OAR Standards.

The assessment shows that the sound levels generated by the Station and substation, and logarithmically added to the established ambient sound levels are predicted to be below the OAR Standards at each noise sensitive receiver. It can be deduced that, even during maximum operation the Station and substation, overall sound pressure levels should not exceed the OAR Standards during operation. Therefore, Perennial can build and operate the proposed Wind Chaser Station and addition to the BPA McNary Substation without expecting to create any noise ordinance exceedances.

* * * * *

APPENDX A SOUND PRESSURE LEVEL TABLES

Modeled Sound Power Levels

Station	Source Type	Name	Quantity	Octave Spectrum (dB) 31.5	63	125	250	500	1000	2000	4000	8000	Overall PWL A	Overall PWL lin
Wind Chaser Station	Points	Auxiliary Transformer	2	90.5	90.5	94.5	91.5	97.5	89.5	79.5	74.5	68.5	96.0	101.2
		Chemical Feed Skid	2	96.0	95.0	97.0	97.0	97.0	97.0	97.0	94.0	87.0	102.6	105.5
		Condensate Pump	2	90.3	104.3	99.3	97.3	97.3	96.3	96.3	91.3	89.3	102.0	107.6
		Cooling Tower Transformer	2	90.5	90.5	94.5	91.5	97.5	89.5	79.5	74.5	68.5	96.0	101.2
		Gas Compressor Transformer	3	90.5	90.5	94.5	91.5	97.5	89.5	79.5	74.5	68.5	96.0	101.2
		Gas Metering Area	1	96.0	94.0	91.0	90.0	90.0	92.0	96.0	95.0	92.0	101.0	103.0
		Generator Air Exhaust	8	105.0	95.0	96.0	98.0	94.0	85.0	82.0	79.0	58.0	94.5	106.8
		Secondary Unit Sub Trans	4	90.5	90.5	94.5	91.5	97.5	89.5	79.5	74.5	68.5	96.0	101.2
		Sump	4	97.0	105.0	106.0	105.0	104.0	103.0	98.0	89.0	62.0	106.7	112.0
		Turbine Enclosure Vent	4	100.0	93.0	97.0	98.0	92.0	92.0	94.0	92.0	86.0	99.5	104.9
		Turbine Stack	4	127.0	118.0	114.0	108.0	100.0	93.0	97.0	107.0	104.0	110.5	127.8
		Variable Bleed Valve Stack	4	135.0	130.0	117.0	95.0	82.0	80.0	100.0	104.0	96.0	109.5	136.2
		Variable Bleed Valve Stack Base	4	100.0	104.0	104.0	100.0	94.0	86.0	79.0	69.0	57.0	95.8	108.6
		water pump/sump	10	97.0	105.0	106.0	105.0	104.0	103.0	98.0	89.0	62.0	106.7	112.0
	Areas	Air Intake	4	101.0	93.0	83.0	68.0	58.0	55.0	71.0	70.0	59.0	76.3	101.7
		Auxiliary Skid	4	99.0	95.0	90.0	90.0	100.0	89.0	86.0	80.0	76.0	98.1	103.9
		Cooling Tower Outlet	1	112.8	114.8	112.8	111.9	108.9	108.7	106.0	106.9	109.8	115.1	120.7
		Expansion Joint	4	110.0	92.0	80.0	77.0	72.0	57.0	49.0	43.0	27.0	75.2	110.1
		Fuel Gas Filter Seperator	4	96.0	94.0	91.0	90.0	90.0	92.0	96.0	95.0	92.0	101.0	103.0
		Gas Compressor	5	0.0	87.0	95.0	96.0	98.0	104.0	100.0	98.0	87.0	107.0	107.5
		Generator	4	90.0	84.0	99.0	81.0	80.0	81.0	79.0	74.0	70.0	87.3	99.9
		Generator Enclosure Vent Inlet/Exhaust	4	106.0	95.0	95.0	92.0	82.0	81.0	86.0	85.0	74.0	91.6	106.9
		Intercooler	4	99.0	91.0	91.0	88.0	89.0	80.0	67.0	53.0	36.0	87.8	100.8
		LMS100	4	106.0	95.0	95.0	92.0	82.0	81.0	86.0	85.0	74.0	91.6	106.9
		Gas Compressor Lube Oil Skid	5	91.0	104.0	115.0	85.0	94.0	90.0	94.0	92.0	83.0	101.9	115.4
		SCR	4	104.0	96.0	97.0	100.0	94.0	85.0	82.0	78.0	57.0	95.2	106.7
		SCR Skid	4	104.0	96.0	97.0	100.0	94.0	85.0	82.0	78.0	57.0	95.2	106.7
		Transformer	2	104.5	104.5	108.5	108.5	108.5	92.5	87.5	80.5	75.5	106.8	114.3
		VBV Silencer	8	89.0	90.0	94.0	101.0	106.0	108.0	101.0	100.0	89.0	110.6	111.6
	Vertical Areas	Air Intake	4	102.0	93.0	90.0	81.0	70.0	69.0	77.0	70.0	59.0	81.5	102.8
		Auxiliary Skid	4	99.0	95.0	90.0	90.0	100.0	89.0	86.0	80.0	76.0	98.1	103.9
		Cooling Tower Inlet	1	112.8	114.8	112.8	111.9	108.9	108.7	106.0	106.9	109.8	115.1	120.7
		Expansion Joint	4	110.0	92.0	80.0	77.0	72.0	57.0	49.0	43.0	27.0	75.2	110.1
		Fuel Gas Filter Seperator	4	96.0	94.0	91.0	90.0	90.0	92.0	96.0	95.0	92.0	101.0	103.0
		Gas Compressor	5	0.0	87.0	95.0	96.0	98.0	104.0	100.0	98.0	87.0	107.0	107.5
		Generator	4	90.0	84.0	99.0	81.0	80.0	81.0	79.0	74.0	70.0	87.3	99.9
		Generator Enclosure Vent Inlet/Exhaust	4	106.0	95.0	95.0	92.0	82.0	81.0	86.0	85.0	74.0	91.6	106.9
		Intercooler	4	99.0	91.0	91.0	88.0	89.0	80.0	67.0	53.0	36.0	87.8	100.8
		LMS100	4	106.0	95.0	95.0	92.0	82.0	81.0	86.0	85.0	74.0	91.6	106.9
		Gas Compressor Lube Oil Skid	5	91.0	104.0	115.0	85.0	94.0	90.0	94.0	92.0	83.0	101.9	115.4
		SCR	4	104.0	96.0	97.0	100.0	94.0	85.0	82.0	78.0	57.0	95.2	106.7
		SCR Skid	4	104.0	96.0	97.0	100.0	94.0	85.0	82.0	78.0	57.0	95.2	106.7
		Stack Structure	4	97.0	92.0	92.0	92.0	87.0	78.0	75.0	74.0	62.0	88.1	100.2
		Transformer	2	104.5	104.5	108.5	108.5	108.5	92.5	87.5	80.5	75.5	106.8	114.3
		VBV Silencer	8	89.0	90.0	94.0	101.0	106.0	108.0	101.0	100.0	89.0	110.6	111.6

Station	Source Type	Name	Quantity	Octave Spectrum (dB) 31.5	63	125	250	500	1000	2000	4000	8000	Overall PWL A	Overall PWL lin
Substation	Areas	Transformer	3	92.3	98.3	100	95.3	95.3	89.3	84.3	79.3	72.3	95.7	104.3
	Vertical Areas	Transformer	3	92.3	98.3	100	95.3	95.3	89.3	84.3	79.3	72.3	95.7	104.3

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APPENDIX X-2

Field Data Sheets and Equipment Calibration Documentation

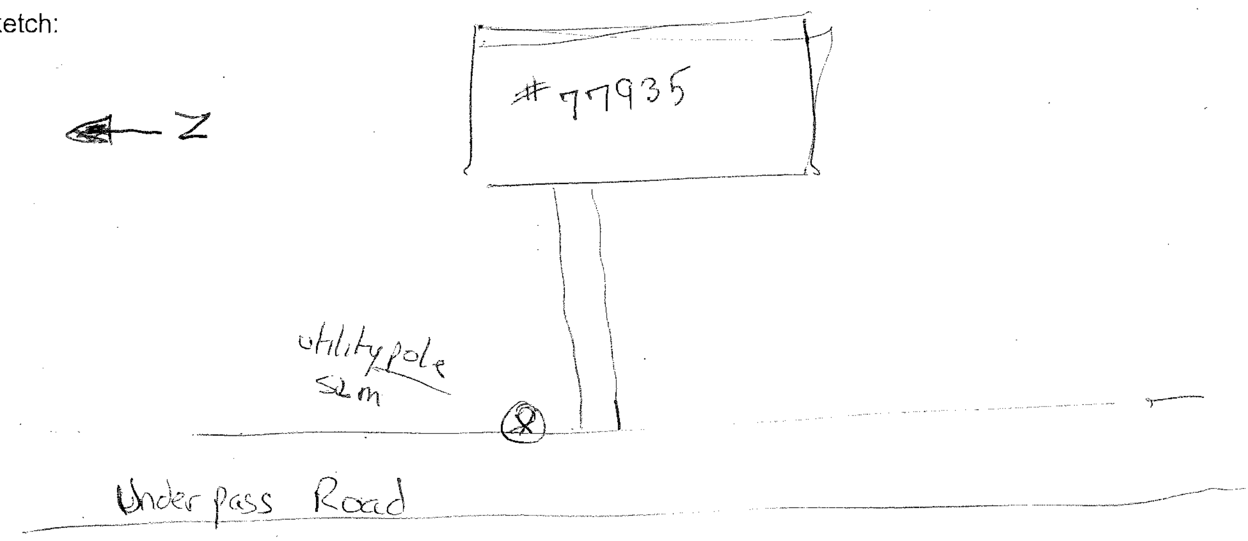
rev.6/13

24 Hour L_{eq} NOISE STUDY FIELD SHEET

Site Location: Perennial Wind Chaser	*NOISE SPECIALIST:* T. Siener / M.F.
Purpose: Background Survey	*DATE:* 6/27/13
Conditions: Pre-Construction	*WEATHER:* 80's sunshine light breeze
Lawn + gravel	

LOCATION: #1 Long term / LT1		START DATE:	6/27/13
77935 Underpass Road		START TIME:	16:20
Aka Cottonwood Bend		STOP DATE:	6/29/13
Run Number:		STOP TIME:	11:30

Sketch:



NOISE METER:	CALIBRATOR
MAKE: Rion	*MAKE:* Noisonic
MODEL: NL31	*MODEL:* 1251
SER. NUMBER: 00593644	*SER. NUMBER:* 33225
FACTORY CALIBRATION DATE: 3/18/13	*FACTORY CALIBRATION DATE:* 9/5/12
FIELD CALIBRATION DATE: 6/27/13	114 dB

Post Cal. 114.2

notes:
Dog barking at Start up
Birds Chirping
Rooster
Passing Cars on Gravel Road
Gravel Road

✓ Photo
✓ Saved

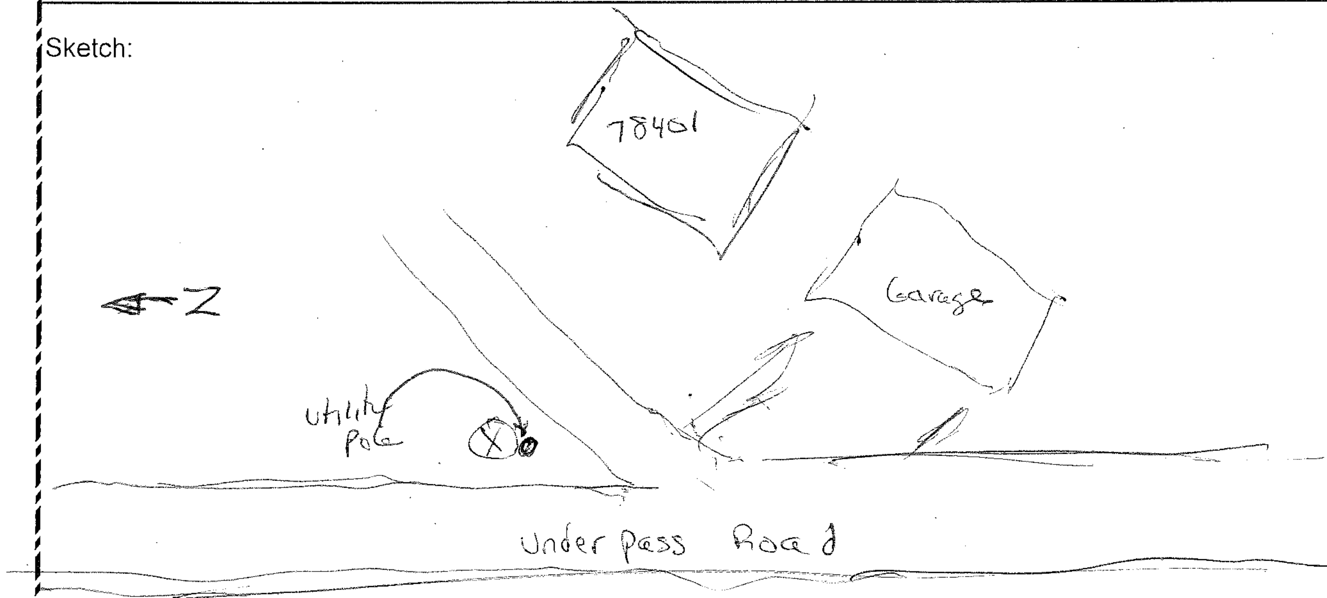
rev.6/13

24 Hour L_{eq} NOISE STUDY FIELD SHEET

Site Location: Perennial Wind Chaser	*NOISE SPECIALIST:* T. Siener / M. F.
Purpose: Background Survey	*DATE:* 6/27/13
Conditions: Lawn + Pavement	*WEATHER:* 80s, Partly cloudy calm
Preconstruction	

LOCATION: 2 Long Term LT2		START DATE:	6/27/13
78401 Underpass Road		START TIME:	17:35
AKA Cottonwood Bend Road		STOP DATE:	6/29/13
Run Number:		STOP TIME:	11:50

Sketch:



NOISE METER:	CALIBRATOR
MAKE: Rion	*MAKE:* Norsonic
MODEL: NL31	*MODEL:* 1251
SER. NUMBER: 00303797	*SER. NUMBER:* ~~9/5/12~~ 33225
FACTORY CALIBRATION DATE: 3/18/13	*FACTORY CALIBRATION DATE:* 9/5/12
FIELD CALIBRATION DATE: 6/27/13	114 dB

Post Cal 114 dB

notes:
Plant Audible in distance
Barking Dogs Distance
Paved Road — Trucks passing

✓ Photo
✓ Saved

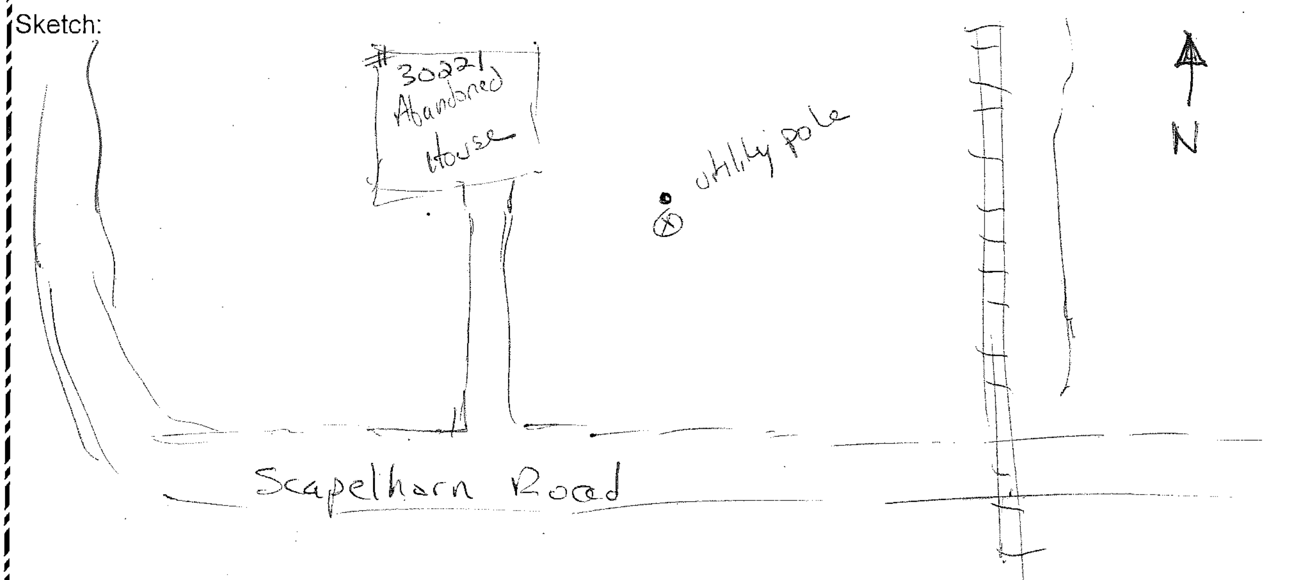
rev.6/13

24 Hour L_{eq} NOISE STUDY FIELD SHEET

Site Location:	Perennial Wind Chaser	*NOISE SPECIALIST:* T. Siener / M.F.	
Purpose:	Background Survey	*DATE:* 6/27/13	
Conditions:	Field / Soft Ground	*WEATHER:* Sunshine 80s light breeze	
Pre-Construction			

LOCATION: #3 Longterm / LT3		START DATE:	6/27/13
30221 Scapelhorn Road		START TIME:	18:25
		STOP DATE:	6/29/13
Run Number:		STOP TIME:	Battery Dead

Sketch:



NOISE METER:	CALIBRATOR
MAKE: Rion	*MAKE:* Norsonic
MODEL: NL31 31	*MODEL:* 1251
SER. NUMBER: 00541620	*SER. NUMBER:* 33225
FACTORY CALIBRATION DATE: 3/18/13	*FACTORY CALIBRATION DATE:* 9/5/12
FIELD CALIBRATION DATE: 6/27/13	114 dB

Post Cal 114 dB

notes:
Gravel Road
Distant plant audible

* Cv Harness failed unit off at pickup

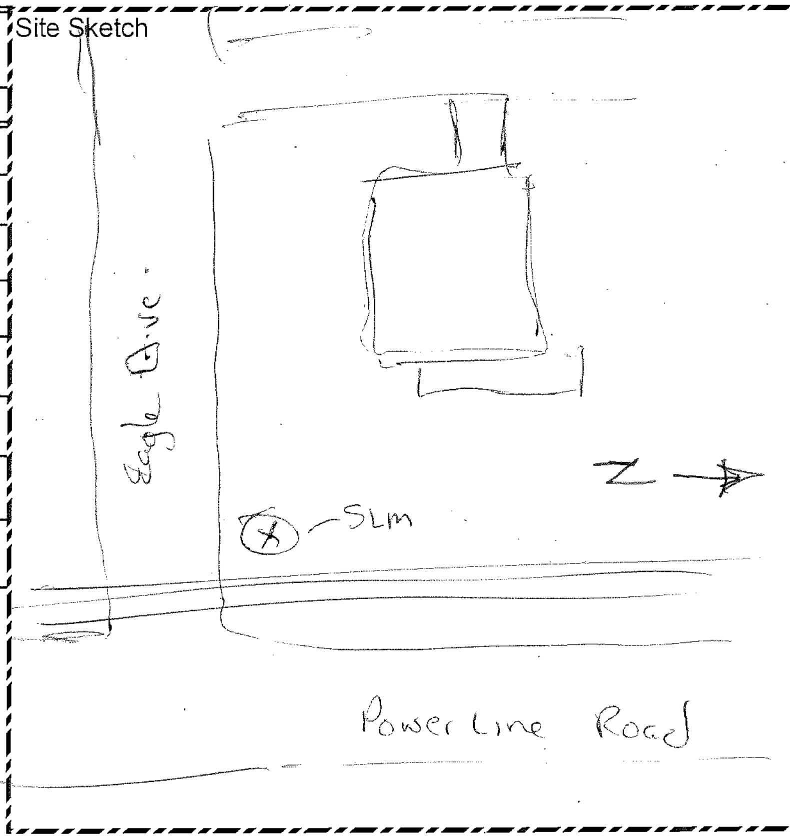
X Photo Saved

NOISE STUDY FIELD SHEET

Site Location: Perennial Wind Chaser	*Noise Specialist:* TS / M.F.
Purpose: Baseline Noise Survey	*Date:* 6/28/13
Ground Conditions: Pre Construction lawn + pavement	*Weather:* Sunshine 70's
Short Term #1 ST1	

LOCATION: Powerline Road + Eagle Avenue #1	
Run Number	
Start Time	8:15
Stop Time	8:29
Day / ~~Night~~	
LAeq	57.1
LA10	
LA50	
LA90	
Measurement Duration (min.)	~~10~~ 13:37

Site Sketch



NOISE METER:	CALIBRATOR:
MAKE: B & K	*MAKE: B&K*
MODEL: 2260	*MODEL: 4231*
SER. NUMBER: 2391318/	*SER. NUMBER: 2394049/*
FACTORY CALIBRATION DATE: 2/22/13	*FACTORY CALIBRATION DATE: 2/22/13*
FIELD CALIBRATION DATE: 6/28/13	94 dB / -26.1 Sens.

Photo: ✓
File Saved: ✓

Notes:

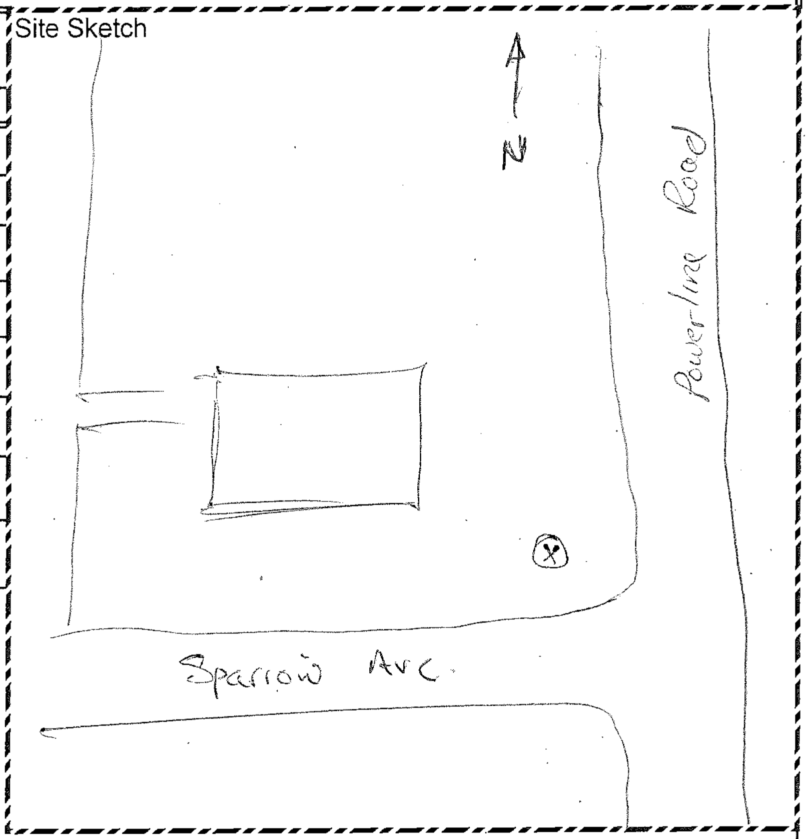
Dogs barking
Traffic along Powerline Road
Birds Chirping

NOISE STUDY FIELD SHEET

Site Location: Perennial Wind	*Noise Specialist:* TS / MF
Purpose: Baseline Noise Survey	*Date:* 6/28/13
Ground Conditions: Lawn + Pavement	*Weather:* Sunshine 70s, Calm
Short Term #2 ST2	

LOCATION: Powerline Road + Sparrow Avenue #2	
Run Number	
Start Time	8:26
Stop Time	8:50
Day / ~~Night~~	
LAeq	62.6
LA10	
LA50	
LA90	
Measurement Duration (min.)	14:12

Site Sketch



NOISE METER:	CALIBRATOR:
MAKE: B & K	*MAKE: B&K*
MODEL: 2260	*MODEL: 4231*
SER. NUMBER: 2391318/	*SER. NUMBER: 2394049/*
FACTORY CALIBRATION DATE: 2/22/13	*FACTORY CALIBRATION DATE: 2/22/13*
FIELD CALIBRATION DATE: 6/28/13	94 dB

Photo: ✓
File Saved: 2

Notes:

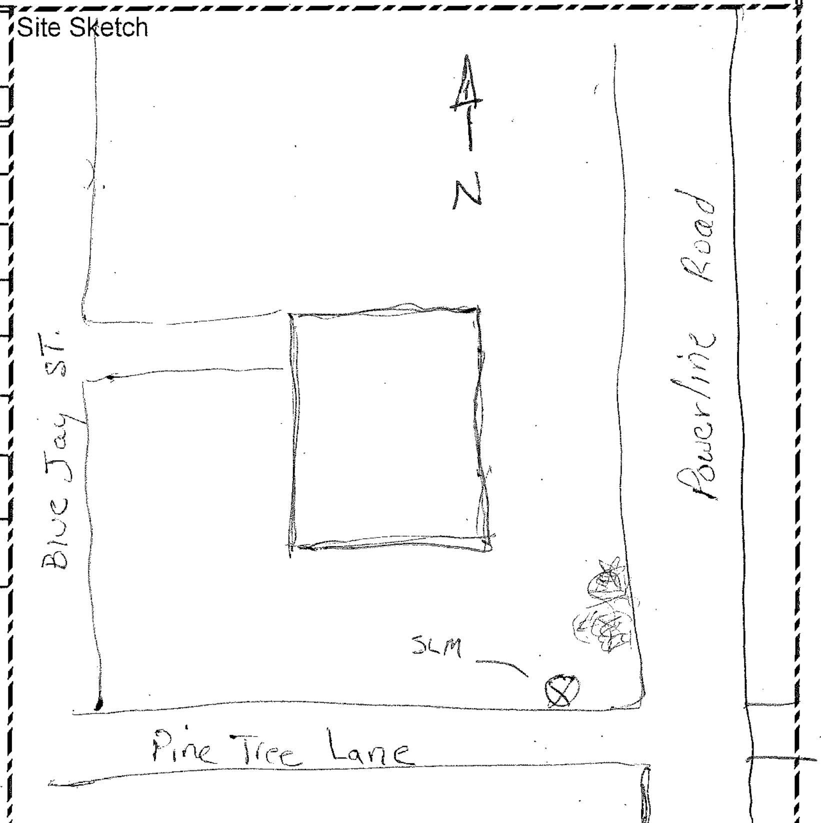
Traffic on Powerline Road
distant dog barking
Birds chirping

NOISE STUDY FIELD SHEET

Site Location: Perennial Wind Chaser	Noise Specialist: TS/ M.F.
Purpose: Baseline Noise Monitoring	Date: 6/28/13
Ground Conditions: Lawn and pavement	Weather: Sunshine, 70s, Calm
Short Term #3 ST3	

LOCATION: PowerLine Road and Pine Tree Lane #3	
Run Number	
Start Time	8:54
Stop Time	9:07
Day / Night	
LAeq	60.9
LA10	
LA50	
LA90	
Measurement Duration (min.)	13

Site Sketch



NOISE METER:	CALIBRATOR:
MAKE: B & K	MAKE: B&K
MODEL: 2260	MODEL: 4231
SER. NUMBER: 2391318/	SER. NUMBER: 2394049/
FACTORY CALIBRATION DATE: 2/22/13	FACTORY CALIBRATION DATE: 2/22/13
FIELD CALIBRATION DATE: 6/28/13	94 dBA

Photo: ✓

File Saved: 3

Notes:

Lawn mover front of house

Truck + Car Traffic

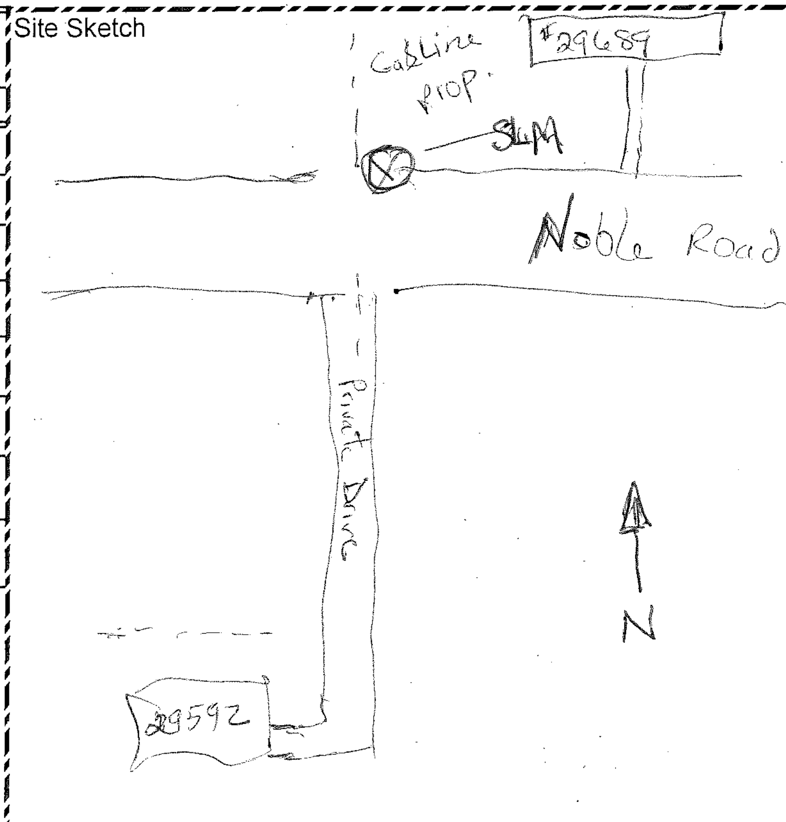
Birds Chirping

NOISE STUDY FIELD SHEET

Site Location: Perennial Wind Chaser	*Noise Specialist:* TS / MF
Purpose: Baseline Noise	*Date:* 6/28/13
Ground Conditions: Soft / Gravel	*Weather:* Sunshine, 70s, Light
ST4	Breeze

LOCATION: 29689 ~~29592~~ Noble #4	
Run Number	
Start Time	9:36
Stop Time	9:46
Day / Night	
LAeq	53.7
LA10	
LA50	
LA90	
Measurement Duration (min.)	11:28

Site Sketch



NOISE METER:	CALIBRATOR:
MAKE: B & K	*MAKE: B&K*
MODEL: 2260	*MODEL: 4231*
SER. NUMBER: 2391318/	*SER. NUMBER: 2394049/*
FACTORY CALIBRATION DATE: 2/22/13	*FACTORY CALIBRATION DATE: 2/22/13*
FIELD CALIBRATION DATE: 6/28/13	94 dB

Photo: ✓
File Saved: 4

Notes:

Distant Highway noise
Sparse traffic on Gravel Road
Birds Chirping
Crows calling
Distant Tractor

