Exhibit F

Property Owners of Record

Wheatridge Wind Energy Facility
June 2019

Prepared for

NEXTera ENERGY RESOURCES

Prepared by

TETRA TECH

Tetra Tech, Inc.

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Attachment F-1. Owners of Record within 500 Feet of the Site Boundary

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1.0 Introduction

As part of Request for Amendment 4 to the Wheatridge Wind Energy Facility (Facility) Site Certificate, Wheatridge Wind Energy, LLC (Certificate Holder) is proposing to add photovoltaic solar energy generation to the Facility to provide an integrated, renewable energy facility with both wind and solar energy generation and energy storage (see Exhibit B for a detailed description). Exhibit F provides taxlot information for the Facility and related and participating landowners, as required by Oregon Administrative Rule (OAR) 345-021-0010(1)(f).

2.0 Property Owner Contact Information – OAR 345-021-0010(1)(f)(A)(B)(C)

A list of the names and mailing addresses of all owners of record, as shown on the most recent property tax assessment roll, of property located within or adjacent to the site boundary as defined in OAR 345-001-0010. The applicant shall submit an updated list of property owners as requested by the Department before the Department issues notice of any public hearing on the application for a site certificate as described in 345-015-0220. In addition to incorporating the list in the application for a site certificate, the applicant shall submit the list to the Department in an electronic format approved by the Department. Property adjacent to the site boundary means property that is:

OAR 345-021-0010(1)(f)(A) Within 100 feet of the site boundary where the site, corridor or micrositing corridor is within an urban growth boundary.

OAR 345-021-0010(1)(f)(B) Within 250 feet of the site boundary where the site, corridor or micrositing corridor is outside an urban growth boundary and not within a farm or forest zone.

OAR 345-021-0010(1)(f)(C) Within 500 feet of the site boundary where the site, corridor or micrositing corridor is within a farm or forest zone.

The Certificate Holder has provided the names and addresses of all owners of record from the most recent property tax assessment roll in Attachment F-1, which has also been provided as a Microsoft Excel file. A map showing these taxlots has been provided as part of Figure F-1.

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Figures

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Wheatridge Wind Energy Facility Request for Amendment 4

Figure F-1 Taxlots Adjacent to Site Boundary

MORROW AND UMATILLA COUNTIES, OR

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Figure F-1.4
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Figure F-1.6
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Figure F-1.9
Figure F-1.10
Figure F-1.11
Figure F-1.12
Figure F-1.13
Figure F-1.14
Figure F-1.15
Figure F-1.16
Figure F-1.17
Figure F-1.18

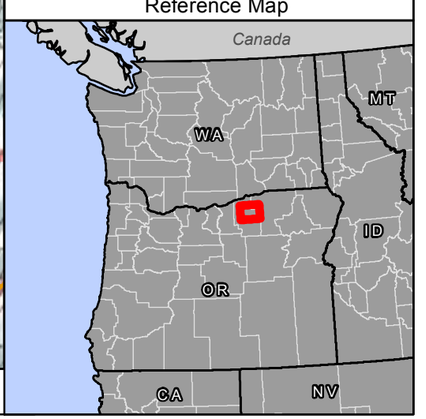
Morrow County
Umatilla County

- Approved Site Boundary (Approved Wind Micrositing Corridors)
- Amended Site Boundary (Proposed Solar Micrositing Corridors)
- Leased Parcels *
- Morrow County Taxlot
- Umatilla County Taxlot
- Township/Range
- County Boundary
- Map Grid
- State Highway

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Reference Map



1:140,000 WGS 1984 UTM Zone 11N

0 0.5 1 2 3 4 Miles

NOT FOR CONSTRUCTION

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Wheatridge Wind Energy Facility Request for Amendment 4

Figure F-1.1 Taxlots Adjacent to Site Boundary

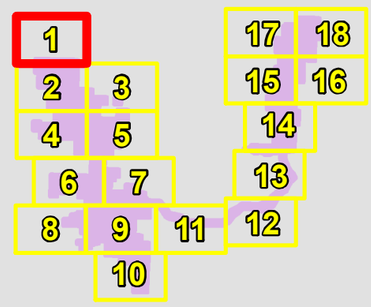
MORROW AND UMATILLA COUNTIES, OR

- Approved Site Boundary (Approved Wind Micrositing Corridors)
- Leased Parcels *
- Morrow County Taxlot
- Local Road
- Township/Range
- County Boundary
- Map Grid

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Reference Map



T2N R26E

Bombing Range Rd

02N25E000000200

02N26E000000500

Well Spring Rd

Immigrant Ln

Wells Springs Rd

02N25E000000500

Grieb-Wood Rd

02N25E000000400

02N26E000001200

T2N R25E

Figure F-1.1
Figure F-1.2

Figure F-1.2

Figure F-1.3

1:24,000 WGS 1984 UTM Zone 11N

0 0.5 1 2 3 Miles

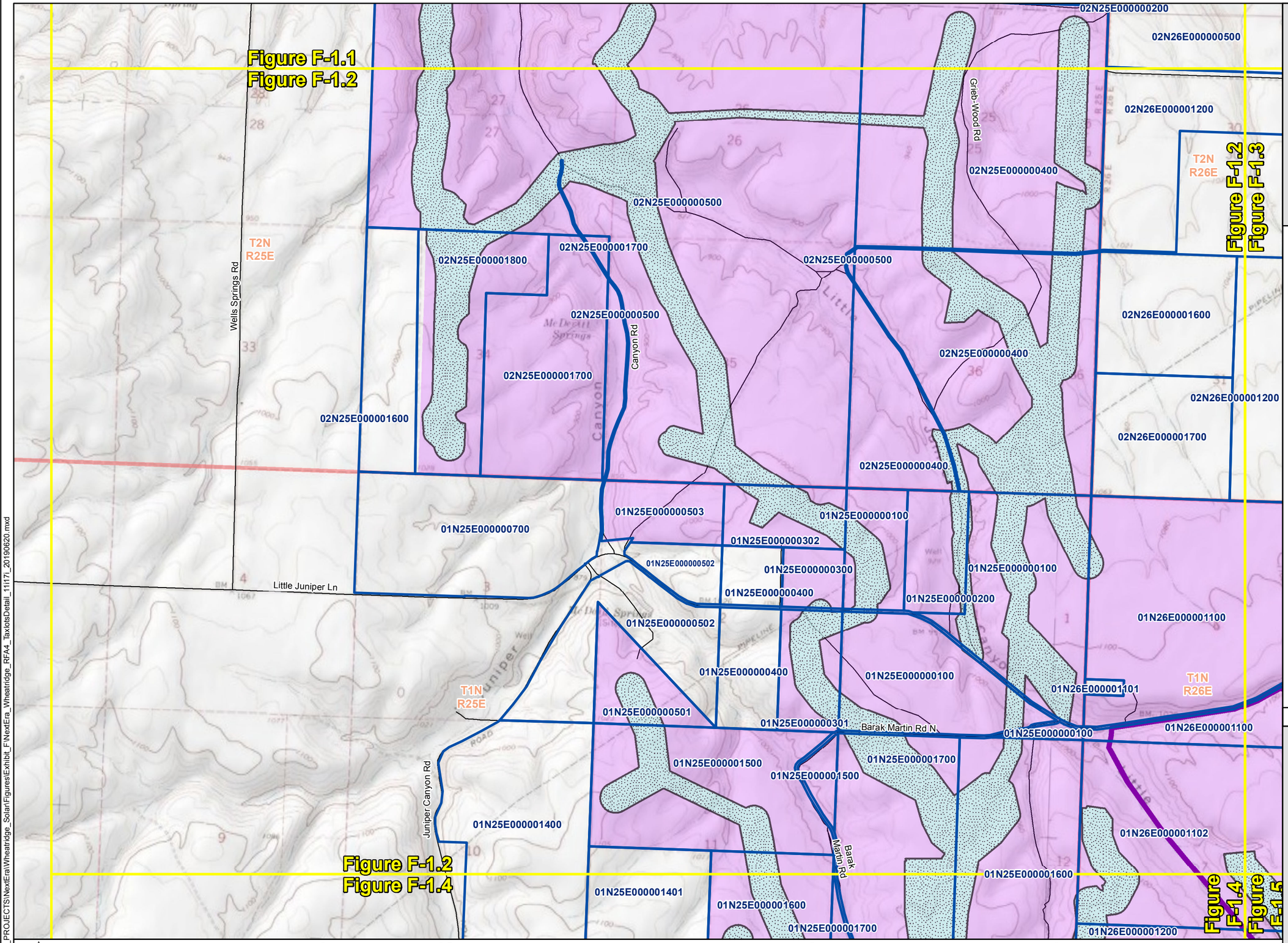
NOT FOR CONSTRUCTION

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Wheatridge Wind Energy Facility Request for Amendment 4

Figure F-1.2 Taxlots Adjacent to Site Boundary

MORROW AND UMATILLA COUNTIES, OR



Approved Site Boundary (Approved Wind Micrositing Corridors)

Amended Site Boundary (Proposed Solar Micrositing Corridors)

Leased Parcels *

Morrow County Taxlot

Local Road

Township/Range

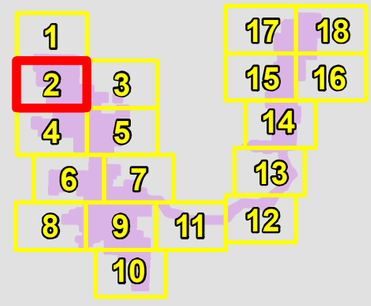
County Boundary

Map Grid

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Reference Map



1:24,000 WGS 1984 UTM Zone 11N

0 0.5 1 2 3 Miles

NOT FOR CONSTRUCTION

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Wheatridge Wind Energy Facility Request for Amendment 4

Figure F-1.3 Taxlots Adjacent to Site Boundary

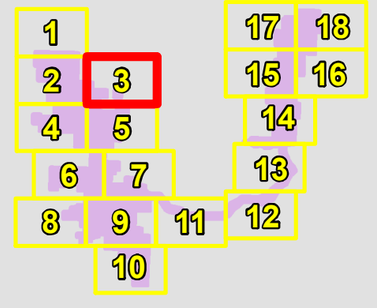
MORROW AND UMATILLA COUNTIES, OR

- Approved Site Boundary (Approved Wind Micrositing Corridors)
- Amended Site Boundary (Proposed Solar Micrositing Corridors)
- Leased Parcels *
- Morrow County Taxlot
- State Highway
- Local Road
- Township/Range
- County Boundary
- Map Grid

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Reference Map



Alpine Ln
Wagon Trail Rd
PIPELINE
Well
02N26E000000500
02N26E000001200
02N26E000001600
02N26E000001700
02N26E000001200
02N26E000001200
Figure F-1.2
Figure F-1.3
T2N
R26E
Hollow
Alpine
Bombing Range Rd
Sand
Doherty Rd
01N26E000000600
01N26E000001100
Juniper Rd
Little Juniper Ln
01N26E000001100
01N26E000000701
Grieb Ln
T1N
R26E
01N26E000000800
01N26E000000400
01N26E000000400
Lexington-Echo Hwy
207
Lower Sand Hollow Rd
01N26E000000400
Melville Rd
Sand Hollow
01N26E000000400
01N26E000001102
01N26E000001301
01N26E000001300
01N26E000001500
01N26E000000400
01N26E000000400
Figure F-1.3
Figure F-1.5
01N26E000001200
Borrow Pit

1:24,000 WGS 1984 UTM Zone 11N

0 0.5 1 2 3 Miles

NOT FOR CONSTRUCTION

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Wheatridge Wind Energy Facility Request for Amendment 4

Figure F-1.4 Taxlots Adjacent to Site Boundary

MORROW AND UMATILLA COUNTIES, OR

Figure F-1.2
Figure F-1.4

Figure F-1.2
Figure F-1.3
Figure F-1.4
Figure F-1.5

01N25E000001500
01N25E000001700
01N25E000001401
01N25E000001400
01N25E000001800
01N25E000001700
01N25E000001600
01N26E000001102
01N26E000001200
01N25E000002000
01N25E000001400
01N25E000001900
01N25E000001600
01N26E000003100
01N26E000003200
01N26E000003201
01N25E000002600
01N25E000001900
01N25E000002900
01N25E000003100
01N25E000003100
01N26E000003300
01N25E000001400
01N26E000003400
01N25E000003200
01N26E000003502
01N26E000003500
01N25E000003200
01N25E000002803
01N25E000003200
01N25E000002803
01N26E000004500

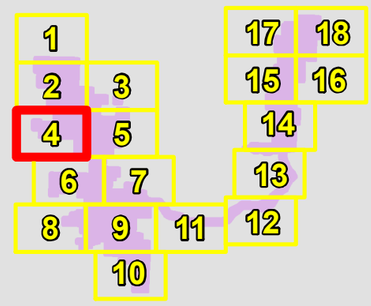
Strawberry Ln
Strawberry East Rd
Strawberry Canyon
Barak Martin Rd N
Barak Martin Rd
Lexington-Echo Hwy
Juniper Canyon Rd
Lindsay Rd
207

T1N R26E
T1N R25E

Approved Site Boundary (Approved Wind Micrositing Corridors)
Amended Site Boundary (Proposed Solar Micrositing Corridors)
Leased Parcels *
Morrow County Taxlot
State Highway
Local Road
Township/Range
County Boundary
Map Grid

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Reference Map



1:24,000 WGS 1984 UTM Zone 11N

0 0.5 1 2 3 Miles

NOT FOR CONSTRUCTION

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Wheatridge Wind Energy Facility Request for Amendment 4

Figure F-1.5 Taxlots Adjacent to Site Boundary

MORROW AND UMATILLA COUNTIES, OR

- Approved Site Boundary (Approved Wind Micrositing Corridors)
- Amended Site Boundary (Proposed Solar Micrositing Corridors)
- Leased Parcels *
- Morrow County Taxlot
- State Highway
- Local Road
- Township/Range
- County Boundary
- Map Grid

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Reference Map

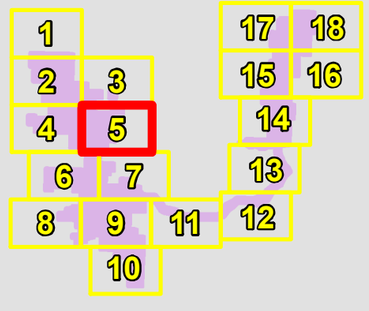


Figure F-1.2
Figure F-1.3
Figure F-1.4
Figure F-1.5

Bombing Range Rd
Strawberry Ln
Strawberry East Rd
Lexington-Echo Hwy
State Hwy 207
Kilkenny Rd
Sand Hollow Rd
Barclay Rd
Barclay Ln
Kemp Rd
Beach Ln
Sand Hollow
Cistern
Borrow Pit

T1N
R26E

01N26E000001102
01N26E000001200
01N26E000003100
01N26E000003200
01N26E000003201
01N26E000003301
01N26E000003300
01N26E000003502
01N26E000003500
01N26E000003501
01N26E000001301
01N26E000001300
01N26E000000400
01N26E000001500
01N26E000002700
01N26E000002900
01N26E000003600
01N26E000003700
01N26E000002801
01N26E000002806
01N26E000002808
01N26E000002804
01N26E000002805
01N26E000002800
01N26E000002807
01N26E000002803
01N26E000002602
01N26E000003800
01N26E000002802
01N26E000002202
01N26E000002600
01N26E000002400
01N26E000004500
01N26E000004400
01N26E000004300
01N26E00000470
01N26E000004800

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Wheatridge Wind Energy Facility Request for Amendment 4

Figure F-1.6 Taxlots Adjacent to Site Boundary

MORROW AND UMATILLA COUNTIES, OR

- Approved Site Boundary (Approved Wind Micrositing Corridors)
- Leased Parcels *
- Morrow County Taxlot
- State Highway
- Local Road
- Township/Range
- County Boundary
- Map Grid

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Reference Map

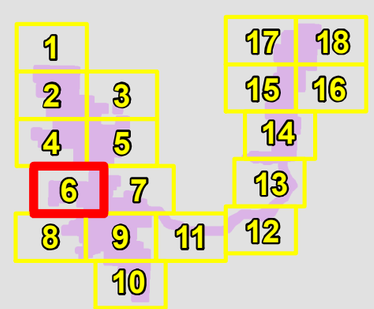


Figure F-1.4
Figure F-1.5
Figure F-1.6
Figure F-1.7
Figure F-1.8
Figure F-1.9

01N25E000003200
01N26E000003500
01N26E000004400
01N25E000002803
01N26E000004500
01N26E000004800
01N26E000004700
01S26E000000900
01S26E000000700
01S26E000000600
01S25E000000100
01S26E000000800
01S26E000001500
01S25E000002100
01S26E000001300
01S26E000001100
01S26E000001000
01S25E000002000
01S26E000001602
01S26E000001400
01S26E000000500
01S26E000002300