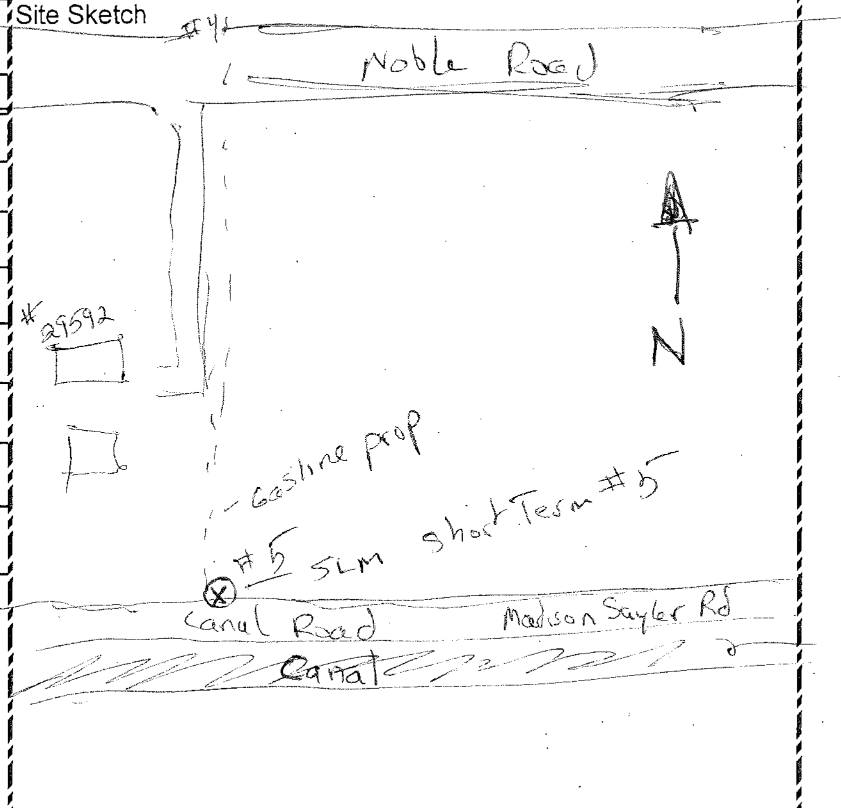
NOISE STUDY FIELD SHEET

Site Location: Perennial Wind Chaser	*Noise Specialist:* TS/MF
Purpose: Baseline Noise Survey	*Date:* 6/28/13
Ground Conditions: Soft Fields	*Weather:* Sunshine 70s Light
Short Term #5 ST5	breeze

LOCATION: Short Term #5
Madison Sayler Road

Run Number	
Start Time	10:07
Stop Time	10:24
Day / Night	
LAeq	42.4
LA10	
LA50	
LA90	
Measurement Duration (min.)	12:43

Site Sketch



NOISE METER:	CALIBRATOR:
MAKE: B & K	*MAKE: B&K*
MODEL: 2260	*MODEL: 4231*
SER. NUMBER: 2391318/	*SER. NUMBER: 2394049/*
FACTORY CALIBRATION DATE: 2/22/13	*FACTORY CALIBRATION DATE: 2/22/13*
FIELD CALIBRATION DATE: 6/28/13	94 dB

Photo: ✓
File Saved: #5

Notes:

Birds Chirping
Train whistle
Distant Highway

NOISE STUDY FIELD SHEET

Site Location: Perennial Wind Chaser	*Noise Specialist:* TS / MF
Purpose: Baseline Noise Study	*Date:* 6/28/13
Ground Conditions: Field soft	*Weather:* Sunshine, 80s, Light
Pre-Construction	breeze

LOCATION: Short Term #5 ST5	
Run Number	
Start Time	17:10
Stop Time	17:21
Day / ~~Night~~	
LAeq	45.3
LA10	
LA50	
LA90	
Measurement Duration (min.)	11:

Site Sketch

see #5 Short Term

NOISE METER:	CALIBRATOR:
MAKE: B & K	*MAKE: B&K*
MODEL: 2260	*MODEL: 4231*
SER. NUMBER: 2391318/	*SER. NUMBER: 2394049/*
FACTORY CALIBRATION DATE: 2/22/13	*FACTORY CALIBRATION DATE: 2/22/13*
FIELD CALIBRATION DATE: 6/28/13	94. dB

Photo: X

File Saved: 6

Notes:

Distant highway

Birds

Crows Calling

NOISE STUDY FIELD SHEET

Site Location: Perennial Wind Chaser	*Noise Specialist:* TS / MF
Purpose: Baseline Noise Study	*Date:* 6/28/13
Ground Conditions: Field + adjacent gravel road	*Weather:* Sunshine/90s/Light
Pre-Construction	breeze

LOCATION: ST4 Short Term #4	
Run Number	
Start Time	17:32
Stop Time	17:42
Day / ~~Night~~	~~60.0~~
LAeq	60.0
LA10	
LA50	
LA90	
Measurement Duration (min.)	10:38

Site Sketch

See Short Term #4

NOISE METER:	CALIBRATOR:
MAKE: B & K	*MAKE: B&K*
MODEL: 2260	*MODEL: 4231*
SER. NUMBER: 2391318/	*SER. NUMBER: 2394049/*
FACTORY CALIBRATION DATE: 2/22/13	*FACTORY CALIBRATION DATE: 2/22/13*
FIELD CALIBRATION DATE: 6/28/13	94 dB

Photo: X
File Saved: 7

Notes:

Farm Equipment moving at nearby barn
Crows Calling
Birds chirping
18 Wheeler pass by on gravel
Distant Highway noise Rt 84 interstate

NOISE STUDY FIELD SHEET

Site Location: Perennial Wind Chaser	Noise Specialist: TS / MF
Purpose: Baseline Noise Survey	Date: 6/28/13
Ground Conditions: Field Soft + Gravel road Pre-Construction	Weather: Sunshine / 90s / Light breeze

LOCATION:	Long Term #1 LT1
Run Number	17
Start Time	~~18~~ 17:50
Stop Time	18:02
Day / ~~Night~~	
LAeq	55.5
LA10	
LA50	
LA90	
Measurement Duration (min.)	10:03

Site Sketch

See previous LT #1 Sketch

NOISE METER:	CALIBRATOR:
MAKE: B & K	MAKE: B&K
MODEL: 2260	MODEL: 4231
SER. NUMBER: 2391318/	SER. NUMBER: 2394049/
FACTORY CALIBRATION DATE: 2/22/13	FACTORY CALIBRATION DATE: 2/22/13
FIELD CALIBRATION DATE: 6/28/13	94 dB

Photo: X
File Saved: 8

Notes:

Train passing - Horn
Gravel Road
Birds Chirping
Farm Tractor pulling out of driveway
Distant Plant Noise

rev. 6/13

NOISE STUDY FIELD SHEET

Site Location: Perennial Wind Chaser	*NOISE SPECIALIST: TS/MF*
Purpose: Background Noise Survey	*DATE:* 6/28/13
Conditions: Field and Paved Road Adjacent	*WEATHER:* Sunshine, 90s, Light
Pre-construction Noise	breeze

LOCATION: Long-Term #2	
Receptor	LT2
START TIME	18:11
STOP TIME	18:22
LAeq	53.5
Lpeak	
Lmax	
RUN TIME	11:10

Site Sketch:

See Long Term #2 24 hour Sketch

NOISE METER:	CALIBRATOR
MAKE: B&K	*MAKE: B&K*
MODEL: 2260	*MODEL: 4231*
SER. NUMBER: 2391318	*SER. NUMBER: 2394049*
FACTORY CALIBRATION DATE: 2/22/13	*FACTORY CALIBRATION DATE: 2/22/13*
FIELD CALIBRATION DATE: 6/28/13	94 dB

Notes:

Dogs Barking

Birds Chirping

Distant Train

Traffic on Underpass Rd

Distant Power Plant

File: 10

Pic: ✓

rev. 6/13

NOISE STUDY FIELD SHEET

Site Location: Perennial Wind Chaser	*NOISE SPECIALIST: TS/MF*
Purpose: Background Survey	*DATE:* 6/28/13
Conditions: Lawn & paved road	*WEATHER:* Sunshine, 90s, Light
Preconstruction	breeze

LOCATION: Short Term 1	
Receptor	ST1
START TIME	18:34
STOP TIME	18:44
LAeq	56.9
Lpeak	
Lmax	
RUN TIME	10:25

Site Sketch:

See previous ST1 Sketch

NOISE METER:	CALIBRATOR
MAKE: B&K	*MAKE: B&K*
MODEL: 2260	*MODEL: 4231*
SER. NUMBER: 2391318	*SER. NUMBER: 2394049*
FACTORY CALIBRATION DATE: 2/22/13	*FACTORY CALIBRATION DATE: 2/22/13*
FIELD CALIBRATION DATE:	

Notes: Distant Lawn Mower

File: 11
Pic: ✓

rev. 6/13

NOISE STUDY FIELD SHEET

Site Location: Perennial Wind Chaser	*NOISE SPECIALIST:* TS/MF
Purpose: Background Survey	*DATE:* 6/28/13
Conditions: Lawn + Paved Roads	*WEATHER:* Sunshine, 90s, Calm
Pre-Construction	

LOCATION: Short Term #2	
Receptor	ST2
START TIME	18:48
STOP TIME	18:59
LAeq	59.2
Lpeak	
Lmax	
RUN TIME	11:08

Site Sketch:

See previous ST2 Sketch

NOISE METER:	CALIBRATOR
MAKE: B&K	*MAKE:* B&K
MODEL: 2260	*MODEL:* 4231
SER. NUMBER: 2391318	*SER. NUMBER:* 2394049
FACTORY CALIBRATION DATE: 2/22/13	*FACTORY CALIBRATION DATE:* 2/22/13
FIELD CALIBRATION DATE: 6/28/13	94 dB

Notes:
Traffic on Powerline Road

File: 12
Pic: ✓

rev. 6/13

NOISE STUDY FIELD SHEET

Site Location:	Perennial Wind Chaser	*NOISE SPECIALIST: TS/MF*
Purpose:	Background Survey	*DATE:* 6/28/13
Conditions:	Lawn + Paved Roads	*WEATHER:* Sunshine, 90s, Calm
	Pre-Construction	

LOCATION: Short Term #3		Site Sketch:
Receptor	ST3	See previous ST3 Sketch
START TIME	19:04	
STOP TIME	19:15	
LAeq	59.2	
Lpeak		
Lmax		
RUN TIME	10:44	

NOISE METER:	CALIBRATOR
MAKE: B&K	*MAKE: B&K*
MODEL: 2260	*MODEL: 4231*
SER. NUMBER: 2391318	*SER. NUMBER: 2394049*
FACTORY CALIBRATION DATE: 2/22/13	*FACTORY CALIBRATION DATE: 2/22/13*
FIELD CALIBRATION DATE:	

Notes:
Air Conditioner running at adjacent residence
Talkers on roadside

File: 13
Pic: ✓

rev. 6/13

NOISE STUDY FIELD SHEET

Site Location: Perennial Wind Chaser	*NOISE SPECIALIST:* TS/MF
Purpose: Background Survey	*DATE:* 6/28/13
Conditions: Fields/soft ground	*WEATHER:* Sunshine, 90s, Calm
Pre-Construction	

LOCATION: Long Term #3 Abandoned House	
Receptor	LT3
START TIME	19:26
STOP TIME	19:37
LAeq	44.6
Lpeak	
Lmax	
RUN TIME	11:20

Site Sketch: See previous LT3 Sketch

NOISE METER:	CALIBRATOR
MAKE: B&K	*MAKE:* B&K
MODEL: 2260	*MODEL:* 4231
SER. NUMBER: 2391318	*SER. NUMBER:* 2394049
FACTORY CALIBRATION DATE: 2/22/13	*FACTORY CALIBRATION DATE:* 2/22/13
FIELD CALIBRATION DATE: 6/28/13	94 dB

Notes:
Distant factory noise
Birds chirping
Distant shooting range
Kids on distant playground

File: 15
Pic: ✓

rev. 6/13

NOISE STUDY FIELD SHEET

Site Location: Perennial Wind Chaser	*NOISE SPECIALIST:* TS/MF
Purpose: Background Survey	*DATE:* 6/28/13
Conditions: Field / soft ground / Night	*WEATHER:* Clear, 70s / Calm
Pre-Construction	

LOCATION: Short Term #5	
Receptor	ST5
START TIME	23:10
STOP TIME	23:21
LAeq	46.7
Lpeak	
Lmax	
RUN TIME	10:33

Site Sketch:

See previous sketch ST5

NOISE METER:	CALIBRATOR
MAKE: B&K	*MAKE: B&K*
MODEL: 2260	*MODEL: 4231*
SER. NUMBER: 2391318	*SER. NUMBER: 2394049*
FACTORY CALIBRATION DATE: 2/22/13	*FACTORY CALIBRATION DATE: 2/22/13*
FIELD CALIBRATION DATE: 6/28/13	94 dB

Notes:

Distant Highway

Frogs Croaking

File: 16

Pic: ✓

rev. 6/13

NOISE STUDY FIELD SHEET

Site Location: Perennial Wind Chaser	*NOISE SPECIALIST:* TS/MF
Purpose: Background Survey	*DATE:* 6/28/13
Conditions: Field + Gravel Road / Night	*WEATHER:* Clear, 70s, Calm
Pre-Construction	

LOCATION: Short Term #4	
Receptor	ST4
START TIME	23:30
STOP TIME	23:40
LAeq	49.7
Lpeak	
Lmax	
RUN TIME	10:23

Site Sketch:

See previous ST4 Sketch

NOISE METER:	CALIBRATOR
MAKE: B&K	*MAKE: B&K*
MODEL: 2260	*MODEL: 4231*
SER. NUMBER: 2391318	*SER. NUMBER: 2394049*
FACTORY CALIBRATION DATE: 2/22/13	*FACTORY CALIBRATION DATE: 2/22/13*
FIELD CALIBRATION DATE: 6/28/13	94 dB

Notes:

Dogs Barking

Insects

Frogs Croaking

File: 17
Pic: ✓

rev. 6/13

NOISE STUDY FIELD SHEET

Site Location: Perennial Wind Chaser	*NOISE SPECIALIST: TS/MF*
Purpose: Background Survey	*DATE:* 6/28/13
Conditions: Lawn + Pavement / Night	*WEATHER:* clear / 70s / Light Breeze
Pre-Constructions	

LOCATION: Short Term #1		Site Sketch: see ST1 previous sketch
Receptor	ST1	
START TIME	23:58	
STOP TIME	00:10	
LAeq	57.1	
Lpeak		
Lmax		
RUN TIME	12:28	

NOISE METER:	CALIBRATOR
MAKE: B&K	*MAKE: B&K*
MODEL: 2260	*MODEL: 4231*
SER. NUMBER: 2391318	*SER. NUMBER: 2394049*
FACTORY CALIBRATION DATE: 2/22/13	*FACTORY CALIBRATION DATE: 2/22/13*
FIELD CALIBRATION DATE: 6/28/13	94 dB

Notes:
Dogs Barking
Sparse Traffic

File: 18
Pic: ✓

rev. 6/13

NOISE STUDY FIELD SHEET

Site Location: Perennial Wind Chaser	*NOISE SPECIALIST:* TS/MF
Purpose: Background Survey	*DATE:* 6/29/13
Conditions: Lawn + Paved Roads / Night	*WEATHER:* Clear, 70s, Calm
Pre-Construction	

LOCATION: Short Term #2	
Receptor	ST2
START TIME	00:14
STOP TIME	00:26
LAeq	56.1
Lpeak	
Lmax	
RUN TIME	12:16

Site Sketch:

See Previous ST2 Sketch

NOISE METER:	CALIBRATOR
MAKE: B&K	*MAKE:* B&K
MODEL: 2260	*MODEL:* 4231
SER. NUMBER: 2391318	*SER. NUMBER:* 2394049
FACTORY CALIBRATION DATE: 2/22/13	*FACTORY CALIBRATION DATE:* 2/22/13
FIELD CALIBRATION DATE: 6/28/13	94 dB

Notes:

File: 19
Pic: ✓

rev. 6/13

NOISE STUDY FIELD SHEET

Site Location: Perennial Wind Chaser	*NOISE SPECIALIST: TS/MF*
Purpose: Background Survey	*DATE:* 6/29/13
Conditions: Lawn / Paved Road / Night	*WEATHER:* clear, 70s, Calm
Pre-construction	

LOCATION: Short Term #3		Site Sketch: See previous sketch for ST3
Receptor	ST3	
START TIME	00:30	
STOP TIME	00:42	
LAeq	52.4	
Lpeak		
Lmax		
RUN TIME	13:03	

NOISE METER:	CALIBRATOR
MAKE: B&K	*MAKE: B&K*
MODEL: 2260	*MODEL: 4231*
SER. NUMBER: 2391318	*SER. NUMBER: 2394049*
FACTORY CALIBRATION DATE: 2/22/13	*FACTORY CALIBRATION DATE: 2/22/13*
FIELD CALIBRATION DATE: 6/28/13	94 dB

Notes:
Crickets
Air Conditioning running at nearby residence
Passing Cars
Dogs Barking

File: 20
Pic: ✓

rev. 6/13

NOISE STUDY FIELD SHEET

Site Location: Perennial Wind Chaser	*NOISE SPECIALIST:* TS/MF
Purpose: Background Survey	*DATE:* 6/29/13
Conditions: Fields / soft ground	*WEATHER:* Sunshine, 79°, Light
Pre-Construction	Breeze

LOCATION:	Short Term #5
Receptor	ST5
START TIME	8:06
STOP TIME	8:17
LAeq	54.2
Lpeak	—
Lmax	—
RUN TIME	11:32

Site Sketch:

See previous sketch ST5

NOISE METER:	CALIBRATOR
MAKE: B&K	*MAKE: B&K*
MODEL: 2260	*MODEL: 4231*
SER. NUMBER: 2391318	*SER. NUMBER: 2394049*
FACTORY CALIBRATION DATE: 2/22/13	*FACTORY CALIBRATION DATE: 2/22/13*
FIELD CALIBRATION DATE: 6/29/13	94 dB -26.0

Notes:

Birds

Distant Highway

Small Plane Overflight

File: 21

Pic: ✓

rev. 6/13

NOISE STUDY FIELD SHEET

Site Location: Perennial Wind Chaser	*NOISE SPECIALIST: TS/MF*
Purpose: Background Survey	*DATE:* 6/29/13
Conditions: Fields / adjacent gravel road	*WEATHER:* sunshine, 81°F / Light
Pre-Construction	Breeze

LOCATION: Short Term #4	
Receptor	ST4
START TIME	8:34
STOP TIME	8:46
LAeq	58.4
Lpeak	—
Lmax	—
RUN TIME	13:01

Site Sketch:

See Previous ST4 Sketch

NOISE METER:	CALIBRATOR
MAKE: B&K	*MAKE: B&K*
MODEL: 2260	*MODEL: 4231*
SER. NUMBER: 2391318	*SER. NUMBER: 2394049*
FACTORY CALIBRATION DATE: 2/22/13	*FACTORY CALIBRATION DATE: 2/22/13*
FIELD CALIBRATION DATE: 6/29/13	94 dB

Notes:

File: 22
Pic: ✓

rev. 6/13

NOISE STUDY FIELD SHEET

Site Location:	Perennial Wind Chaser	*NOISE SPECIALIST:* TS/MF	
Purpose:	Background Survey	*DATE:*	6/29/13.
Conditions:	Lawn / Paved Road	*WEATHER:*	Sunshine, 78°, Light
Pre-Construction		Breeze	

LOCATION: Short Term #1	
Receptor	ST1
START TIME	9:02
STOP TIME	9:15
LAeq	58.8
Lpeak	—
Lmax	—
RUN TIME	13:27

Site Sketch:

NOISE METER:	CALIBRATOR
MAKE: B&K	*MAKE: B&K*
MODEL: 2260	*MODEL: 4231*
SER. NUMBER: 2391318	*SER. NUMBER: 2394049*
FACTORY CALIBRATION DATE: 2/22/13	*FACTORY CALIBRATION DATE: 2/22/13*
FIELD CALIBRATION DATE: 9/29/13	94 dB

Notes:
Traffic on Powerline Road
Birds

File: 23
Pic: ✓

NOISE STUDY FIELD SHEET

Site Location: Perennial Wind Chaser	NOISE SPECIALIST: TS/MF
Purpose: Background Survey	DATE: 6/29/13
Conditions: Lawn + Paved Roads	WEATHER: Sunshine, 82°F, Calm
Pre-Construction	

LOCATION: Short Term #2	
Receptor	ST2
START TIME	9:19
STOP TIME	9:31
LAeq	57.6
Lpeak	—
Lmax	—
RUN TIME	12:17

Site Sketch:

See Previous sketch ST2

NOISE METER:	CALIBRATOR
MAKE: B&K	MAKE: B&K
MODEL: 2260	MODEL: 4231
SER. NUMBER: 2391318	SER. NUMBER: 2394049
FACTORY CALIBRATION DATE: 2/22/13	FACTORY CALIBRATION DATE: 2/22/13
FIELD CALIBRATION DATE: 6/29/13	94 dB

Notes:

Traffic along road

Birds

File: 24
Pic: ✓

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NOISE STUDY FIELD SHEET

Site Location: Perennial Wind Chaser	NOISE SPECIALIST: TS/MF
Purpose: Background Survey	DATE: 6/29/13
Conditions: Lawn + Paved Roads	WEATHER: Sunshine, 89°F, Calm
Pre-Construction	

LOCATION: Short Term # 3	
Receptor	ST3
START TIME	9:34
STOP TIME	9:44
LAeq	56.8
Lpeak	—
Lmax	—
RUN TIME	10:02

Site Sketch:

See previous Sketch ST3

NOISE METER:	CALIBRATOR
MAKE: B&K	MAKE: B&K
MODEL: 2260	MODEL: 4231
SER. NUMBER: 2391318	SER. NUMBER: 2394049
FACTORY CALIBRATION DATE: 2/22/13	FACTORY CALIBRATION DATE: 2/22/13
FIELD CALIBRATION DATE: 6/29/13	94 dB

Notes:
Birds Chirping
Traffic
Dog Barking
Distant Lawn Mower

File: 25
Pic: ✓

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NOISE STUDY FIELD SHEET

Site Location: Perennial Wind Chaser	NOISE SPECIALIST: TS/MF
Purpose: Background Survey	DATE: 6/29/13
Conditions: Field + adjacent gravel roads	WEATHER: Sunshine, 88°F, Light
Pre-Construction	Breeze

LOCATION: Long Term #1	
Receptor	LT 1
START TIME	11:11
STOP TIME	11:25
LAeq	52.5
Lpeak	—
Lmax	—
RUN TIME	15:06

Site Sketch:

See previous sketch LT 1

NOISE METER:	CALIBRATOR
MAKE: B&K	MAKE: B&K
MODEL: 2260	MODEL: 4231
SER. NUMBER: 2391318	SER. NUMBER: 2394049
FACTORY CALIBRATION DATE: 2/22/13	FACTORY CALIBRATION DATE: 2/22/13
FIELD CALIBRATION DATE:	

Notes:

Birds chirping

Distant Factory

Train passing - distant

File: 26

Pic: ✓

rev. 6/13

NOISE STUDY FIELD SHEET

Site Location: Perennial Wind Chaser	NOISE SPECIALIST: TS/MF
Purpose: Background Survey	DATE: 6/29/13
Conditions: Field + adjacent gravel road	WEATHER: Partly cloudy, 89°F,
Pre-construction	Light breeze

LOCATION: Long Term #2	
Receptor	LT 2
START TIME	11:42
STOP TIME	11:52
LAeq	50.8
Lpeak	—
Lmax	—
RUN TIME	10:37

Site Sketch:

See previous Sketch. LT2

NOISE METER:	CALIBRATOR
MAKE: B&K	MAKE: B&K
MODEL: 2260	MODEL: 4231
SER. NUMBER: 2391318	SER. NUMBER: 2394049
FACTORY CALIBRATION DATE: 2/22/13	FACTORY CALIBRATION DATE: 2/22/13
FIELD CALIBRATION DATE: 6/29/13	94 dB

Notes:
Factory noise audible in distance
Distant highway

File: 27
Pic: ✓

rev. 6/13

NOISE STUDY FIELD SHEET

Site Location:	Perennial Wind Chaser	*NOISE SPECIALIST:* TS/MF
Purpose:	Background Survey	*DATE:* 6/29/13
Conditions:	Field + adjacent gravel road	*WEATHER:* Overcast, 86°F, light
	Pre-construction	breeze

LOCATION: Long Term #3	
Receptor	LT3
START TIME	12:10
STOP TIME	12:21
LAeq	45.7
Lpeak	
Lmax	
RUN TIME	10:58

Site Sketch:

See previous LT3 sketch

NOISE METER:	CALIBRATOR
MAKE: B&K	*MAKE: B&K*
MODEL: 2260	*MODEL: 4231*
SER. NUMBER: 2391318	*SER. NUMBER: 2394049*
FACTORY CALIBRATION DATE: 2/22/13	*FACTORY CALIBRATION DATE: 2/22/13*
FIELD CALIBRATION DATE:	

Notes:
wind in Trees
Factory noise audible in distance
Birds chirping

File: 28
Pic: ✓

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC and APLAC signatory)

NVLAP®

NVLAP Lab Code: 200625-0

Calibration Certificate No.28374

Instrument:	**Sound Level Meter**	*Date Calibrated:* **3/18/2013**	*Cal Due:* **3/18/2014**	
Model:	**NL31**	*Status:*	**Received**	**Sent**
Manufacturer:	**Rion**	*In tolerance:*	X	X
Serial number:	**00303797**	*Out of tolerance:*		
Tested with:	**Microphone UC53A s/n 316428**	*See comments:*		
	Preamplifier NH21 s/n 32315	*Contains non-accredited tests:* __Yes X No		
Type (class):	**1**	*Calibration service:* __ Basic X Standard		
Customer:	**Scantek, Inc.**	*Address:* **6430 Dobbin Road, Suite C,**		
Tel/Fax:	**410-290-7726 / 410-290-9167**	**Columbia, MD 21045**		

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/22/2012
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31052	Sep 14, 2012	Scantek, Inc./ NVLAP	Sep 14, 2013
DS-360-SRS	Function Generator	33584	Sep 9, 2011	ACR Env./ A2LA	Sep 9, 2013
34401A-Agilent Technologies	Digital Voltmeter	US36120731	Sep 12, 2012	ACR Env. / A2LA	Sep 12, 2013
HM30-Thommen	Meteo Station	1040170/39633	Dec 6, 2012	ACR Env./ A2LA	Dec 6, 2013
PC Program 1019 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Dec 14, 2012	Scantek, Inc./ NVLAP	Dec 14, 2013

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
23.8 °C	100.240 kPa	35.5 %RH

Calibrated by:	Preston Mackin	**Authorized signatory:**	Mariana Buzduga
Signature	Preston Mackin	Signature	[signature]
Date	3/18/2013	Date	3/19/2013

Document stored Z:\Calibration Lab\SLM 2013\RIONL31_00303797_M1.doc

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC and APLAC signatory)

NVLAP®
NVLAP Lab Code: 200625-0

Calibration Certificate No.28372

Instrument:	**Sound Level Meter**	*Date Calibrated:* **3/18/2013**	*Cal Due:* **3/18/2014**	
Model:	**NL31**	*Status:*	**Received**	**Sent**
Manufacturer:	**Rion**	*In tolerance:*	**X**	**X**
Serial number:	**00541620**	*Out of tolerance:*		
Tested with:	**Microphone UC53A s/n 310197**	*See comments:*		
	Preamplifier NH21 s/n 19449	*Contains non-accredited tests:* __**Yes** _X_ **No**		
Type (class):	**1**	*Calibration service:* __ **Basic** _X_ **Standard**		
Customer:	**Scantek, Inc.**	*Address:* **6430 Dobbin Road, Suite C,**		
Tel/Fax:	**410-290-7726 / 410-290-9167**	**Columbia, MD 21045**		

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/22/2012
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31052	Sep 14, 2012	Scantek, Inc./ NVLAP	Sep 14, 2013
DS-360-SRS	Function Generator	33584	Sep 9, 2011	ACR Env./ A2LA	Sep 9, 2013
34401A-Agilent Technologies	Digital Voltmeter	US36120731	Sep 12, 2012	ACR Env. / A2LA	Sep 12, 2013
HM30-Thommen	Meteo Station	1040170/39633	Dec 6, 2012	ACR Env./ A2LA	Dec 6, 2013
PC Program 1019 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Dec 14, 2012	Scantek, Inc./ NVLAP	Dec 14, 2013

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
23.0 °C	100.270 kPa	42.7 %RH

Calibrated by:	Preston Mackin	**Authorized signatory:**	Mariana Buzduga
Signature	Preston Mackin	Signature	[signature]
Date	3/18/2013	Date	3/19/2013

Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC and APLAC signatory)

NVLAP Lab Code: 200625-0

Calibration Certificate No.28376

Instrument:	**Sound Level Meter**	*Date Calibrated:* **3/18/2013**	*Cal Due:* **3/18/2014**	
Model:	**NL31**	*Status:*	**Received**	**Sent**
Manufacturer:	**Rion**	*In tolerance:*	**X**	**X**
Serial number:	**00593644**	*Out of tolerance:*		
Tested with:	**Microphone UC53A s/n 316172**	*See comments:*		
	Preamplifier NH21 s/n 30406	*Contains non-accredited tests:* __Yes **X** No		
Type (class):	**1**	*Calibration service:* __ Basic **X** Standard		
Customer:	**Scantek, Inc.**	*Address:* **6430 Dobbin Road, Suite C,**		
Tel/Fax:	**410-290-7726 / 410-290-9167**	**Columbia, MD 21045**		

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/22/2012
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31052	Sep 14, 2012	Scantek, Inc./ NVLAP	Sep 14, 2013
DS-360-SRS	Function Generator	33584	Sep 9, 2011	ACR Env./ A2LA	Sep 9, 2013
34401A-Agilent Technologies	Digital Voltmeter	US36120731	Sep 12, 2012	ACR Env. / A2LA	Sep 12, 2013
HM30-Thommen	Meteo Station	1040170/39633	Dec 6, 2012	ACR Env./ A2LA	Dec 6, 2013
PC Program 1019 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Dec 14, 2012	Scantek, Inc./ NVLAP	Dec 14, 2013

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
22.4 °C	99.430 kPa	44.2 %RH

Calibrated by:	Preston Mackin	**Authorized signatory:**	Mariana Buzduga
Signature	Preston Mackin	Signature	[illegible]
Date	3/19/2013	Date	3/19/2013

APPENDIX X-3

Noise Sensitive Property within 1 Mile of Energy Facility Boundary

Tax Lot Identification	Owner	Mailing Address	City	State	Zip	Miles from Station
4N2819A000800	LAPLANT BRIAN	540 DIANE CT	HERMISTON	OR	97838-9618	0.9591
4N2819A000700	HOYOS-ABUNDIS BENJAMIN & DELAPAZ CELIA	78486 S AGNEW RD	HERMISTON	OR	97838	0.9341
4N2819A000600	FLORES, PEDRO & RAFAELA	PO BOX 923	UMATILLA	OR	97882	0.9219
4N2819A000400	BLAKE, JASON H & JODI A	78586 WESTLAND RD	HERMISTON	OR	97838	0.9129
4N2819A000601	RIMBEY, ADRION T	78470 AGNEW RD	HERMISTON	OR	97838	0.9095
4N2819D000700	HUMBERT NED E	78462 AGNEW RD	HERMISTON	OR	97838	0.8853
4N2820C000400	TUCKER WINFORD & JANICE	78433 AGNEW RD	HERMISTON	OR	97838	0.8736
4N2819D000600	SWEEK CURTIS & KATHLEEN	78444 AGNEW RD	HERMISTON	OR	97838	0.8616
4N2820C000900	NEWMAN JEFF & KATHY	29411 FEEDVILLE RD	HERMISTON	OR	97838	0.8589
4N2819D000400	SEARLE EDDIE S & PATIENCE S	78408 S AGNEW RD	HERMISTON	OR	97838	0.8157
4N2819D000300	LEAL ROSENDO & ADOLFO	PO BOX 1334	HERMISTON	OR	97838	0.7936
4N2819D000200	MARLOW JOHN V & KRYSTA J	78390 AGNEW RD	HERMISTON	OR	97838	0.7721
4N27360000800	INGRAM, DENNIS R	1216 E MAIN ST	MEDFORD	OR	97504	0.7111
4N2820C000500	FREDERIKS WALTER J	PO BOX 1120	HERMISTON	OR	97838	0.6964
4N2819D000900	ANTEAU JASON C & ANGELA D	PO BOX 982	HERMISTON	OR	97838	0.6732
4N28300002000	LIBERATED L & E LLC	80261 S EDWARDS RD	HERMISTON	OR	97838-6564	0.6310
4N2820C000600	STRAWICK PETER M & DEANNA R	29345 FEEDVILLE RD	HERMISTON	OR	97838-8465	0.6285
4N28C00002703	LOWRANCE WILLIAM D & LORETTA K	29278 BLOOM RD	HERMISTON	OR	97838	0.6214
4N28C00002704	MIDDLETON ROBERT L & CAROL R	29270 BLOOM RD	HERMISTON	OR	97838	0.5866
4N28C00002700	SMITH DEAN & CONNIE	29224 BLOOM RD	HERMISTON	OR	97838	0.5237
4N28C00002904	TERRA POMA LAND LLC	PO BOX 867	HERMISTON	OR	97838	0.4900
4N28300001900	BUCKALLEW CREGG A & M MARY	77867 COTTONWOOD BEND RD	HERMISTON	OR	97838	0.4678
4N28C00002701	O'BANNON JAMES R & CINDY L	78401 COTTONWOOD BEND RD	HERMISTON	OR	97838	0.4264
4N28300001600	STRAND MARY E & PAUL J	77941 COTTONWOOD BEND RD	HERMISTON	OR	97838	0.4240

Notes: The parcels with noise sensitive receptors (including residences) that are listed in this table were identified by analysing current aerial imagery (Esri 2013).

EXHIBIT Y

CARBON DIOXIDE EMISSIONS

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

TABLE OF CONTENTS

TABLES

APPENDICES

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 0.675 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 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 is eventually 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 the 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. Documentation of emission rate calculations is provided in Appendix Y-2.

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 0.380 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 Station, 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 4,400 hours per year were estimated to be approximately 57,834 million pounds of CO_2, as shown in Table Y-2

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 4,400 hours per year are estimated to be approximately 10.416 million tons of CO_2, as shown in Table Y-2. The excess CO_2 emission rate is estimated to be 0.38 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 2 S 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.*

[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.

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 4,400 hours per year. The expected total annual fuel input is 16.5 x 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 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 Station. As shown in Table Y-2, the estimated load net power output is 415 MW, with a capacity of approximately 50 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 CO_2 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)	0.675

Table Y-2 Carbon Dioxide Emission Factor Calculations

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	4,400

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	4,400
Percent Time on Non-Base Load	50.2%
Net Annual Generation (million kWh/yr)	1,827
Deemed Life of Plant (years) by Statute or Rule	30
Total Gross Plant Output (million kWh for 30 years)	56,223
Total Net Plant Output (million kWh for 30 years)	54,821
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 for 30 years)	57,834

E. Total Operations

Combined Net Output (million kWh for 30 years)	54,821
Combined CO_2 Emissions (million lbs for 30 years)	57,834
Net CO_2 Emissions Rate (lbs CO_2/kWh)	1.055
CO_2 Standard (lbs CO_2/kWh)	0.675
Excess CO_2 Emissions Rate (lbs CO_2/kWh)	0.380
Excess Tons CO_2 (million tons over 30 years)	10.416

F. Monetary Path

Offset Fund Rate ($/ton CO_2)	$1.27
Offset Funds Required ($ million)	$13.23
Contracting and Selection Funds ($ million)	$0.60
Monetary Path Requirement ($ million)	$13.83

Table Y-2 Carbon Dioxide Emission Factor Calculations

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 0.675 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 0.389 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 4,400 hours per year, were estimated to be approximately 57,834 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 and Rate

The total excess CO_2 emissions for 30 years, at average site conditions, and 4,400 hours per year are estimated to be approximately 10.57 million tons of CO_2, as shown in Table 2. The excess CO_2 emission rate is estimated to be 0.389 lbs CO_2/kWh, also shown in Table 2.

8 SITE CONDITIONS

The annual average site conditions were calculated based on the Hermiston 2 S 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.

9 FUEL INPUT

Perennial proposes to use only natural gas as fuel for the Station. It is expected that the Station will operate 4,400 hours per year. The expected total annual fuel input would be 16.5 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 50 percent and an estimated gross heat rate of 8,781 Btu/kWh, HHV.

10 NON GENERATING FACILITY EFFICIENCY AND CAPACITY

The Station will be an electrical generating facility.

11 COGENERATION TO LOWER CARBON DIOXIDE EMISSIONS

[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.

The Project will 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)	0.675

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	4,400

C. Parameters for Power Augmentations

	Net Power Output (kW)	NA
	New and Clean Heat Rate (Btu/kWh) HHV	
	Annual Hours of Operation	

D. Calculations

	Net Power Output (kW)	411,882
	Annual Hours of Operation	4,400
	Percent Time on Non-Base Load	50.2%
	Net Annual Generation (million kWh/year)	1812.3
	Deemed Life of Plant (years) by Statute or Rule	30
	Total Gross Plant Output (million kWh for 30 years)	56,223
	Total Net Plant Output (million kWh for 30 years)	54,368
	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 for 30 years)	57,834

E. Total Operations

	Combined Net Output (million kWh for 30 years)	54,368
	Combined CO_2 Emissions (million lbs for 30 years.)	57,834
	Net CO_2 Emissions Rate (lbs CO_2/kWh)	1.064
	CO_2 Standard (lbs CO_2/kWh)	0.675
	Excess CO_2 Emissions Rate (lbs CO_2/kWh)	0.389
	Excess Tons CO_2 (million tons over 30 years)	10.57

F. Monetary Path

Offset Fund Rate ($/ton CO_2)	$1.27
Offset Funds Required ($ million)	$13.42
Contracting and Selection Funds ($ million)	$0.60
Monetary Path Requirement ($ million)	$14.02

Key:

Btu British thermal units
CO_2 carbon dioxide
HHV higher heating value
kW kilowatt
kWh kilowatt hour
lbs pounds

APPENDIX Y-2

Emission Rate Documentation

Appendix Y-2 Emission Rate Documentation

Estimated Average Engine Performance NOT FOR GUARANTEE, REFER TO PROJECT F&ID FOR DESIGN
Predicted Intercooler Performance not to be utilized for Balance of Plant design. Please contact GE.

Provided by GE Power & Water

Performance By:	**Vu, Christopher**		
Project Info:	**Wind Chaser**		
Engine:	**LMS100 PA**		
Deck Info:	**G0179E - 8k1.scp**		
Generator:	**BDAX 82-445ER 60Hz, 13.8kV, 0.85PF (35404)**	Date:	**04/04/2013**
Fuel:	**Site Gas Fuel#900-3694, 20828 Btu/lb,LHV**	Time:	**8:57:07 AM**
		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**
Fuel Flow	
MMBtu/hr, LHV	843.2
lb/hr	40484
Intercooler	**Wet Cooling**
Humidification	OFF
IC Heat Extraction, btu/s	29698
KOD Water Extraction, lb/s	0.0
Control Parameters	
HP Speed, RPM	9152
LP Speed, RPM	5361
PT Speed, RPM	3600
PS3 - CDP, psia	596.1
T23 - Intcrl Inlet Temp, °F	346.0
P23 - Intcrl Inlet Pressure, psia	57.9
W23 - Intcrl Inlet Flow, lb/s	478.1
P3, psia	616.78
T3CRF - CDT, °F	690.98
T48IN, °R	2037
T48IN, °F	1577
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 (NOT FOR USE IN ENVIRONMENTAL PERMITS)	
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 (NOT FOR USE IN ENVIRONMENTAL PERMITS)	
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 (NOT FOR USE IN ENVIRONMENTAL PERMITS)	
AR	0.8695

Estimated Average Engine Performance NOT FOR GUARANTEE, REFER TO PROJECT F&ID FOR DESIGN
Predicted Intercooler Performance not to be utilized for Balance of Plant design. Please contact GE.

Provided by GE Power & Water

Performance By:	**Vu, Christopher**		
Project Info:	**Wind Chaser**		
Engine:	**LMS100 PA**		
Deck Info:	**G0179E - 8k1.scp**		
Generator:	**BDAX 82-445ER 60Hz, 13.8kV, 0.85PF (35404)**	Date:	**04/04/2013**
Fuel:	**Site Gas Fuel#900-3694, 20828 Btu/lb,LHV**	Time:	**8:57:07 AM**
		Version:	**3.9.6b**

Case #	**106**
N2	72.7265
O2	11.7717
CO2	3.9441
H20	10.6837
SO2	0.0000
CO	0.0013
HC	0.0003
NOX	0.0029
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

Calculated by Burns & McDonnell

	Without ZLD	**With ZLD**
GE Exhaust Parameters (lbs/hr) (see above)	1,776,351	1,776,351
GE Exhaust CO2 Wght % (Wet) (see above)	6.1662	6.1662
CO2 (lbs/hr)-(lbs/hr exh*exhCO2weight%wet)	109,533	109,533
Annual Operation Hours	4,400	4,400
GE Gross Generation (kW)(see above times 4)	425,932	425,932
Aux Load (kW)	10,620	14,050
Net Power Output (MW)	415.31	411.88
lb per 30 year CO2	57,833,611,631.14	57,833,611,631.14
Net annual generation (kWh)	1,827,372,800	1,812,280,800
Net 30-yr generation (kWh)	54,821,184,000	54,368,424,000
Net CO2 Emission Rate (lb/kWh)	1.055	1.064

EXHIBIT Z

COOLING TOWER IMPACTS
OAR 345-021-0010(1)(z)

TABLE OF CONTENTS

TABLES

FIGURES

Z.1 INTRODUCTION

OAR 345-021-0010(1)(z) *The application for site certificate for the proposed project must contain information about the cooling tower plume, if the proposed facility has an evaporative cooling tower.*

Response: This exhibit provides information regarding impacts of the cooling tower plume that will result from operation of the Perennial Wind Chaser Station (Station) proposed for construction by Perennial-WindChaser LLC (Perennial). The Station is a natural gas–fired power plant that will include up to four General Electric LMS100 (or equivalent) turbines in open cycle, expected to produce up to approximately 415 megawatts (MW) of electric power. The Station will have no fuel oil backup. Each natural gas turbine will incorporate an intercooler between the compressor stages, together with higher combustor firing temperatures, which will result in turbine generator efficiency approximately 10 percent more efficient than similar simple cycle combustion turbines. This means that the turbines can produce approximately 10 percent more electricity on the same amount of fuel. This intercooling technology requires an external heat exchanger, which is provided for through the use of a cooling tower. Each turbine block will be connected to a single common cooling tower comprised of four individual cells. The cooling tower dimension is approximately 81 feet in length, 37 feet wide, and 40 feet in height. It is for this cooling tower that the visual plume analyses were prepared for this exhibit.

The Station will be located in the northwest quarter of Section 30, Township 4 North, Range 28 East in Umatilla County, Oregon (see Exhibit C – Location for location maps). The Perennial Wind Chaser Station project site (Site) is located approximately 3 miles southwest of Hermiston, Oregon, in Umatilla County. The Universal Transverse Mercator (UTM) Zone 11 coordinates of the Site are 315,977 meters easting, 5,074,829 meters northing. The Station will be accessed via Westland Road, which provides access to Interstate Highways 82 (I-82) and 84 (I-84). Figure Z-1 presents the location of the Perennial Wind Chaser Station project (Project).

In addition to the visual impacts associated with the Station's cooling tower plume, this study assessed the plume's potential impacts on local roadway operations as well. Because of public concerns that the visual cooling tower plume may impact the operations of the Hermiston Airport, which is located approximately 5.3 miles (8.5 kilometers) to the east northeast of the Station site, a qualitative assessment of combined visual plumes involving the Station and the Hermiston Generating Plant (HGP) was performed to assess these impacts. The concern is that a visual plume could impact a pilot's visual reference on approach or takeoff. The Hermiston Airport Authority staff and Oregon Department of Aviation were consulted prior to the study. These agencies were also sent a draft of this exhibit for their comments and review. No permit from the Federal Aviation Administration is expected to be needed for the cooling tower.

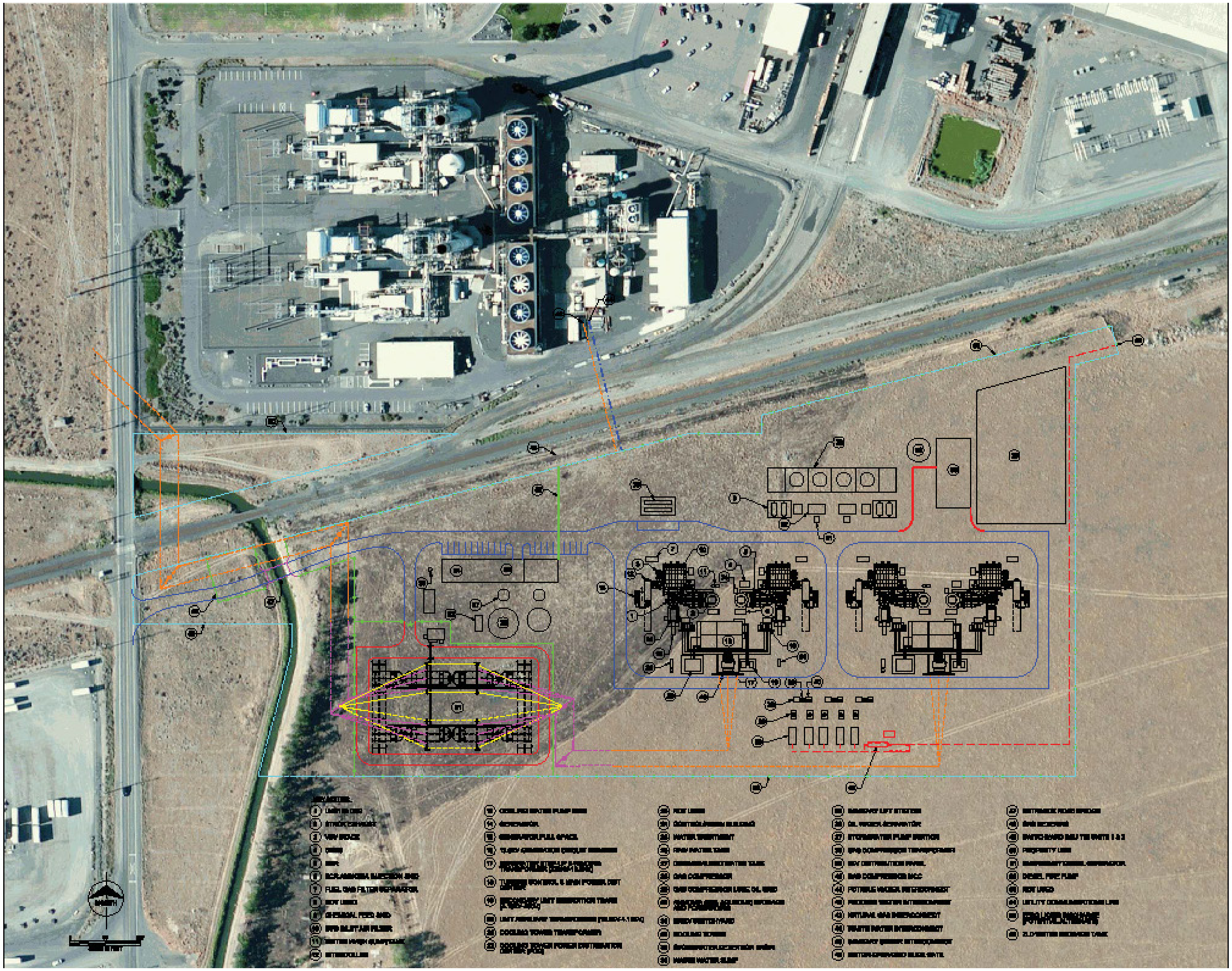

Figure Z-1 Project Location

Based on a computer modeling analysis performed for the Station's cooling tower using preliminary engineering data and five years of representative meteorological data, no potential significant adverse impacts warranting mitigation from the cooling tower operation are expected.

Z.2 SIZE AND FREQUENCY OF OCCURRENCE OF VISIBLE PLUME

OAR 345-021-0010(1)(z)(A) *Exhibit Z shall include the predicted size and frequency of occurrence of a visible plume and an assessment of its visual impact.*

Response: The Station will utilize a mechanical-draft "wet" cooling tower. The Station's preliminary design includes four blocks of power, each with its own cell, which will be arranged in a single cooling tower. Final selection of the combustion turbine will determine the actual cooling tower arrangement. Mechanical-draft cooling towers use fans to force air into the cooling tower and through a fine spray of heated water, where evaporation cools the water stream and transfers heat to the air. The warm, moist air exhausts vertically, dispelling excess heat. When this warm, moist exhaust air comes into contact with the cooler ambient atmosphere, the water vapor condenses into fine water drops, creating a visible "steam" plume. As the plume mixes with more ambient air, the drops eventually re-evaporate and the plume dissipates. The length of the visible plume depends on the ambient air mixing rate and the amount of water vapor already in the ambient air (i.e., relative humidity). During periods of low temperature and high humidity, vapor plumes from the cooling towers and exhaust stacks may be visible. These plumes are most likely to be visible during the winter months. In general, plumes tend to be persistent if the air is calm (low mixing) and the relative humidity high. Vapor plumes may also be visible during nighttime hours when an energy facility is illuminated. Fogging is assumed to occur when the visible plume reaches the ground, and ice formation occurs when the visible plume reaches the ground under freezing conditions.

For this analysis, 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) and in Section Z.6 of this document. This model was created by Argonne National Laboratories in the mid-1980s to better evaluate impacts associated with water vapor plumes emitted from cooling towers. The model can assess:

- Plume visibility,
- Deposition of cooling tower drift,
- Ground-level fogging and icing, and
- Shadowing by the plume and reduction of solar energy.

SACTI contains algorithms for both natural and mechanical draft cooling towers arranged singly or in clusters. Plume merging and associated enhanced plume rise are treated by the routines contained in the model. While the SACTI model does not have any official regulatory endorsement (no visual plume model does), this model has been widely applied for a large number of projects that required cooling tower impact assessments, including the recent PGE-Carty combined cycle power project, where SACTI was also used to assess plume visual impacts.

The SACTI model uses hourly meteorological data and mixing height data to establish environmental conditions. For this assessment, five years of the most current representative hourly surface data (1995–1999) were obtained from a monitoring station located at the Umatilla Army Depot, approximately 2.8 miles (4.5 kilometers) northwest of the Site. This is the same data set used in the Prevention of Significant Deterioration (PSD) permit application for the project. The mixing height data were obtained from Spokane, Washington, for the same time period as the surface data. The SACTI model was run using these meteorological data to calculate the potential annual plume drift patterns around the Station and the potential incidence of fogging and ice formation. Figure Z-2 present the wind rose used for these analyses.

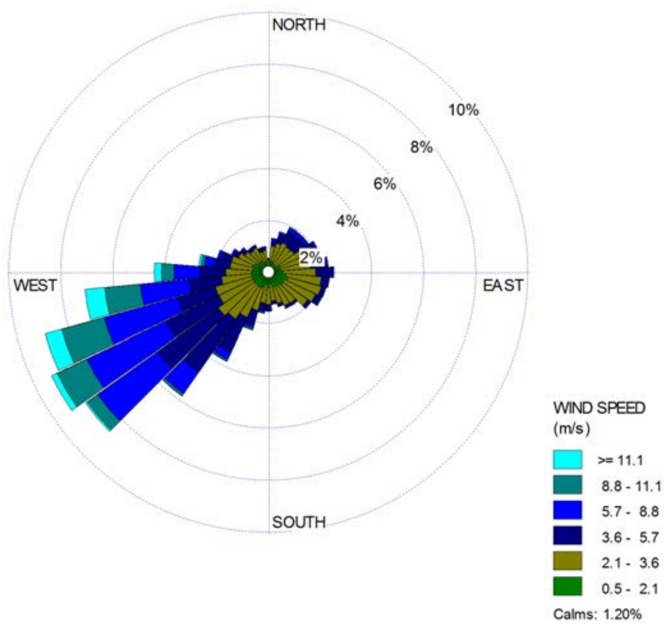

Figure Z-2 Wind Rose at the Station from 1995 to 1999 (wind blowing from)

The characteristics of the cooling tower expected to be used for the Project are listed in Table Z-1. These input parameters were obtained from the Project's engineering consultant and are based on preliminary design data for the Station.

Table Z-1 Cooling Tower Input Parameters

Parameter	Value
Type	linear mechanical draft 1 tower, 4 cells
Heat Dissipation Rate (MW)	Annual 161
Circulation Rate (gpm)	Annual 28,000
Total Tower Air Flow (kg/s)	Annual 1996 (dry)
Max Drift Rate (%)	0.0005
TDS Concentration (mg/L)	1,000
Orientation	Based on GA
Height (m)	Based on GA
Equivalent Total Cell Diameter (m)	Calculated
Exit Velocity and Temperature	variable, calculated by the model assuming saturation conditions

Key:

GA General Arrangement
gpm gallons per minute
kg/s kilograms per second
m meter
mg/L milligrams per liter
MW megawatts
TDS total dissolved solids

Z.2.1 Model Conservatism and Accuracy

SACTI was applied to simulate plumes from the Station’s cooling tower using the five-year meteorological data set and tower design characteristics described previously. Default options were assumed for the input variables controlling the model’s operation. The data set was input into SACTI to produce a five-year average frequency distribution for condensed plume length, condensed plume height, plume shadowing, and ground level fogging. Although the model provides information on plume shadowing and drift deposition, this analysis and the discussion that follows focus on visible plume dimensions and ground-based fogging.

The SACTI model provides a conservative (over-predictive) analysis of cooling tower operations and their behavior under ambient meteorological conditions. The parameters used to define cooling tower operations are based on design operating scenarios and, therefore, represent worst case conditions. Under normal circumstances, equipment such as cooling towers are operated at some fraction of its design rating, so emissions from the towers would most often be lower than the model predicts.

Conditions favoring a long, condensed plume occur more frequently in the fall and winter seasons, as atmospheric conditions such as air temperature and relative humidity are more favorable for plume formation during these periods. Additionally, plumes tend to form more frequently during nighttime hours and adverse weather conditions such as storms or periods of high relative humidity.

Z.2.2 Plume Length

Table Z-2 shows the frequency of time (in percent) that the model predicted that a visible plume from the Station's cooling tower will have a particular length, expressed in terms of downwind distance from the cooling tower location, for any wind direction. The modeling output demonstrates that, on an annual basis, the visual plume length will be less than 200 meters (656 feet) from the site and that the frequency of occurrence at 200 meters will be less than 50 percent. Table Z-2 shows seasonal and annual data, where the SACTI model predicts that a visible plume could extend up to 500 meters (1,540 feet) from the cooling tower 20 percent of the time on an annual basis. Figure Z-3 presents the overall length of the predicted plumes, along with their frequency of occurrence.

Table Z-2 Predicted Frequency of the Length of Visible Plume (in percent)

Distance (meters)	Seasons		
	Nov–April (Fall-Spring)	May–Oct (Summer-Fall)	Annual
25	95.8	96.9	96.4
50	93.1	64.9	79.4
100	90.3	48.8	69.3
150	82.9	31.6	56.9
200	72.3	19.1	45.3
250	61.7	13.2	37.2
300	52.1	9.3	30.4
350	46.7	7.4	26.8
400	42.3	6.0	23.9
450	38.4	4.9	21.4
500	35.6	4.5	19.8
600	33.1	3.9	18.3
700	29.2	3.4	16.1
800	23.8	2.8	13.2
900	21.1	2.5	11.7
1,000	20.2	2.4	11.1
2,000	19.1	2.4	11.1
3,000	15.9	1.9	8.8
4,000	13.4	1.8	7.5
5,000	10.7	1.6	6.1
6,000	9.2	1.5	5.3
7,000	7.7	1.4	4.5
8,000	6.5	1.2	3.8
10,000	6.5	1.2	3.8

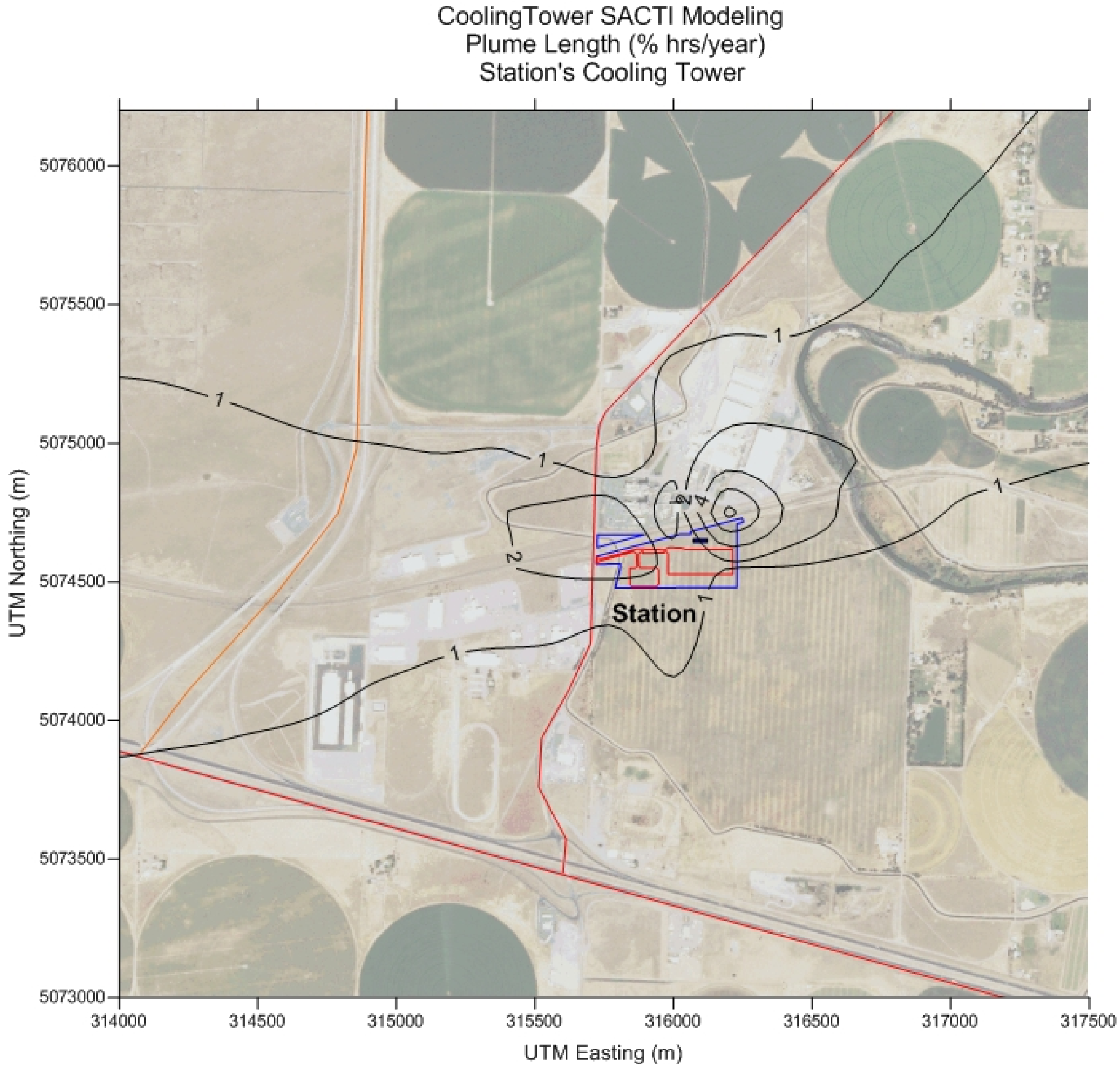

Figure Z-3 Station's Annual Plume Length

Z.2.3 Plume Heading

The data in Table Z-2 are directional, and on any given day, the plume could extend in one general direction to the length indicated. The plume is expected to align with the prevailing winds in the area. Therefore, Figure Z-2 shows the 1995–1999 wind rose for the Project impact area as described in Section Z.2.

Z.2.4 Visual Impact

The Station will be built in an area close to the intersection of I-82 and I-84. The landscape is relatively flat, which allows the existing power plant (HGP) to be seen from a distance, which is also expected for the Station.

The plume from the Station's cooling tower may be visible from existing public roads and I-82 I-84, from agricultural facilities, from private residences, and from the HGP. At night, the cooling tower plume may be visible at the Station because of onsite lighting and also depending on clarity and cloud cover. The period of maximum visual impact will be during clear, cold, and calm days. Based on meteorological records, cooler ambient temperatures that tend to promote formation of a visual plume occur typically during the period from November through March, but it should also be noted that calm wind conditions registered during that period are rare (1.55 percent). Cloud cover is often present in the winter months, which would tend to obscure the cooling tower plume and lessen its visual impact.

The relatively longer condensed plumes occur during conditions of high relative humidity when the ambient air is near saturation. The model does not account for low overcast conditions or fog that would tend to obscure the plume during such conditions. Note that 100% humidity cases have been removed from the analysis because the model cannot simulate that condition. In addition to high relative humidity, stable atmospheric stratification and cool temperatures also foster a long condensed plume as the air at colder temperatures may already be near saturation. These conditions may produce long visible plumes during the hours near sunrise and sunset, but generally occur during the night when the condensed plume would not be visible.

The plume generated by the cooling tower is not expected to generate significant visual impact due to ambient weather conditions and cloud cover because, as shown in Figure Z-3, the occurrence of long visible plumes is expected to be minimal.

Z.2.5 Project and Combined Source Impact Assessment of Operations at the Hermiston Airport

SACTI was used to assess the combined visual plume impacts of the Station and the HGP at the Hermiston Airport, which is located approximately 5.3 miles (8.5 kilometers) to the northeast of the Station. The HGP has one eight-cell cooling tower. SACTI was run twice: first, to assess the Project's impacts and second, to assess the combined visual plumes' impacts from the Station and the existing HGP.

Because SACTI cannot model more than one cooling tower at a time, for the combined plume assessment, both the existing eight-cell tower and the proposed four-cell tower were combined into one hypothetical cooling tower. Source characteristics such as air flow and heat dissipation rate were combined and modeled as one existing tower. The combined tower modeling parameters are summarized in Table Z-3. This was done to show impacts in a conservative and simple fashion. Table Z-4 lists the results from these analyses. These results show a slightly larger impact, with a 50 percent frequency of plume visibility at a distance of 250 meters (820 feet), and a prediction that a visible plume could extend up to 800 meters (2,325 feet) from the cells 20 percent of the time annually.