T1N R25E
T1N R26E
T1S R25E
T1S R26E

Lindsay Rd
Lexington-Echo Hwy
Strawberry
Kilkenny Rd
Juniper Canyon Rd
Canyon
Baseline Ln
Nichols Rd
Cutsforth Rd
Dolven Rd
Petteys Ln
Lexington Grange Rd
Lovegren Rd
Turner Ln
207

1:24,000 WGS 1984 UTM Zone 11N

0 0.5 1 2 3 Miles

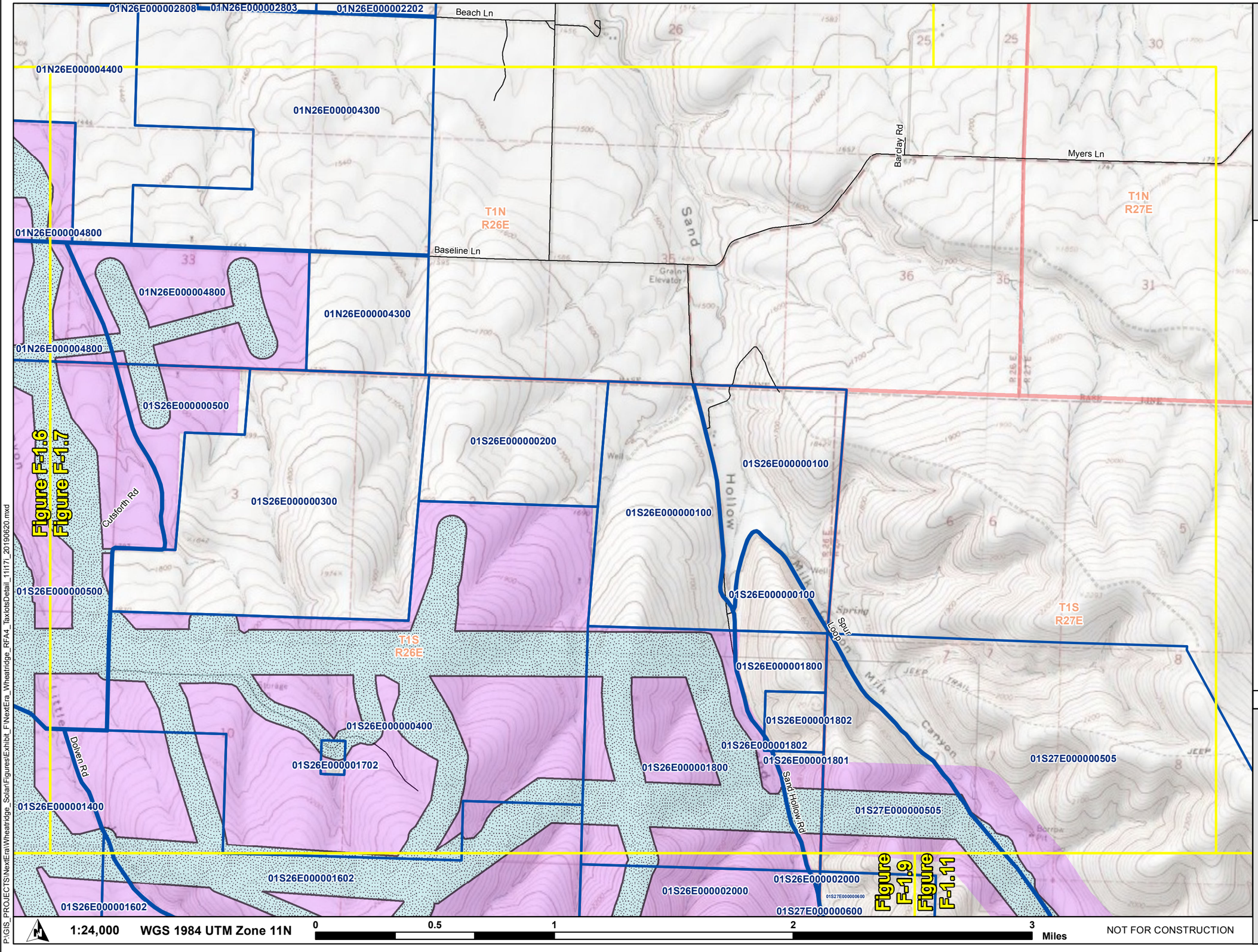
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Wheatridge Wind Energy Facility Request for Amendment 4

Figure F-1.7 Taxlots Adjacent to Site Boundary

MORROW AND UMATILLA COUNTIES, OR

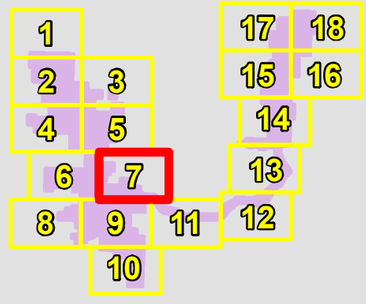


- Approved Site Boundary (Approved Wind Micrositing Corridors)
- Leased Parcels *
- Morrow County Taxlot
- Local Road
- Township/Range
- County Boundary
- Map Grid

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Reference Map



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Wheatridge Wind Energy Facility Request for Amendment 4

Figure F-1.8 Taxlots Adjacent to Site Boundary

MORROW AND UMATILLA COUNTIES, OR

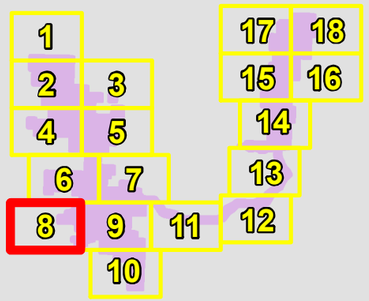
Figure F-1.8
Figure F-1.9

- Approved Site Boundary (Approved Wind Micrositing Corridors)
- Leased Parcels *
- Morrow County Taxlot
- State Highway
- Local Road
- Township/Range
- County Boundary
- Map Grid

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Reference Map



Petteys Ln
Turner Ln
Lexington Grange Rd
Lexington-Echo Hwy
Grain Elevator
Cutsforth Corner
Lovegren Rd
Juniper
Nichols Rd
Cistern
State Hwy 207
207
T1S R25E
T1S R26E
Canyon
Pieper
Heppner Hwy
74
Clarks Canyon Rd
Tom St
Airport Way
Old Airport Rd
Front St
Clay St
East St
D St
E Clay St
C St
S Depot St
F St
W Water St
W Arcade St
B St
E East St
E Water St
West St
SW 3rd St
Main St
Lexington
Blackhorse Canyon Rd
74, 207
State Hwy 74
Cemetery Hill Rd
Piper Canyon Rd
Bell Canyon Loop
Blackhorse Canyon Ln
Blackhorse
COUNTY AIRPORT
BM 1634
BM 1673
BM 1468
Gravel Pit

01S25E000002100
01S26E000001100
01S26E000001000
01S26E000001100
01S25E000002000
01S25E000002100
01S26E000001100
01S26E000001400
01S25E000002100
01S26E000002300
01S25E000002000
01S25E000002000
01S26E000002100
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01S25E000002000
01S26E000002500
01S26E000002200
01S26E000002500
01S26E000002600
01S26E000002900

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1:24,000 WGS 1984 UTM Zone 11N

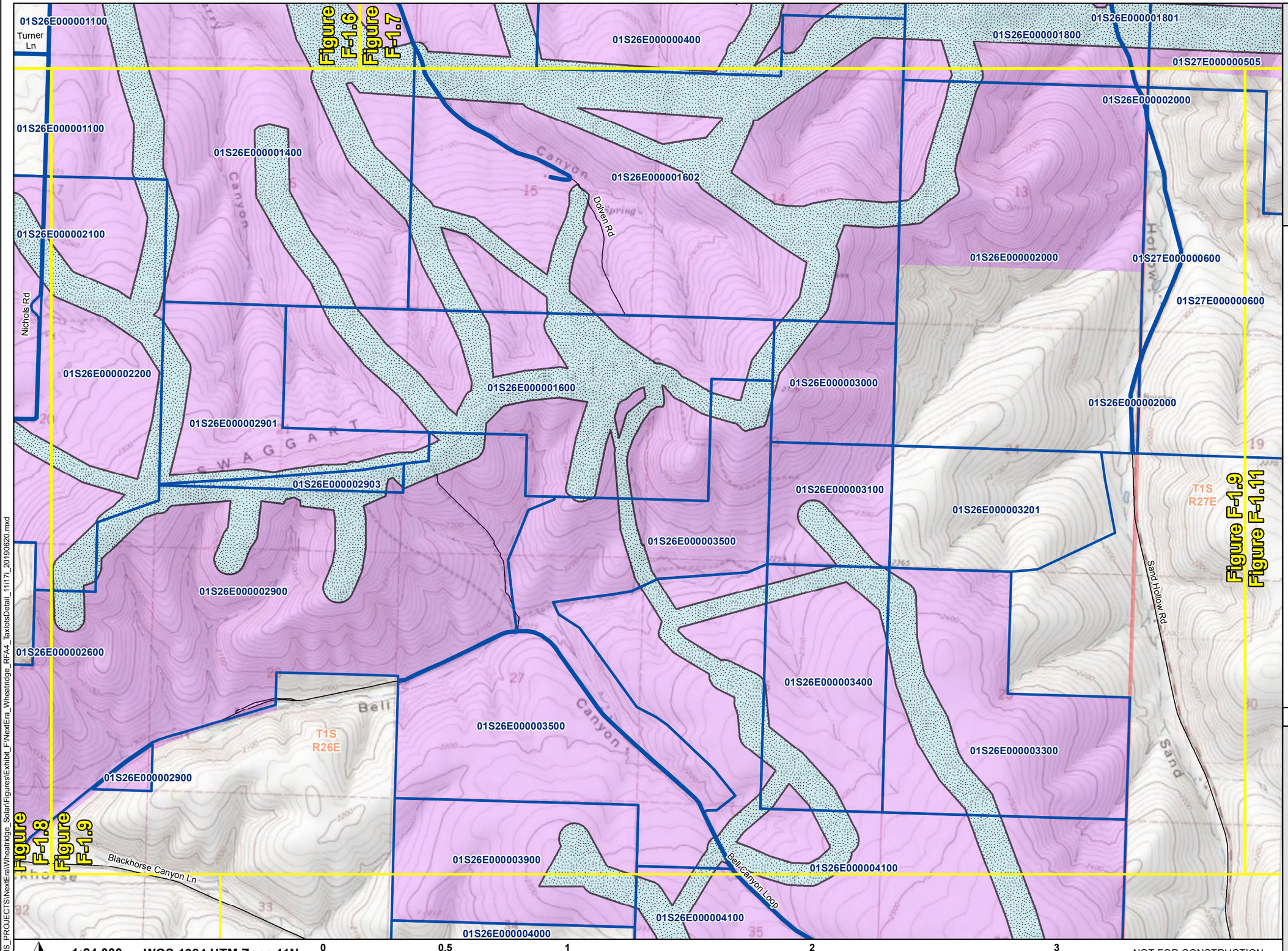
0 0.5 1 2 3 Miles

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Wheatridge Wind Energy Facility Request for Amendment 4

Figure F-1.9 Taxlots Adjacent to Site Boundary

MORROW AND UMATILLA COUNTIES, OR



Approved Site Boundary (Approved Wind Micrositing Corridors)

Leased Parcels *

Morrow County Taxlot

Local Road

Township/Range

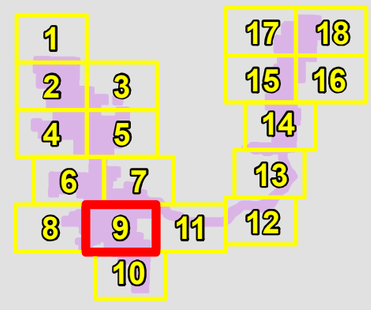
County Boundary

Map Grid

TETRA TECH

NEXTera ENERGY RESOURCES

Reference Map



1:24,000 WGS 1984 UTM Zone 11N

0 0.5 1 2 3 Miles

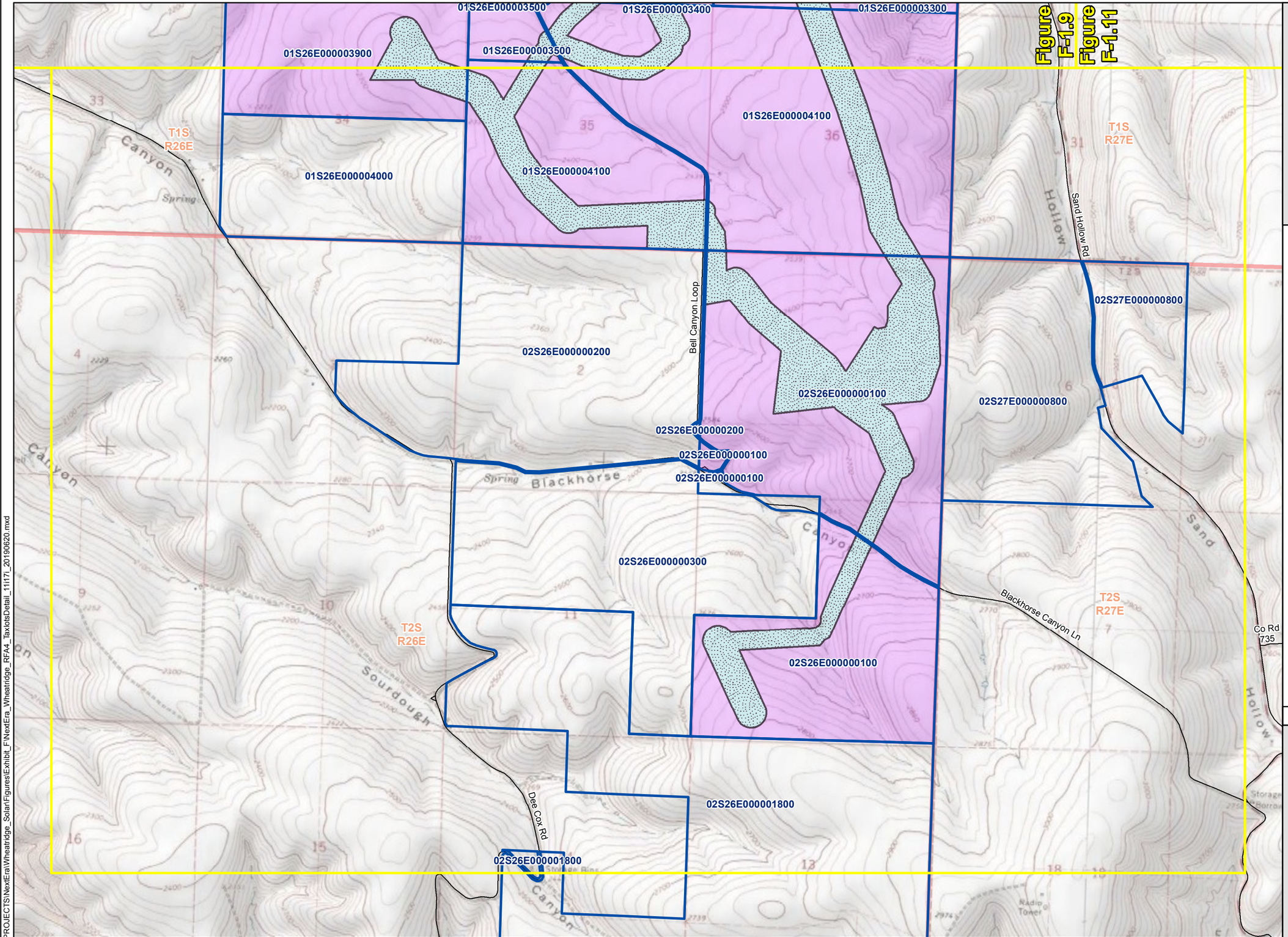
NOT FOR CONSTRUCTION

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Wheatridge Wind Energy Facility Request for Amendment 4

Figure F-1.10 Taxlots Adjacent to Site Boundary

MORROW AND UMATILLA COUNTIES, OR



Approved Site Boundary (Approved Wind Micrositing Corridors)

Leased Parcels *

Morrow County Taxlot

Local Road

Township/Range

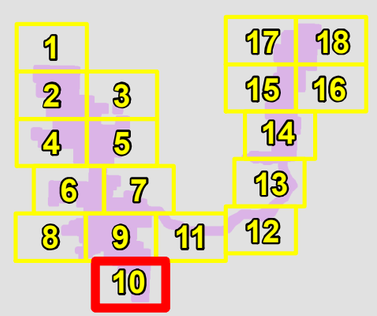
County Boundary

Map Grid

TETRA TECH

NEXTera ENERGY RESOURCES

Reference Map



1:24,000 WGS 1984 UTM Zone 11N

0 0.5 1 2 3 Miles

NOT FOR CONSTRUCTION

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Wheatridge
Wind Energy Facility
Request for Amendment 4