Table Z-3 Combined Tower-Specific Design (Modeling) Parameters

Input Parameter Name	Cooling Tower	Units/Description
Number of Tower Housings	1	-
Tower Height	12.12	Meters
Tower Housing Width	13	Meters
Cells per Tower Housing	1	-
Total Number of Cells	1	-
Single Cell Diameter	7.32	Meters
Tower Effective Diameter	31.99	Meters
Total Heat Dissipation	319	MW
Air Flow Rate	7,643	kg/s
Drift Rate Total	42.9	g/s

Key:
g/s grams per second
kg/s kilograms per second
MW megawatts

Table Z-4 Predicted Frequency of the Length of Visible Plume (in percent) at the Station and Hermiston Generating Plant Cooling Towers

Distance (meters)	Seasons		
	Nov–April	May–Oct	Annual
25	95.8	96.9	96.4
50	95.8	96.1	96.2
100	93.2	86.9	90.0
150	82.3	49.0	65.4
200	77.6	33.5	55.3
250	67.5	16.7	41.8
300	65.2	15.1	39.8
350	60.5	12.5	36.2
400	55.3	10.3	32.5
450	52.4	9.1	30.5
500	47.2	7.2	26.9
600	45.2	6.6	25.6
700	39.7	5.0	22.1
800	35.1	4.1	19.4
900	33.8	3.8	18.6
1,000	32.0	3.4	17.5
2,000	31.7	3.4	17.4
3,000	29.6	3.2	16.2
4,000	25.8	3.1	14.3
5,000	21.2	2.6	11.8
6,000	17.4	2.4	9.8
7,000	12.1	1.8	6.8
8,000	10.8	1.5	6.0
10,000	5.9	0.8	3.3

For the Project's cooling tower impact assessment, SACTI calculated insignificant impacts for plume visibility, fogging, and/or icing. SACTI also calculated no impacts from fogging or icing at distances near the vicinity of the airport. Figure Z-4 shows the percent of plume impacts (when occurring) to be less than one percent of the time at distances of approximately 3.8 miles (6 kilometers) from the project site or within 2.2 miles (3.5 kilometers) of the airport. The frequency rises to two percent of the time at a distance of about 5.0 miles (8 kilometers) from the airport. These conservative analyses include all hours, day and night, as well as hours when the visibility is negligible due to precipitation or reduced ceiling height.

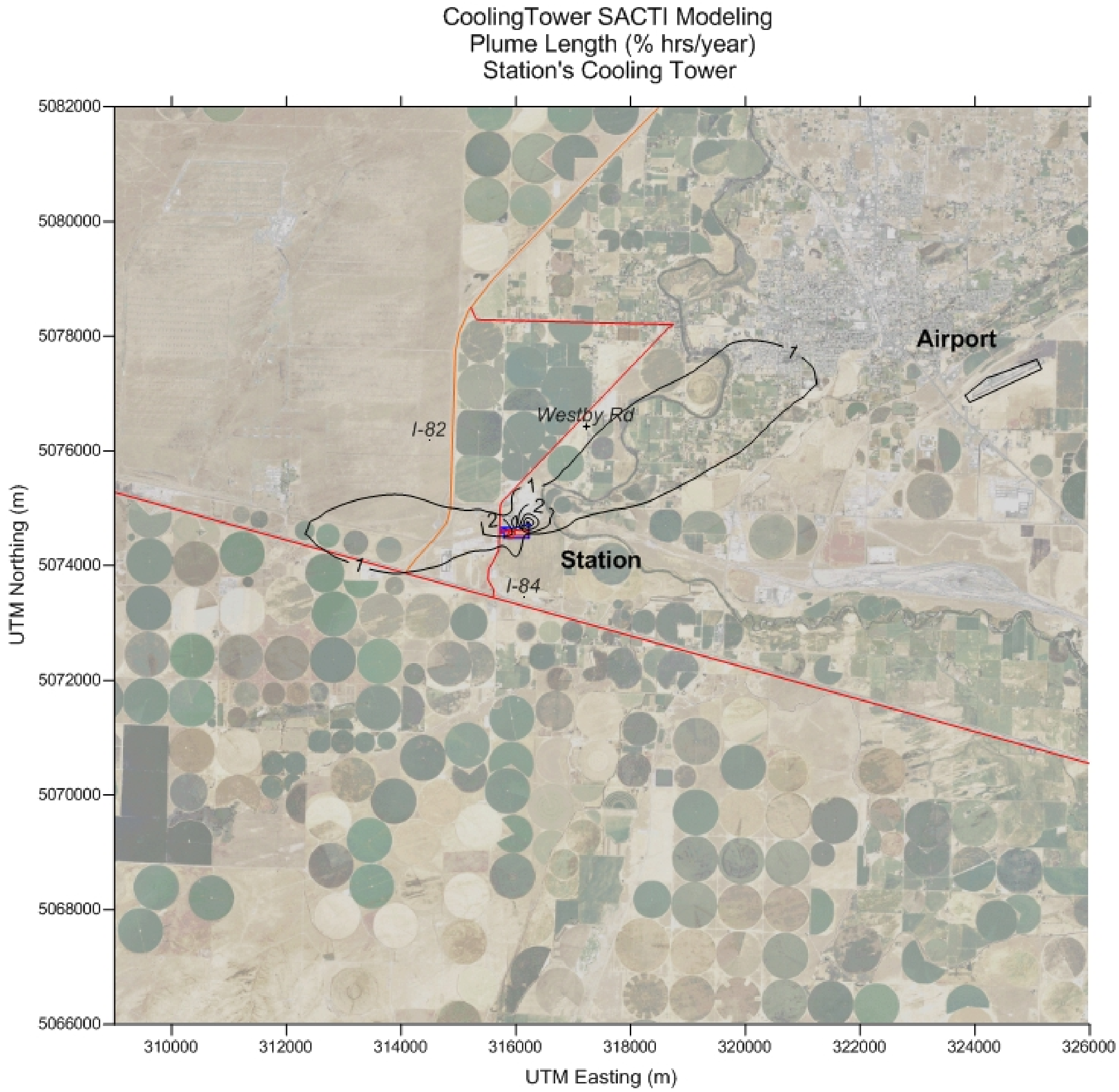

Figure Z-4 Station's Annual Plume Length Impact at Airport

For the combined Project plus existing cooling tower impact assessment, the results show a slightly increased chance for a visual plume formation at distances towards the Hermiston

Airport, as displayed in Figure Z-5. However, the frequency of plume impacts in the vicinity of the airport is still less than one percent of the total hours used in the modeling analysis.

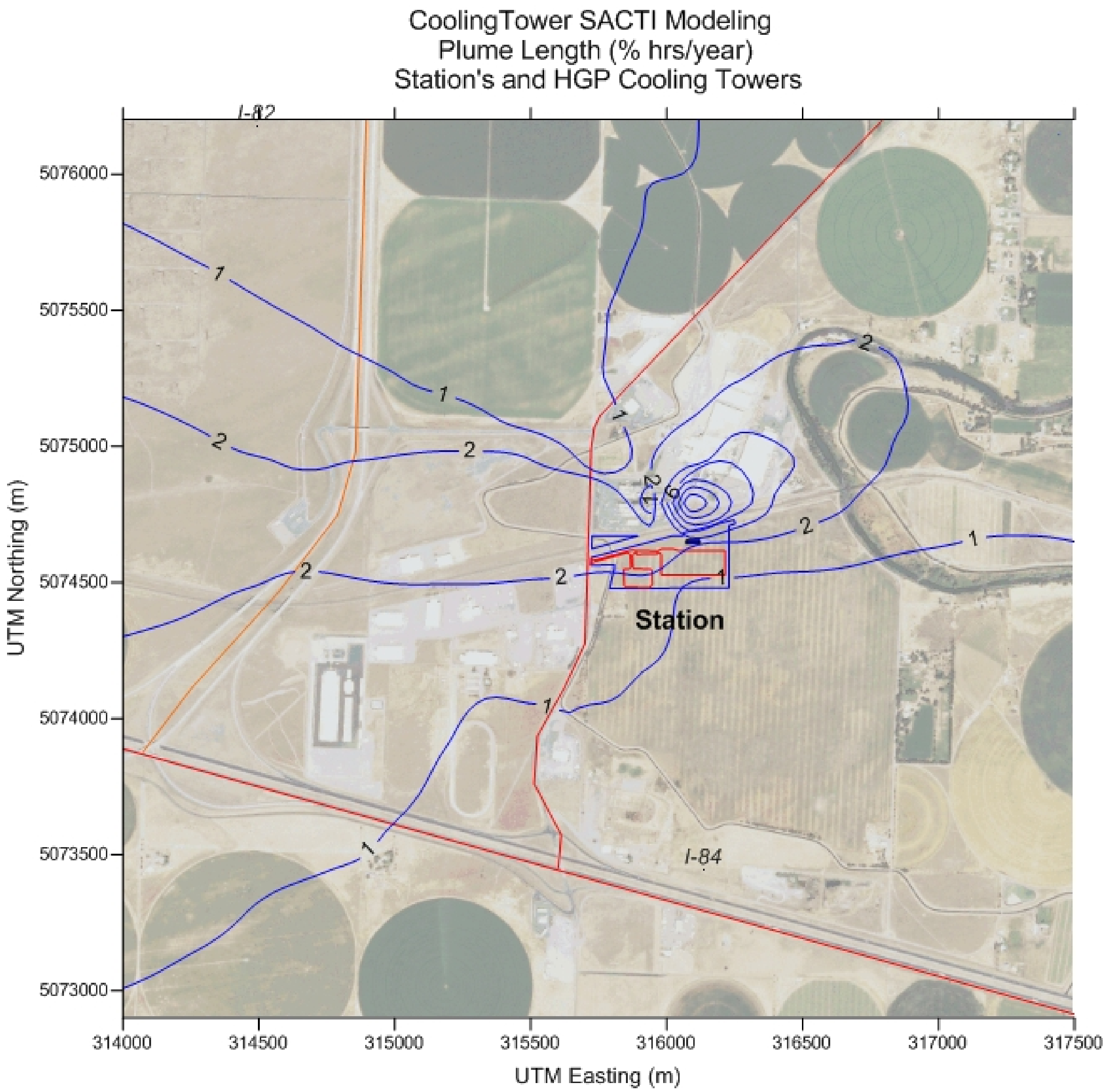

Figure Z-5 Station's and Hermiston Generating Plant's Plume Length Impact

Therefore, the plume generated by the cooling tower is not expected to generate significant visual impact in the general locale of the Hermiston airport.

Z.3 LOCATIONS AND FREQUENCY OF OCCURRENCE OF ICE FORMATION AND GROUND LEVEL FOGGING

OAR 345-021-0010(1)(z)(B) *Exhibit Z shall include 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.*

Response: The SACTI model was also used for predicting ice formation and ground fogging from the cooling tower. This model uses actual meteorological data (five years) to conservatively predict the occurrence of ice formation and other parameters. This prediction is based on the assumption that when a visible plume from a cooling tower extends to the ground surface under freezing conditions, a potential traffic hazard may be created on nearby roadways. SACTI calculates fogging and ice formation by the number of hours during which the visible plume reaches the ground.

Z.3.1 Ground Level Fogging

Table Z-5 displays the total number of hours that fogging was calculated to occur over the length of the five-year meteorological record for the Project. The frequency and magnitude of the fogging impacts are a conservative representation of conditions that would be expected during the operation of the Station. The frequency of the direction in which fogging is likely to occur appears to be aligned with the local prevailing winds as presented in the wind rose (Figure Z-2). Accordingly, SACTI's output for ground fogging is shown in Figure Z-6, which reflects the influence of the prevailing winds at the Site to the northeasterly direction. Potential fogging impacts will be constrained to 25 hours a year at location immediately adjacent (within 150 meters (492 feet)) to the Station, and about 5 hours a year at distances up to 800 meters (2,625 feet) from the cooling tower.

Table Z-5 Projected Average Annual Hours of Fogging Formation

Distance (meters)	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	Total
100	2.68	4.12	2.62	0.12	0	0	0	0.18	0.9	1	10.9	0.24	0	0	0.16	0.44	23.4
200	1.98	4.08	1.64	0	0	0	0	0	0.04	0.26	7.92	0	0	0	0.08	0.28	16.3
300	1.14	3.84	0.54	0	0	0	0	0	0	0.2	2.58	0	0	0	0	0.04	8.32
400	1	3.8	0.4	0	0	0	0	0	0	0.18	2.1	0	0	0	0	0	7.48
500	0.72	2.64	0.4	0	0	0	0	0	0	0.1	2.1	0	0	0	0	0	5.98
600	0.5	1.9	0.4	0	0	0	0	0	0	0.1	2.1	0	0	0	0	0	5
700	0.5	1.9	0.4	0	0	0	0	0	0	0.04	2.1	0	0	0	0	0	4.94
800	0.5	1.9	0.3	0	0	0	0	0	0	0	1.86	0	0	0	0	0	4.56
900	0.5	1.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.4
1000	0.4	1.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.7
1100	0.4	1.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.7
1200	0.2	0.64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.84
1300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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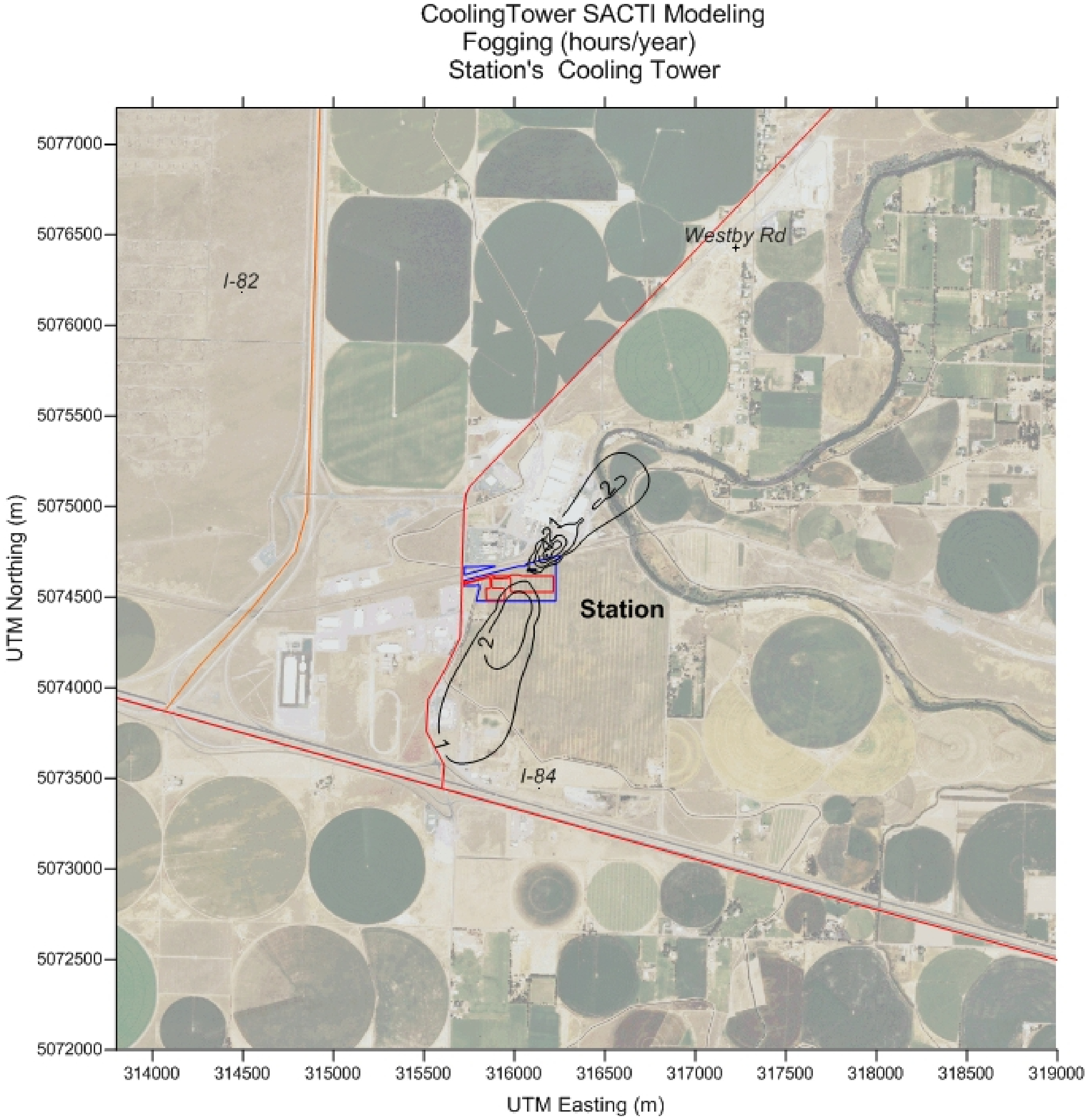

Figure Z-6 Station Plume Fogging

Z.3.2 Roadways

The area over land potentially affected by fogging will be limited to an area northeast and, to a lesser extent, to the southwest of the Station's cooling tower. Furthermore, the total predicted duration of fogging at 500 meters (1,640 feet) from the cooling tower is expected to be less than 6 hours per year. Westland Road is the nearest road in this area, located largely to the west at a distance of approximately 300 meters. I-82 and I-84 are located approximately 1,000 meters (3,281 feet) to the west and southwest. The traffic hazards due to fogging of roadways are expected to be minimal at any of these locations. Figure Z-6 shows the predicted impacts at these locations for the potential for fogging due to the Project. The percentage of time that the plume is predicted to extend over these roadways is also fairly limited. As shown in Figure Z-6, the potential for fog to impact any of the surrounding roadways is minimal.

Z.3.3 Ice Formation Impacts

Figure Z-7 and Table Z-6 display the total number of hours that ice formation could have occurred under meteorological and mixing conditions encountered in Umatilla County between 1995 and 1999. As with fogging, the magnitude of these data is assumed to be conservatively representative of conditions that could be expected in future years near the Station. The direction in which ice formation would likely occur is assumed to be aligned with the winds above 7.5 meters per second that are accompanied with temperatures below -5 degrees Celsius, to the southwest of the Station.

The horizontal and temporal extent of ice formation due to the Station's cooling tower plume will be quite limited, occurring only toward the south and southwest for 1 hour or less at 500 meters (1,640 feet). In addition, there are no public roads within the 500 meters (1,640 feet) and few service roads in the area. As Figure Z-6 indicates, the duration and extent of ice formation are very limited. The traffic hazard due to ice formation on roadways is expected to be negligible, and no potential significant adverse impacts are anticipated. The cumulative plume analyses show no appreciable increase to impacts from icing.

Table Z-6 Projected Average Annual Hours of Ice Formation for the Station

Distance (meters)	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	Total
100	0.7	1.2	0.5	0	0	0	0	0.18	0.78	0.5	1.92	0.02	0	0	0	0.08	5.9
200	0.4	1.24	0.2	0	0	0	0	0	0	0.06	1.1	0	0	0	0	0.04	3.04
300	0.2	1.2	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	1.5
400	0.2	1.2	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	1.5
500	0.12	0.74	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0.96
600	0.1	0.6	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0.8
700	0.1	0.6	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0.8
800	0.1	0.6	0	0	0	0	0	0	0	0	0.08	0	0	0	0	0	0.78
900	0.1	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7
1000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

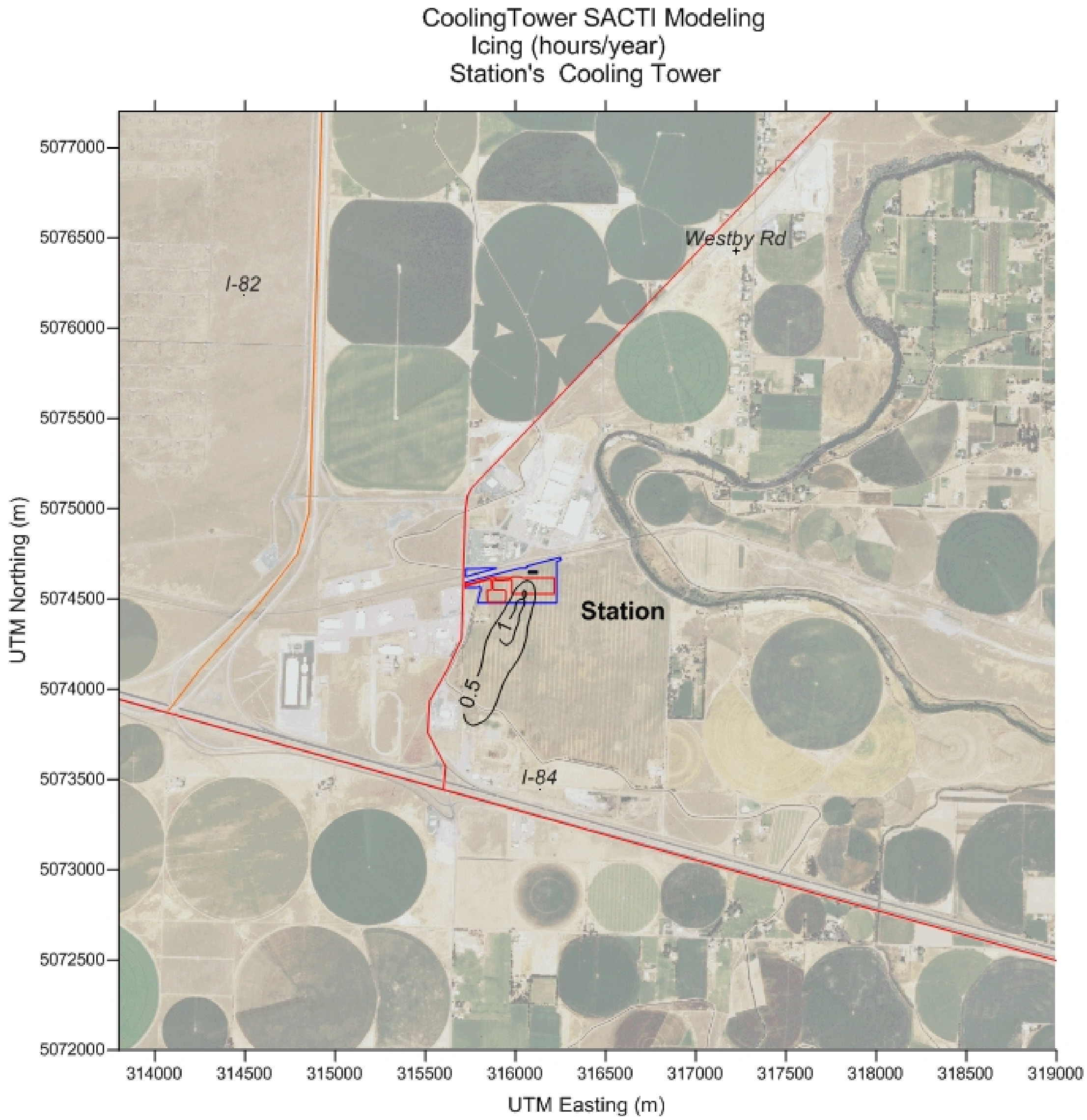

Figure Z-7 Ground Icing (Station)

Z.4 LOCATIONS AND RATES OF DEPOSITION OF SOLIDS RELEASED FROM THE COOLING TOWER

OAR-345-021-0010(1)(z)(C) *Exhibit Z shall include 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*

Response: This section addresses the significant potential adverse impacts to soils, vegetation, and other land uses that could result from the deposition of solids released from the cooling tower. Based on modeling with SACTI, the predicted deposition rates for salts (combination of sodium, potassium, and magnesium) were assessed. Based on the water analysis, the Station cooling tower is not expected to emit arsenic, cadmium, or other toxic heavy metals, and therefore these materials were not included in this impacts analysis.

The modeling results show that the greatest salt deposition rates occur within 200 meters (656 feet) of the cooling tower (Figure Z-8 and Table Z-7). From 200 to 600 meters (656 to 1,969 feet) from the source, deposition rates decrease rapidly, such that the deposition area depicted in the figure lies within the Site Boundary. Beyond this boundary, deposition rates will be less than 5 kilograms per square kilometer per month (kg/km^2-month). Westward from the Site, the closest irrigation circles are 700 meters (2,297 feet) away, where the predicted deposition rates were lower than 1 kg/km^2-month.

Table Z-7 Projected Average Salt Deposition Rate (kg/km^2-month)

Distance (meters)	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	Ave
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100	0.362	0.842	0.060	0.000	0.000	0.000	0.000	0.152	1.020	1.002	1.532	0.000	0.000	0.000	0.030	0.082	0.314
150	1.028	1.534	0.250	0.004	0.012	0.012	0.000	0.836	2.188	2.660	3.838	0.016	0.014	0.006	0.096	0.590	0.820
200	0.902	1.264	0.434	0.094	0.168	0.124	0.000	0.786	1.846	2.226	4.014	0.146	0.194	0.098	0.198	0.556	0.814
250	0.650	0.746	0.432	0.232	0.416	0.290	0.000	0.494	1.228	1.494	3.554	0.896	0.678	0.208	0.224	0.382	0.746
300	0.306	0.382	0.394	0.244	0.440	0.302	0.000	0.364	0.904	1.044	2.850	0.962	0.720	0.216	0.206	0.188	0.594
350	0.204	0.284	0.212	0.248	0.446	0.308	0.000	0.300	0.646	0.728	0.936	1.036	0.792	0.214	0.160	0.158	0.418
400	0.190	0.248	0.204	0.250	0.448	0.308	0.000	0.246	0.402	0.498	0.818	1.066	0.820	0.214	0.148	0.146	0.376
450	0.156	0.196	0.204	0.244	0.442	0.300	0.000	0.194	0.286	0.404	0.794	1.034	0.784	0.210	0.148	0.122	0.344
500	0.140	0.166	0.176	0.188	0.362	0.244	0.000	0.172	0.256	0.372	0.632	0.686	0.512	0.152	0.128	0.110	0.270
600	0.130	0.148	0.074	0.090	0.190	0.134	0.000	0.168	0.250	0.346	0.222	0.242	0.198	0.052	0.048	0.102	0.148
700	0.080	0.090	0.040	0.042	0.102	0.074	0.000	0.108	0.156	0.234	0.146	0.074	0.070	0.034	0.028	0.058	0.084
800	0.054	0.060	0.040	0.038	0.094	0.072	0.000	0.070	0.106	0.164	0.142	0.068	0.058	0.024	0.028	0.040	0.068
900	0.040	0.046	0.024	0.032	0.074	0.056	0.000	0.058	0.084	0.122	0.108	0.062	0.050	0.022	0.014	0.032	0.050
1000	0.032	0.040	0.020	0.012	0.026	0.016	0.000	0.050	0.072	0.102	0.094	0.040	0.020	0.006	0.010	0.026	0.034
2000	0.012	0.018	0.014	0.012	0.022	0.014	0.000	0.020	0.028	0.038	0.080	0.038	0.018	0.004	0.010	0.010	0.022
3000	0.002	0.004	0.010	0.010	0.020	0.012	0.000	0.004	0.006	0.008	0.044	0.032	0.018	0.004	0.006	0.002	0.012
4000	0.000	0.000	0.000	0.002	0.006	0.006	0.000	0.000	0.000	0.004	0.010	0.010	0.010	0.000	0.000	0.000	0.000
5000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.004	0.000	0.000	0.000	0.000
6000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000
7000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

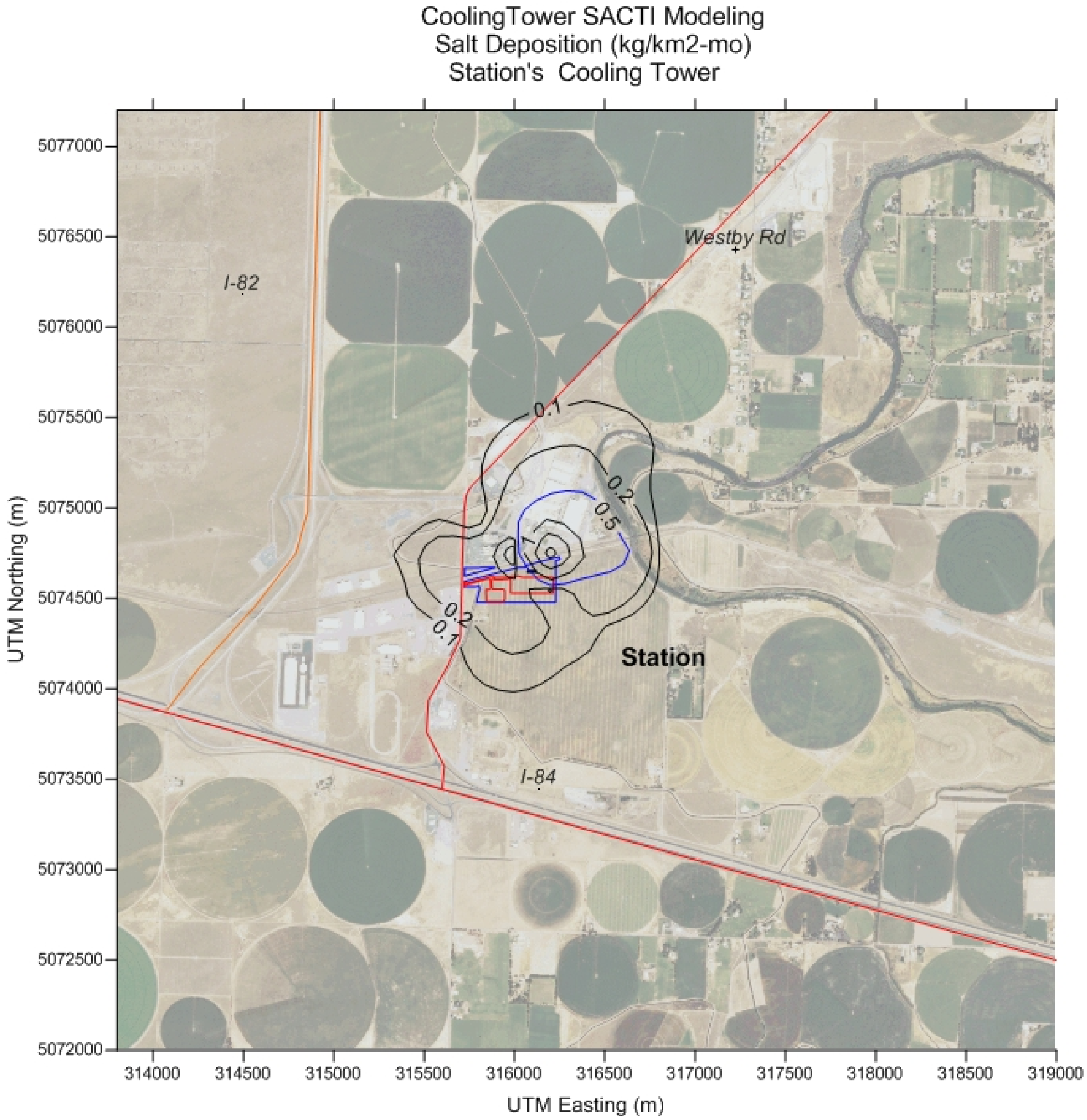

Figure Z-8 Salt Deposition (Station)

Z.4.1 Soils

The analysis area for soils is based on the extent of the modeled salt deposition of 0.1 kg/km^2-month, which was 357.55 acres total (see Figure Z-8). Within this area, three soil series were identified, which contained a total of four soil phases, and some open water. Soils type and water acreages included:

- Quincy fine sand, 0 to 5 percent slopes (24.11 acres);
- Quincy loamy fine sand, 5 to 25 percent slopes (15.45 acres);
- Quincy loamy fine sand, gravelly substratum, 0 to 5 percent slopes (295.95 acres);

- Xerofluvents, 0 to 3 percent slopes (14.31 acres); and
- Water (7.72 acres).

Soil classes were identified using the Natural Resources Conservation Service (NRCS) soil survey program. The NRCS soil survey describes soil conditions in the upper 5 feet and classifies land capability classes and subclasses. A complete description of the soils is provided in Exhibit I – Soils and shown in the Figure I-1 series.

As stated previously, the higher rates of salt deposition will occur within the Site Boundary, mainly over soils such as Quincy loamy fine sand, part of which will be covered by structures and artificial surfaces due to the construction of Project facilities. Beyond the Site Boundary, salt deposition rates will be below 50 kg/km^2-month, much lower than the average application rates of nitrogen-based fertilizers to agricultural fields in the Midwest, of approximately 775 kg/km^2-month (Vitousek et al. 2009).

Z.4.2 Vegetation

Natural vegetation at the Site and beyond the Site Boundary to the north and east has been classified as shrub-steppe. There are agricultural areas currently in production to the west and north of the Site Boundary. Vegetation is described in Exhibit P – Fish and Wildlife Habitat. Research into the effects of salt deposition from cooling tower emissions on vegetation has primarily focused on agricultural crops. Research has shown that those crops most sensitive to salt deposition began to show salt stress symptoms above a rate of 836 kg/km^2-month (Pahwa and Shipley 1979). As indicated previously, the predicted deposition rates obtained were lower than 6 kg/km^2-month outside the Site Boundary, which is 140 times less than the quoted threshold; therefore, no significant impacts to vegetation are anticipated outside of the Site Boundary. Please refer to Exhibit P – Fish and Wildlife Habitat for the vegetation types that surround the Station.

Z.4.3 Land Uses

The predominant land types on the Site are classified as cultivated crops or shrub/scrub, and the terrain is essentially flat, with minimal slopes. Associated land uses include existing industrial uses (HGP), farm and agricultural uses, limited natural resource areas, and some wetland features in the vicinity of the Site. The Station will be built in an area zoned for Exclusive Farm Use but is partly surrounded by areas zoned as Light Industrial. A detailed description of land uses and zoning can be found in Exhibit K – Land Use.

The Project will be located to the south of the existing HGP. As described previously, the nearest crops would receive rates much below the threshold at which stress symptoms are shown. Therefore, no significant impacts to industrial or agricultural activities are anticipated from cooling tower–related salt deposition.

Z.4.4 Reference Regulations

The applicable regulation indicated by the Oregon Department of Agriculture is the OAR 603-059-0100 *Limits of Non Nutritive Constituents*, which limits the level of the metals arsenic, lead, cadmium, nickel, and mercury contained in fertilizers, agricultural amendments, agricultural minerals, and lime products sold or distributed in the state of Oregon. According to the cited regulation, the concentration of metals in the products is limited depending on the amount of other nutrients. No detectable levels of these metals are expected (based on a brief review of the HGP's cooling tower blowdown) in the Station's cooling tower water; thus, the Project will comply with OAR 603-059-0100.

Z.5 MEASURES TO REDUCE ADVERSE IMPACTS

OAR 345-021-0010(1)(z)(D) *Exhibit Z shall include any measures Applicant proposes to reduce adverse impacts from the cooling tower plume or drift.*

Response: The Station's cooling tower will be configured with high efficiency mist eliminators to limit the amount of drift that exhaust vents atop the towers emit, thus reducing adverse impacts.

Z.6 PLUME ANALYSIS

OAR 345-021-0010(1)(z)(E) *Exhibit Z shall include the assumptions and methods used in the plume analysis*.

Response: The SACTI model was used for this analysis. This model was developed by Argonne National Laboratories for the Electric Power Research Institute in the mid-1980s to better evaluate impacts associated with water vapor plumes emitted from cooling towers. The model is composed of several modules: a meteorological data preprocessor, a plume drift processor, and several post-processing routines. With a full year of meteorological data, the model will determine whether a water vapor plume from a set of cooling towers would cause ground-level fogging and shadowing, and then determine the frequency with which these conditions would occur.

Specifically, the model calculates the following:

- Vapor plume length, height, and radius based on meteorological conditions;
- Frequency of plume length, height, and radius as a function of downwind distance and direction;
- Number of hours of plume shadowing as a function of distance and direction;

- Water and salt deposition as a function of distance and direction; and
- Number of hours of ground-level fogging and ice formation as a function of direction and distance.

Because of the potential adverse effects of particulate deposition on plant equipment and possible atmospheric hazards to surrounding areas, such as nearby roadways, this analysis focused on the impacts associated with salt deposition, fogging, and ice formation. In addition, a visibility assessment of the cooling tower plume length was also performed.

Table Z-8 shows the general site parameters used in this SACTI modeling.

Table Z-8 General SACTI Model Input Parameters (Project)

Input Parameter Name	Input Value	Comments
Site Latitude	45.8	Decimal degrees
Site Longitude	119.4	Decimal degrees
Zone	8	Pacific Time Zone
Rural/Urban Switch	R	Rural model
Surface Roughness	1	cm
Mixing Height Type	Spokane	Twice daily values
Years of Meteorological Data	1995-1999	
CD144 Meteorological Data	Umatilla	Hourly surface data
Mixing Height Data	Spokane	1995–1999
Number of Representative Wind Directions	3	-
Representative Wind Directions	0, 45, 270	Degrees
Evaluation Period	1995–1999	Full 5 years evaluated
Maximum Downwind Distance	10,000	Meters
Salt Concentration	0.001	g salt/g solution
Salt Density	2.17	g/cm^3
Number of Drop Sizes	9	-
Drop Size Distribution	See Table Z-11	-

Key:
cm centimeter
g grams
g/cm^3 grams per cubic centimeter
SACTI Seasonal/Annual Cooling Tower Impact

The SACTI model was designed to evaluate a single group of cooling towers that have similar characteristics (e.g., type, shape, and exhaust characteristics). The Station's cooling tower system is assumed to be contained in one structure, which is aligned east to west and consists of four cells. Design parameters are presented in Table Z-9.

Table Z-9 Tower-Specific Design Parameters

Input Parameter Name	Cooling Tower	Units/Description
Number of Tower Housings	1	-
Tower Height	12.12	Meters
Tower Housing Width	13	Meters
Cells per Tower Housing	4	-
Total Number of Cells	4	-
Single Cell Diameter	7.32	Meters
Tower Effective Diameter	14.63	Meters
Total Heat Dissipation	161	MW
Air Flow Rate	1996	kg/s
Drift Rate Total	8.83	gm/s

Key:
MW megawatts
g/s grams per second
kg/s kilograms per second

The effective diameter of each cell is simply a diameter that corresponds to the combined area of all cells and is given by:

$$D_{eff} = \left[\frac{4}{\pi} A_{tot}\right]^{1/2} = \left[\frac{4}{\pi}\left(N\frac{\pi}{4} D_{cell}^2\right)\right]^{1/2} = [N\ D_{cell}^2]^{1/2}$$

Where A_{tot} is the area of all cells together, N is the number of cells, and D_{cell} is the diameter of a single cell. The model also requires monthly clearness index values and total average daily solar insolation values. For this analysis, values from Richland, Washington, as reported in Appendix B of the SACTI User's Manual were used, as shown in Table Z-10 (Dunn et al. 1987). The SACTI User's Manual directs use of the closest source of validated information for these two parameters; in this case Richland, Washington data was the closest to the Site.

Table Z-10 Monthly Values of Clearness and Average Daily Insolation Values (Richland, Washington)

Month	Clearness	Average Daily Solar Insolation (MJ/m^2)
January	0.32	3.60
February	0.50	8.41
March	0.57	13.93
April	0.60	19.53
May	0.56	21.58
June	0.65	27.06
July	0.60	24.09
August	0.72	25.13
September	0.60	16.23
October	0.51	9.58
November	0.41	5.19
December	0.42	4.14

Key:
MJ/m^2 MegaJoules per square meter

Table Z-11 shows the drop distribution used in this analysis.

The cooling tower will use process water from the Port of Umatilla, after some filtration treatment. Exhibit V – Solid Waste and Wastewater provides the water quality analysis expected in the cooling tower. Thus, deposition modeling utilized increased concentrations to represent maximum feasible emissions for minerals and metals found in the water quality analysis. When the SACTI model was developed, techniques that evaluated plumes on an hour-by-hour basis required simplified algorithms to keep the computational times reasonable. The developers of SACTI realized that because of symmetry, a relatively small number of truly distinct plume conditions could be identified for a given site. Thus, the SACTI model does not evaluate plumes on an hour-by-hour basis, but rather evaluates plume behavior, using a more complex plume model, along a selected set of representative wind directions. The representative wind directions are selected based on the geometry of the cooling tower, depending on how plumes may merge. For a straight line of cells, representative wind directions would be parallel to the long axis, perpendicular to the long axis, and at 45 degrees (mid-way) to the long axis. For this analysis, the representative wind directions are 270 degrees east of north (wind aligned with the line of cells), 0 degrees (wind perpendicular to the line of cells), and 45 degrees (mid-way to the line of cells), as shown in Figure Z-2. For this analysis, five years (1995 to 1999) of hourly surface meteorological data from Umatilla, Oregon, and twice-daily mixing height data estimated from the surface records were used. The surface data were obtained from a station located at the Umatilla Army Depot, while the mixing height file was created using the hourly upper air radiosonde data from Spokane, Washington. These data were processed by the National Climate Data Center into the twice daily readings format required by the SACTI model.

Table Z-11 Drop Size Distribution

Drop Diameter (microns)	Mass Fraction
10	0.12
15	0.20
35	0.20
65	0.20
115	0.20
170	0.10
230	0.05
375	0.04
525	0.01

Cooling Tower Plume Formation

The SACTI results for all seasons are summarized in Table Z-12. Impacts are more extensive in the period from November to March. This can be accounted for by the variation in seasonal meteorological conditions, with the effects of cooler, moist conditions in that season becoming evident. The annual values indicate that the majority of visible plume lengths will be less than 190 meters (623 feet). Larger downwind visible plume lengths are possible, but the downwind visible plume length will be less than 320 meters (1,050 feet) for 70 percent of all the hours where a visible plume will form. SACTI also predicts that the probability that a visible plume height is relatively slight, averaging 44 meters (144 feet), and has a median radius of 30 meters (98 feet). When assessing the plume as a single merged (cumulative of the Station and HGP) plume from all 12 cells, the visual characteristics increase. The annual median length of the plume increases from 190 meters to 220 meters (623 to 722 feet), and the median height increases from 44 to 61 meters (144 to 200 feet).

Table Z-12 Seasonal Plume Characteristics from SACTI (meters) for Station and Hermiston Generating Plant Plume

Station	**Annual**	**Nov–Mar**	**Apr–Oct**
Median Length	190	370	100
Median Height	44	82	30
Median Radius	30	36	22
Cumulative Plume	**Annual**	**Nov–Mar**	**Apr–Oct**
Median Length	220	480	150
Median Height	61	160	56
Median Radius	59	72	40

Z.7 MONITORING

OAR 345-021-0010(1)(z)(F) *Applicant's proposed monitoring program, if any, for cooling tower plume impacts shall be included in Exhibit Z.*

Response: 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 (Appendix P-2 of Exhibit P – Fish and Wildlife Habitat), which includes a monitoring program to determine whether construction and operation of the Station will result in significant negative impacts to vegetation. 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 means to monitor and mitigate such impacts.

would provide a

Z.8 REFERENCES

Dunn, W.E., L. Coke, and A.J. Policastro. 1987. Seasonal/Annual Cooling Tower Impacts (SACTI) User's Manual: Cooling-Tower-Plume. Prediction Code (Revision 1), September, 1987.

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EXHIBIT AA

ELECTRIC AND MAGNETIC FIELDS

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

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TABLES

FIGURES

APPENDIX

AA.1 INTRODUCTION

OAR 345-021-0010(1)(aa) *If the proposed energy facility is a transmission line or has, as a related or supporting facility, a transmission line of any size:*

Response: An evaluation of electric and magnetic fields (EMF) is provided for the future transmission line associated with the Perennial Wind Chaser Station project (Project) proposed by Perennial-WindChaser LLC (Perennial), which satisfies the requirements of Oregon Administrative Rules (OAR) 345-021-0010(1)(aa) and the standards contained in OAR 345-024-0090.

AA.2 SUMMARY

Oscillating EMFs at power frequency are generated by all electrical devices. The earth itself has naturally occurring steady-state magnetic and electric fields. This exhibit provides estimates of the maximum possible EMF strengths that would be produced by conducting electrical energy from the Perennial Wind Chaser Station (Station) through the existing transmission line, owned and operated by Umatilla Electric Cooperative (UEC) and extending from the Hermiston Generating Plant to the Bonneville Power Administration (BPA) McNary Substation. The existing conductors are supported on double-circuit steel monopoles. Currently, the double-circuit steel monopoles support a 230-kilovolt (kV) and a 115-kV transmission line. The development of the Station will require restringing the 115-kV side of the transmission line to 230 kV. This exhibit evaluates the EMF effects and radio interference expected to result from the upgrade of the 115-kV portion of the transmission line to 230 kV.

When a conductor is energized, an electric field forms around it that is proportionate to the energization voltage. The strength of the electric field is independent of the current flowing in the conductor. When alternating current (AC) flows through a conductor, an alternating magnetic field is created around the conductor. Areas of equal magnetic field intensity can be envisioned as concentric cylinders with the conductor at the center. The magnetic field intensity drops exponentially with distance from the conductor.

In AC power systems, voltage swings from positive to negative and back to positive, a 360-degree cycle, 60 times every second. Current follows the voltage, flowing forward, reversing direction, and returning to the forward direction, again a 360-degree cycle, 60 times every second. Each AC transmission circuit carries power over three conductors. One phase of the circuit is carried by each of the three conductors. The AC voltage and current in each phase conductor is out of sync with the other two phases by 120 degrees, or one-third of the 360-degree cycle. The fields from these conductors tend to cancel out because of the phase difference, which is referred to as phase cancellation. However, a person standing on the right-of-way (ROW) under a transmission line will not be equidistant from all conductors, which results in a net field at the person's location. The strength of the magnetic field depends on the current in the conductor, the geometry of the structures, the degree of cancellation from other conductors, and the distance from the conductors.

The proposed conductor design for the reconductored Hermiston to McNary 230-kV transmission line will utilize a two-conductor bundle design and arrange each phase conductor such that the greatest feasible maximum reduction and cancelation of field strengths is achieved. Figures AA-1 and AA-2 illustrate the existing transmission system design and the anticipated configuration of the proposed transmission line to the existing transmission system, respectively.

AA.3 INFORMATION ABOUT THE EXPECTED ELECTRIC AND MAGNETIC FIELDS

OAR 345-021-0010(1)(aa)(A) *Information about the expected electric and magnetic fields, including:*

(i) The distance in feet from the proposed center line of each proposed transmission line to the edge of the right-of-way.

Response: UEC's ROWs for the transmission line range from 25 to 65 feet from the center line. The EMF impacts have been examined with respect to the narrowest width identified along the ROW, approximately 25 feet. The maximum EMF effects were calculated from the center line of the ROW (also the transmission center line) to approximately 200 feet from the center line to determine the field strengths for all occupied structures near the transmission system.

(ii) The type of each occupied structure, including, but not limited to, residences, commercial establishments, industrial facilities, schools, daycare centers and hospitals, within 200 feet on each side of the proposed center line of each proposed transmission line.

Response: A total of 48 structures were found within 200 feet of the ROW center line. These 48 structures included residences, farm buildings, and unknown structures. A list of location numbers, corresponding distance from structure to ROW center line building type, and electric field strength identified at each structure is shown in Table AA-1.

(iii) *The approximate distance in feet from the proposed center line to each structure identified in OAR 345-021-0010(1)(aa)(A).*

Response: Of the 48 structures found within 200 feet of the ROW center line, 17 were located within 100 feet of the ROW center line, including 14 residences and three farm buildings. No structures were identified to be within the ROW boundary of 25 feet. The nearest structure was located approximately 46 feet from the ROW center line and identified as a residence. The remaining 31 structures were located more than 100 feet from the ROW center line and consisted of 22 residences, five farm buildings, and four unknown structures. The majority of these structures were found along Powerline Road just south of City of Umatilla and approximately 10 miles north of the Hermiston Generating Plant. A detailed map of the structure locations is shown on Figure AA-3, with location numbers shown for each residence. Table AA-1 shows a list of location numbers, corresponding distance from structure to ROW center line, building type, and electric field strength identified at each structure.

Table AA-1 Structures Located within 200 feet of Transmission Line Right-of-Way Center Line

Location No.	Distance from the Center Line (feet)	Building Type	Electric Field Strength (kV/m)
1	156.31 R	Farm Building	0.026
2	173.36 R	Structure	0.022
3	117.75 R	Structure	0.033
4	138.93 R	Structure	0.03
5	131.48 L	Residence	0.031
6	177.90 L	Residence	0.021
7	62.51 L	Residence	0.174
8	45.71 L	Residence	0.431
9	192.16 L	Residence**	0.018
10	72.08 L	Residence	0.089
11	190.47 L	Residence**	0.018
12	60.83 L	Residence	0.174
13	65.15 L	Residence	0.125
14	167.51 R	Residence	0.023
15	130.22 R	Residence	0.031
16	183.48 L	Residence**	0.02
17	78.80 L	Residence	0.063
18	190.81 L	Residence**	0.018
19	78.29 L	Residence	0.063
20	186.88 L	Residence**	0.019
21	68.55 L	Residence	0.125
22	157.15 R	Residence	0.026
23	182.45 L	Residence**	0.02
24	68.62 L	Residence	0.125
25	147.62 R	Residence	0.028
26	185.46 L	Residence**	0.019
27	53.91 L	Residence	0.324
28	145.04 R	Residence	0.028
29	193.84 L	Residence**	0.018
30	53.83 L	Residence	0.324
31	180.76 L	Residence**	0.02

Table AA-1 Structures Located within 200 feet of Transmission Line Right-of-Way Center Line

Location No.	Distance from the Center Line (feet)	Building Type	Electric Field Strength (kV/m)
32	70.39 L	Residence	0.089
33	100.71 L	Residence	0.032
34	138.97 L	Residence	0.03
35	138.91 L	Residence	0.03
36	101.48 L	Residence	0.032
37	60.76 L	Residence	0.174
38	126.39 L	Structure	0.032
39	58.30 L	Residence	0.239
40	177.17 L	Residence	0.021
41	177.79 L	Residence	0.021
42	125.92 L	Farm Building	0.032
43	185.73 L	Farm Building	0.019
44	93.73 L	Farm Building	0.174
45	158.01 L	Farm Building	0.026
46	119.01 L	Farm Building	0.032
47	48.50 R	Farm Building	0.427
48	86.88 R	Farm Building	0.035

**Structures that are partially in the study area

Key:
kV/m kilovolts per meter
L left of center line
R right of center line

(iv) *At representative locations along each proposed transmission line, a graph of the predicted electric and magnetic fields levels from the proposed center line to 200 feet on each side of the proposed center line.*

<u>Response</u>: An analysis was performed to determine the electrical effects of replacing the present 115-kV to 230-kV transmission line on the double circuit–configured Hermiston to McNary transmission infrastructure. The electric fields, magnetic fields, audible noise, and radio interference strengths were calculated within 200 feet of the ROW center line, with emphasis on the minimum ROW width of 25 feet. The strengths of these effects in relation to the distance to the ROW center line are shown in Figures AA-4 through AA-7, respectively.

Electric field strength is dependent upon voltage. The proposed transmission line will increase the present voltage on the transmission system, and therefore it is anticipated to increase the electric field strength. Using the proposed conductor design and arrangement techniques, the maximum electric field strength at 1 meter above ground was calculated to be located approximately 20 feet from the ROW center line, with a magnitude of 1.34 kilovolts per meter (kV/m), as shown in Figure AA-4. The electric field strengths at the minimum ROW width of 25 feet were calculated to be 1.31 kV/m. These values were identified to be well below the state of Oregon's electric field regulation of 9 kV/m (OAR 345-024-0090).

Magnetic field strength is a function of the current or loads on the transmission system. With incorporation of the mitigation techniques and measures proposed by Perennial, the maximum magnetic field strength at 1 meter above ground was calculated using current ratings of 1,219 amperes and 997 amperes for the existing and proposed 230 kV transmission lines, respectively, as shown in Figure AA-5. This assessment is conservative, given that the average loads are anticipated to be less than the maximum operating current. The calculated maximum magnetic field strength within the ROW was 112.23 milligauss (mG), located at the ROW center line. The maximum magnetic field strength at the minimum ROW width of 25 feet was calculated to be 85.74 mG.

Audible noise and radio interference are related to the electric field strength and the breakdown strength of the surrounding air. These electrical effects can be minimized by designing the transmission cabling such that enough conductive surface is available to disperse the electric field strength along a segment of cabling. The proposed transmission line is anticipated to be designed using a two-conductor bundle cable design, which separates the transmission current to two parallel cables and increases surface area. The audible noise and radio interference strengths at 2 meters above ground, as shown in Figures AA-6 and AA-7, were calculated at the minimum ROW width of 25 feet from the ROW center line to be 37.7 decibels (dB) and 58.1 decibels relative to 1 microvolt per meter (dBuv/m), respectively, during wet weather conditions when an increase in water vapor occurred. Using the design configuration noted above, the nearby Interstate Highway 82 (I-82) and residences are anticipated to experience minimal additional audible noise and radio interference disturbances compared to the existing transmission system.

All structures found within and near to the ROW boundaries were calculated to experience electrical effects well below the EMF standards, as outlined in OAR 345-024-0090. It is noted that the proposed transmission line is expected to produce even lower EMF than calculated because the proposed transmission line is not anticipated to perform with maximum operating current. Furthermore, the mitigation of harmonics in transmission lines is more effective when double circuit transmission lines use similar voltage levels/ratings. Replacement of the 115-kV with a 230-kV transmission line is anticipated to increase harmonic cancelation on the line due to similar electric field strengths between the proposed and existing 230-kV transmission lines. Therefore, structures are expected to experience a minimal increase in electrical field strength and decrease in magnetic field strength due to the reconductoring of the proposed transmission line. However, without knowledge of the local signal strengths, these electrical effects cannot be fully evaluated.

(v) Any measure applicant proposes to reduce electric or magnetic field levels.

Response: Electrical effects of transmission lines refer to the effects associated with EMF and electric discharge. Effects from EMF are created by electrical radiation from induced voltages on the energized conductor. Electric discharge effects, such as corona, are created by an electrical discharge between conductive materials and nearby fluid. As the electric field exceeds the voltage gradient limit of the fluid, audible noise, radio interference, and energy losses are created. In transmission lines, electrical effects can be minimized by line design, construction practices, and optimizing line location within an ROW. Perennial intends to use mitigation measures when designing the proposed transmission system, such as using two-conductor bundle design and arranging each phase conductor such that a maximum reduction and cancelation of field strengths is achieved within reason.

Power utilities that operate transmission lines attempt to organize the conductors attached to structures in ways that are consistent and intuitive so that line workers are less apt to make mistakes in maintenance operations. For the double circuit transmission line proposed here, the most common transmission conductor arrangement would place both A-phase conductors at the top position, both B-phase conductors in the middle, and both C-phase conductors on the bottom. For the case where the power in all circuits flows in the same direction, there is some field cancellation to be gained by rearranging the locations of the phase conductors. Field reduction would be achieved by rearranging the conductors of the second 230-kV circuit so the phases are A-phase, B-phase, and C-phase (top to bottom) on one side of the tower, and C-phase, B-phase, and A-phase (top to bottom) on the other side. Due to resultant cancellation effects, the overall magnitude of the field strengths using this configuration is less than the existing facility.

The combined radiation of electric and magnetic fields is typically characterized by frequency and described as non-ionizing, low-level, and generally harmless, or ionizing, high-level, and harmful at a cellular level. Typically man-made sources of magnetic fields, such as electrical transmission and distribution lines, are commonly associated with non-ionizing EMF radiation exposure due to the low-level frequencies generated. In the United States, there are no federal standards that limit exposure to EMF; however, seven states, including Oregon, have established standards for regulating EMF exposure by requiring set volt per meter requirements based on the width of the ROWs and the ratings of the transmission and distribution lines.

In summary, the mitigation measures proposed for the Project consist of: 1) rearranging the location of the phase conductors such that a maximum reduction and cancelation of field strengths is achieved within reason and 2) use of a two-conductor bundle cable design to minimize audible noise and radio interference.

(vi) The assumptions and methods used in the electric and magnetic field analysis, including the current amperes on each proposed transmission line.

Response: To estimate the maximum fields, calculations are performed at mid-span, where the conductor is positioned at its lowest point between structures (the estimated maximum sag point). The magnetic fields are computed at 1 meter above ground using a program called "Corona and Field Effects Program," developed by the BPA. This program and others like it have been used to predict EMF levels for many years and have been confirmed by field measurements taken by numerous utilities. Calculations use 1.05 per unit of nominal voltage for the 230-kV lines. The vertical height of electric field, magnetic field, and radio interference sensors is 3.28 feet (1 meter).

All loads on all circuits are assumed to be maximum and coincident; however, this condition rarely occurs. This is a conservative assumption. It is important to note that electric fields are voltage dependent and are always the same when a transmission line is operated at a given voltage, regardless of load. Magnetic fields vary with current or load. They are higher when the current is higher and produce higher ground level magnetic fields. Since the average loads will be less than the maximum operating current, the proposed transmission line typically will produce lower EMFs than predicted for the maximum condition. The dimensions of the existing BPA power lines were estimates from the data provided from BPA and site investigations.

The existing structure type is a vertical configuration double-circuit tubular steel pole. This circuit remains the same configuration for all cases analyzed. The proposed double-circuit vertical configuration is modeled to be ABC-CBA phasing top to bottom for the double circuit lines to maximize field cancellation. The assumed maximum line current for the existing 230-kV circuit is 1,219 amps (510 megavolt amperes). The assumed maximum line current for the proposed 230-kV circuit is 997 amps (417 megavolt amperes).

The existing 230-kV circuit has a two-conductor bundled 795 kcmil[1] aluminum conductor, steel reinforced (ACSR) "Drake," with a ground clearance of 33 feet at mid-span. The proposed 230-kV circuit has a two-conductor bundled 795 kcmil ACSR with a ground clearance of 33 feet at mid-span. The existing three-phase distribution underbuild circuit is estimated to be 12.47 kV, 4/0 ACSR "Penguin" with a 4/0 neutral conductor, having a ground clearance of 25 feet at mid-span. The assumed maximum line current is 350 amps. The shield wires are two 7#8 Alumoweld.

(vii) The applicant's proposed monitoring program, if any, for actual electric and magnetic field levels.

Response: No monitoring programs are proposed to measure the actual EMF levels generated by construction of the Project.

[1] 1,000 circular mils

AA.4 ALTERNATIVE METHODS TO REDUCE RADIO INTERFERENCE

OAR 345-021-0010(1)(aa)(B) *An evaluation of alternative methods and costs of reducing radio interference likely to be caused by the transmission line in the primary reception area near interstate, U.S. and state highways.*

Response: Overhead transmission lines do not, as a general rule, interfere with normal radio or TV reception. There are two potential sources for interference: corona and gap discharges. Corona discharges cause short pulses of voltage and current to be propagated along the transmission line, resulting in radio frequency noise in the vicinity of the line. Gap discharges are different from corona and can occur on low voltage distribution lines. Gap discharges can take place at locations where tiny electrical separations (gaps) develop between mechanically connected metal parts (for example, on broken or poorly fitting line hardware, such as insulators, clamps, or brackets). A small electric spark discharge across the gap can create unwanted electrical noise. Typically, corona interference to radio and television reception is not a design problem. Interference levels both in fair weather and in rain are extremely low at the right-of-way edge for transmission lines of 230 kV or less, and will usually meet or exceed reception guidelines of the Federal Communications Commission.

The portion of the existing line that parallels I-82 does not cause noticeable AM or FM radio interference on a car radio. It is anticipated that the Project will not cause a noticeable increase in TV or radio reception interference near I-82. Where the line crosses I-82 near the city of Umatilla, it does so in parallel with two other BPA transmission lines. Despite not anticipating a noticeable increase in TV or radio reception interference, additional precautions were taken to minimize TV and radio reception interference by designing the proposed transmission line using a two-conductor bundle design, which increases surface area and reduces current strength per conductor.