Figure F-1.11
Taxlots Adjacent to
Site Boundary

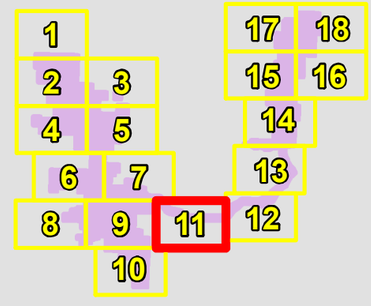
MORROW AND UMATILLA COUNTIES, OR

- Approved Site Boundary (Approved Wind Micrositing Corridors)
- Leased Parcels *
- Morrow County Taxlot
- Local Road
- Township/Range
- County Boundary
- Map Grid

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NEXTera ENERGY RESOURCES

Reference Map



01S27E000000505
01S27E000000505
01S27E000000510
01S27E000000503
01S27E000000600
01S27E000000509
01S27E000000503
01S27E000000512
01S27E000000200
01S27E000001000
01S27E000000500
Gleason Butte
Radio Facility
Milk Canyon
Spring
Spur Loop
T1S R27E
Co Rd 735
Sand Hollow Rd
Springs
Milk
Figure F-1.9
Figure F-1.11

1:24,000 WGS 1984 UTM Zone 11N

0 0.5 1 2 3 Miles

NOT FOR CONSTRUCTION

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Wheatridge
Wind Energy Facility
Request for Amendment 4

Figure F-1.12
Taxlots Adjacent to
Site Boundary

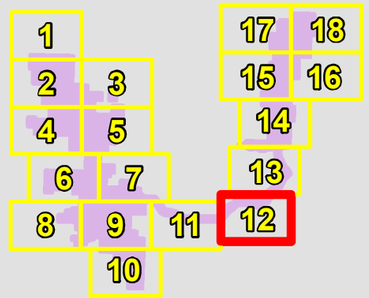
MORROW AND UMATILLA COUNTIES, OR

- Approved Site Boundary (Approved Wind Micrositing Corridors)
- Leased Parcels *
- Morrow County Taxlot
- Local Road
- Township/Range
- County Boundary
- Map Grid

TETRA TECH

NEXTera ENERGY RESOURCES

Reference Map



01S28E000000600

01S28E000000600

01S27E000000200

01S28E000000200

T1S R28E

T1S R27E

Little Buttercreek Rd

Little Butter Creek Rd

Co Rd 813

Morris Butte

Johnson Canyon

Little Butter Creek

Butter Creek Canyon

Spring

1:24,000 WGS 1984 UTM Zone 11N

0 0.5 1 2 3 Miles

NOT FOR CONSTRUCTION

P:\GIS_PROJECTS\NextEra\Wheatridge_Solar\Figures\Exhibit_F\NextEra_Wheatridge_RFA4_TaxlotsDetail_11i17l_20190620.mxd

Wheatridge Wind Energy Facility Request for Amendment 4

Figure F-1.13 Taxlots Adjacent to Site Boundary

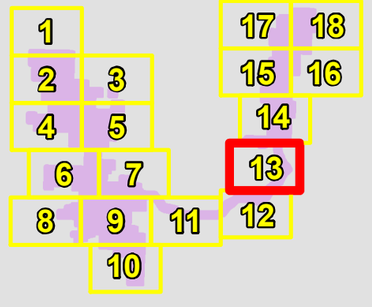
MORROW AND UMATILLA COUNTIES, OR

- Approved Site Boundary (Approved Wind Micrositing Corridors)
- Leased Parcels *
- Morrow County Taxlot
- Local Road
- Township/Range
- County Boundary
- Map Grid

TETRA TECH

NEXTera ENERGY RESOURCES

Reference Map



01N28E000000301
01N28E000000304
01N28E000000200
01N28E000000300
01N28E000000303
01S28E000000200
01S27E000000200
01S28E000000600

T1N R28E
T1N R27E
T1S R27E
T1S R28E

Big Butter Creek Ln
Big Butter Crk Ln
Little Buttercreek Rd
827

1:24,000 WGS 1984 UTM Zone 11N

0 0.5 1 2 3 Miles

NOT FOR CONSTRUCTION

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Wheatridge Wind Energy Facility Request for Amendment 4

Figure F-1.14 Taxlots Adjacent to Site Boundary

MORROW AND UMATILLA COUNTIES, OR

Figure F-1.15

Figure F-1.16

01N28E000000400

01N28E000000301

01N28E000000200

01N28E000000304

01N28E000000300

01N28E000000303

T1N R27E

T1N R28E

Natl Forest Develop Road 768 Rd

Big Butter Creek Ln

Big Butter Crk Ln

Mule Hollow

827

Service

Butter

Landing Strips

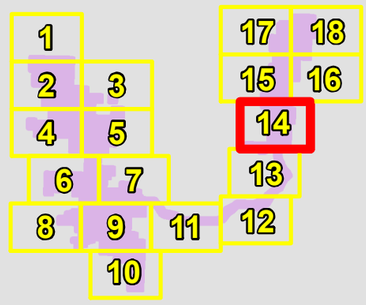
Gaging Station

- Approved Site Boundary (Approved Wind Micrositing Corridors)
- Leased Parcels *
- Morrow County Taxlot
- Local Road
- Township/Range
- County Boundary
- Map Grid

TETRA TECH

NEXTera ENERGY RESOURCES

Reference Map



1:24,000 WGS 1984 UTM Zone 11N

0 0.5 1 2 3 Miles

NOT FOR CONSTRUCTION

P:\GIS_PROJECTS\NextEra\Wheatridge_Solar\Figures\Exhibit_F\NextEra_Wheatridge_RFA4_TaxlotsDetail_11i17i_20190620.mxd

Wheatridge Wind Energy Facility Request for Amendment 4

Figure F-1.15 Taxlots Adjacent to Site Boundary

MORROW AND UMATILLA COUNTIES, OR

Figure F-1.17
Figure F-1.15
Figure F-1.17
Figure F-1.18
Figure F-1.15
Figure F-1.16

Lexington Echo Hwy
207
Garden Creek Rd
Service Butte Rd
Canyon
Co 1353 Rd
Well
UMATILLA Umatilla County
MORROW Morrow County
UMATILLA CO
MORROW CO
827

T2N R28E
T2N R27E
T1N R27E
T1N R28E

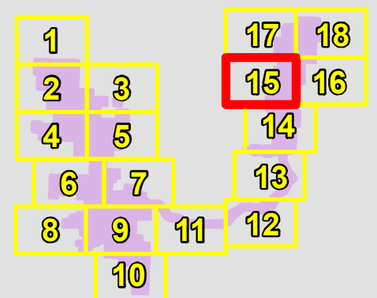
2N28000001900
2N28000003000
2N28000003300
2N28000003400
2N28000003500
2N28000003500
01N28E000000400
01N28E000000301
01N28E000000200

- Approved Site Boundary (Approved Wind Micrositing Corridors)
- Leased Parcels *
- Morrow County Taxlot
- Umatilla County Taxlot
- State Highway
- Local Road
- Township/Range
- County Boundary
- Map Grid

TETRA TECH

NEXTera ENERGY RESOURCES

Reference Map



1:24,000 WGS 1984 UTM Zone 11N

0 0.5 1 2 3 Miles

NOT FOR CONSTRUCTION

P:\GIS_PROJECTS\NextEra\Wheatridge_Solar\Figures\Exhibit_F\NextEra_Wheatridge_RFA4_TaxlotsDetail_11i17i_20190620.mxd

Wheatridge Wind Energy Facility Request for Amendment 4

Figure F-1.16 Taxlots Adjacent to Site Boundary

MORROW AND UMATILLA COUNTIES, OR

Figure F-1.17
Figure F-1.18
Figure F-1.15
Figure F-1.16
Figure F-1.18
Figure F-1.16

2N28000002700
2N28000002800
2N28000001900
2N28000000100
2N28000000100
2N28000003300
2N28000003500
2N28000003500
01N28E000000200
01N28E000000301

T2N R28E
T2N R29E
T1N R28E
T1N R29E

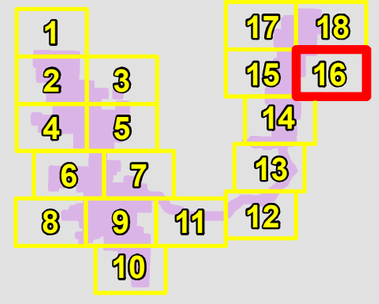
Co 1349 Rd
Whitehouse Rd
Natl Forest Develop Road 768 Rd
Natl Forest Develop Road 825 Rd
Canyon
Gulch
Spikes
Service
Borrow Pit
Well
UMATILLA CO
MORROW CO
Morrow County
Umatilla County

- Approved Site Boundary (Approved Wind Micrositing Corridors)
- Leased Parcels *
- Morrow County Taxlot
- Umatilla County Taxlot
- Local Road
- Township/Range
- County Boundary
- Map Grid

TETRA TECH

NEXTera ENERGY RESOURCES

Reference Map



1:24,000 WGS 1984 UTM Zone 11N

0 0.5 1 2 3 Miles

NOT FOR CONSTRUCTION

P:\GIS_PROJECTS\NextEra\Wheatridge_Solar\Figures\Exhibit_F\NextEra_Wheatridge_RFA4_TaxlotsDetail_11i17i_20190620.mxd

Wheatridge Wind Energy Facility Request for Amendment 4

Figure F-1.17 Taxlots Adjacent to Site Boundary

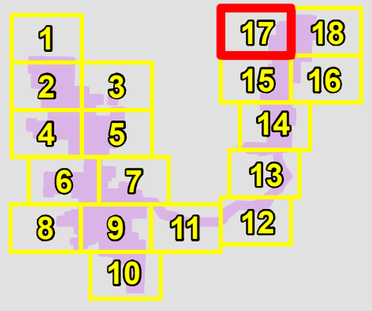
MORROW AND UMATILLA COUNTIES, OR

- Approved Site Boundary (Approved Wind Micrositing Corridors)
- Leased Parcels *
- Umatilla County Taxlot
- State Highway
- Local Road
- Township/Range
- County Boundary
- Map Grid

TETRA TECH

NEXTera ENERGY RESOURCES

Reference Map



T3N R27E
T3N R28E
T2N R27E
T2N R28E
Madison
Madison Rd
Hwy 207
Saylor Rd
Butter
Cochran Rd
Water Tank
BM 825
BM 880
BM 910
BM 945
207
Lexington Echo Hwy
Landing Strip
Garden Creek Rd
Service Butte Rd
Service Springs
Service
McCarty Ranch Ln
Eagle Ranch Rd
2N280000001901
2N28000002000
2N28000001900
2N28000003000
Figure F-1.17
Figure F-1.18
Figure F-1.17
Figure F-1.15
Figure F-1.16

1:24,000 WGS 1984 UTM Zone 11N

0 0.5 1 2 3 Miles

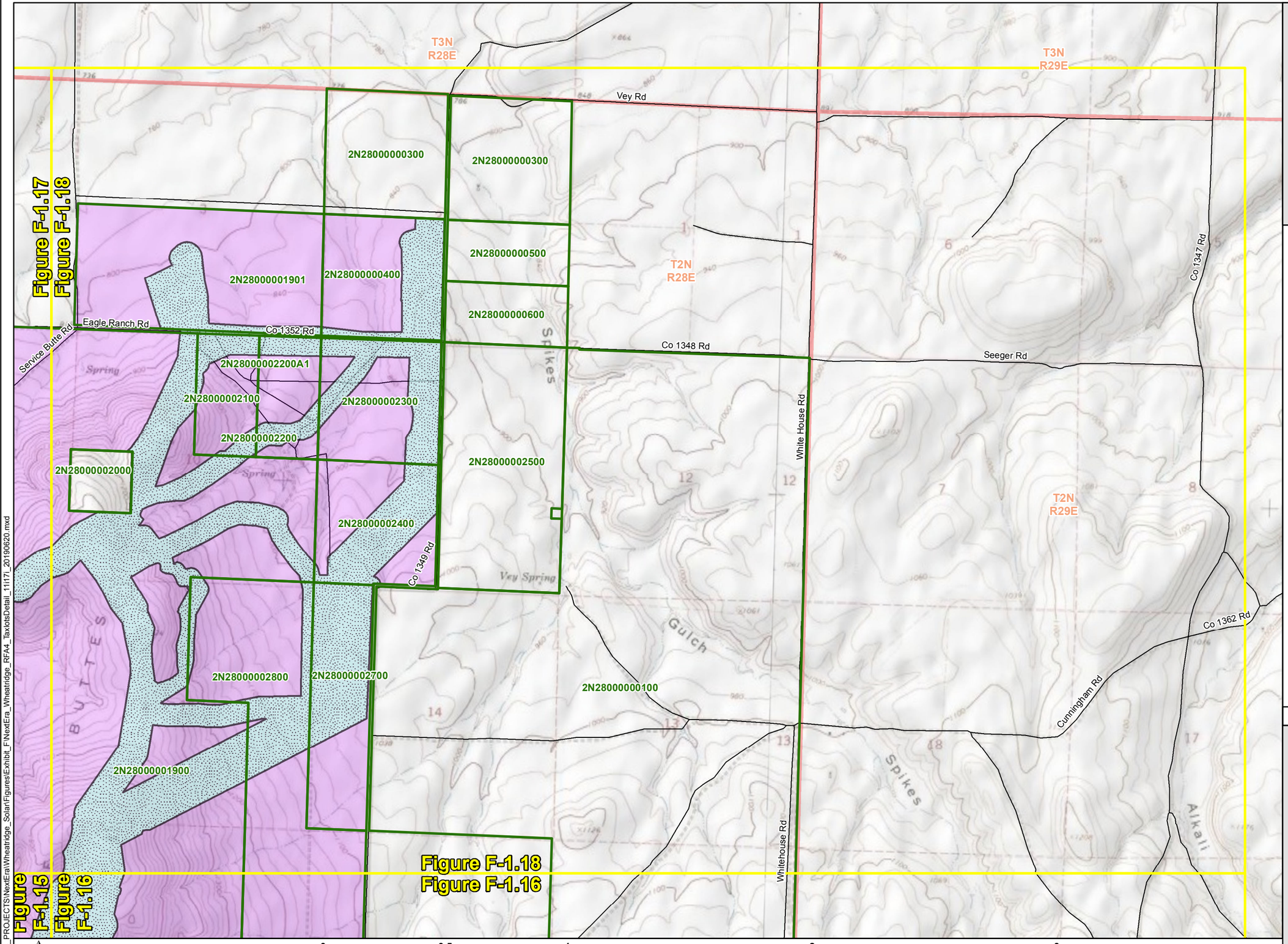
NOT FOR CONSTRUCTION

P:\GIS_PROJECTS\NextEra\Wheatridge_SolarFigures\Exhibit_F\NextEra_Wheatridge_RFA4_TaxlotsDetail_11i17i_20190620.mxd

Wheatridge Wind Energy Facility Request for Amendment 4

Figure F-1.18 Taxlots Adjacent to Site Boundary

MORROW AND UMATILLA COUNTIES, OR



1:24,000 WGS 1984 UTM Zone 11N

0 0.5 1 2 3 Miles

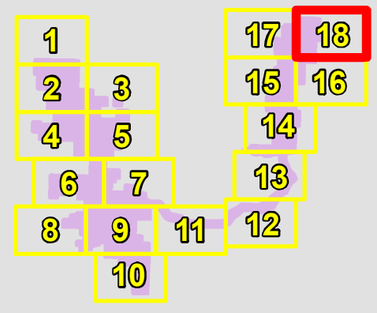
NOT FOR CONSTRUCTION

- Approved Site Boundary (Approved Wind Micrositing Corridors)
- Leased Parcels *
- Umatilla County Taxlot
- Local Road
- Township/Range
- County Boundary
- Map Grid

TETRA TECH

NEXTera ENERGY RESOURCES

Reference Map



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Attachment F-1. Owners of Record within 500 Feet of the Site Boundary

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Morrow County Tax Lot Data (June 13, 2019)