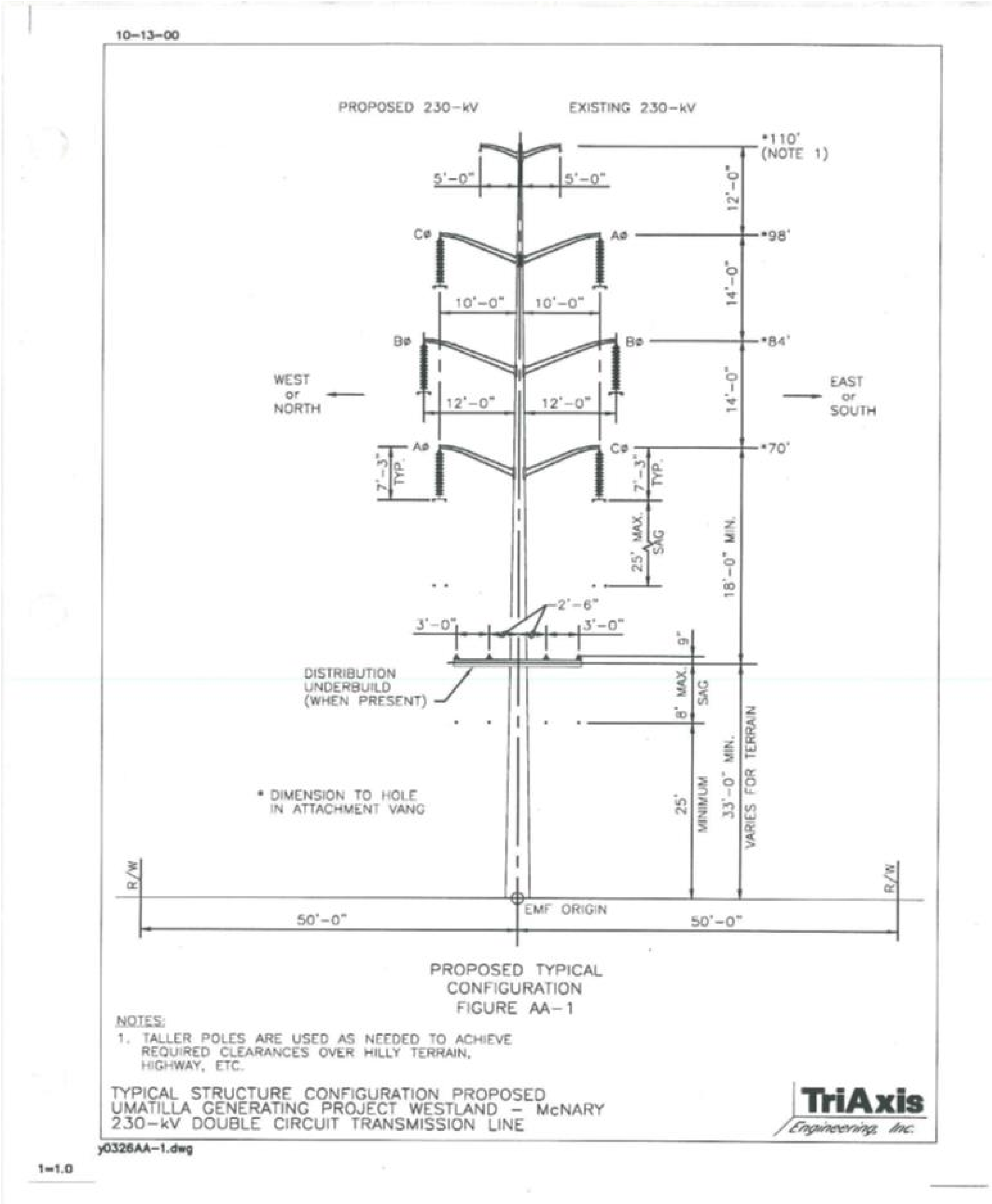
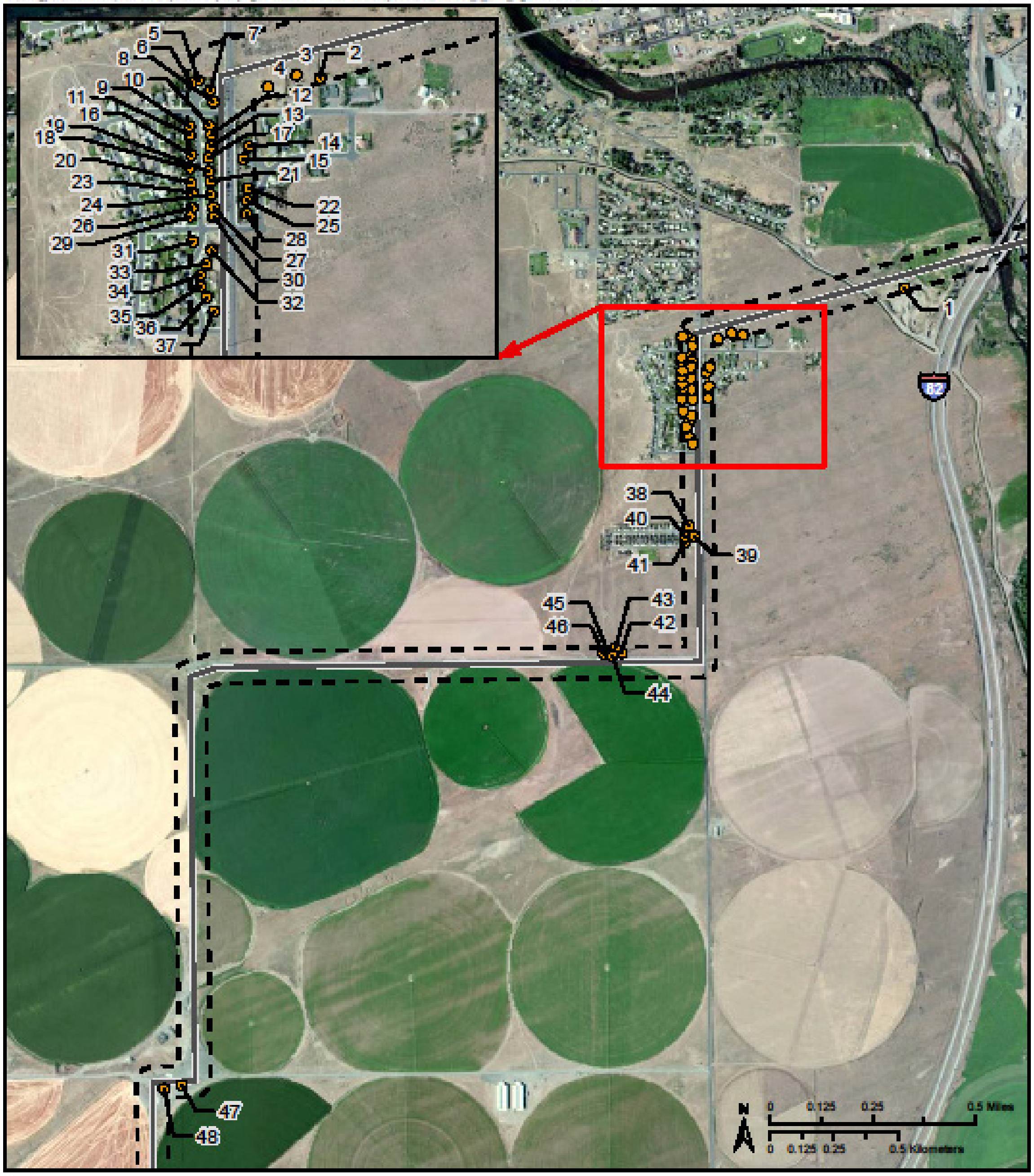


Figure AA-1 Vertical Configuration Double-Circuit Tubular Steel Pole

Figure AA-2 Proposed Hermiston to McNary 230-kV Transmission Line Configuration



Impacted Structure

Existing Transmission Line

400-ft Impact Corridor

Sources: ESRI 2010

Figure AA-3

Structures Idenified within 200-ft of Existing Transmission Line

Perennial Wind Chaser Station

November 2013

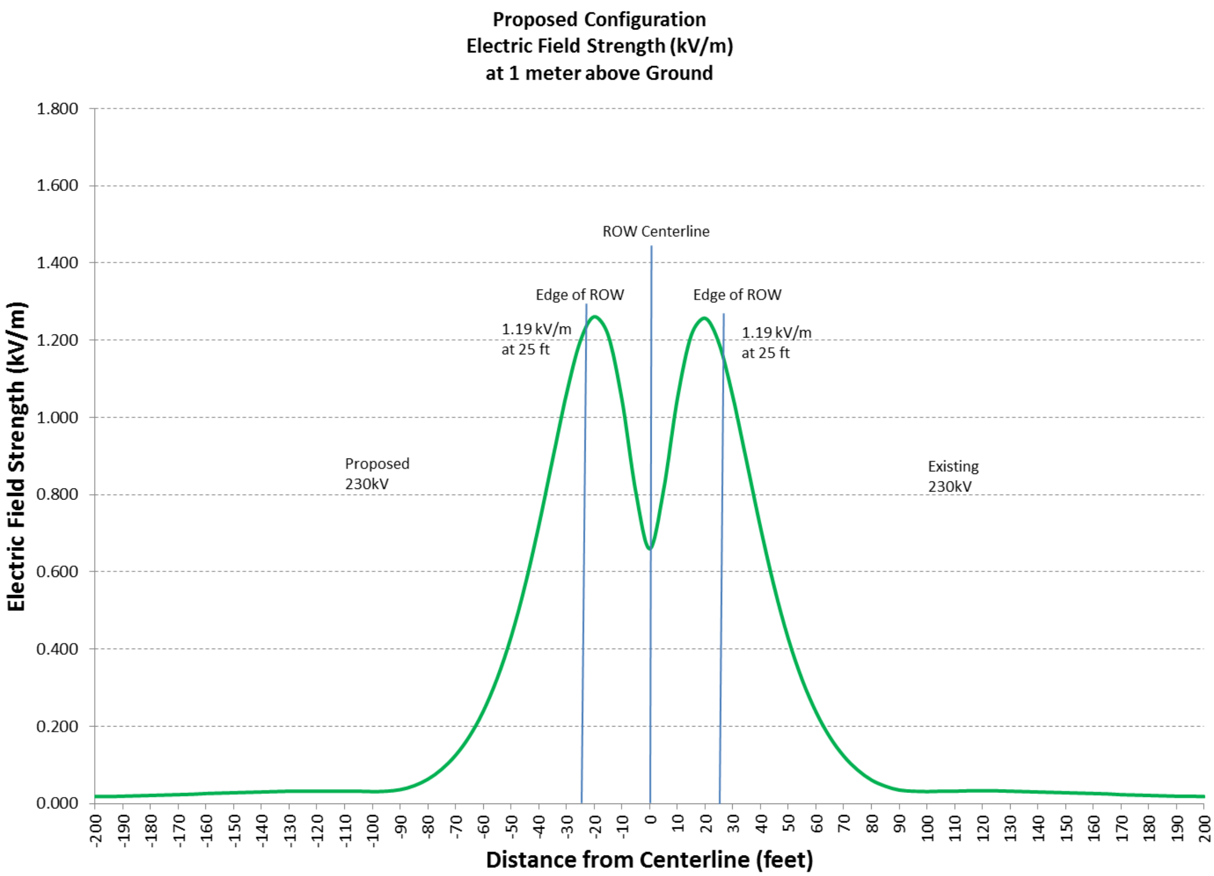


Figure AA-4 Proposed Configuration Electric Field Strength (kV/m) at 1 Meter Above Ground

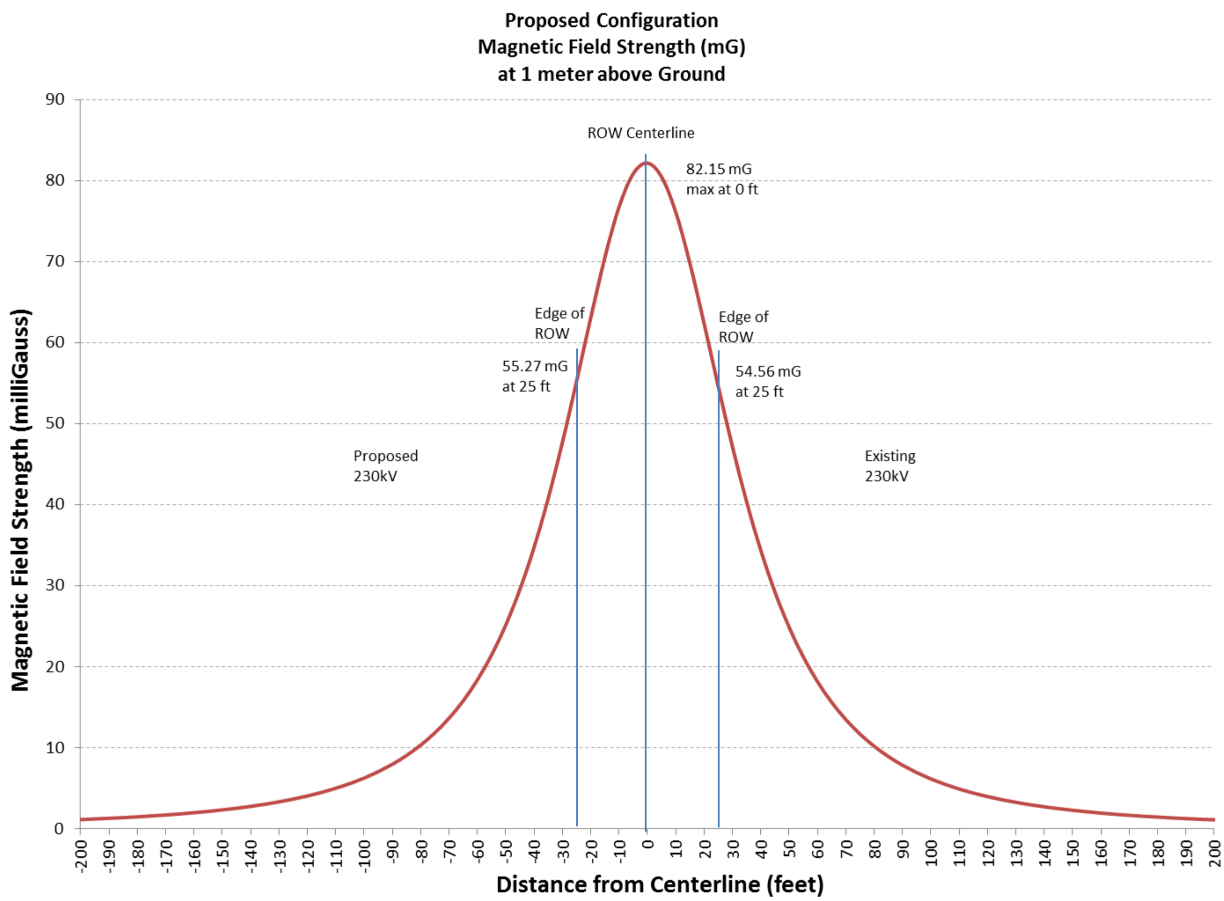


Figure AA-5 Proposed Configuration Magnetic Field Strength (mG) at 1 Meter Above Ground

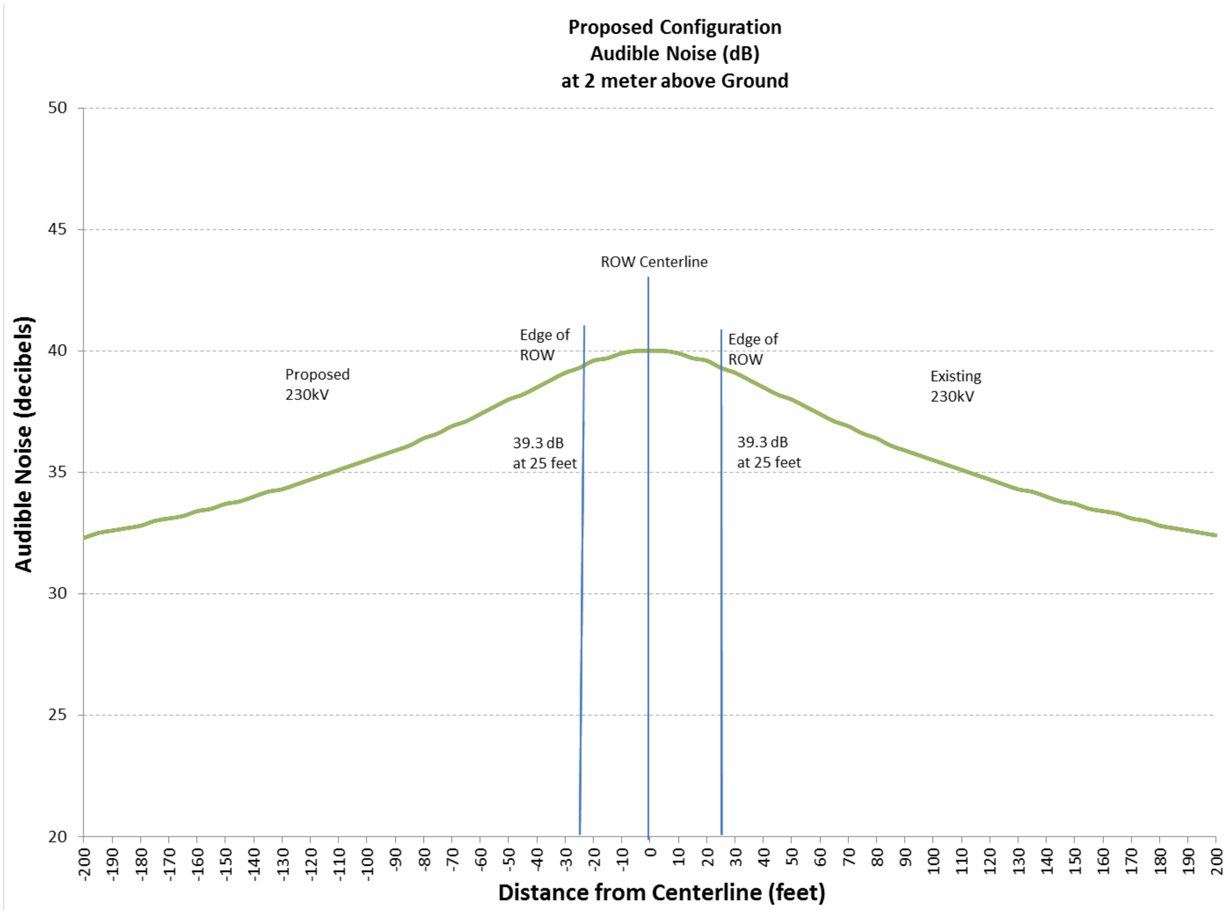


Figure AA-6 Proposed Configuration Audible Noise (dB) at 2 Meters Above Ground

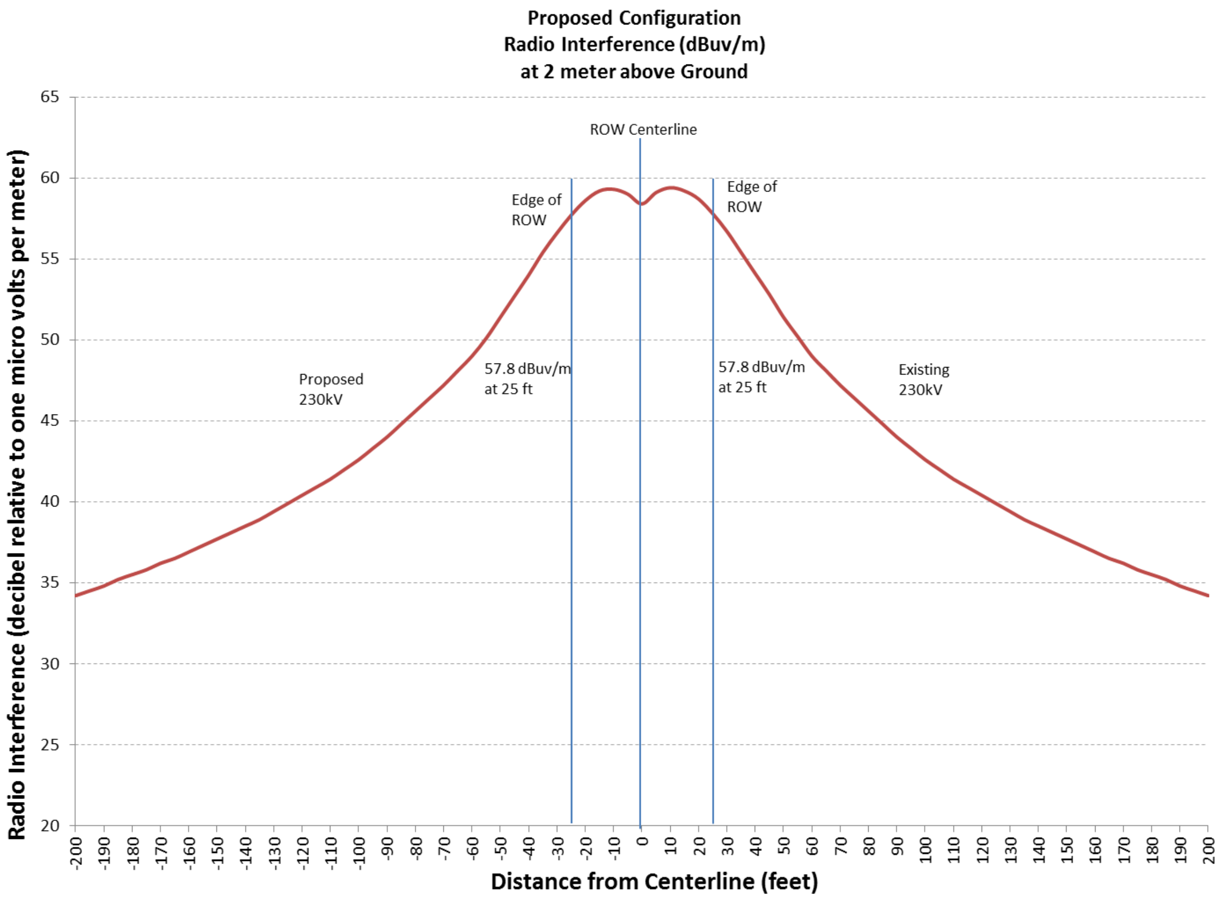


Figure AA-7 Proposed Configuration Radio Interference (dBuv/m) at 2 Meters Above Ground

APPENDIX AA-1

Electric and Magnetic Fields Study

Burns & McDonnell
SINCE 1898

Report on the

Perennial Wind Chaser Station Electric and Magnetic Fields Study

PERENNIAL POWER

Perennial-WindChaser LLC

Project No. 55745

December 2013

Perennial Wind Chaser Station Electric and Magnetic Fields Study

Perennial-WindChaser LLC
New York, NY

December 2013

Project No. 55745

prepared by

Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri

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LIST OF ABBREVIATIONS

Abbreviation	**Term/Phrase/Name**
ACSR	Aluminum Conductor, Steel Reinforced
AN	Audible Noise
BMcD	Burns & McDonnell
BPA	Bonneville Power Association
dB	Decibels
dBuv/m	Decibels relative to one microvolt per meter
EMF	Electric and Magnetic Fields
G	Gauss
HGP	Hermiston Generating Plant
kcmil	One thousand circular mils
kV	Kilovolts
kV/m	Kilovolt per meter
mG	Milligauss
MHz	Megahertz
MVA	Megavolt ampere
Perennial	Perennial-WindChaser LLC
RI	Radio Interference
ROW	Right-of-Way
T	Tesla

1.0 INTRODUCTION

Perennial-WindChaser LLC (Perennial) proposes to construct and operate up to four General Electric LMS 100 (or equivalent) natural gas-fired combustion turbine generators in simple cycle, which will produce up to approximately 415 megawatts of electric power near Hermiston, Oregon. The Perennial Wind Chaser Station project (Project) is proposed to be located adjacent to the existing Hermiston Generating Plant (HGP). HGP utilizes the Umatilla Electric Cooperative (UEC) owned and operated transmission line infrastructure from the HGP to the BPA McNary substation which consists of double-circuit steel monopoles. Currently the double-circuit steel monopoles are supporting a 230 kV and a 115 kV transmission line. The development of the proposed gas turbine generating facility will require restringing the 115 kV side of the transmission line to 230 kV.

The purpose of the study is to evaluate the electric and magnetic field effects and radio interference due to the upgrade of the 115 kV portion of the transmission line to 230 kV. This study will evaluate the proposed transmission infrastructure consisting of two 230 kV transmission lines.

UEC's right of ways (ROW) for the transmission line range from 25 to 65 feet from the center line. The electric and magnetic field impacts will be examined with respect to the thinnest width identified along the ROW, approximately 25 feet. The maximum electric and magnetic field (EMF) effects will be calculated from the center line of the ROW (also the transmission centerline) to approximately 200 feet from the centerline to determine the field strengths for all occupied structures nearby to the transmission system. Audible noise and radio interference will be described during both fair and rain conditions. Figure 2-1 and Figure 2-2 illustrate the existing transmission system design and the anticipated configuration of the proposed transmission line to the existing transmission system respectively.

Perennial intends to use mitigation measures when designing the proposed transmission system such as reconductoring the Hermiston to McNary 230 kV transmission line using a two-conductor bundle design and arranging each phase conductor such that a maximum reduction and cancelation of field strengths is achieved within reason. Therefore, this study will evaluate the field strength based on these mitigation measures to identify the anticipated field strengths on the surrounding area.

2.0 CALCULATION METHODOLOGY AND ASSUMPTIONS

The following describe the methodology for calculations and the assumptions used in the development of the study.

- Calculations Method: Output Results are based upon the algorithms in the BPA Corona & Field Effects Program (BPA CORONA) software developed by Bonneville Power Administration (BPA).

- Calculations use 1.05 per unit of nominal voltage for the 230-kV lines.

- Vertical height of Electric Field and Magnetic Field sensors is 3.28 feet (1 meter).

- Vertical height of the Radio and Television interference sensors is 6.6 feet (2 meters) and 9.8 feet (3 meters) respectively.

- Radio interference levels are reported at a single measurement frequency of 1 megahertz (MHz).

- Television interference levels are reported at a single measurement frequency of 75 megahertz (MHz)

- The existing structure type is a vertical configuration double-circuit tubular steel pole. This circuit remains the same configuration for all cases analyzed. A drawing of this structure is provided in Figure 2-1.

- The proposed double-circuit vertical configuration is modeled to be ABC-CBA phasing top to bottom for the double circuit lines to maximize field cancellation. The assumed maximum line current for the existing 230-kV circuit is 925 amps. The assumed maximum line current for the proposed 230-kV circuit is 925 amps.

- The existing 230-kV circuit has a two-conductor bundled 795 kcmil ACSR “Drake”, with a ground clearance of 33 feet at midspan.

- The proposed 230-kV circuit has a two-conductor bundled 795 kcmil ACSR with a ground clearance of 33 feet at midspan.

- The existing 3-phase distribution underbuild circuit is estimated to be 12.47kV, 4/0 ACSR "Penguin" with a 4/0 neutral conductor, having a ground clearance of 25 feet at midspan. The assumed maximum line current is 350 amps.
- The shield wires are two 7#8 Alumoweld.

Figure 2-1: Vertical configuration double-circuit tubular steel pole.

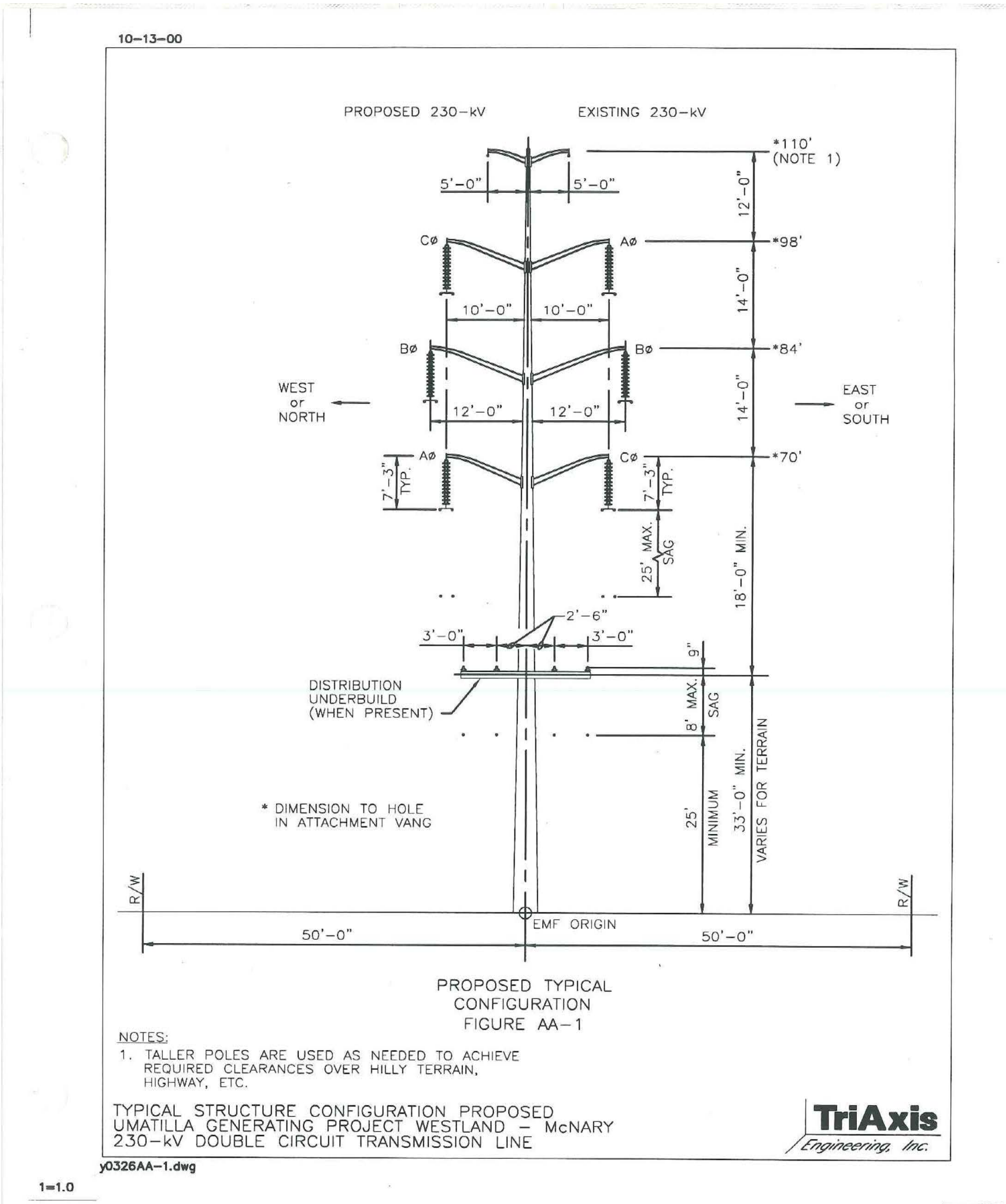


Figure 2-2: Proposed Hermiston to McNary 230 kV transmission line configuration.

3.0 ELECTRICAL EFFECTS

Electrical effects of transmission lines refer to the effects associated with EMF, and electric discharge. Effects from EMF are created by electrical radiation from induced voltages on the energized conductor. Electric discharge effects, such as corona, are created by an electrical discharge between conductive materials and nearby fluid. As the electric field exceeds the voltage gradient limit of the fluid, audible noise (AN), radio interference (RI) and energy losses are created. In transmission lines, electrical effects can be minimized by line design, construction practices, and optimizing line location within ROW.

3.1 Electric and Magnetic Fields

Electric fields are created by the electric force exerted between electric charges. Electric fields occur in conductive materials such as electrical appliances and electrical equipment. The magnitude of an electric field is represented in units of volts per meter (V/m) or thousands of volts per meter (kV/m). Electric fields may be present even in the absence of electric charge movement and are related to the static force between electric charges. The strength of an electric field can be shielded by common objects such as trees, vehicles, and buildings. More modern techniques for shielding electric fields include conductive caging and burying electrical equipment.

Magnetic fields are produced by the movement of electric charges within conductive material. Magnetic fields are typically only present if electric charges are in motion. The magnitude of a magnetic field is related to the quantity of charges in motion through a conductive material, such as electrical appliances and electrical equipment, and is represented in units of tesla (T) or gauss (G). The strength of a magnetic field is typically shielded by arranging active conductors such that the magnetic fields produced are minimized.

The combined radiation of electric and magnetic fields is typically characterized by frequency and described as non-ionizing, low-level and generally harmless, or ionizing, high-level and harmful at a cellular level. Typically man-made sources of magnetic fields, such as electrical transmission and distribution lines, are commonly associated with non-ionizing EMF radiation exposure due to the low-level frequencies generated. In the United States, there are no federal standards which limit exposure to EMF; however, currently seven states, including Oregon, have established standards for regulating EMF exposure by requiring set volt per meter requirements based on the width of the ROWs and the ratings of the transmission and distribution lines. To reduce EMF effects, Perennial plans to use mitigations measures such as using a two-conductor bundle design and arranging each phase conductor such that a maximum reduction and cancelation of field strengths is achieved within reason.

3.2 Corona

Corona is an electrical discharge caused by the ionization of fluid, such as air, surrounding an energized conductor. When the strength of the electric field surrounding a conductor exceeds the voltage gradient of the nearby fluid, the electric discharge occurs and as more fluid surrounds the energized conductor, the magnitude of electric discharge increases. Electric discharge from the energized conductor results in the transformation of electric energy into light, sound, chemical reaction and heat.

Corona can be reduced by increasing the conductor surface, thereby reducing the electric field. In transmission systems, several designs and configurations can be implemented to reduce the surface voltage gradient. Perennial plans to use a two-conductor bundle design to increase the conductor surface reduce the electric field.

3.3 Radio Interference

Overhead transmission lines are not typically associated with radio interference. However, electric discharges are common occurrences on transmission lines and are related to radio interference. Corona, as described in the prior section, causes audible noise when electric discharge between conductive material and surrounding fluid occurs. Corona can be minimized by reducing the electric field, and thus increasing the area, of conductive material. Other common electric discharges with transmission lines include electric discharges due to insufficient contact between conductive materials. When conductive material is separated by fluid, an electric discharge occurs at the instance when the electric field between the energized conductors exceeds the voltage gradient of the separating fluid. This is a common occurrence during “slack” or low tension moments on transmission lines.

To minimize electric discharge, appropriate design techniques will be used to reduce the separation between conductive materials. To reduce the audible noise and radio interference caused by corona, Perennial plans to use a two-conductor bundle design to increase the conductor surface reduce the electric field.

3.4 Oregon Transmission Line Standard

The state of Oregon has promulgated a standard for the siting of transmission lines (OAR-345-024-0090). The standard consists of two parts:

1. Design, construct, and operate the proposed transmission line such 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. 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 reasonable achievable.

The discussion in Section 5.0 below details how the proposed Project will meet the standard.

4.0 OCCUPIED STRUCTURES NEAR ROW

A total of 48 structures were found within 200 feet of the ROW centerline. Of the 48 structures, 17 structures were located within 100 feet from the ROW centerline including 14 residences and 3 farm buildings. No structures were identified to be within the ROW boundary of 25 feet, the nearest structure was located approximately 46 feet from the ROW centerline and identified to be a residence. The remaining 31 structures were located more than 100 feet from the ROW centerline and consisted of 22 residences, 5 farm buildings and 4 unknown structures. The majority of these structures were found along Powerline Road just south of the City of Umatilla and approximately 10 miles north of the HGP. A detailed map of the residential locations is shown on Figure 4-1 with lot location numbers shown for each residence. A list of the lot numbers, corresponding distance from residence to the ROW centerline, and the electric field strength identified at each resident is shown in Table 4-1.

Figure 4-1: map of structures within 200 feet of ROW centerline.

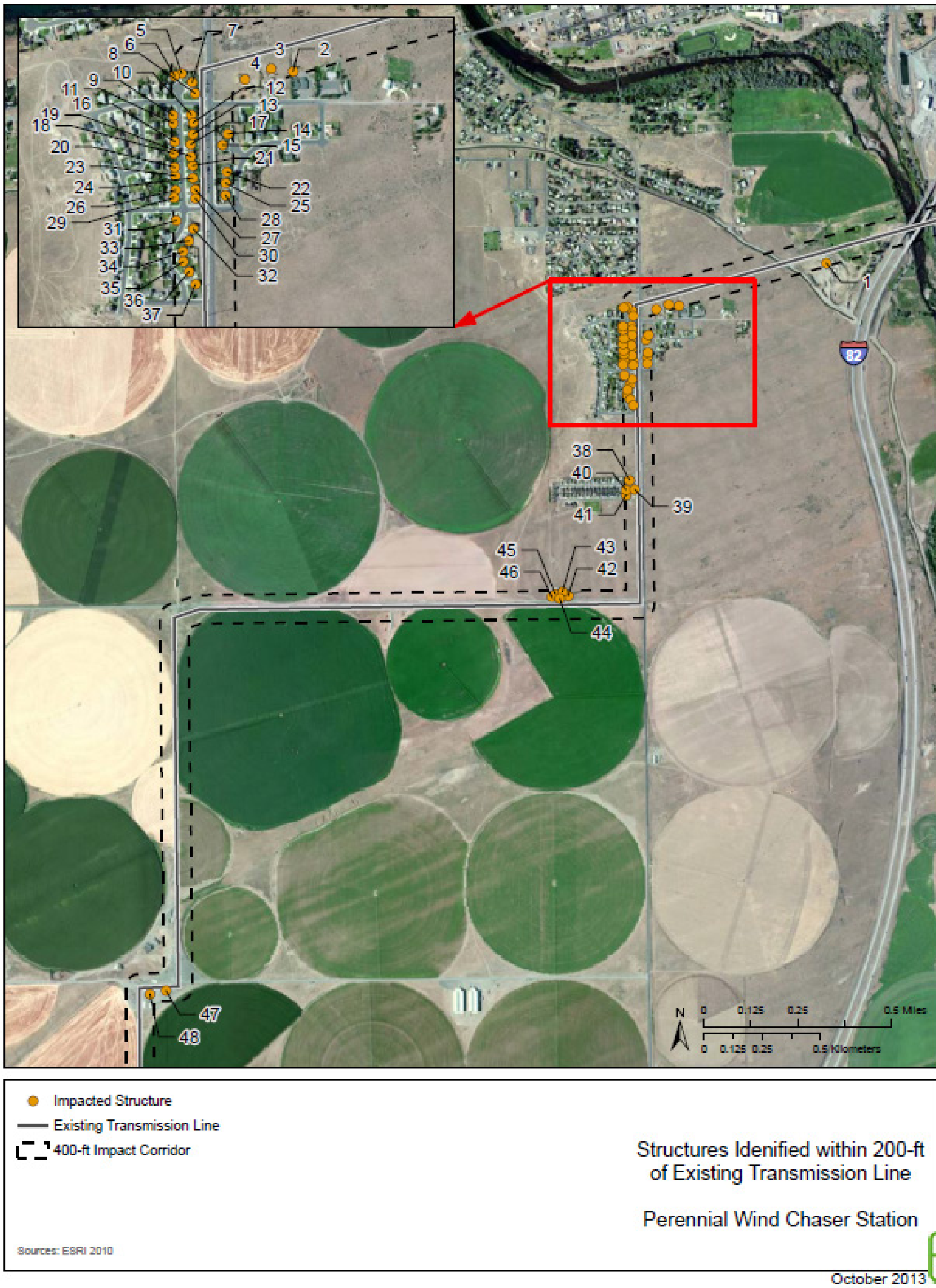


Table 4-1: Structures located within 200 feet of ROW centerline

Perennial Wind Chaser Station			
Existing Transmission Line			
Location No.	Distance from the Centerline (ft)	Building Type	Electric Field Strength (kV/m)
1	156.31 R	Farm Building	0.026
2	173.36 R	Structure	0.022
3	117.75 R	Structure	0.033
4	138.93 R	Structure	0.03
5	131.48 L	Residence	0.031
6	177.90 L	Residence	0.021
7	62.51 L	Residence	0.174
8	45.71 L	Residence	0.431
9	192.16 L	Residence**	0.018
10	72.08 L	Residence	0.089
11	190.47 L	Residence**	0.018
12	60.83 L	Residence	0.174
13	65.15 L	Residence	0.125
14	167.51 R	Residence	0.023
15	130.22 R	Residence	0.031
16	183.48 L	Residence**	0.02
17	78.80 L	Residence	0.063
18	190.81 L	Residence**	0.018
19	78.29 L	Residence	0.063
20	186.88 L	Residence**	0.019
21	68.55 L	Residence	0.125
22	157.15 R	Residence	0.026
23	182.45 L	Residence**	0.02
24	68.62 L	Residence	0.125
25	147.62 R	Residence	0.028
26	185.46 L	Residence**	0.019
27	53.91 L	Residence	0.324
28	145.04 R	Residence	0.028
29	193.84 L	Residence**	0.018
30	53.83 L	Residence	0.324
31	180.76 L	Residence**	0.02
32	70.39 L	Residence	0.089
33	100.71 L	Residence	0.032
34	138.97 L	Residence	0.03
35	138.91 L	Residence	0.03
36	101.48 L	Residence	0.032
37	60.76 L	Residence	0.174

38	126.39 L	Structure	0.032
39	58.30 L	Residence	0.239
40	177.17 L	Residence	0.021
41	177.79 L	Residence	0.021
42	125.92 L	Farm Building	0.032
43	185.73 L	Farm Building	0.019
44	93.73 L	Farm Building	0.174
45	158.01 L	Farm Building	0.026
46	119.01 L	Farm Building	0.032
47	48.50 R	Farm Building	0.427
48	86.88 R	Farm Building	0.035

**Structures that are partially in the study area

5.0 RESULTS

An analysis was performed to determine the electrical effects of replacing the present 115 kV to 230 kV transmission line on the double circuit configured Hermiston to McNary transmission infrastructure. The electric fields, magnetic fields, audible noise, and radio interference strengths were calculated within 200 feet of the ROW centerline with emphasis on the minimum ROW width of 25 feet. The strengths of these effects in relation to the distance to the ROW centerline are shown in Appendix A.

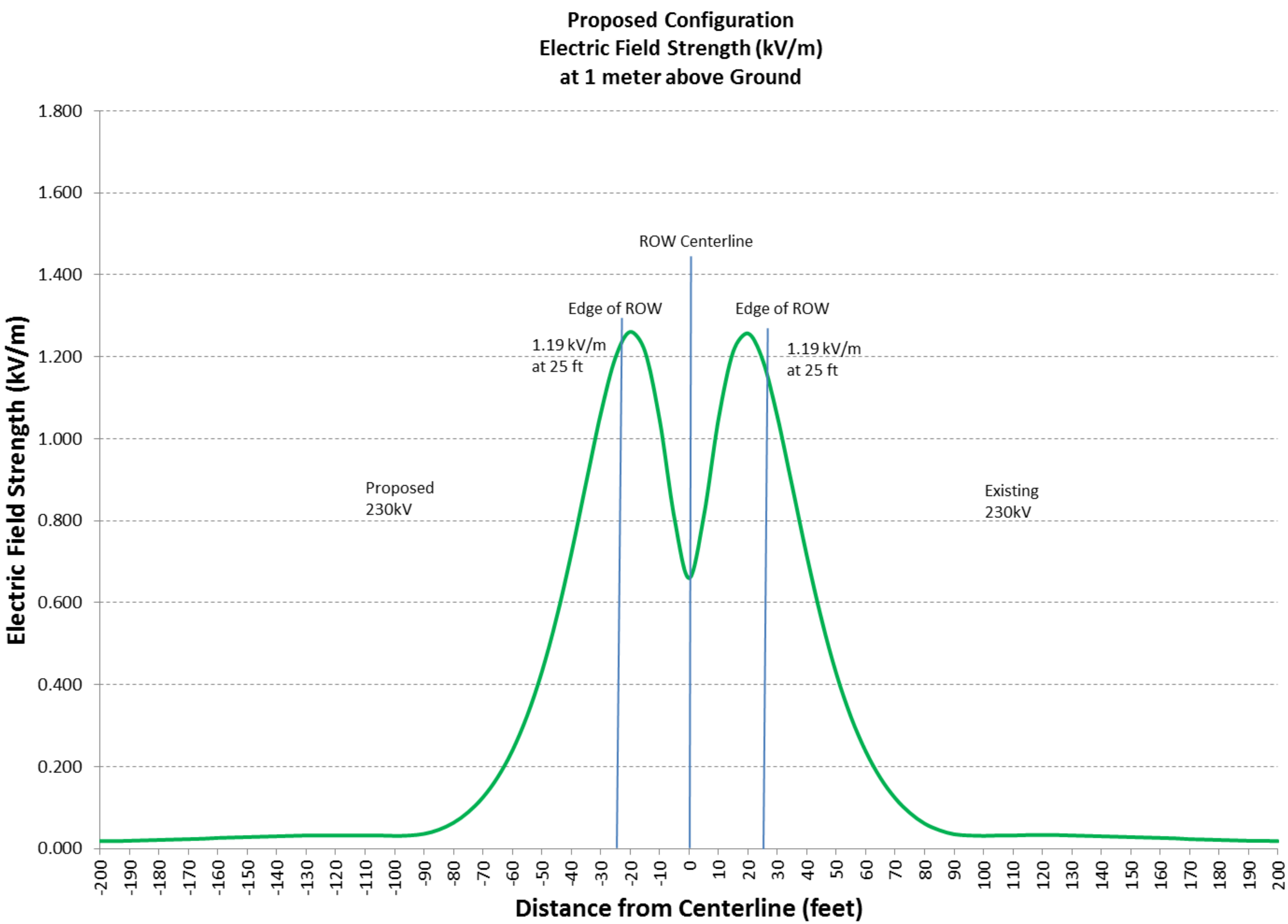
Electric field strength is dependent upon voltage. The proposed line will increase the present voltage on the transmission system and therefore it is anticipated to increase the electric field strength. Using the mitigation techniques and measures, the maximum electric field strength was calculated to be located approximately 20 feet from the ROW centerline with a magnitude of 1.261 kV/m. The electric field strengths at the minimum ROW width of 25 feet was calculated to be 1.19 kV/m. These values were identified to be well below the state of Oregon’s electric field regulation of 9 kV/m (OAR 345-024-0090).

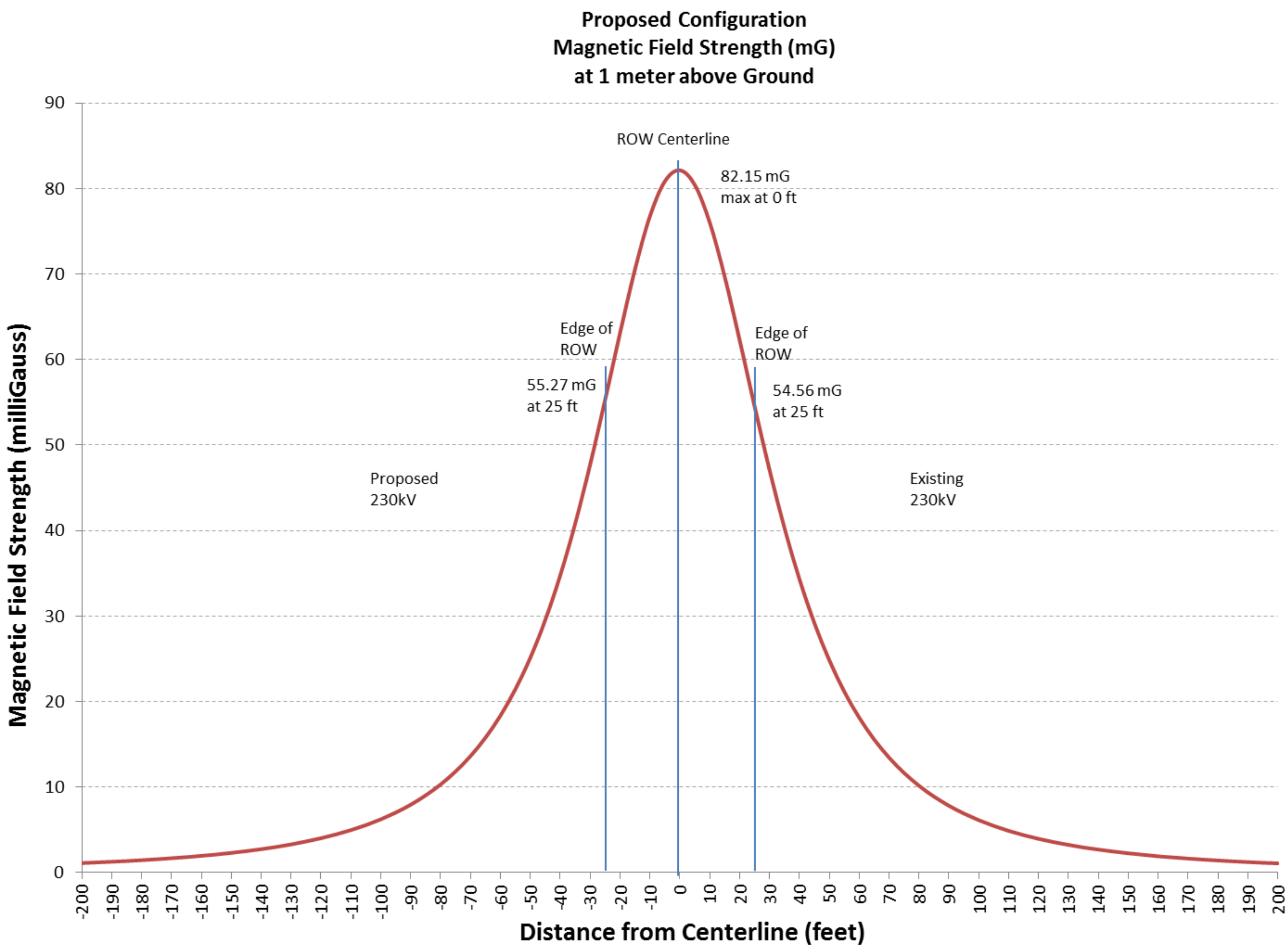
Magnetic field strength is a function of the current or loads on the transmission system. The current was anticipated to be the same on the existing 115 kV line as the 230 kV line, identified to be 925 amperes. Therefore, the magnetic field strength was calculated using the same maximum operating current of 925 amperes as identified for the 115 kV line. This was conservative given that the average loads are anticipated to be less than the maximum operating current. The calculated maximum magnetic field strength within the ROW was 82.15 mG, located at the ROW centerline. The maximum magnetic field strength at the minimum ROW width of 25 feet was calculated to be 54.56 mG.

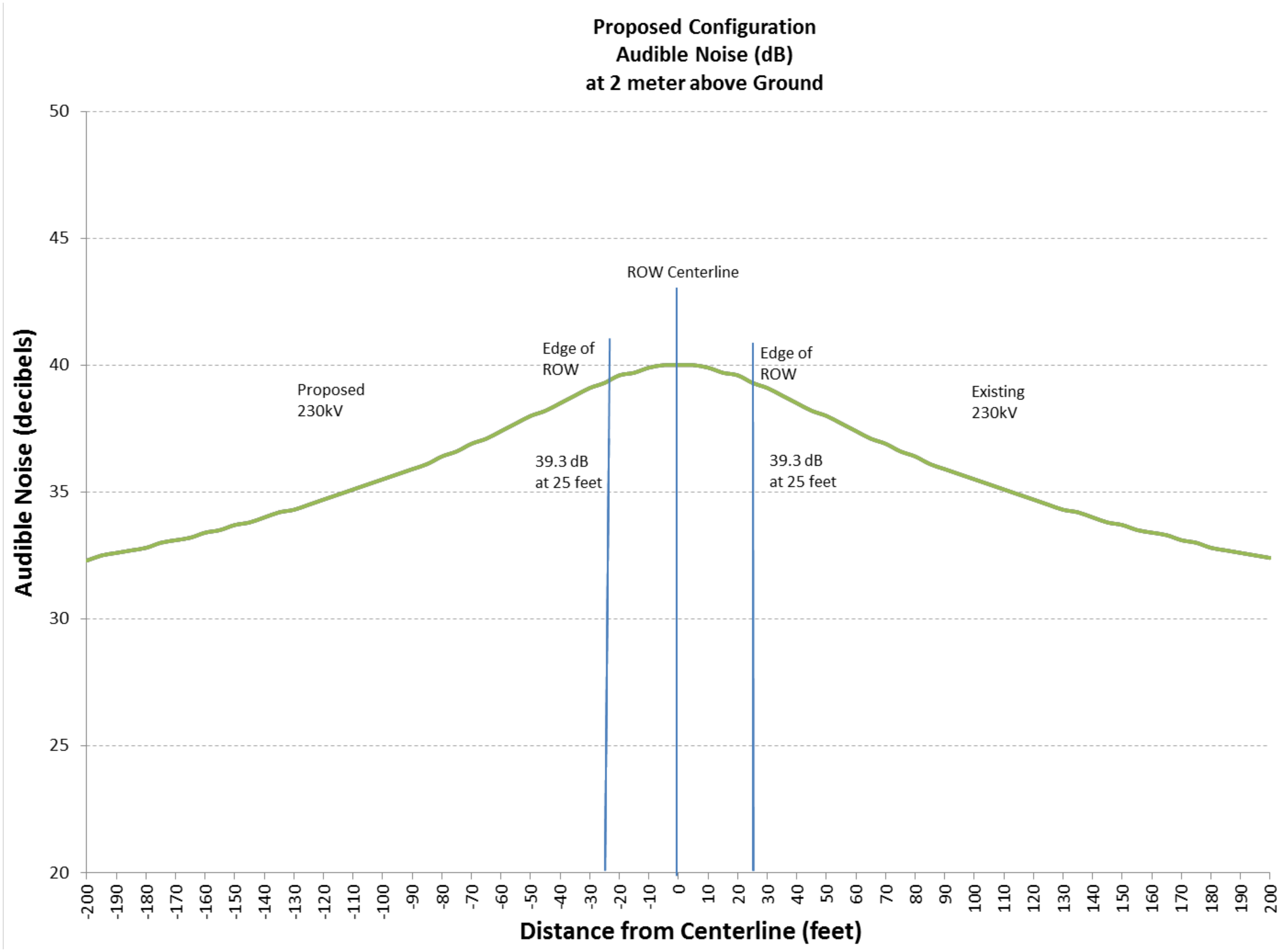
Audible noise and radio interference are related to the electric field strength and the breakdown strength of the surround air. These electrical effects can be minimized by designing the transmission cabling such that enough conductive surface is available to disperse the electric field strength along a segment of cabling. The proposed line is anticipated to be designed using a two-conductor bundle cable design which separates the transmission current to two parallel cables and increases surface area. The audible noise and radio interference strengths were calculated at the minimum ROW width of 25 feet from the ROW centerline at 6.6 feet (2 meters) above ground level to be 39.3 dB and 57.8 dBuv/m, respectively, during wet weather conditions when an increase in water vapor occurred. Using techniques and mitigation measures as described above, the maximum reduction in audible noise and radio interference within reason is anticipated and the nearby highway I-82 and residences are anticipated to experience minimal additional disturbances compared to the existing transmission system.

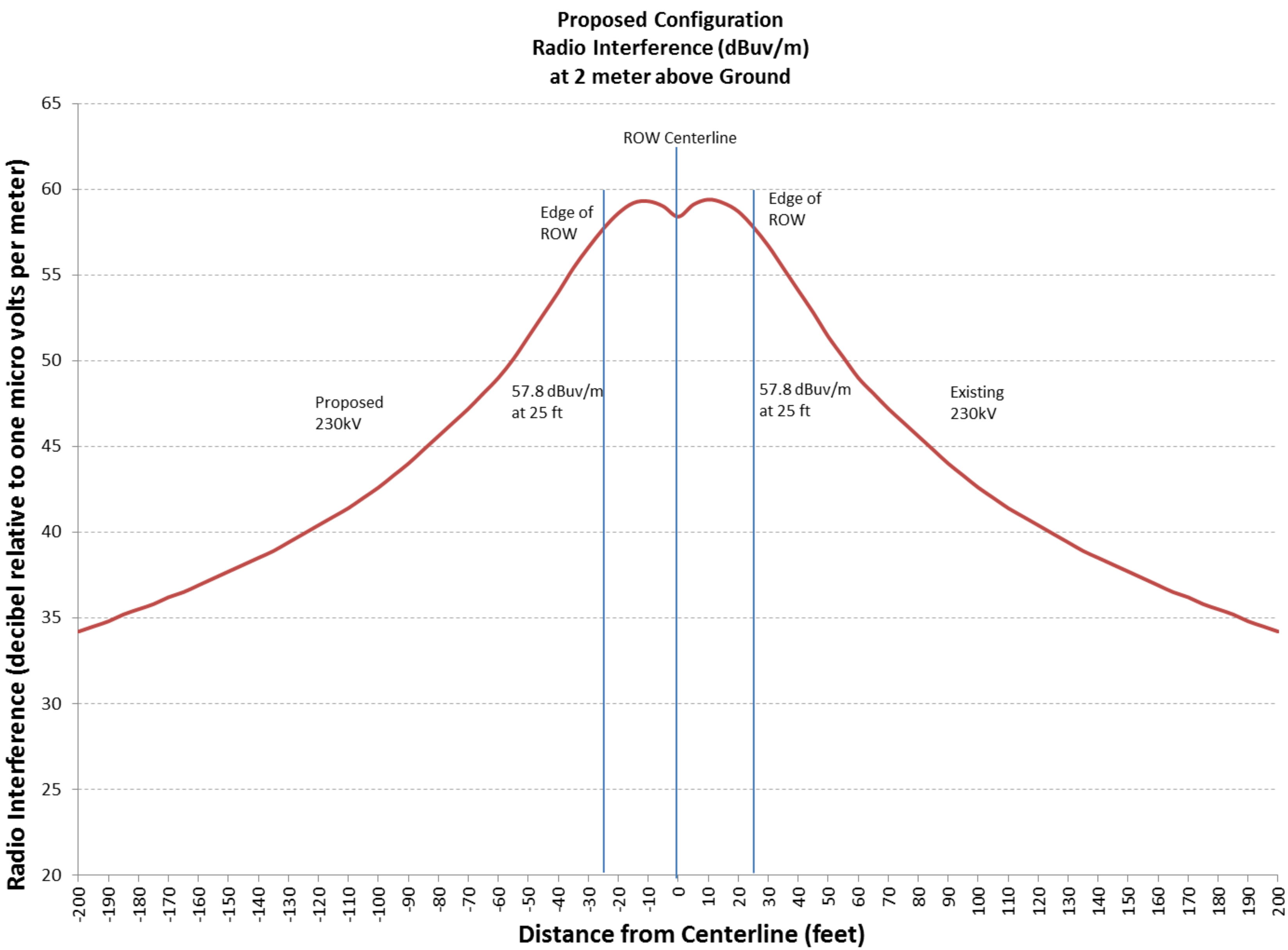
All structures found within and nearby to the ROW boundaries were calculated to experience electrical effects well below the EMF regulations of the state of Oregon. It is noted that the proposed transmission line is expected to produce even lower EMF than calculated because the proposed transmission line is not anticipated to perform with maximum operating current. Furthermore, the mitigation of harmonics in transmission lines is more effective when double circuit transmission lines use similar voltage levels/ratings. Replacement of the 115 kV with a 230 kV transmission line is anticipated to increase harmonic cancelation on the line due to similar electric field strengths between the proposed and existing 230 kV transmission lines. Therefore, structures are expected to experience a minimal increase in electrical field strength and decrease in magnetic field strength due to the implementation of the proposed transmission line, however, without knowledge of the local signal strengths these electrical effects cannot be fully evaluated.

APPENDIX A - ELECTRIC AND MAGNETIC FIELD STRENGTH CHARTS FOR PROPOSED 230 KV AND 230 KV LINE


Proposed Configuration
Electric Field Strength (kV/m)
at 1 meter above Ground
1.800
1.600
1.400
1.200
1.000
0.800
0.600
0.400
0.200
0.000
Electric Field Strength (kV/m)
ROW Centerline
Edge of ROW
Edge of ROW
1.19 kV/m
at 25 ft
1.19 kV/m
at 25 ft
Proposed
230kV
Existing
230kV
-200 -190 -180 -170 -160 -150 -140 -130 -120 -110 -100 -90 -80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200
Distance from Centerline (feet)


Proposed Configuration
Magnetic Field Strength (mG)
at 1 meter above Ground
ROW Centerline
82.15 mG
max at 0 ft
Edge of
ROW
55.27 mG
at 25 ft
Edge of
ROW
54.56 mG
at 25 ft
Proposed
230kV
Existing
230kV
Magnetic Field Strength (milliGauss)
Distance from Centerline (feet)


Proposed Configuration
Audible Noise (dB)
at 2 meter above Ground
Audible Noise (decibels)
50
45
40
35
30
25
20
ROW Centerline
Edge of ROW
Edge of ROW
Proposed 230kV
Existing 230kV
39.3 dB at 25 feet
39.3 dB at 25 feet
-200 -190 -180 -170 -160 -150 -140 -130 -120 -110 -100 -90 -80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200
Distance from Centerline (feet)


Proposed Configuration
Radio Interference (dBuv/m)
at 2 meter above Ground
Radio Interference (decibel relative to one micro volts per meter)
Distance from Centerline (feet)
ROW Centerline
Edge of ROW
Edge of ROW
57.8 dBuv/m at 25 ft
57.8 dBuv/m at 25 ft
Proposed 230kV
Existing 230kV
65
60
55
50
45
40
35
30
25
20
-200 -190 -180 -170 -160 -150 -140 -130 -120 -110 -100 -90 -80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200

APPENDIX B - BPA CORONA AND FIELD EFFECTS PROGRAM RESULTS FOR THE PROPOSED 230 KV AND 230 KV LINES

```
**********************************************
*      C O R O N A   A N D   F I E L D       *
*        E F F E C T S   P R O G R A M       *
*   Source: Bonneville Power Administration  *
**********************************************


  +++++++++++++++++++
  + INPUT DATA LIST +

 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
  10/18/2013            5:37:12 pm
+*** WINDCHASER                        *********************************
+*** 230/230kV Double-circuit Transmission Line, Drake/ACSR Winter Rating
+      1       0       9      12   242.0    2.00    1.00     .00

(ENGLISH UNITS OPTION)

   LINE GRADIENTS COMPUTED BY PROGRAM

PHYSICAL SYSTEM CONSISTS OF  12 CONDUCTORS, OF WHICH   9 ARE ENERGIZED PHASES

+COMB  MF  EF  XX  XX  XX  XX  XX
+   4.921   6.562   9.842    .000   1.000  75.000   3.280   4.000   3.280
+PH.A-1       A   -11.00   37.75    2   1.108    18.00  139.43       .0     .93     .00
+PH.B-1       A   -13.00   51.75    2   1.108    18.00  139.43   -120.0     .93     .00
+PH.C-1       A   -10.50   65.00    2   1.108    18.00  139.43    120.0     .93     .00
+PH.A-2       A    10.50   65.00    2   1.108    18.00  139.43       .0     .93     .00
+PH.B-2       A    13.00   51.75    2   1.108    18.00  139.43   -120.0     .93     .00
+PH.C-2       A    11.00   37.75    2   1.108    18.00  139.43    120.0     .93     .00
+PH.A-3       A    -6.50   33.00    1    .563      .00    7.50       .0     .35     .00
+PH.B-3       A    -3.50   33.00    1    .563      .00    7.50   -120.0     .35     .00
+PH.C-3       A     3.50   33.00    1    .563      .00    7.50    120.0     .35     .00
+GND1-1       A    -5.50   90.00    1    .385      .00     .00       .0     .00     .00
+GND2-1       A     5.50   90.00    1    .385      .00     .00       .0     .00     .00
+GND3-1       A     6.50   33.00    1    .563      .00     .00       .0     .00     .00
+      81  -200.0     5.0
+       0      .0      .0
```

COMBINED OUTPUT OF AUDIBLE NOISE, RADIO INTERFERENCE, TVI, OZONE CONCENTRATION, GROUND GRADIENT AND MAGNETIC FIELD

*** WINDCHASER ********************************
*** 230/230kV Double-circuit Transmission Line, Drake/ACSR Winter Rating

242.0 KV

	DIST. FROM CENTER OF TOWER (FEET)	HEIGHT (FEET)	MAXIMUM GRADIENT (KV/CM)	SUBCON DIAM. (IN)	NO. OF SUBCON	SUBCON SPACING (IN)	VOLTAGE L-N (KV)	PHASE ANGLE (DEGREES)	CURRENT (KAMPS)	CORONA LOSSES (KW/MI)
PH.A-1	-11.00	37.75	13.71	1.11	2.00	18.00	139.43	.00	.925	3.874
PH.B-1	-13.00	51.75	13.50	1.11	2.00	18.00	139.43	-120.00	.925	3.504
PH.C-1	-10.50	65.00	13.29	1.11	2.00	18.00	139.43	120.00	.925	3.162
PH.A-2	10.50	65.00	13.29	1.11	2.00	18.00	139.43	.00	.925	3.162
PH.B-2	13.00	51.75	13.51	1.11	2.00	18.00	139.43	-120.00	.925	3.510
PH.C-2	11.00	37.75	13.73	1.11	2.00	18.00	139.43	120.00	.925	3.904
PH.A-3	-6.50	33.00	4.25	.56	1.00	.00	7.50	.00	.350	.000
PH.B-3	-3.50	33.00	4.49	.56	1.00	.00	7.50	-120.00	.350	.000
PH.C-3	3.50	33.00	.98	.56	1.00	.00	7.50	120.00	.350	.000
GND1-1	-5.50	90.00	2.02	.38	1.00	.00	.00	.00	.000	.000
GND2-1	5.50	90.00	2.02	.38	1.00	.00	.00	.00	.000	.000
GND3-1	6.50	33.00	6.58	.56	1.00	.00	.00	.00	.000	.000

AN MICROPHONE HT.= 4.9 FT, RI ANT. HT.= 6.6 FT, TV ANT. HT.= 9.8 FT, ALTITUDE= .0 FT
RI FREQ= 1.000 MHZ, TV FREQ= 75.000 MHZ, WIND VEL.(OZ) = 2.000 MPH, GROUND CONDUCTIVITY = 4.0 MMHOS /M
E-FIELD TRANSDUCER HT.= 3.3FT, B-FIELD TRANSDUCER HT. = 3.3FT