Map Tax Lot	First Name	Last Name	Name 2	Company/Organization	C/O-Attn.	Address	City	State	Zip Code
02N25E000000400				KILKENNY LAND COMPANY, LLC	HALE, KELLY	1124 SW MYRTLE DR	PORTLAND	OR	97201
02N25E000001600				EUGENE A DOHERTY REVOCABLE LIVING ET AL	MITCHELLM STEVE	1901 W GREENHEAD DR	MERIDAIAN	ID	83642
02N25E000001800				NORTH LEX POWER AND LAND, LLC	RAUCH, CHRISTIAN K	72967 STRAWBERRY LN	LEXINGTON	OR	97839
02N25E000001700				NORTH LEX POWER AND LAND, LLC	RAUCH, CHRISTIAN K	72967 STRAWBERRY LN	LEXINGTON	OR	97839
02N25E000000200				USA (BOMBING RANGE)					0
02N25E000000500				KILKENNY LAND COMPANY, LLC	HALE, KELLY	1124 SW MYRTLE DR	PORTLAND	OR	97201
02N26E000001700				WOOD, J WALT TRUSTEE ETAL		3448 CANOGA PL	CAMARILLO	CA	93010
02N26E000001600				WOOD, J WALT TRUSTEE ETAL		3448 CANOGA PL	CAMARILLO	CA	93010
02N26E000001200				GRIEB FARMS, INC		70575 BOMBING RANGE RD	LEXINGTON	OR	97839
02N26E000000500				BAKER PRODUCE SOUTH, INC		PO BOX 3110	PASCO	WA	99302
01N25E000002803	LAWRENCE D	LINDSAY	CORRINE ANN			PO BOX 307	LEXINGTON	OR	97839
01N26E000004800	MARK T	MILLER	SHANNON E			67775 CUTSFORTH RD	HEPPNER	OR	97836
01N26E000004300				MARIAH WIND, LLC		PO BOX 605	VICTOR	ID	83455
01N26E000004500	SUEZANNE	DUNCAN	ROBERT			1547 ALPENSEE STRA	LEAVENWORTH	WA	98826
01N26E000004400	ERIC M	OREM	BRANDI L			72028 BLACKHORSE CYN LN	HEPPNER	OR	97836
01N26E000003501				RJK FAMILY, LLC	HALE, KELLY	1124 SW MYRTLE DR	PORTLAND	OR	97201
01N25E000003200				MUNKERS, SHEILA H ETAL		PO BOX 34	COTTONWOOD	ID	83522
01N26E000002806	AARON D	HEIDEMAN				33999 RIVER VIEW DR	HERMISTON	OR	97838
01N26E000002808	AARON D	HEIDEMAN				33999 RIVER VIEW DR	HERMISTON	OR	97838
01N26E000002803				KARYL SMITH, INC		8825 N ORCHARD PR RD	SPOKANE	WA	99217
01N26E000002202				KEMP LAND LLC	KEMP,SHERRY	516 NW 4TH	PENDLETON	OR	97801
01N26E000003700				STATE OF OREGON		417 TRANSPORTATION BLDG	SALEM	OR	97310
01N26E000002801	AARON D	HEIDEMAN				33999 RIVER VIEW DR	HERMISTON	OR	97838
01N26E000002807	AARON D	HEIDEMAN				33999 RIVER VIEW DR	HERMISTON	OR	97838
01N26E000002802				KARYL SMITH, INC		8825 N ORCHARD PR RD	SPOKANE	WA	99217
01N26E000003502				RJK FAMILY, LLC	HALE, KELLY	1124 SW MYRTLE DR	PORTLAND	OR	97201
01N26E000003500				RJK FAMILY, LLC	HALE, KELLY	1124 SW MYRTLE DR	PORTLAND	OR	97201
01N25E000002600	RANDY	HUGHES				67554 JUNIPER CANYON RD	LEXINGTON	OR	97839
01N25E000001900				NORTH LEX POWER AND LAND, LLC	RAUCH, CHRISTIAN K	72967 STRAWBERRY LN	LEXINGTON	OR	97839
01N25E000002900	LAWRENCE D	LINDSAY	CORRINE ANN			PO BOX 307	LEXINGTON	OR	97839
01N26E000003400				NORTH LEX POWER AND LAND, LLC	RAUCH, CHRISTIAN K	72967 STRAWBERRY LN	LEXINGTON	OR	97839
01N26E000003300				NORTH LEX POWER AND LAND, LLC	RAUCH, CHRISTIAN K	72967 STRAWBERRY LN	LEXINGTON	OR	97839
01N26E000003301	STEPHEN	HILL	TANA JO			73114 STRAWBERRY LN	LEXINGTON	OR	97839
01N26E000003600				NORTH LEX POWER AND LAND, LLC	RAUCH, CHRISTIAN K	72967 STRAWBERRY LN	LEXINGTON	OR	97839
01N26E000002800				HEIDEMAN, LOREN A & DELLA K, TRUSTEES		22948 FAIRVIEW LN	IONE	OR	97843

Map Tax Lot	First Name	Last Name	Name 2	Company/Organization	C/O-Attn.	Address	City	State	Zip Code
01N26E000003800				HEIDEMAN, LOREN A & DELLA K, TRUSTEES		22948 FAIRVIEW LN	IONE	OR	97843
01N26E000003201	CHRISTIAN	RAUCH	KATHERINE A			72967 STRAWBERRY LN	LEXINGTON	OR	97839
01N26E000002602				HEIDEMAN, LOREN A & DELLA K, TRUSTEES		22948 FAIRVIEW LN	IONE	OR	97843
01N26E000003200				NORTH LEX POWER AND LAND, LLC	RAUCH, CHRISTIAN K	72967 STRAWBERRY LN	LEXINGTON	OR	97839
01N26E000002900				TOWER ASSOCIATES, LLC		700 UNIVERSE BLVD PSX/JB	JUNO BEACH	FL	33408
01N26E000002700				NORTH LEX POWER AND LAND, LLC	RAUCH, CHRISTIAN K	72967 STRAWBERRY LN	LEXINGTON	OR	97839
01N25E000001400	RANDY	HUGHES				67554 JUNIPER CANYON RD	LEXINGTON	OR	97839
01N26E000003100				PETTYJOHN, KERRY D, TRUSTEE ET AL		26675 ICE HARBOR DR	BURBANK	WA	99323
01N26E000002805				HEIDEMAN, LOREN A & DELLA K, TRUSTEES		22948 FAIRVIEW LN	IONE	OR	97843
01N25E000002000				BERRY, BARBARA NEAL ETAL	DIAZ, LISA	2532 SANTIAM HWY SE #155	ALBANY	OR	97322
01N25E000001800	RANDY	HUGHES				67554 JUNIPER CANYON RD	LEXINGTON	OR	97839
01N26E000002804				KARYL SMITH, INC		8825 N ORCHARD PR RD	SPOKANE	WA	99217
01N26E000002400	WILLIAM J	DOHERTY				70644 DOHERTY RD	LEXINGTON	OR	97839
01N25E000001401	RANDY WILLIAM	HUGHES				67554 JUNIPER CANYON RD	LEXINGTON	OR	97839
01N25E000001600				TOWER ASSOCIATES, LLC		700 UNIVERSE BLVD PSX/JB	JUNO BEACH	FL	33408
01N25E000001700				NORTH LEX POWER AND LAND, LLC	RAUCH, CHRISTIAN K	72967 STRAWBERRY LN	LEXINGTON	OR	97839
01N26E000001500				NORTH LEX POWER AND LAND, LLC	RAUCH, CHRISTIAN K	72967 STRAWBERRY LN	LEXINGTON	OR	97839
01N25E000001500				KILKENNY LAND COMPANY, LLC	HALE, KELLY	1124 SW MYRTLE DR	PORTLAND	OR	97201
01N26E000001102				NORTH LEX POWER AND LAND, LLC	RAUCH, CHRISTIAN K	72967 STRAWBERRY LN	LEXINGTON	OR	97839
01N26E000001300	WILLIAM J	DOHERTY				70644 DOHERTY RD	LEXINGTON	OR	97839
01N26E000001101	STANLEY M	RAUCH	JAMIE ANN			72629 JUNIPER LN	LEXINGTON	OR	97839
01N25E000000501				KILKENNY LAND COMPANY, LLC	HALE, KELLY	1124 SW MYRTLE DR	PORTLAND	OR	97201
01N25E000000400				NATURE CONSERVANCY		821 SE 14TH AVE	PORTLAND	OR	97214
01N25E000000301				KILKENNY LAND COMPANY, LLC	HALE, KELLY	1124 SW MYRTLE DR	PORTLAND	OR	97201
01N25E000000100				KILKENNY LAND COMPANY, LLC	HALE, KELLY	1124 SW MYRTLE DR	PORTLAND	OR	97201
01N26E000000800				NORTH LEX POWER AND LAND, LLC	RAUCH, CHRISTIAN K	72967 STRAWBERRY LN	LEXINGTON	OR	97839
01N25E000000502				NATURE CONSERVANCY		821 SE 14TH AVE	PORTLAND	OR	97214
01N25E000000300				KILKENNY LAND COMPANY, LLC	HALE, KELLY	1124 SW MYRTLE DR	PORTLAND	OR	97201
01N25E000000700				EUGENE A DOHERTY REVOCABLE LIVING ET AL	MITCHELLM STEVE	1901 W GREENHEAD DR	MERIDAIAN	ID	83642
01N25E000000503				KILKENNY LAND COMPANY, LLC	HALE, KELLY	1124 SW MYRTLE DR	PORTLAND	OR	97201
01N25E000000302				TOWER ASSOCIATES, LLC		700 UNIVERSE BLVD PSX/JB	JUNO BEACH	FL	33408
01N25E000000200				KILKENNY LAND COMPANY, LLC	HALE, KELLY	1124 SW MYRTLE DR	PORTLAND	OR	97201
01N25E000003100				NORTH LEX POWER AND LAND, LLC	RAUCH, CHRISTIAN K	72967 STRAWBERRY LN	LEXINGTON	OR	97839
01N26E000002600				TURNER-LINDSAY FARMS, LLC		75655 BASELINE RD	HEPPNER	OR	97836
01N26E000004700	COREY M	MILLER	M JILL			74655 BASELINE LN	HEPPNER	OR	97836
01N26E000000400	WILLIAM J	DOHERTY				70644 DOHERTY RD	LEXINGTON	OR	97839

Map Tax Lot	First Name	Last Name	Name 2	Company/Organization	C/O-Attn.	Address	City	State	Zip Code
01N26E000001200				NORTH LEX POWER AND LAND, LLC	RAUCH, CHRISTIAN K	72967 STRAWBERRY LN	LEXINGTON	OR	97839
01N26E000001301				NORTH LEX POWER AND LAND, LLC	RAUCH, CHRISTIAN K	72967 STRAWBERRY LN	LEXINGTON	OR	97839
01N26E000000701				NORTH LEX POWER AND LAND, LLC	RAUCH, CHRISTIAN K	72967 STRAWBERRY LN	LEXINGTON	OR	97839
01N26E000000600				GRIEB FARMS, INC		70575 BOMBING RANGE RD	LEXINGTON	OR	97839
01N26E000001100				NORTH LEX POWER AND LAND, LLC	RAUCH, CHRISTIAN K	72967 STRAWBERRY LN	LEXINGTON	OR	97839
01N28E000000301				TOWER ASSOCIATES, LLC		700 UNIVERSE BLVD PSX/JB	JUNO BEACH	FL	33408
01N28E000000304	MARILYN	SCHILLER				69958 SCHILLER DR	ECHO	OR	97826
01N28E000000303	MARILYN	SCHILLER				69958 SCHILLER DR	ECHO	OR	97826
01N28E000000300	MARILYN	SCHILLER				69958 SCHILLER DR	ECHO	OR	97826
01N28E000000400				OREGON WINDFARMS, LLC		3145 GEARY BLVD 723	SAN FRANCISCO	CA	94118
01N28E000000200				PINE CANYON RANCH, GP	CAVALLETTO, DONALD O	PO BOX 4965	PASO ROBLES	CA	93447
01S25E000002100				MILLER WHEAT, INC	MILLER, MARK	67775 CUTSFORTH RD	HEPPNER	OR	97836
01S25E000000602				BILL & RENA MARQUARDT LLC		67070 MARQUARDT RD	LEXINGTON	OR	97839
01S25E000000100				PROUDFOOT, PAUL J ET AL		PO BOX 28	IONE	OR	97843
01S25E000002000	JEFFREY	CUTSFORTH				66790 HWY 207-ECHO	LEXINGTON	OR	97839
01S26E000004000	KEVEN O	HAGUEWOOD				64396 MCNAB LN	IONE	OR	97843
01S26E000004100	JAMES W	CUTSFORTH	DIANA M			2604 S HARRISON CT	KENNEWICK	WA	99338
01S26E000003900				BELL RANCH PARTNERSHIP		74655 BASELINE LN	HEPPNER	OR	97836
01S26E000003400	JAMES W	CUTSFORTH	DIANA M			2604 S HARRISON CT	KENNEWICK	WA	99338
01S26E000003300	DOUGLAS A	DRAKE	CARLEY E			64598 SANDHOLLOW RD	HEPPNER	OR	97836
01S26E000002500	JEFFREY PATRICK	CUTSFORTH				66790 HWY 207	LEXINGTON	OR	97839
01S26E000002903	KEVEN O	HAGUEWOOD				64396 MCNAB LN	IONE	OR	97843
01S26E000002600	ANTHONY J	DOHERTY				73779 BLACK HORSE CANYON LN	HEPPNER	OR	97836
01S26E000003100				TURNER RANCH, INC		75655 BASELINE RD	HEPPNER	OR	97836
01S26E000001600	VICKI M	WAGENBLAST				65936 DOLVEN RD	LEXINGTON	OR	97839
01S26E000003000				TURNER RANCH, INC		75655 BASELINE RD	HEPPNER	OR	97836
01S26E000002100	ELDEN LEE	PADBERG				18407 NE 21ST ST	REDMOND	WA	98052
01S26E000002901				CUTSFORTH, STANLEY ETAL		67509 CUTSFORTH RD	LEXINGTON	OR	97839
01S26E000002000				TURNER RANCH, INC		75655 BASELINE RD	HEPPNER	OR	97836
01S26E000001602				TOWER ASSOCIATES, LLC		700 UNIVERSE BLVD PSX/JB	JUNO BEACH	FL	33408
01S26E000001702	MARK T	MILLER	SHANNON E			67775 CUTSFORTH RD	HEPPNER	OR	97836
01S26E000001801				TURNER RANCH, INC		75655 BASELINE RD	HEPPNER	OR	97836
01S26E000000800	MARK T	MILLER	SHANNON E			67775 CUTSFORTH RD	HEPPNER	OR	97836
01S26E000001802				FRITZ CUTSFORTH LAND CO		67191 SANDHOLLOW RD	HEPPNER	OR	97836
01S26E000001400				CUTSFORTH, STANLEY ETAL		67509 CUTSFORTH RD	LEXINGTON	OR	97839
01S26E000001100				OREM, ERIC & OREM, BRANDI ETAL		72028 BLACKHORSE CANYON LN	HEPPNER	OR	97836