LATERAL DIST FROM REFERENCE (FEET)	AUDIBLE NOISE (RAIN) L50 DBA	AUDIBLE NOISE (FAIR) L50 DBA	RADIO INTERFERENCE (RAIN) L50 DBUV/M	RADIO INTERFERENCE (FAIR) L50 DBUV/M	TVI TOTAL RAIN DBUV/M	OZONE FOR RAIN RATE OF 1.00 IN/HR AT 0FT PPB	ELECTRIC FIELD KV/M	MAGNETIC FIELD GAUSS
-200	32.3	7.3	34.2	17.2	0.1	0	0.018	0.00111
-195	32.5	7.5	34.5	17.5	0.3	0	0.018	0.00119
-190	32.6	7.6	34.8	17.8	0.5	0	0.019	0.00127
-185	32.7	7.7	35.2	18.2	0.8	0	0.02	0.00135
-180	32.8	7.8	35.5	18.5	1	0	0.021	0.00145
-175	33	8	35.8	18.8	1.3	0	0.022	0.00156
-170	33.1	8.1	36.2	19.2	1.5	0	0.023	0.00168
-165	33.2	8.2	36.5	19.5	1.8	0	0.024	0.00181
-160	33.4	8.4	36.9	19.9	2.1	0	0.026	0.00196
-155	33.5	8.5	37.3	20.3	2.4	0	0.027	0.00212
-150	33.7	8.7	37.7	20.7	2.7	0	0.028	0.00231
-145	33.8	8.8	38.1	21.1	3	0	0.029	0.00251
-140	34	9	38.5	21.5	3.3	0	0.03	0.00274
-135	34.2	9.2	38.9	21.9	3.6	0	0.031	0.003
-130	34.3	9.3	39.4	22.4	3.9	0	0.032	0.0033
-125	34.5	9.5	39.9	22.9	4.3	0	0.032	0.00364
-120	34.7	9.7	40.4	23.4	4.7	0	0.032	0.00402
-115	34.9	9.9	40.9	23.9	5	0	0.032	0.00446
-110	35.1	10.1	41.4	24.4	5.4	0	0.032	0.00497
-105	35.3	10.3	42	25	5.9	0	0.032	0.00555
-100	35.5	10.5	42.6	25.6	6.3	0	0.031	0.00623
-95	35.7	10.7	43.3	26.3	6.7	0	0.032	0.00702
-90	35.9	10.9	44	27	7.2	0	0.036	0.00794
-85	36.1	11.1	44.8	27.8	7.7	0	0.046	0.00903
-80	36.4	11.4	45.6	28.6	8.2	0	0.063	0.01031
-75	36.6	11.6	46.4	29.4	8.8	0	0.089	0.01183
-70	36.9	11.9	47.2	30.2	9.4	0	0.125	0.01363
-65	37.1	12.1	48.1	31.1	10	0	0.174	0.01578
-60	37.4	12.4	49	32	10.7	0	0.239	0.01836
-55	37.7	12.7	50.1	33.1	11.3	0	0.324	0.02145
-50	38	13	51.4	34.4	12.1	0	0.431	0.02514
-45	38.2	13.2	52.7	35.7	12.8	0	0.563	0.02954
-40	38.5	13.5	54	37	13.6	0	0.719	0.03475
-35	38.8	13.8	55.4	38.4	14.4	0	0.891	0.04081
-30	39.1	14.1	56.6	39.6	15.1	0	1.061	0.04771
-25	39.3	14.3	57.7	40.7	15.8	0	1.198	0.05527
-20	39.6	14.6	58.6	41.6	16.3	0	1.261	0.0631
-15	39.7	14.7	59.2	42.2	16.7	0	1.214	0.07056
-10	39.9	14.9	59.3	42.3	16.8	0	1.046	0.07678
-5	40	15	59	42	16.6	0	0.807	0.08086
0	40	15	58.4	41.4	16.2	0.000294	0.66	0.08215
5	40	15	59.1	42.1	16.6	0.007059	0.811	0.08044

10	39.9	14.9	59.4	42.4	16.8	0.025039	1.048	0.07606
15	39.7	14.7	59.2	42.2	16.7	0.047258	1.213	0.06973
20	39.6	14.6	58.7	41.7	16.4	0.068162	1.257	0.0623
25	39.3	14.3	57.8	40.8	15.9	0.088435	1.192	0.05456
30	39.1	14.1	56.7	39.7	15.2	0.114838	1.054	0.04711
35	38.8	13.8	55.4	38.4	14.4	0.144401	0.885	0.04031
40	38.5	13.5	54.1	37.1	13.6	0.172562	0.714	0.03433
45	38.2	13.2	52.8	35.8	12.9	0.196824	0.559	0.02919
50	38	13	51.4	34.4	12.1	0.216122	0.427	0.02484
55	37.7	12.7	50.2	33.2	11.4	0.230442	0.321	0.02118
60	37.4	12.4	49	32	10.7	0.240353	0.237	0.01813
65	37.1	12.1	48.1	31.1	10.1	0.246622	0.172	0.01558
70	36.9	11.9	47.2	30.2	9.4	0.250014	0.123	0.01345
75	36.6	11.6	46.4	29.4	8.9	0.251193	0.087	0.01166
80	36.4	11.4	45.6	28.6	8.3	0.250705	0.061	0.01016
85	36.1	11.1	44.8	27.8	7.8	0.248983	0.045	0.00889
90	35.9	10.9	44	27	7.3	0.246361	0.035	0.00782
95	35.7	10.7	43.3	26.3	6.8	0.243096	0.032	0.00691
100	35.5	10.5	42.6	25.6	6.3	0.239383	0.031	0.00613
105	35.3	10.3	42	25	5.9	0.23537	0.032	0.00546
110	35.1	10.1	41.4	24.4	5.5	0.231168	0.032	0.00488
115	34.9	9.9	40.9	23.9	5.1	0.226861	0.033	0.00438
120	34.7	9.7	40.4	23.4	4.7	0.222512	0.033	0.00395
125	34.5	9.5	39.9	22.9	4.4	0.218167	0.033	0.00357
130	34.3	9.3	39.4	22.4	4	0.213859	0.032	0.00324
135	34.2	9.2	38.9	21.9	3.7	0.209615	0.031	0.00294
140	34	9	38.5	21.5	3.3	0.205452	0.03	0.00269
145	33.8	8.8	38.1	21.1	3	0.201383	0.029	0.00246
150	33.7	8.7	37.7	20.7	2.7	0.197415	0.028	0.00226
155	33.5	8.5	37.3	20.3	2.4	0.193555	0.027	0.00208
160	33.4	8.4	36.9	19.9	2.1	0.189804	0.026	0.00191
165	33.3	8.3	36.5	19.5	1.9	0.186165	0.025	0.00177
170	33.1	8.1	36.2	19.2	1.6	0.182637	0.023	0.00164
175	33	8	35.8	18.8	1.3	0.179219	0.022	0.00152
180	32.8	7.8	35.5	18.5	1.1	0.175908	0.021	0.00142
185	32.7	7.7	35.2	18.2	0.8	0.172703	0.02	0.00132
190	32.6	7.6	34.8	17.8	0.6	0.169601	0.019	0.00123
195	32.5	7.5	34.5	17.5	0.3	0.166598	0.019	0.00115
200	32.4	7.4	34.2	17.2	0.1	0.163691	0.018	0.00108

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EXHIBIT BB

OTHER INFORMATION
OAR 345-021-0010(1)(bb)

TABLE OF CONTENTS

TABLES

BB.1 INTRODUCTION

OAR 345-021-0010(1)(bb) *Any other information that the Department requests in the project order or in a notification regarding expedited review.*

Response: The regulatory information requested by the Oregon Department of Energy (Department) regarding the Perennial Wind Chaser Station project (Project) is addressed in other exhibits of the Application for Site Certificate (ASC). While, in general, agency and public comments are addressed in their corresponding exhibits, specific responses are listed below for additional clarity.

BB.2 INFORMATION REQUESTED IN THE PROJECT ORDER

The Amended Project Order was issued by the Department on September 30, 2013. Note that an earlier Project Order was issued for the Project on February 4, 2013, and responses have covered both Project Orders, where appropriate. The Amended Project Order established the following guidance:

1) *State statutes and rules that must be met for the Council to issue a Site Certificate for the Facility. The agencies implementing the state statutes and rules include:*

   (a) Oregon Department of Energy, Energy Facility Siting Council (Council): Council statutes and regulations are addressed throughout the ASC.

   (b) Oregon Department of Agriculture, Plant Division, Native Plant Conservation Program: Applicable requirements are addressed in Exhibit Q – Threatened and Endangered Species.

   (c) Oregon Department of Environmental Quality (DEQ), Air Quality Division: DEQ's air quality program is federally delegated; therefore, pursuant to Oregon Revised Statutes (ORS) 469.503(3), the Council does not have jurisdiction to determine compliance with those standards. A copy of Perennial-WindChaser LLC's (Perennial's) application to DEQ for an Air Contaminant Discharge Permit is included in Exhibit E – Permits.

   (d) Oregon Department of Environmental Quality, Water Quality Division: DEQ's Water Quality Division administers the National Pollutant Discharge Elimination System (NPDES) program under authority delegated by the U.S. Environmental Protection Agency. Therefore, under ORS 469.503(3) the Council does not have jurisdiction to determine compliance with rules of DEQ's NPDES program. Perennial has included a copy of its NPDES 1200-C permit application in Exhibit I – Soils. DEQ's Water Quality Division also issues Water Pollution Control Facilities

(WPCF) permits and Onsite Sewage Treatment System permits; these are not federally delegated permit programs and are within the Council's jurisdiction. Perennial intends to rely on a WPCF permit issued to Lamb Weston, as discussed in Exhibit V – Solid Waste and Wastewater. Perennial is seeking an Onsite Sewage Treatment System Permit to manage sanitary waste. Exhibit V – Solid Waste and Wastewater addresses the standards for issuance of that permit.

(e) Oregon Department of Environmental Quality, Land Quality Division: Issues regarding land quality are addressed in Exhibit E – Permits, Exhibit G – Materials Analysis, Exhibit I – Soils, and Exhibit V – Solid Waste and Wastewater.

(f) Oregon Department of Environmental Quality – Noise Control Regulations: Compliance with DEQ's noise control regulations is addressed in Exhibit X – Noise.

(g) Oregon Department of Fish and Wildlife (ODFW): Compliance with applicable requirements of the ODFW is addressed in Exhibits P – Fish and Wildlife Habitat and Q – Threatened and Endangered Species.

(h) Oregon Department of Geology and Mineral Industries: Requirements are addressed in Exhibit H - Geology.

(i) Oregon Parks and Recreation Department, State Historic Preservation Office: Requirements are addressed in Exhibit S – Cultural Resources.

(j) Oregon Department of State Lands (DSL) – Removal-Fill Authorizations: The Project does not require removal-fill authorization from DSL, as addressed in Exhibit J – Jurisdictional Wetlands.

(k) Oregon Water Resources Department, Water Rights/Adjudications Division: The Project does not require a new water right. Water sources are addressed in Exhibit O – Water Use.

(l) Oregon Department of Land Conservation and Development (DLCD): The applicable rules of DLCD are addressed in Exhibit K – Land Use.

(m) Oregon Department of Transportation: Regulations and concerns are addressed in Exhibits E — Permits and U – Public Services.

Response: Perennial will comply with all appropriate state statutes and rules implemented by the above agencies, as demonstrated by the information provided in the various exhibits to this ASC.

2) *Requirement for evidence of consultation with affected tribes;*

Response: Consultation with affected tribes is addressed in Exhibit S – Cultural Resources.

3) *Applicable Local Government Ordinances-Applicable substantive criteria from the Umatilla County and City of Umatilla zoning ordinances, comprehensive plans and directly applicable statutes and administrative rules;*

Response: Refer to the comprehensive discussion and responses to these criteria in Exhibit K – Land Use.

4) *Other Construction-Related Regulations*

Response: As indicated in the Project Order, pursuant to ORS 469.401(4) the site certificate does not address construction-related regulations. The Project Order also notes that the Council's rules include as a mandatory condition of the site certificate a requirement that Perennial must have construction rights on the property before beginning construction. Perennial does not anticipate difficulty in complying with this requirement. Perennial has an option to purchase the land utilized for the Perennial Wind Chaser Station (Station). Perennial will obtain rights-of-way (ROWs) for the Project's step-up substation and underground electrical lines from the Bonneville Power Administration and from the U.S. Army Corps of Engineers. Perennial will assist Umatilla Electric Cooperative in obtaining any necessary ROW for the transmission line and Cascade Natural Gas Corporation in obtaining any necessary ROW for the natural gas pipeline.

5) *Applicable requirements from OAR Chapter 345, Division 21: All exhibits apply except N.*

Response: The exhibits in this ASC provide information regarding these requirements as they pertain to individual resources.

6) *Analysis areas for the Proposed Facility.*

Response: The analysis area required for each affected standard or resource is noted in the applicable exhibits.

7) *Comments from Reviewing Agencies and the Public.*

Response: The Amended Project Order summarized comments from the public. Responses to these summary comments are provided in Table BB-1, as well as in other exhibits contained in this ASC. Comments from agency reviewers and other governmental organizations that were provided to Perennial have been reviewed and are addressed in the applicable exhibits. A public comment received in response to the third Notice of Intent has been added to the end of the table.

Table BB-1 Summary of Public Comments and Applicant Responses on the Perennial Wind Chaser Station

Comment	Response
Comments Related to Land Use (OAR 345-022-0030)	
Impacts to agricultural lands and agricultural operations should be avoided. *Comment from Ms. Dixie D. Echeverria, Treasurer, ELH, LLC.*	Perennial is minimizing impacts to agricultural lands and operations by utilizing existing transmission towers on EFU lands and siting the natural gas pipeline entirely within the ROW for the pipeline serving the Hermiston Generating Plant. Impacts to agricultural lands and operations are addressed in Exhibit I – Soils and Exhibit K – Land Use.
Transmission lines associated with the facility should be sited to avoid impacts to center-pivot irrigation, use of aerial spraying equipment, use of large agricultural equipment, and field mowing practices. *Comments from Mr. Craig Coleman. Comment from Mr. Justin Burns on behalf of Windy River and L&L Farms, LLC.*	Perennial is no longer considering the transmission line route that elicited this comment. An existing transmission line will be reconductored to transmit power to the BPA McNary Substation. Approximately six new poles will be required for the inter-tie to the existing transmission line with four of the poles on the Station site. A new step-up substation will be constructed immediately south of the McNary Substation, and an underground electrical line will connect the substations. There will be no new impacts to agricultural operations, including center-pivot irrigation, from the reconductored transmission line.
The natural gas supply line should be located to minimize impacts to residences and farm operations. *Comment from Ms. Dixie D. Echeverria, Treasurer, ELH, LLC.*	The natural gas pipeline will be located entirely within the existing 50-foot-wide ROW for the gas pipeline serving the Hermiston Generating Plant to minimize the impact on nearby residences and agricultural areas. The pipeline will be below ground; therefore, all impacts of construction will be temporary.
The transmission line associated with the proposed facility would have significant impacts on a current aggregate mining operation. *Comment from Mr. and Mrs. Wade and Debora Aylett.*	Perennial is no longer considering the transmission line that which would affect the aggregate mining operation.
Induced currents associated with the proposed transmission lines may corrode metal pipelines and parts associated with irrigation systems. *Comment from Mr. Justin Burns on behalf of Windy River and L&L Farms, LLC.*	The Council's standards for transmission lines, OAR 345-024-0090, address induced currents; the Project complies with those standards, as discussed in Exhibit AA – Electric Magnetic Fields.

Table BB-1 Summary of Public Comments and Applicant Responses on the Perennial Wind Chaser Station

Comment	Response
Comments Related to Fish and Wildlife Habitat (OAR 345-022-0060)	
Ground disturbance associated with the project could result in habitat loss, erosion, water pollution, and spread of noxious weeds. *Comment from Mr. Doug Heiken, Oregon Wild.*	Temporary and permanent ground disturbance and potential associated impacts are addressed in Exhibit I – Soils, the NPDES 1200-C application to DEQ (included for informational purposes in Exhibit I – Soils), and Exhibit P – Fish and Wildlife Habitat. A Revegetation and Noxious Weed Control Plan is included with Exhibit P – Fish and Wildlife Habitat.
Impacts to fish and wildlife should be considered, including birds that may collide with the emissions stack or transmission lines. *Comment from Mr. Doug Heiken, Oregon Wild.*	Impacts to fish and wildlife are addressed in Exhibits P – Fish and Wildlife Habitat and Q – Threatened and Endangered Species. Construction of the natural gas pipeline will not cross any fish-bearing streams. Impacts to birds from reconductoring the existing transmission line will be minimized by complying with the Avian Protection Plan Guidelines (APLIC and USFWS 2005).[1] Although there may be bird collisions with the emission stacks, such incidents are anticipated to be low since the ongoing industrial activities would act as a deterrent to bird use.
Comments Related to Public Services (OAR 345-022-0110)	
Potential groundwater drawdown could affect local water supply systems from the additional water needs of the proposal. *Comment from Mr. Doug Heiken, Oregon Wild.*	The source of the process water is the Port of Umatilla, which will utilize the Columbia River to supply the Station. No significant groundwater usage is anticipated for the operation of the Station. Groundwater may be used for the Station's domestic system, but since the operational staff is expected to be less than 10 full-time personnel, the use of ground water will be minimal. Additional information and discussion is included in Exhibit O – Water Use.
The proposed transmission lines could result in impacts to transportation systems and traffic safety. *Comment from Mr. Justin Burns on behalf of Windy River and L&L Farms, LLC.*	Perennial is no longer considering the transmission line route that elicited this comment. The transmission line now associated with the Station is an existing transmission line that will be reconductored for substantially all of the distance; thus, impacts to transportation systems and traffic safety will not be any greater than those currently existing.

[1] The Edison Electric Institute's Avian Power Line Interaction Committee and U.S. Fish and Wildlife Service (APLIC and USFWS). 2005. Avian Protection Plan (APP) Guidelines. Available at: http://www.aplic.org/uploads/files/2634/APPguidelines_final-draft_Aprl2005.pdf. Accessed on October 10, 2013.

Table BB-1 Summary of Public Comments and Applicant Responses on the Perennial Wind Chaser Station

Comment	Response
Comments Related to Public Health and Safety (ORS 469.310)	
Water vapor from the proposed cooling towers will reduce visibility for the Hermiston Airport and will reduce use of the airport overall. Reduced visibility could also affect vehicle traffic on nearby roadways. *Comment from Mr. Chester Prior.*	Analysis of the impact of the cooling tower plume is presented in Exhibit Z – Cooling Tower, which shows minimal impact to the Hermiston Airport and to vehicle traffic on nearby roads. Staff at the Hermiston Airport and at the Oregon Department of Aviation were contacted regarding these studies.
Comments Related to Air Quality	
Relying on fossil fuels for energy produces greenhouse gases and contributes to global climate change. *Comment from Mr. Doug Heiken, Oregon Wild.*	The statutes and rules governing issuance of a site certificate address greenhouse gases and the potential for climate change exclusively through the carbon dioxide emissions standard of ORS 469.503(2) and the Council's implementing rules at OAR 345-024-0500 through 345-024-0720. The Project's compliance with those standards is addressed in Exhibit Y – Carbon Dioxide Emissions. The Council does not have jurisdiction to determine compliance with greenhouse gas rules implemented by DEQ under federally delegated authority. The Project will be utilizing Best Available Control Technology (BACT) to minimize the greenhouse gas emissions. The air permit application, which is included in Exhibit E – Permits for informational purposes, discusses the BACT review.
Visibility in the Columbia Gorge National Scenic Area could be further impaired by emissions from the proposed facility. Additional acid deposition would impact scenic, natural, cultural, and recreational resources in the Columbia River Gorge. *Comment from Mr. Richard Till, Conservation Legal Advocate, Friends of the Columbia Gorge.* *Comment from Mr. Doug Heiken, Oregon Wild.*	The Council does not have jurisdiction over air quality issues addressed by DEQ regulations. Both visibility and acid deposition are reviewed in the air permit application submitted to DEQ, which is included for informational purposes in Exhibit E – Permits. The emissions of the Project are not expected to degrade or impair the resources of the Columbia River Gorge.

Table BB-1 Summary of Public Comments and Applicant Responses on the Perennial Wind Chaser Station

Comment	Response
Other Issues of Concern	
Perennial may not have a legal right to develop transmission facilities within an existing easement. *Comment from Ms. Dixie D. Echeverria, Treasurer, ELH, LLC.*	The Council's rules regarding issuance of a site certificate do not require that the applicant demonstrate, as part of the ASC, that the applicant has all property rights necessary to construct and operate the energy facility and its related or supporting facilities. A mandatory site certificate condition, OAR 345-027-0020(5), generally requires that a certificate holder may not begin construction, as defined in OAR 345-001-0010, until it has construction rights on all parts of the site. Perennial will comply with that mandatory condition.
The facility could operate at more than the 5,000 hours stated in the NOI. *Comment from Mr. Phil Sharkey.*	The Station will be a "non-base load power plant" designed to operate at variable loads. Under OAR 345-001-0010(40), the Station must be limited by its site certificate to an average number of hours of operation per year of not more than 6,600 hours, "determined by dividing the actual annual electric output of the facility in megawatt-hours by the facility's nominal electric generating capacity in megawatts." Under that definition, the Station can qualify as a "non-base load power plant" even if it is in operation more than 6,600 hours per year, because it will operate at variable (and often less than full) load.
Electromagnetic fields associated with the proposed transmission lines may negatively impact crop production and result in food safety issues. *Comment from Mr. Justin Burns on behalf of Windy River and L&L Farms, LLC.*	Compliance with the Council's standards for transmission lines, OAR 345-024-0090, is addressed in Exhibit AA – Electric Magnetic Fields.
Comments regarding the proposed transmission lines to the Longhorn Substation. *Comments from Mr. Justin Burns on behalf of Windy River and L&L Farms, LLC. Comments from Mr. Craig Coleman. Comment from Mr. Robert Lamb. Comments from Mr. and Mrs. Wade and Debora Aylett. Comments from Mr. and Mrs. Maurice and Lucy Ziemer.*	Perennial is no longer considering a new transmission line to the Longhorn Substation.

Table BB-1 Summary of Public Comments and Applicant Responses on the Perennial Wind Chaser Station

Comment	Response
Concern that the construction work and resulting facilities in proximity to the transmission line may cause any derate, planned outage, or other loss of line utilization of the 230-kV line used to deliver the existing generation to McNary. *Comment from Mr. Jack Podlesnik, Director, Transmission Planning & Capital Investment, PacifiCorp.*	Perennial expects that the reconductoring of the transmission line will be fully constructed so that Umatilla Electric Cooperative will be able to perform the electrical cutover from the existing line to the new one in a short timeframe so there will be very minimal impact to the existing generation being delivered to McNary.

Key:

BACT	Best Available Control Technology
BPA	Bonneville Power Administration
Council	Oregon Energy Facility Siting Council
DEQ	Oregon Department of Environmental Quality
EFU	Exclusive Farm Use
kV	kilovolt
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
OAR	Oregon Administrative Rules
ORS	Oregon Revised Statutes
ROW	right-of-way
Station	Perennial Wind Chaser Station

EXHIBIT CC

ADDITIONAL STATUTES, RULES AND ORDINANCES

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

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TABLES

CC.1 INTRODUCTION

OAR 345-021-0010(1)(cc) *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.*

CC.2 APPLICABLE STATUTES, RULES, AND ORDINANCES

Response: Table CC-1 lists state statutes and administrative rules, not listed in Exhibit E – Permits, that contain standards or criteria that must be met in order for the Energy Facility Siting Council to issue a Site Certificate for the Perennial Wind Chaser Station project. All applicable local ordinances related to permits required for the facility are listed in Exhibit E – Permits.

Table CC-1 Applicable State Statutes and Administrative Rules for the Perennial Wind Chaser Station Project

State Statutes/Administrative Rules	Administering Agency	Compliance Issue	Associated Exhibit
Noise			
ORS Chapter 467 OAR Chapter 340, Division 35	Department of Environmental Quality	DEQ Noise Standard Compliance	Exhibit X – Noise
Fish and Wildlife			
ORS Chapters 496 and 506	Department of Fish and Wildlife	Oregon Habitat Conservation Compliance	Exhibits J – Jurisdictional Wetlands, P – Fish and Wildlife Habitat, and Q – Threatened and Endangered Species
OAR Chapter 635, Division 100		ODFW Habitat Mitigation Policy Compliance	
OAR Chapter 635, Division 415		Fish Screening Requirements	

Table CC-1 Applicable State Statutes and Administrative Rules for the Perennial Wind Chaser Station Project

State Statutes/Administrative Rules	Administering Agency	Compliance Issue	Associated Exhibit
Threatened & Endangered Plant Species			
ORS Chapter 564 OAR Chapter 603, Division 73	Department of Agriculture	State and federal threatened and endangered species protection and compliance programs	Exhibit Q – Threatened and Endangered Species
Water Quality			
OAR 340 Divisions 14, 41, and 55	Department of Environmental Quality	DEQ Water Quality Standard Compliance	Exhibit O – Water Use
Hazardous Waste			
ORS Chapters 465 and 466 OAR Chapter 340, Division 100-113	Department of Environmental Quality	DEQ Hazardous Waste Management Compliance	Exhibit G – Material Analysis
Solid Waste			
ORS Chapter 459 OAR Chapter 340, Division 93	Department of Environmental Quality	DEQ Solid Waste Management Compliance	Exhibit V – Solid Waste and Wastewater
Water Rights			
ORS Chapters 537 and 540 OAR Chapter 690	Oregon Water Resources Department	Water Rights Management Compliance	Exhibit O – Water Use
Geology			
OAR Chapter 632	Department of Geology and Mineral Industries	Geologic Impact Review	Exhibits H – Geology and I – Soils
Fire Marshal			
ORS Chapter 453 OAR Chapter 837, Division 85	Oregon Office of State Fire Marshal	Hazardous Material Management Compliance	Exhibit G – Material Analysis
Historic Preservation			
ORS Sections 97.740-97.760	State Historic Preservation Office, State Parks and Recreation Department	Historic, Cultural or Archeological Resources Site Assessment	Exhibit S – Cultural Resources
ORS Sections 358.905-358.955 *ORS Section 390.235* OAR Chapter 736, Division 51		Recreational Opportunities Site Assessment	

Table CC-1 Applicable State Statutes and Administrative Rules for the Perennial Wind Chaser Station Project

State Statutes/Administrative Rules	Administering Agency	Compliance Issue	Associated Exhibit
Wetlands			
ORS Chapters 273 and 274 OAR Chapter 141	Oregon Division of State Lands	Wetlands Review	Exhibit J – Jurisdictional Wetlands,
Land Use			
ORS Chapter 197	Department of Land Conservation and Development	Statewide Land Use Goals	Exhibit K – Land Use
OAR Chapter 660			
OAR 660-033-0090, Agricultural Lands			
OAR 660-033-0100, Agricultural Lands			
OAR 660-033-0120, Agricultural Lands			
660-015-0000(1), Statewide Land Use Goal 1, Citizen Involvement			
660-015-0000(2), Statewide Land Use Goal 2, Land Uses			
660-015-0000(3), Statewide Land Use Goal 3, Agricultural Lands			
660-15-0000(5), Statewide Land Use Goal 5, Natural Resources, Scenic and Historic Areas and Open Spaces			
660-015-0000(6), Statewide Land Use Goal 6, Air, Water and Land Resource Quality			
660-015-0000(7), Statewide Land Use Goal 7, Areas Subject to Natural Hazards			
660-015-0000(8), Statewide Land Use Goal 8, Recreational Needs			
660-015-0000(9), Statewide Land Use Goal 9, Economic Development			
660-015-0000(10), Statewide Land Use Goal 10, Housing			
660-015-0000(11), Statewide Land Use Goal 11, Public Facilities and Services			
660-015-0000(12) Statewide Land Use Goal 12, Transportation			
660-015-0000(13), Statewide Land Use Goal 13, Energy Conservation			
660-015-0000(14), Statewide Land Use Goal 14, Urbanization			
ORS 215.275, Utility Facilities Necessary for Public Service			

Key:

DEQ	Oregon Department of Environmental Quality	ODFW	Oregon Department of Fish and Wildlife
OAR	Oregon Administrative Rules	ORS	Oregon Revised Statutes

Perennial has reviewed the statutes and rules implemented by the Oregon Department of Aviation. Under Oregon Revised Statutes (ORS) 836.616 and 836.619, the Oregon Land Conservation and Development Commission (LCDC), in consultation with the Oregon Department of Aviation, must adopt rules for airports and compatibility of uses near airports, and local governments must amend their comprehensive plan and land use regulations consistent with those rules. The statute does not directly regulate land uses; that occurs only when local governments amend their comprehensive plans and land use regulations. Similarly, LCDC's "Airport Planning Rule" (Oregon Administrative Rules [OAR] 660, Division 13), which implements ORS 836.616 and 836.619, does not directly regulate airports or land uses near airports; rather, the requirements of the Airport Planning Rule affect land uses near airports only when the local government adopts comprehensive plan and land use regulations provisions to implement the Airport Planning Rule.

ORS 836.535 prohibits hazards to air navigation, and is implemented by the Oregon Department of Aviation's rules on "Physical Hazards to Air Navigation" in OAR 738, Division 70. The statute, however, expressly exempts facilities that apply to the Federal Aviation Administration or EFSC for approval.

CC.3 EMERGENCY RESPONSE

Response: State and federal provisions include requirements for responding to, or reporting, spills or releases of various hazardous materials under a variety of circumstances or conditions. These statutes and rules include the following: ORS 466.635; OAR Chapter 340 Divisions 45, 47, 108, 122, 150, and 160; 33 Code of Federal Regulations (CFR) Part 153; and 40 CFR Parts 68, 110, 122, 262, 265, 280, 302, 355, and 761. In the event of a release, the Applicant will inform the Oregon Emergency Management Division, the Oregon Department of Environmental Quality, and/or the Oregon Department of State Police, depending on the nature of the release.

EXHIBIT DD

OTHER SPECIFIC STANDARDS

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

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DD.1 INTRODUCTION

The following information is provided in response to other standards adopted by the Council to address specific types of energy facilities.

DD.2 OTHER SPECIFIC STANDARDS

OAR 345-021-0010(1)(dd) *If the proposed facility is a facility for which the Council has adopted specific standards, information about the facility providing evidence to support findings by the Council as required by the following rules:*

DD.2.1 Wind Energy Facilities

OAR 345-021-0010(1)(dd)(A) *For wind energy facilities, OAR 345-024-0010 and -0015.*

Response: Perennial-WindChaser LLC is not proposing to build a wind energy facility. Therefore, Oregon Administrative Rule (OAR) 345-021-0010(1)(dd)(A) does not apply.

DD.2.2 Gas Facilities

OAR 345-021-0010(1)(dd)(B) *For surface facilities related to underground gas storage reservoirs, OAR 345-024-0030, including information required by OAR 345-021-0020.*

Response: The Perennial Wind Chaser Station project (Project) does not include underground gas storage reservoirs. Therefore, OAR 345-021-0010(1)(dd)(B) does not apply.

DD.2.3 Transmission Lines Under Council Jurisdiction

OAR 345-021-0010(1)(dd)(C) *For any transmission line under Council jurisdiction, OAR 345-024-0090.*

Response: The Project does not include a transmission line that meets the definition of an "energy facility" as defined in Oregon Revised Statutes 469.300(11)(a)(C). However, the proposed 230-kilovolt transmission line is a "related or supporting facility" under Council jurisdiction, and therefore is subject to the Council's standards under OAR 345-024-0090. Compliance with those standards is addressed in Exhibit AA – Electric Magnetic Fields.