Map Tax Lot	First Name	Last Name	Name 2	Company/Organization	C/O-Attn.	Address	City	State	Zip Code
01S26E000001300	MARK T	MILLER	SHANNON E			67775 CUTSFORTH RD	HEPPNER	OR	97836
01S26E000001500	MARK T	MILLER	SHANNON E			67775 CUTSFORTH RD	HEPPNER	OR	97836
01S26E000001800	VICKI M	WAGENBLAST				65936 DOLVEN RD	LEXINGTON	OR	97839
01S26E000000900				PROUDFOOT, PAUL J, ET AL		PO BOX 28	IONE	OR	97843
01S26E000000700	MARK T	MILLER	SHANNON E			67775 CUTSFORTH RD	HEPPNER	OR	97836
01S26E000000500	MARK T	MILLER	SHANNON E			67775 CUTSFORTH RD	HEPPNER	OR	97836
01S26E000000300				MARIAH WIND, LLC		PO BOX 605	VICTOR	ID	83455
01S26E000000200				FRITZ CUTSFORTH LAND CO		67191 SANDHOLLOW RD	HEPPNER	OR	97836
01S26E000000100				FRITZ CUTSFORTH LAND CO		67191 SANDHOLLOW RD	HEPPNER	OR	97836
01S26E000000600	MARK T	MILLER	SHANNON E			67775 CUTSFORTH RD	HEPPNER	OR	97836
01S26E000001000				W W & O FARMS, INC	DERUWE, ZOEE	701 MUSE RD	CONNELL	WA	99326
01S26E000002200				TOWER ASSOCIATES, LLC		700 UNIVERSE BLVD PSX/JB	JUNO BEACH	FL	33408
01S26E000002300				W W & O FARMS, INC	DERUWE, ZOEE	701 MUSE RD	CONNELL	WA	99326
01S26E000003201				TURNER RANCH, INC		75655 BASELINE RD	HEPPNER	OR	97836
01S27E000001000				VOGE, WARREN H, ET AL	GAIL A VOGE	16838 NE HOYT ST	PORTLAND	OR	97230
01S27E000000500				DOUGHERTY, PATRICIA, TR, 1/2 ETAL		66317 SPUR LOOP RD	HEPPNER	OR	97836
01S27E000000509				DOUGHERTY, PATRICIA, TR, 1/2 ETAL		66317 SPUR LOOP RD	HEPPNER	OR	97836
01S27E000000600				TURNER RANCH, INC		75655 BASELINE RD	HEPPNER	OR	97836
01S27E000000510				COMM TECH INC	BEAUCHAMP MIKE, PRESIDENT	PO BOX 6856	KENNEWICK	WA	99336
01S27E000000200				VOGE, WARREN H, ET AL	GAIL A VOGE	16838 NE HOYT ST	PORTLAND	OR	97230
01S28E000000600				VOGE, WARREN H, ET AL	GAIL A VOGE	16838 NE HOYT ST	PORTLAND	OR	97230
01S28E000000200	MARILYN	SCHILLER				69958 SCHILLER DR	ECHO	OR	97826
01S26E000002400	BRYAN E	PADBERG				10607 CRESCENT VALLEY DR NW	GIG HARBOR	WA	98332
02S27E000000800				ROLLING RANCH LLC		8385 WHEATLAND RD N	SALEM	OR	97303
01S27E000000512				DOUGHERTY, CLIFFORD ET AL		65450 SPURLOOP RD	HEPPNER	OR	97836
01S27E000000503				DOUGHERTY, PATRICIA, TR ETAL		66317 SPUR LOOP RD	HEPPNER	OR	97836
01S27E000000503				DOUGHERTY, PATRICIA, TR ETAL		66317 SPUR LOOP RD	HEPPNER	OR	97836
01S27E000000505				DOUGHERTY, PATRICIA, TRUSTEE, 1/2 ETAL		66317 SPUR LOOP RD	HEPPNER	OR	97836
01S27E000000505				DOUGHERTY, PATRICIA, TRUSTEE, 1/2 ETAL		66317 SPUR LOOP RD	HEPPNER	OR	97836
02S26E000001800				CX5 LIMITED	COX, STEVEN D	3043 N 25 WEST	PROVO	UT	84604
02S26E000000100				TOWER ASSOCIATES, LLC		700 UNIVERSE BLVD PSX/JB	JUNO BEACH	FL	33408
02S26E000000200	COLIN	ANDERSON	ERIN			75257 BLACKHORSE CYN LN	HEPPNER	OR	97836
02S26E000000300	KEVEN O	HAGUEWOOD				64396 MCNAB LN	IONE	OR	97843
01S26E000002900				WINTER WIND ENERGY LLC		3000 EL CAMINO REAL STE 700	PALO ALTO	CA	94306
01S26E000003500				BELL RANCH PARTNERSHIP		74655 BASELINE LN	HEPPNER	OR	97836
01S26E000003500				BELL RANCH PARTNERSHIP		74655 BASELINE LN	HEPPNER	OR	97836

Map Tax Lot	First Name	Last Name	Name 2	Company/Organization	C/O-Attn.	Address	City	State	Zip Code
01S26E000000400	MARK T	MILLER	SHANNON E			67775 CUTSFORTH RD	HEPPNER	OR	97836

Umatilla County Tax Lot Data (June 18, 2019)

Map Tax Lot	First Name	Last Name	Name 2	Company/Organization	C/O-Attn.	Address	City	State	Zip Code
2N28000000100				SNOW H RICHARD 1/2 & (TRS) 1/2		33263 OREGON TRAIL RD	ECHO	OR	
2N28000000300				EAGLE RANCH		32327 OREGON TRAIL RD	ECHO	OR	
2N28000000300				EAGLE RANCH		32327 OREGON TRAIL RD	ECHO	OR	
2N28000000400	MARILYN	SCHILLER				69958 SCHILLER DR	ECHO	OR	97826-9044
2N28000000500				EAGLE RANCH		32327 OREGON TRAIL RD	ECHO	OR	
2N28000000600				EAGLE RANCH		32327 OREGON TRAIL RD	ECHO	OR	
2N28000001900	MARILYN	SCHILLER				69958 SCHILLER DR	ECHO	OR	97826-9044
2N28000001901	MARILYN	SCHILLER				69958 SCHILLER DR	ECHO	OR	97826-9044
2N28000002000				USA	BUREAU OF LAND MGT	PO BOX 2965	PORTLAND	OR	
2N28000002100	MARILYN	SCHILLER				69958 SCHILLER DR	ECHO	OR	97826-9044
2N28000002200	MARILYN	SCHILLER				69958 SCHILLER DR	ECHO	OR	97826-9044
2N28000002200A1	MARILYN	SCHILLER				69958 SCHILLER DR	ECHO	OR	97826-9044
2N28000002300	MARILYN	SCHILLER				69958 SCHILLER DR	ECHO	OR	97826-9044
2N28000002400	MARILYN	SCHILLER				69958 SCHILLER DR	ECHO	OR	97826-9044
2N28000002500				EAGLE RANCH		32327 OREGON TRAIL RD	ECHO	OR	97826-9001
2N28000002700	MARILYN	SCHILLER				69958 SCHILLER DR	ECHO	OR	97826-9044
2N28000002800	MARILYN	SCHILLER				69958 SCHILLER DR	ECHO	OR	97826-9044
2N28000003000				HAWKINS CO INC		78771 EGGERS RD	PENDLETON	OR	
2N28000003300				USA	BUREAU OF LAND MGT	PO BOX 2965	PORTLAND	OR	
2N28000003400	JOHN H	LUCIANI				27633 BUTTER CREEK RD	ECHO	OR	97826-9047
2N28000003500				PINE CANYON RANCH GP	DONALD O CAVALLETTO	PO BOX 4965	PASO ROBLES	CA	

Exhibit G

Materials Analysis

Wheatridge Wind Energy Facility
June 2019

Prepared for



Prepared by



Tetra Tech, Inc.

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Acronyms and Abbreviations

ASC	Application for Site Certificate
Certificate Holder	Wheatridge Wind Energy, LLC
Council	Energy Facility Siting Council
Facility	Wheatridge Wind Energy Facility
MW	megawatt
O&M	Operations and maintenance
OAR	Oregon Administrative Rule
ODEQ	Oregon Department of Environmental Quality
RFA 2	Request for Amendment 2
RFA 3	Request for Amendment 3
RFA 4	Request for Amendment 4
SPCC	Spill Prevention Control and Countermeasures

1.0 Introduction

The Wheatridge Wind Energy Facility (Facility) is an approved, but not yet constructed, wind energy generation facility consisting of up to 292 turbines with a peak generating capacity of up to 500 megawatts (MW), to be located in an Approved Site Boundary of approximately 13,097 acres in Morrow and Umatilla counties, Oregon. In Request for Amendment 4 (RFA 4) to the Facility Site Certificate, Wheatridge Wind Energy, LLC (Certificate Holder) is proposing to add photovoltaic solar energy generation to the Facility to provide the opportunity for an integrated, renewable energy facility with both wind and solar energy generation and energy storage. In RFA 4, the Certificate Holder is proposing five changes to the approved Facility:

1. Amend the description of the Facility to include photovoltaic solar energy generation equipment to leverage the complementary nature of wind and solar generation to provide more reliable renewable energy generation.
2. Amend the Site Boundary to provide for solar micrositing corridors for the photovoltaic solar energy system.
3. Increase the maximum peak generating capacity for the Facility by up to 150 MW of solar energy generation, for a total Facility maximum peak generating capacity of 650 MW.
4. Add distributed energy storage as a related or supporting facility for solar energy generation, along with new collector lines connecting the solar arrays, and an expansion of an approved substation.
5. Amend four existing site certificate conditions and increase the approved MW of the turbines by approximately 12 percent, from 2.5 MW to 2.8 MW.

Exhibit G provides the information required by OAR 345- 021-0010(1)(g) in support of RFA 4. Similar to with wind turbines, the Certificate Holder is requesting to permit a range of technology in order to preserve permitting flexibility and will stipulate the precise details of photovoltaic solar energy generation and related and supporting facilities including energy storage during final design and engineering prior to construction. Therefore, this exhibit analyzes the maximum amount of materials anticipated within the solar micrositing corridors (Amended Site Boundary) to address the maximum impact. To the extent it is representative of the best available information, analysis in this Exhibit incorporates and/or relies on reference information, analysis, and findings found in the Application for Site Certificate (ASC) (Wheatridge Wind Energy, LLC 2015), previous RFAs, and Oregon Department of Energy Final Orders to demonstrate that the Facility, as proposed, continues to comply with applicable Site Certificate conditions and the approval standard in OAR 345-022-0010(1)(g).

Exhibit B provides the Facility description, which includes major components and systems and a description of related or supporting facilities. The major components and systems include:

- Photovoltaic Modules and Racking; and

- Electrical Infrastructure including combiner boxes and conduits, inverters, and transformers;

The related or supporting facilities include:

- Collection systems, including underground 34.5-kilovolt cables and overhead collector lines;
- Distributed energy storage, including lithium-ion batteries in concrete containers;
- A collector substation expansion of 5 acres which will provide space for additional transformers and switches and protective relay and metering equipment; and
- Service roads and gates within the proposed expanded site boundary and a 100-foot wide cleared area including a perimeter road around the solar arrays. The perimeter road will be bordered by an up to 8-foot-high chain-link security fence with locked gates.

The information summarized in this exhibit and described in RFA 4 demonstrates that the Facility, as proposed, can be designed, engineered, constructed, operated, and retired in a manner that satisfies the applicable Council standards. The proposed changes in RFA 4 do not alter the Certificate Holder's ability to comply with the Council's earlier findings and approved conditions in the previously amended site certificates.

2.0 Materials Inventory – OAR 345-021-0010(1)(g)(A)

OAR 345-021-0010(1)(g) A materials analysis including:

OAR 345-021-0010(1)(g)(A) An inventory of substantial quantities of industrial materials flowing into and out of the proposed facility during construction and operation.

2.1 Construction Materials

In addition to the construction materials identified in Exhibit G of the Final ASC and RFAs 2 and 3, this section describes the materials needed to support the solar arrays within the Amended Site Boundary. The solar arrays will be composed of a combination of solar modules, tracker systems, posts, and related electrical equipment. The solar modules will be composed of mono- or polycrystalline cells supported on non-specular, galvanized steel racks. The modules are inert and will not introduce any hazardous materials to the Facility. Each tracker will be supported by steel posts. Other onsite equipment will include overhead and buried conduits, inverters, combiners, and transformers.

The distributed energy storage system will contain chemical electrolyte. Lithium-ion batteries are modular systems that contain multiple smaller battery cells. The cells are the primary containment for the gel or liquid electrolyte materials. The module containing the cells is relatively small, generally about the size of a desktop computer processer, and serves as leak-proof secondary containment. Modules are placed in anchored racks within concrete containers. Although leaks

from the modules are very unlikely because any leak would require failure of the individual cell(s) as well as the sealed module, any material that might leak from the cell into the module and then to the floor of the container would easily be contained within the container. Typically, each rack houses 12 battery modules along with a switchgear assembly. The lithium-ion batteries will be manufactured offsite and will be shipped to the site as self-enclosed prefabricated modules, which will be installed and electrically connected onsite.

Materials used to construct the solar array foundations, support structures, the collector substation expansion, and service roads will consist of rock and gravel (aggregate), concrete, steel, steel cabling, and other typical construction materials similar to those used for construction of wind turbines that the Council has already approved. As required by Condition PRE-OE-05, the Certificate Holder will provide proof of the aggregate source and county permits. The amount of concrete and water used for concrete mixing will vary depending on the design of the solar array. Concrete foundations will be needed for the solar modules, transformer pads, and the catchment, and distributed energy storage containers. The amount of concrete will vary depending on the configuration of the energy storage system.

Table G-1 provides a list of industrial materials that would be used during Facility construction, based on current engineering estimates. The amount of water used for concrete is discussed in Exhibit O. Solid wastes generated and flowing out of the Facility during construction are outlined in Exhibit V.

Table G-1. Inventory of Construction Materials

Material	Ultimate Disposition	Units	Quantity
Aggregate	Remains on-site as graveled area associated with battery storage, access roads, perimeter road, and substation expansion.	tons	2,600 tons (5-acres of battery storage); 46,881 tons (72,804 linear feet of access and perimeter roads); 2,600 tons (5-acre expansion of substation): 52,081 tons total
Concrete	Remains on site as foundation for DC storage, inverter & Transformer, and substation	cubic yards (yd^3)	3,936 yd^3 for foundations for battery storage, inverter, and transformer; 500 yd^3 for substation foundation 4,436 yd^3 total
Solar block	Throughout Site Boundary	blocks	41
Solar modules	Throughout each solar module block	modules	10,173 solar modules per block; 14 blocks; 417,093 solar modules total
Solar tracker mounting table	Throughout each solar module block	tracker mounting table	6,000 (70 modules per tracker)

Material	Ultimate Disposition	Units	Quantity
Steel solar module tracking posts	Throughout each solar module block	posts	195,000
Lithium-ion battery racks	Throughout each solar module block	racks	600
Concrete battery storage containers	Throughout each solar module block	containers	23
Combiner boxes	Throughout each solar module block	combiner boxes	748
Overhead or Underground Collector lines	Throughout solar arrays	miles	20.83
Overhead or Underground collector lines	Between solar arrays and substation	miles	2.98
Inverters	Modular inverter enclosure	inverters	41
Transformers (34.5-kV)	Substation	transformers	41 (each inverter has a pad mounted transformer)
Solar area fencing	Will remain around solar area	feet	102,496

2.2 Operations

No substantial quantities of industrial materials will be brought onto or removed from the Facility site during operation of the solar array. The materials that will be brought onto or removed from the site will relate to maintenance or replacement of damaged equipment (e.g., solar module components, electrical equipment). Batteries within the distributed energy storage system will require periodic replacement. During the expected 50-year life cycle of the Facility, it is assumed that 11 battery racks per 1 MW will be replaced every 3 years. Operations materials would be delivered to the required location at the time needed. Table G-2 lists materials and amounts that will be used for operations and maintenance (O&M) of the solar array components.

Table G-2. Inventory of Operations Materials

Material	Units	Quantity	Ultimate Disposition
Lithium-ion batteries	racks	11 battery racks per 1 MW replaced every 3 years	Disposed of at approved facility

Material	Units	Quantity	Ultimate Disposition
Simple Green (general cleaner)	# gallons/year per installed MW	5	Stored in O&M building
Transformer oil	gallons	1,000 [1]	Within transformer boxes for cooling
1. Some inverters use dry-type transformers which don't have oil; others will range from 700-1,000 gallons depending on the size of the inverter.			

3.0 Hazardous Materials Handling and Management – OAR 345-021-0010(1)(g)(B)

OAR 345-021-0010(1)(g)(B) The applicant's plans to manage hazardous substances during construction and operation, including measures to prevent and contain spills.

During the construction or operations phases of the Facility, it may be necessary to use minor quantities of hazardous substances (materials requiring Safety Data Sheets). These materials would include small, but necessary, quantities of herbicide for use around the substation and solar arrays for weed control. All potentially hazardous substances, during both phases, would be used in a manner that is protective of human health, protective of the environment, and that complies with all applicable local, state, and federal environmental laws and regulations. For any necessary, potentially hazardous substance used during the Facility's construction or operation, Safety Data Sheets would be made available and located at the construction area or the relevant Facility component.

Extremely Hazardous Substances in excess of threshold planning quantities, highly toxic substances, or explosive materials would not be necessary to support either the construction or the operations phase of the Facility. Additionally, materials used during the construction and operations of the Facility would be selected so that they minimize the potential for producing "hazardous waste," as defined by the Resource Conservation and Recovery Act.

3.1 Construction Materials

Potentially hazardous substances are not expected to be used during the construction phase. The presence of any hazardous substances would be limited to the amounts of motor vehicle fuel and automotive fluids required to operate construction vehicles and equipment, as identified in the ASC. Potentially hazardous substances will not be permanently present within the construction areas in quantities that exceed Oregon State Fire Marshall Reportable Quantities.

As identified for the approved wind energy project, fuel for construction equipment would be delivered to the site via a specialized mobile vehicle by a licensed service contractor on an as-needed basis. Following the completion of fueling activities, these vehicles would not remain at the

on-site longer than necessary to complete their fueling tasks. Construction-based equipment would be regularly inspected to detect potential leaks or other issues that may require maintenance. Potentially hazardous substances related to the maintenance of the construction equipment would only be brought to the construction site by a maintenance technician on an as-needed basis, and any unused or waste substances would be removed during the same service call.

An Oregon Department of Environmental Quality (OEDQ)-approved Spill Prevention Control and Countermeasure Plan (SPCC Plan) (Condition PRE-SP-01) would apply during construction and will outline preventative measures and practices to reduce the likelihood of an accidental release of a hazardous or regulated liquid and, in the event such a release occurs, to expedite the response to and remediation of the release.

The prevention and minimization of accidental releases would be accomplished through proper containment during use and transportation to the site, and the observance of appropriate handling procedures during the transfer of any fuels from the delivery vehicles to the construction equipment as described in the SPCC Plan. As identified in the ASC, will take place a substantial distance from waterways or wetlands to prevent water quality impacts in the event of an accidental release.

In the unlikely event that an accidental spill occurs, any spilled or released substances would be cleaned up, and any contaminated media impacted by the spill would be managed in accordance with all applicable regulations as described in the SPCC Plan. Larger spill kits with absorbents, absorbent pads, spill socks, and disposable bags would be maintained, in close proximity to construction activities. In addition, to reduce the response time to a spill, smaller spill kits containing absorbent pads would be located on key pieces of construction equipment. All employees would be instructed in the location, handling, and usage of the spill kits. All spills would be reported to a designated qualified person who would make an assessment of the cleanup activities and a determination if further actions or notifications are required.

3.2 Operations

As identified in the ASC, during operation of the Facility, small quantities of a few hazardous materials may be utilized; such materials may include cleaners, insecticides or herbicides, paint, or solvents. The solar arrays would not require a significant increase in use of these items and none would be present in substantial reportable quantities; the amounts present (if any) would be no greater than household quantities of no more than a few gallons each. When not in use these would be stored in a secure location within the O&M Buildings.

Use of the battery storage system were addressed in RFA 2 and there is no change to their general operation and materials with the inclusion of distributed energy storage. The lithium-ion batteries may include hazardous materials. Lithium-ion batteries are considered non-hazardous when used according to the recommendations of the manufacturer and as long as their integrity is maintained (not damaged and internal seal is intact). Lithium-ion batteries present a flammability hazard and require cooling systems to prevent overheating. The battery storage system will have integrated safety systems that monitor battery performance to detect malfunctions and implement response

measures (such as notifying operators, depowering the system, or deploying fire suppression devices). Batteries will be housed in leak-proof containers to prevent inadvertent releases of hazardous materials. O&M staff will conduct inspections of the battery cells for damage.

A lithium-ion system will require regular change out of batteries as they degrade over time. The lithium-ion batteries will be replenished at a rate depending on usage. For example, a battery that is cycled more often will degrade faster than one that is used less often. For this analysis, it is assumed that 11 battery racks per 1 MW will be replaced every 3 years over the life of the Facility (50 years). This assumption likely overestimates the number of batteries that will flow into and out of the Facility, because not all batteries will be replaced during each replenishment cycle (e.g., fewer batteries will need replacing early in the Facility life). A group of lithium-ion battery cells will comprise a "rack." At this replacement rate, approximately 27,500 battery racks will be used over operation term of the battery storage system.

As identified in RFA 2, for the replacement of batteries during operation, the Certificate Holder will follow the handling guidelines of 49 Code of Federal Regulations 173.185 – Department of Transportation Pipeline and Hazardous Material Administration related to the shipment of lithium-ion batteries. Licensed third party battery suppliers will be responsible for transporting batteries to and from the Facility in accordance with applicable regulations, as required through their licensure (Condition GEN-OE-04). Spent batteries will be disposed at a facility permitted to handle them in compliance with applicable Resource Conservation and Recovery Act and Toxic Substances Control Act regulations administered by the U.S. Environmental Protection Agency or ODEQ (Condition OPR-PS-03).

As identified in Condition PRO-SP-01, an operational SPCC Plan may be required. It will depend on the quantity of transformer oil maintained on site. In the unlikely event of an accidental hazardous materials release, any spill or release will be cleaned up and the contaminated soil or other materials disposed of and treated according to applicable regulations. Employees will be trained to be aware of the potential hazards of the contents of the module through the availability of Material Safety Data Sheets, and to handle such releases in accordance with applicable regulations. See Exhibit CC for a list of applicable regulations. Spill kits containing items such as absorbent pads will be located on equipment and in onsite temporary storage facilities to respond to accidental spills, if any were to occur. Employees handling hazardous materials will be instructed in the proper handling and storage of these materials, as well as where spill kits are located. The Certificate Holder will report spills or releases of hazardous materials during construction or operation to the Oregon Department of Energy.

Fire prevention and response training will be implemented (Condition GEN-PS-03) and the Facility site plan will be submitted to fire protection officials (Condition PRO-PS-02) to minimize the risk of fire and to respond appropriately to any fires that occur on the Facility site. An Emergency Management Plan will be prepared (Condition PRE-PS-05) and a Site Health and Safety Plan will be prepared (Condition PRE-PS-06). The plans will cover equipment located at the site, including the new solar array and battery storage. The Certificate Holder will meet annually with local fire

protection agency personnel to discuss emergency planning and will invite local fire protection agency personnel to observe any emergency drills.

4.0 Non-Hazardous Waste Management – OAR 345-021-0010(1)(g)(C)

OAR 345-021-0010(1)(g)(C) The applicant's plans to manage non-hazardous waste materials during construction and operation.

4.1 Construction

Solid waste materials such as excess construction materials or steel will be generated during construction, in addition to the materials identified in the Site Certificate. Measures for minimizing recycling and reusing waste generated during construction, and for disposing of waste concrete are identified in the Construction Waste Management Plan (Condition PRE-WM-01).

Excess construction materials similar to those generated by construction of the wind turbines will be generated from construction of the solar array and battery storage. These materials will include scrap steel, wood, concrete waste, and earth materials. The wastes will be managed according to the Construction Waste Management Plan (Condition PRE-WM-01). Condition PRE-WM-02 requires the investigation and confirmation that there will be no impact from concrete washout water. Condition CON-WM-01 requires consent from the party receiving the earth materials and confirmation of earth material disposal sites to ensure no impact to sensitive environmental resources. In addition, Condition GEN-GS-07 requires that upon completion, the Certificate Holder to remove all temporary structures not required for facility operation and dispose of all timber, brush, refuse and flammable or combustible material resulting from clearing of land and construction of the Facility.

Construction stormwater will be generated at the location of the solar array and battery storage construction sites. Such stormwater will be covered under the Facility's National Pollutant Discharge Elimination System 1200-C construction permit and its associated erosion and sediment control plan (Condition CON-SP-01).

4.2 Operations

Condition OPR-PS-03 requires the Site Certificate Holder to prepare an Operational Waste Management plan which will include handling procedures for lithium-ion batteries (addressed in Section 3.2 above). The same types of solid and liquid nonhazardous waste will be generated as a result of construction and operation of the solar facility components; the Certificate Holder will manage such wastes in accordance with the Operational Waste Management Plan (Condition OPR-PS-03). No additional sewage streams will be created. Administrative activities related to the solar array and battery storage system will be conducted at the O&M building, and will not require additional office wastes.

4.3 Conclusions

Based on the information presented in this exhibit, the Facility, as proposed, continues to comply with the requirements of OAR 345-021-0010(1)(g).

5.0 References

Wheatridge (Wheatridge Wind Energy, LLC). 2015. Wheatridge Wind Energy Facility Application for Site Certificate. Prepared by Tetra Tech, Inc. July 2015.

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Exhibit H

Geologic and Soil Stability

Wheatridge Wind Energy Facility
June 2019

Prepared for



Prepared by



Tetra Tech, Inc.

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Attachment H-4. Response Spectrum – Site Class C

Attachment H-5. Response Spectrum – Site Class C Mapped Acceleration Parameters

Attachment H-6. Sample Solar Facility Emergency Action Plan

Acronyms and Abbreviations

ASC	Application for Site Certificate
Certificate Holder	Wheatridge Wind Energy, LLC
Council	Energy Facility Siting Council
DOGAMI	Oregon Department of Geology and Mineral Industries
ESCP	Erosion and Sediment Control Plan
Facility	Wheatridge Wind Energy Facility
FEMA	Federal Emergency Management Agency
IBC	International Building Code
K	erosion factor
MMI	Modified Mercalli Intensity
MW	megawatt
NRCS	Natural Resources Conservation Service
OAR	Oregon Administrative Rules
ODOE	Oregon Department of Energy
OSSC	Oregon Structural Specialty Code
PGA	peak ground acceleration
RFA	Request for Amendment
USGS	U.S. Geological Survey

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1.0 Introduction

The Wheatridge Wind Energy Facility (Facility) is an approved, but not yet constructed, wind energy generation facility consisting of up to 292 turbines with a peak generating capacity of up to 500 megawatts (MW), to be located in an Approved Site Boundary of approximately 13,097 acres in Morrow and Umatilla counties, Oregon. In Request for Amendment (RFA) 4 to the Facility Site Certificate, Wheatridge Wind Energy, LLC (Certificate Holder) is proposing to add photovoltaic solar energy generation to the Facility to provide the opportunity for an integrated, renewable energy facility with both wind and solar energy generation and energy storage. In RFA 4, the Certificate Holder is proposing five changes to the approved Facility:

1. Amend the description of the Facility to include photovoltaic solar energy generation equipment to leverage the complementary nature of wind and solar generation to provide more reliable renewable energy generation.
2. Amend the Site Boundary to provide for solar micrositing corridors[1] for the photovoltaic solar energy system.
3. Increase the maximum peak generating capacity for the Facility by up to 150 MW of solar energy generation, for a total Facility maximum peak generating capacity of 650 MW.
4. Add distributed energy storage as a related or supporting facility for solar energy generation, along with new collector lines connecting the solar arrays, and an expansion of an approved substation.
5. Amend four existing site certificate conditions and increase the approved MW of the turbines by approximately 12 percent, from 2.5 MW to 2.8 MW.

The Energy Facility Siting Council (Council) previously found the Certificate Holder has demonstrated an ability to construct, operate, and retire the Facility in compliance with Council standards and conditions of the Site Certificate. Exhibit H provides an analysis of geologic hazards and soil stability for the Facility as required to meet the current structural standard in Oregon Administrative Rule (OAR) 345-022-0020 and the submittal requirements in OAR 345-021-0010(1)(h) paragraphs (A) through (I).

As detailed in the following sections, although the proposed changes provide for a new source of energy for the Facility and a larger Site Boundary, the Certificate Holder can still comply with all Site Certificate conditions previously adopted by the Council for compliance with the respect to the structure standard OAR 345-022-0020 (ODOE 2017). Therefore, the Council may rely on its previous conclusion that the Facility complies with the Structural Standard OAR 345-022-0020.

Site Certificate conditions applicable to geologic hazard and soil stability include (ODOE 2017):

[1] Per OAR 345-001-0010(32) "micrositing corridor" means a continuous area of land within which construction of facility components may occur, subject to site certificate conditions.

- GEN-GS-08: Construct to prioritize human safety.
- GEN-GS-09: Notification of foundation changes.
- GEN-GS-10: Notification of other geological observations.
- GEN-SS-01: Compliance with building codes.
- PRE-SS-01: Geological investigation reporting.
- PRE-SS-02: Investigation of active faults.
- PRE-SS-03: Investigation of slope instability.
- PRE-SS-04: Investigation of loess soil.
- CON-SP-01: Erosion and Sediment Control Plan (ESCP).
- PRE-PS-05: Preparation of an Emergency Management Plan.
- CON-SP-02: Best management practices to be included in ESCP.

2.0 Analysis Area

The Analysis Area for structural standards is the Site Boundary. The Site Boundary consists of the Approved Site Boundary and the Amended Site Boundary, and is defined in detail in Exhibits B and C. However, conditions have not changed within the Approved Site Boundary and no modifications to approved facilities are proposed. Therefore, this exhibit focuses on new information related to the solar facility within the Amended Site Boundary (Figure H-1).

3.0 Geologic Report – OAR 345-021-0010(1)(h)(A)

> *OAR 345-021-0010(1)(h) Information from reasonably available sources regarding the geological and soil stability within the analysis area, providing evidence to support findings by the Council as required by OAR 345-022-0020, including:*
>
> > *OAR 345-021-0010(1)(h)(A) A geologic report meeting the Oregon State Board of Geologist Examiners geologic report guidelines. Current guidelines shall be determined based on consultation with the Oregon Department of Geology and Mineral Industries, as described in paragraph (B) of this subsection.*

OAR 345-021-0010(1)(h)(A) requires submission of a geological report meeting the Oregon State Board of Geologist Examiners geologic report guidelines. Condition PRE-SS-01 requires the Certificate Holder to submit a protocol to the Oregon Department of Geology and Mineral Industries (DOGAMI), for review, with the applicable codes, standards, and guidelines to be used, and proposed geotechnical work to be conducted for the site-specific geotechnical investigation report. Once DOGAMI has conducted a review and comments on the protocol are incorporated, the site-

specific geological and geotechnical investigation will be conducted and reported to DOGAMI and the Oregon Department of Energy (ODOE) (ODOE 2017).

3.1 Topographic Setting

The Amended Site Boundary is located entirely within Morrow County, approximately 5 miles northeast of Lexington, and approximately 7 miles northwest of Heppner. Morrow County spans from the Columbia River on its northern boundaries to the Blue Mountains on the south end. The topography in Morrow County varies from a gently rolling plain adjoining the Columbia River to broad plateaus and rounded ridges in the central part of the county, which merges with the more rugged terrain of a forested spur of the Blue Mountains in the southern part of the county (Morrow County 2017).

The Facility occupies slopes ranging from 0 to 40 percent, with an average slope of 20 percent (NRCS 2018). Elevations within the Amended Site Boundary range from 3,310 feet above mean sea level to 4,500 feet above mean sea level.

3.2 Geologic Setting

As indicated in the Application for Site Certificate (ASC), the geologic setting of the Facility generally consists of loess and weak sedimentary rock overlying basalt bedrock. In some valley locations, catastrophic flood deposits (gravel and cobble bars overlain by silt) have been deposited by ancient floods. The geologic descriptions below are summarized from a U.S. Geological Survey (USGS) geologic map prepared for the state of Oregon (Walker and MacLeod 1991), and from observations made during the site reconnaissance described in the ASC (Wheatridge 2015). The geologic units within the Amended Site Boundary are shown in Figure H-1.

3.2.1 Bedrock Geologic Units

Basalt flows mapped in the vicinity of the Facility include the Wanapum and Grande Ronde basalt formations. The Grande Ronde Basalt is exposed in the valley walls along Oregon Highway 74, Blackhorse Canyon, and Bell Canyon, as well as Service Buttes. The Grande Ronde Basalt formation is typically black, aphyric, and dense, with even grain size. As shown in Figure H-1, the Wanapum Basalt underlies the southern/western portion of the Amended Site Boundary, along Strawberry Lane and Strawberry East Road. This unit is described as fine- to coarse-grained basalt, with reversed magnetic polarity. The basalt varies from intact to weathered. Tuffaceous sedimentary rocks and tuff underlie the northern/eastern portion of the Amended Site Boundary, primarily along Bombing Range Road (Figure H-1). This unit is described as semi-consolidated to well-consolidated lacustrine tuffaceous sandstone, siltstone, mudstone, concretionary claystone, pumicite, diatomite, air-fall and water-deposited vitric ash, palagonitic tuff and tuff breccia, and fluvial sandstone and conglomerate. In the vicinity of the Facility, this formation consists of imbricated, basaltic cobble gravel, with interbedded tuffaceous sands and silts that are weakly cemented in places. This formation is exposed primarily by in-road cuts and erosional gullies in the vicinity of the Facility (Figure H-1).

3.2.2 Unconsolidated Geologic Units

The Oregon Statewide Landslide Database (SLIDO 3.4; DOGAMI 2017a) indicates a fan in the northeast portion of the Amended Site Boundary (Figure H-1). These deposits are generally triangular shaped deposits of gravel, sand, and smaller sediments. Loess deposits mantle the flatter plateau and upland areas. Loess is composed of wind-deposited fine sand and silt, and it mantles much of the Columbia Plateau. The loess is typically 15 to 30 feet thick, but it can be less than 3 feet thick in upland areas (Wheatridge 2015).

4.0 Evidence of Consultation with DOGAMI – OAR 345-021-0010(1)(h)(B)

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

Consultation with DOGAMI occurred during the preparation of the ASC (Wheatridge 2015). In addition, consultation with DOGAMI for RFA 4 was initiated on November 14, 2018 with Yumei Wang, ODOE, the Certificate Holder, and Tetra Tech (Wang, 2018, pers. comm.). The results of this consultation discussion are included in Attachment H-1.[2]

5.0 Site-Specific Geotechnical Investigation – OAR 345-021-0010(1)(h)(C)

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

Tetra Tech completed a detailed literature review of the local and regional geology in the vicinity of the Amended Site Boundary. This included evaluating existing reports at adjacent sites, as well as reviewing other published literature and geologic mapping. The literature review included a detailed evaluation of seismic hazards at the Facility (see Section 7.0).

Consistent with Site Certificate Condition PRE-SS-01, before beginning construction, the Certificate Holder will conduct a site-specific geological and geotechnical investigation and shall report its findings to DOGAMI and ODOE. The report shall be used by the Certificate Holder in the final Facility layout and design. ODOE shall review the report in consultation with DOGAMI and confirm

[2] Consultation with DOGAMI is ongoing.

that it includes an adequate assessment of the requirements identified in Site Certificate Condition PRE-SS-01.

The site-specific geological and geotechnical investigation will address subsurface exploration plans, testing plans, and proposed methods of how the structures would tolerate long duration ground motions. Subsurface exploration will be considered at fault and fault zones and locations where ground shaking can influence the site response, such as near drainages with softer soil conditions and areas with thicker loess deposits, as requested by DOGAMI.

6.0 Transmission Lines and Pipelines – OAR 345-021-0010(1)(h)(D)

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

The Amended Site Boundary and solar generation facilities presented under RFA 4 will not include additional transmission lines but will rely on the use of related and supporting facilities, including common transmission infrastructure previously approved under the existing Site Certificate. The Facility does not include pipelines carrying hazardous substances as described in OAR 345-021-0010(1)(h)(E).

7.0 Seismic Hazard Assessment – OAR 345-021-0010(1)(h)(E)

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

hazards, including tsunami safety measures if the site is located in the DOGAMI-defined tsunami evacuation zone.

7.1 Methods

The Council previously found that the Certificate Holder adequately characterized the Facility site as to the maximum credible earthquake and maximum probable ground motion, accounting for ground failure and amplification for the site-specific soil profile under the maximum credible and maximum probable seismic event (ODOE 2017). The updated Structural Standard (OAR 345-022-0020) was addressed for the wind facility and energy storage facilities in RFA 2 and RFA 3. This exhibit addresses the updated Structural Standard for the solar array and related or supporting facilities as requested by DOGAMI during the consultation call on November 14, 2018 (Attachment H-1).

Topographic and geologic conditions and hazards within the Amended Site Boundary were evaluated by reviewing available reference materials such as topographic and geologic maps, aerial photographs, existing geologic reports, and data provided by DOGAMI, the Oregon Water Resources Department, USGS, and the Natural Resources Conservation Service (NRCS).

Tetra Tech performed a seismic hazard analysis to characterize seismicity in the vicinity of the Facility, and to evaluate potential seismic impacts. This work was based on the potential for regional and local seismic activity as described in the existing scientific literature, and on subsurface soil and groundwater conditions within the Amended Site Boundary based on geotechnical subsurface investigations. The seismic hazard analysis consisted of the following tasks:

1. Detailed review of USGS, National Geophysical Data Center, and DOGAMI literature and databases.
2. Identification of potential seismic events for the site characterization of those events in terms of a series of design events.
3. Preparation of conclusions and recommendations based on the characteristics of the subsurface soils and design earthquakes, including specific seismic events that might have a significant effect on the site, potential for seismic energy amplification at the site, and the site-specific acceleration response spectrum for the site.
4. Evaluation of seismic hazards, including potential for fault rupture, earthquake-induced landslides, liquefaction and lateral spread, settlement, and subsidence.

7.2 Maximum Considered Earthquake Ground Motion under IBC 2015

The USGS Seismic Hazard Mapping Project (USGS 2018a) developed ground motions using a probabilistic seismic hazard analysis that covered the Facility site. Though these motions are not considered site-specific, they provide a reasonable estimate of the ground motions within the Amended Site Boundary. For new construction, the site should be designed for the maximum considered earthquake, according to the most recently updated International Building Code (IBC;

IBC 2015) as supplemented by the Oregon Structural Specialty Code (OSSC; OSSC 2014). The USGS unified hazard tool analysis was re-run for the Amended Site Boundary and the design event has a 2 percent probability of exceedance in 50 years (or a 2,475-year return period). This event has a peak ground acceleration (PGA) of 0.1712 acceleration from gravity at the bedrock surface, at the western edge of the Amended Site Boundary. The values of PGA on rock are an average representation of the acceleration most likely to occur at the site for all seismic events (crustal, intraplate, or subduction; USGS 2018a).

Seismic design parameters were developed in accordance with the IBC 2015. Using the information currently available, the Facility would be designed for Site Class C, according to IBC requirements (Table H-1).

Table H-1. Seismic Design Parameters – Maximum Considered Earthquake

Site Class	Peak Horizontal Ground Acceleration on Bedrock	Soil Amplification Factor, F_a	Peak Horizontal Ground Acceleration at Ground Surface
S_C	0.1712g	1.2	0.205g
g = acceleration from gravity.			

The following additional parameters for the Maximum Considered Earthquake may be used for structural design:

- Short period (0.2-second) spectral response acceleration, S_{MS} = 0.465g for Site Class S_C
- 1-second period spectral response acceleration, S_{M1} = 0.252g for Site Class S_C

The design spectral response acceleration parameters, S_{DS} and S_{D1}, for both short period and 1-second period are determined by multiplying the Maximum Considered Earthquake spectral response accelerations (S_{MS} and S_{M1}) by a factor of 2/3. However, as stated in Section 5.0, the site-specific geological and geotechnical investigation to be conducted as consistent with Site Certificate Condition PRE-SS-01, will indicate which seismic design parameters to use in the final Facility layout and design.

7.2.1 Earthquake Sources

As identified in the ASC, seismicity in northern Oregon is generated from the convergence of the Juan de Fuca plate and the North American plate at the Cascadia Subduction Zone (Wheatridge 2015). These plates converge at a rate between 1 and 2 inches per year and accumulate large amounts of stress that are released abruptly in earthquake events. The four sources of earthquakes and seismic activity in this region are crustal, intraplate, volcanic, and the Cascadia Subduction Zone (DOGAMI 2010).

Regionally, seismicity has been attributed to crustal deformation resulting from the Cascadia Subduction Zone and volcanism. Faults are considered active if there has been displacement in the last 10,000 years, and potentially active if there has been movement over the Quaternary period

(last 1.6 million years). Overall, earthquakes in Oregon are associated with active faults in four regional zones of seismicity: the Cascade Seismic Zone, Portland Hills (Portland, Oregon-Vancouver, Washington metropolitan area) Zone, South-Central (Klamath Falls) Zone, and Northeastern Oregon Zone (Niewendorp and Neuhaus 2003). There are no known or active faults mapped within the Amended Site Boundary or Approved Site Boundary (USGS 2018b), as indicated on Figure H-2. Site Certificate Condition PRE-SS-02 requires the Certificate Holder to include an investigation of all potentially active faults within the Site Boundary as part of the geotechnical investigation. The investigation will include a description of the potentially active faults, their potential risk to the facility, and any additional mitigation that will be undertaken by the certificate holder to ensure safe design, construction, and operation of the facility.

Probabilistic seismic hazard deaggregation at 475-year intervals are shown in Attachment H-2, and at 2,475-year intervals in Attachment H-3.

7.2.2 Recorded Earthquakes

Recorded earthquake data do not differ from what was reported in the ASC and are restated below for ease of reference. Figure H-2 displays the location and approximate magnitude of all recorded earthquakes within approximately 50 miles of the Site Boundary. The historical seismic events are grouped by magnitude and are displayed with differently-sized symbols based on the strength of event.

Table H-2 provides a summary of recorded earthquakes greater than a magnitude 3.0 and within 50 miles of the Amended Site Boundary that are known to have caused Modified Mercalli Intensity (MMI) III or greater shaking intensity (Wheatridge 2015). For reference, an intensity of MMI III is associated with shaking that is "noticeable indoors but may not be recognized as an earthquake." (USGS 2018a).

Table H-2. Significant Historical Earthquakes within 50 Miles of the Facility

Year	Month	Day	Latitude	Longitude	Moment Magnitude	Estimated MMI Intensity
1893	3	7	45.90	-119.40	--	VII
1922	10	16	45.83	-119.23	--	III
1922	12	12	45.67	-118.75	--	III
1955	8	21	44.5	-120.0	3.0	--
1958	5	7	45.1	-122.0	3.4	--
1959	11	24	46.55	-121.47	3.1	--
1962	11	9	46.13	-121.63	3.2	--
1963	1	17	44.95	-120.8	3.0	--
1963	4	6	44.43	-119.63	3.3	--
1965	8	19	44.6	-118.4	4.4	--
1965	11	7	44.9	-117.0	4.3	--

Year	Month	Day	Latitude	Longitude	Moment Magnitude	Estimated MMI Intensity
1967	8	5	44.9	-118.0	3.5	--
1969	4	19	45.78	-119.7	3.2	--
1969	9	27	46.63	-118.08	3.1	--
1969	11	1	46.85	-120.45	3.2	--
1969	11	21	46.62	-118.88	3.6	--
1970	1	1	46.27	-118.35	3.0	--
1970	4	4	46.3	-119.9	3.0	--
1970	4	22	46.3	-120.13	3.0	--
1970	6	22	46.47	-120.02	3.1	--
1970	9	11	46.63	-120.42	3.5	--
1970	10	2	45.77	-120.56	3.0	--
1970	11	22	46.82	-120.33	3.0	--
1970	11	29	46.2	-120.1	3.0	--
1951	1	7	45.92	-119.23	--	V
1969	4	19	45.78	-119.70	3.2	--
1971	1	4	46.22	-119.35	3.1	--
1975	7	1	45.63	-120.00	3.5	--
1985	2	10	45.86	-119.64	3.7	--
1987	9	8	45.18	-120.09	3.1	--
1987	9	29	45.19	-120.11	2.7	--
1988	7	11	45.25	-120.13	2.9	--
1988	9	29	45.85	-120.26	3.5	--
1989	3	27	45.82	-120.26	3.1	--
1991	4	20	45.35	-120.14	2.8	--
1992	8	7	45.86	-119.59	3.9	--
1993	12	16	45.20	-120.09	3.0	--
1993	12	18	45.25	-120.11	3.1	--
1994	9	22	45.69	-120.16	2.9	--
1994	11	17	45.70	-120.18	2.7	--
1995	11	2	46.15	-119.56	3.1	--
1996	2	13	45.53	-119.61	2.9	--
1997	3	22	45.20	-120.07	2.7	--
1997	3	22	45.19	-120.07	3.9	--
1997	3	23	45.20	-120.07	3.4	--
1997	4	17	45.19	-120.08	3.2	--
1997	8	17	45.65	-120.19	2.8	--

Year	Month	Day	Latitude	Longitude	Moment Magnitude	Estimated MMI Intensity
1997	9	10	45.65	-120.20	2.7	--
1998	2	3	45.81	-120.2	3.1	--
1998	4	28	45.26	-120.28	2.7	--
1998	8	12	45.17	-120.03	2.8	--
1998	9	5	45.65	-120.49	2.9	--
1999	8	31	45.19	-120.09	3.2	--
1999	9	4	45.18	-120.08	2.9	--
2000	1	5	45.70	-120.05	2.8	--
2000	1	30	45.20	-120.13	4.1	--
2000	1	30	45.19	-120.10	3.4	--
2000	1	30	45.18	-120.11	2.8	--
2000	2	1	45.19	-120.11	3.6	--
2000	2	1	45.19	-120.12	2.8	--
2000	7	25	45.34	-121.68	2.8	--
2000	7	28	45.17	-120.14	2.6	--
2000	8	3	45.21	-120.07	2.8	--
2000	8	17	45.31	-120.04	3.2	--
2002	1	31	45.69	-120.17	2.7	--
2002	10	25	45.19	-120.10	2.7	--
2003	6	1	45.19	-120.11	2.8	--
2003	9	12	45.43	-118.86	2.8	--
2004	2	28	46.04	-119.02	3.6	--
2008	5	18	46.16	-119.55	3.7	--
2009	8	16	45.93	-120.10	2.8	--
Sources: Madin 1994, USGS 2018b.						

The Ground Response Spectra Assessment on Attachments H-4 and H-5 compare the design response spectrum given in the 2012/2015 IBC with the 2014 OSSC (USGS 2018a). Response spectra are provided for the maximum considered earthquake at the location of the Facility. For the maximum considered earthquake, separate response spectra modified by the amplification factors for Site Class C (S_C) are provided. Based on the current subsurface information available, it is recommended that the Facility be designed for Site Class C. However, examination of the geology mapped for the site suggests that shallow bedrock formations (Wanapum Basalt) may exist at certain locations, where the S_B response spectra would apply.

7.2.3 Hazards Resulting from Seismic Events

Potential seismic hazards associated with a design seismic event for this Facility include seismic shaking or ground motion, fault displacement, instability from landslides or subsurface movement, and adverse effects from groundwater or surface water. These hazard risks are anticipated to be low, as discussed below.

7.2.3.1 Seismic Shaking or Ground Motion

The design seismic event will have a 2,475-year recurrence interval. The structures will be designed for this unlikely event so that no permanent structural damage will occur. The Facility's structures will be designed to withstand the maximum risk-based design earthquake ground motions developed for the Facility site. The State of Oregon has adopted the IBC 2012 code for structural design. Specifically, this is Section 1613 (Earthquake Loads) of the 2014 OSSC, which is in Chapter 16. It should be noted that building codes are frequently updated; the IBC specifically is updated every 3 years. Consistent with Condition GEN-SS-01, the Certificate Holder will design, engineer, and construct the Facility in accordance with the current version of the latest International Building Code, Oregon Structural Specialty Code, and building codes adopted by the State of Oregon at the time of construction. Therefore, it is incumbent on the design engineers to ensure that the designs are in accordance with the current versions of the latest codes as adopted by the State of Oregon at the time of construction.

Based on geotechnical and geological information, a Site Class for the soil/bedrock at the site is assigned. In this case, as described previously in Section 7.2.1, a Site Class C (very dense soil to soft rock) is appropriate for the Facility.

As identified in the ASC, based on site-specific analyses, the original equipment manufacturer will provide the structural engineer with site specific foundation loads and requirements. The structural engineer then completes the foundation analyses based on the design site-specific parameters. Generally, these include the following loads for solar foundation design: extreme loads, load cases for up-lift, shear failure, tension loads (for pile foundations), earthquake loads, fatigue loads, subsoil properties, spring constants, verification procedures, and maximum allowable inclination.

The geotechnical studies and analyses provide site-specific parameters including but not necessarily limited to: moisture content and density, soil/bedrock bearing capacity, bedrock depth, settlement characteristics, structural backfill characteristics, soil improvement (if required), and dynamic soil/bedrock properties including shear modulus and Poisson's Ratio of the subgrade. The foundation design engineer uses these parameters to design a foundation suitable for the Facility and verifies that the foundation/soil interaction meets or exceeds the minimum requirements stated by the original equipment manufacturer for the Facility.

7.2.3.2 Fault Rupture

The probability of a fault displacement within the Amended Site Boundary is considered low because of the distance (> 25 miles away) of known or mapped potentially active faults from Amended Site Boundary and the absence of faults within the Amended Site Boundary (Figure H-2). Unknown faults could exist, or new fault ruptures could form during a significant seismic event, but the likelihood of either occurrence is low based on the lack of known active faults identified during previous geologic investigations.

7.2.3.3 Liquefaction

Liquefaction is a phenomenon in which saturated, cohesionless soils temporarily lose their strength and liquefy when subjected to dynamic forces such as intense and prolonged ground shaking and seismic activity. The soils in the Amended Site Boundary are not saturated and are generally cohesive in nature. Along with the relatively low seismic event potential, this indicates that the liquefaction of soils within the Amended Site Boundary is considered extremely unlikely.

7.2.3.4 Seismically Induced Landslides

Seismicity in the region has the potential to trigger landslides and mass wasting processes within the Amended Site Boundary; however, the potential is considered low and limited to the steepest canyon areas. Known landslides are shown in Figure H-1. More detailed discussion on the location and type of landslides is included in Section 8.1.

7.2.3.5 Subsidence

Subsidence is the sudden sinking or the gradual downward settling of the land surface, and is often related to groundwater drawdown, compaction, tectonic movements, mining, or explosive activity. Subsidence due to seismic event is highly unlikely. In most areas bedrock is relatively shallow, and as noted above, the overlying soils are not saturated.

7.2.4 Seismic Hazard Mitigation

The State of Oregon uses IBC 2012, with current amendments by the OSSC (OSSC 2014). Pertinent design codes as they relate to geology, seismicity, and near-surface soils are contained in IBC Chapter 16, Section 1613, with slight modifications by the current amendments of the State of Oregon. Prior to submitting any building permit applications, as identified above in Section 7.2.3, the Facility will be designed to meet or exceed the minimum standards required by current design codes (Condition GEN-SS-01).

A geotechnical exploration will be conducted to collect pertinent data for the design of the Facility, to mitigate potential hazards that could be created during a seismic event. The hazard of a surficial rupture along a fault trace is anticipated to be low, given the seismic history of the site displayed in geologic mapping, and the low probability that a fault rupture would displace the ground surface at the location of the solar facility. No mitigation for potential fault rupture is anticipated; the risk to

human safety and the environment will be minimal. Design parameters related to disaster resilience are further described in Section 9.0.

8.0 Non-Seismic Geological Hazards – OAR 345-021-0010(1)(h)(F)

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

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

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

8.1 Landslides

No active landslides are identified in the Statewide Landslide Information Database for Oregon within the Amended Site Boundary (Figure H-1). However, a few small landslides are shown close to the southern portion of Wheatridge West (Wheatridge 2015). These landslides were observed during the site reconnaissance, and may be areas of slope instability (Figure H-1). Per Site Certificate Condition PRE-SS-03, prior to construction, the Certificate Holder will include, as part of the geotechnical investigation, an investigation of specific areas with potential for slope instability and will site facilities as appropriate to avoid potential hazards. The landslide hazards will be investigated and mapped before final facility layout and design. The landslide hazard evaluation will be conducted using a combination of LIDAR (light detection and ranging) remote sensing data and field work.

8.2 Volcanic Activity

Volcanic activity in the Cascade Range is driven by the subduction of the Juan de Fuca Plate beneath the North American Plate. The closest volcanoes to the Amended Site Boundary are Mount Hood and Mount Adams, each located approximately 100 miles away. Most of the potential volcanic hazard impacts would occur within a 50-mile radius of the erupting volcano. Depending on the prevailing wind direction at the time of the eruption and the source of the eruption, ash fallout in the region surrounding the Facility may occur. Because of the distance to the nearest volcanoes, impacts to the Facility from volcanic activity would be indirect and likely be limited to ash fallout. In addition, the Facility is not located near any streams that would likely be subject to pyroclastic

flows from a volcanic eruption from these close volcanoes. It is unlikely that there would be any adverse effects from volcanic activity on the construction or operation of the Facility.

8.3 Erosion

The erosion factor (K) indicates the susceptibility of a soil to sheet and rill erosion by water. The K-Factor is one of six factors used in the Universal Soil Loss Equation and the Revised Universal Soil Loss Equation to predict the average annual rate of soil loss by sheet and rill erosion in tons-per-acre-per-year. The estimates are based primarily on percentage of silt, sand, and organic matter, as well as soil structure and saturated hydraulic conductivity (Ksat). Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water. Data from the NRCS Web Soil Survey (NRCS 2018) indicate that the soils within the Amended Site Boundary have a K that ranges from 0.15 to 0.55. For the range of K at the Facility, the soils could be considered moderately to highly erodible, and subject to sheet erosion and rill erosion by water (NRCS 2018).

8.4 Flooding

To evaluate flood hazards, the DOGAMI Statewide Flood Hazard Database for Oregon – Federal Emergency Management Agency (FEMA) Flood Insurance Study inundation zones (DOGAMI 2017b) were compared to the Amended Site Boundary. The Amended Site Boundary is not within an identified FEMA 100-year or FEMA 500-year floodplain.

Seasonal thunderstorms can result in concentrated stormwater runoff and localized flooding. The engineered access roads and drainages will direct stormwater runoff away from structures and into drainage ditches and culverts as required in the ESCP (Condition CON-SP-01). The Facility will be designed and engineered to meet the requirements of the zoning ordinances and building codes that establish flood protection standards for all construction, to avoid dangers to the infrastructure, as well as human safety and the environment, including criteria to ensure that the foundation will withstand flood forces. Therefore, the risks and potential impacts to the Facility as well as human safety and the environment from flood hazards are expected to be low.

8.5 Shrinking and Swelling Soils

Changes in soil moisture cause certain clay minerals in soils to either expand or contract. The amount and type of clay minerals in the soil influence the change in volume. Structures or roads built on shrinking or swelling soils could be damaged by the change in volume of the soil. Linear extensibility (shrink-swell potential) refers to the change in length of an unconfined clod as its moisture content is decreased from a moist state to a dry state.

There are no soils identified in the Amended Site Boundary with potential for shrinking and swell (see Exhibit I). Regardless, per Site Certification Condition PRE-SS-04, prior to construction, the Certificate Holder will include, as part of the geotechnical investigation, an investigation of the swell and collapse potential of loess soil in the site boundary. Based on the results of the investigation, the Certificate Holder will include mitigation measures including, as necessary: over-excavating and

replacing loess soil with structural fill; wetting and compacting; deep foundations; or avoidance of specific areas.

9.0 Disaster Resilience

The State of Oregon uses IBC 2012, with current amendments by the OSSC and local agencies. Pertinent design codes as they relate to geology, seismicity, and near-surface soils are contained in IBC Chapter 16, Section 1613, with slight modifications by the current amendments of the State of Oregon and local agencies. The Facility will be designed to meet or exceed the minimum standards required by these design codes. The Certificate Holder acknowledges that DOGAMI encourages, but does not require, applicants to design and build for disaster resilience and future climate conditions using science, data and community wisdom to protect against and adapt to risks (DOGAMI 2018). With this in mind, the Certificate Holder has extensive experience building energy facilities and, as indicated in RFA 3, from a structural perspective, designs projects to withstand non-seismic geologic hazards such as the potential for changes in rainfall or temperature. Additional elements such as wind speeds, snow, dust, etc. are also considered into project designs depending on the location in the country. For example, existing solar facilities in Florida have been designed by the Certificate Holder to withstand hurricane force winds.

A qualified engineer will assess and review the seismic, geologic, and soil hazards associated with the construction of the Facility. Construction requirements will be modified, as needed, based on the site-specific characterization of seismic, geologic, and soil hazards. The Facility will be designed, engineered, and constructed to meet all current standards to adequately avoid potential dangers to human safety presented by seismic hazards. Substation structures will be designed in accordance with the current version or equivalent of the latest International Building Code, Oregon Structural Specialty Code, and building codes adopted by the State of Oregon at the time of construction. Codes used to design the substation include American Society of Civil Engineers (ASCE) 7; National Electric Safety Code (NESC); ASCE 113 Guide for Design of Substation Structures; IEEE 693, Recommended Practice for Seismic Design of Substations; IEEE 1527 Recommended Practice for Design of Buswork Located in Seismically Active Areas; and various IEC and ANSI standards. Facility structures will be generally unmanned, and located in a sparsely populated area; therefore, the risks to human safety and the environment due to seismic hazards will be minimal. While it is difficult to predict what disasters will occur in the future, the Facility will be designed, engineered, and constructed to meet all current standards.

Condition PRE-PS-05 requires submittal of the Emergency Management Plan to ODOE prior to construction. Preparation of this plan is not required for evaluation of compliance with standards, but in accordance with Site Certificate Condition PRE-PS-05, ODOE must approve the plan prior to construction. An example of an Emergency Action Plan prepared for a New York energy storage center owned and operated by the certificate holder is provided as Attachment H-6.

10.0 Climate Change

The University of Washington conducted a study to assess climate vulnerability and adaptation in the Columbia River Plateau, the region where the Facility is located (Michalak et. al. 2014). The study involved downscaling five climate models (CCM3, CGM3.1, GISS-ER, MIROC3.2 and Hadley). Climate projections were downscaled to approximately a 1-kilometer resolution for over 40 different direct (mean annual temperature/precipitation) and derived (number of growing-degree days, actual and potential evapotranspiration) climate variables (Michalak et. al. 2014). The downscaling of the climate models for this area led to future projections of greater annual average and summer temperatures, and more severe storm events and wildfires, among other changes. These specific changes are expected to increase stress to power lines in the region.

Reinforcing the Certificate Holder's electric grid with the Facility as modified under RFA 4 provides resilience to the overall energy grid in this part of Oregon. This will be direct, by upgrading the system, which is anticipated to experience higher loads under raising temperatures and the related increases in power demand for summer cooling, and indirect, by supporting the delivery of power generated through a larger variety of sources, minimizing the potential reduction in hydro power's role under future conditions. Both aspects of this Facility support resiliency in the face of future climate change. In addition, the Facility will be designed to withstand extreme events as explained above in Section 9.0.

11.0 Conclusions

The human safety risk of seismic and other geologic and soil-based hazards to low. The Facility is located in a sparsely populated region of Oregon where land management and site conditions are expected to prevent residential or industrial development during the life of the Facility. In addition, only a few maintenance personnel would be on site at any given time. As a result, the probability of a large seismic, volcanic, or mass wasting event occurring while a Facility component is occupied would be much lower than a building or similar facility in a more populated area of similar seismic activity.

Non-seismic hazards that could affect the Facility include volcanic hazards, floods, landslides, and erosion. Volcanic hazards are expected to be low for the Facility. Landslides have been identified near the Amended Site Boundary; these areas will undergo additional geotechnical investigations to ensure that no Facility components are located on or near unstable land masses.

Land disturbance and construction impacts could increase the area's susceptibility to soil erosion. Best management practices will be implemented through the National Pollutant Discharge Elimination System 1200-C Stormwater Construction Permit and associated ESCP to mitigate the potential for erosion (Condition CON-SP-01).

Site Certificate structural standard conditions require the Certificate Holder to design, engineer, and construct the facility in accordance with the current versions of the latest International

Building Code, Oregon Structural Specialty Code, and building codes as adopted by the State of Oregon at the time of construction (Condition GEN-SS-01). In addition, DOGAMI requests that the facility be constructed above code where conditions warrant, specifically as it relates to disaster resilience and future extreme climate events.

The Certificate Holder has demonstrated in accordance with OAR 345-022-0020(1)(b) that the Facility can be designed, engineered, and constructed to avoid dangers to human safety in case of a design seismic event by adhering to IBC requirements.

12.0 References

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Figures

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Wheatridge Wind Energy Facility Request for Amendment 4

Figure H-1 Geologic Map

MORROW AND UMATILLA COUNTIES, OR

Approved Site Boundary (Approved Wind Micrositing Corridors)

Amended Site Boundary (Proposed Solar Micrositing Corridors)

State Highway

County Boundary

Fan

Landslide

Fault Line

Yes

No

Surface Geology

Qal - Alluvial Deposits

Qgs - Glaciofluvial, Lacustrine, and Pediment Sedimentary Deposits (Pleistocene)

Tcg - Grande Ronde Basalt (Middle and Lower Miocene)

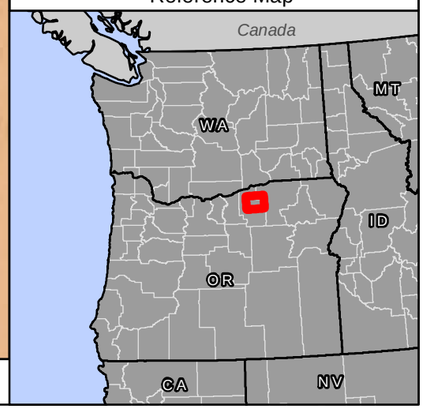
Tcw - Wanapum Basalt (Middle Miocene)

Ts - Tuffaceous Sedimentary Rocks and Tuff (Pliocene and Miocene)

TETRA TECH

NEXTera ENERGY RESOURCES

Reference Map



1:130,000 WGS 1984 UTM Zone 11N

0 0.5 1 2 3 4 Miles

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Wheatridge Wind Energy Facility Request for Amendment 4

Figure H-2 Historical Seismicity and Potentially Active Faults

MORROW AND UMATILLA COUNTIES, OR

Approved Site Boundary (Approved Wind Micrositing Corridors)

Amended Site Boundary (Proposed Solar Micrositing Corridors)

Analysis Area (50-mile Buffer)

State Boundary

County Boundary

Faults

Age

Mid to Late Quaternary

Quaternary

Earthquakes

Magnitude

2.5 - 3.0

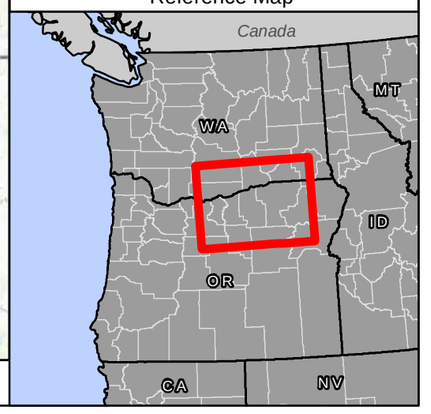
3.1 - 4.0

4.1 - 5.0

TETRA TECH

NEXTera ENERGY RESOURCES

Reference Map



Washington

Oregon

Yakima County

Franklin County

Garfield County

Walla Walla County

Columbia County

Benton County

Klickitat County

Wallowa County

Umatilla County

Sherman County

Gilliam County

Morrow County

Union County

Wasco County

Wheeler County

Grant County

Baker County

Jefferson County

1:820,000 WGS 1984 UTM Zone 11N

0 5 10 20 30 40 Miles

P:\GIS_PROJECTS\NextEra\Wheatridge_Solar\Figures\Exhibit_H\NextEra_Wheatridge_RFA4_ExhibitH_FigureH2_11117i_20181128.mxd

Attachment H-1. Draft Record of Correspondence with DOGAMI

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Wheatridge Solar Project Consultation with Oregon Department of Geology and Mineral Industries (DOGAMI)

November 14, 2018
Skype Call and Meeting in Portland, OR at the DOGAMI office

In Attendance	Yumei Wang, P.E. – DOGAMI
On Phone	Mike Pappalardo – NextEra Energy; Carrie Konkol – Tetra Tech/NextEra Energy; Suzy Cavanagh – Tetra Tech/Pattern Energy; Sarah Esterson - ODOE

DOGAMI requested that the consultation meeting held on November 14, 2018 be summarized and emailed to DOGAMI and ODOE for review so that we are all on the same page as to what is expected to be analyzed.

Project Background, RFA description

The Wheatridge Wind Energy Facility (Facility) is an approved wind energy generation facility consisting of up to 292 turbines with a peak generating capacity of up to 500 megawatts, to be located on approximately 13,097 acres. The final order on the site certificate was in April 2017; the wind facility has not yet been built.

Two requests for amendment (RFA) have been submitted; RFA 2 requests approval for construction and operation of two battery storage systems, to be rated at 20 and 30 megawatts, to be located adjacent to previously approved Facility substation and operation and maintenance building sites, with previously approved site boundary. RFA 3 requests approval for flexibility in wind turbine technologies selected during final Facility design, including changes in wind turbine dimensions that would increase blade tip height, increase blade length from, increase hub height, increase rotor diameter, and reduce minimum aboveground blade tip clearance.

Both of those amendments are still in the EFSC process and we expect issuance at end of this year or early next year. We are working on RFA 4 to add solar to already permitted wind at Wheatridge. Two figures that were emailed to show the permitted wind project and the proposed amended site boundary for the solar array were explained. NextEra Energy Resources (NEER) is proposing to add 150 MW of solar, about 70 racked modules mounted approximately 5 feet off the ground that rotate about 60 degrees to the east and west. The solar array will not be sited completely within the purple area, but a subset of that area. Looking for flexibility based on additional constraints that are determined over time. We are calling these two areas solar array 1 (northern area) and solar array 2 (southern area). They will be connected with two alternative line collector routes (34-kv collector

cables) either underground or overhead. The solar array will share the substation, roads, and O&M building that were previously approved. There will be energy storage; however, it is different than the battery storage requested in RFA2. Under RFA 4, it will be distributed energy storage, which will be 41 sites of lithium ion batteries in small concrete containers throughout the solar array areas.

To recap, there is a site certificate from 2017, but NEER is seeking RFAs for 2, 3, and 4 but haven't submitted for 4 yet. The schedule for RFA 4 is scheduled to be submitted at the end of November 2018.

ODOE stated that for RFA 2 and 3 and the scope of those changes, under the new rules, ODOE relied on the evaluation and consultation that occurred under the ASC. This call is to inform DOGAMI of the proposed changes that are outside of the current Site Boundary.

Information needed for the RFA

- Since 2014 – there have been changes to the structural standards.
- Exhibit H and I from the site certificate were emailed out and are the latest description of soils and geology. DOGAMI only needs the geology and is concerned about the seismic design parameters.
- Mass wasting is unlikely as the site is mostly glacial loess. DOGAMI stated that some owners would scrape away the loess, so they don't have to deal with it. NEER will have geologic engineers conduct studies. NEER has not yet selected the geologic engineers, but Barr Engineering has done work for NEER in the past. The construction timeline is a way out, so the engineering firm hasn't been selected.
- DOGAMI will want to know that Barr Engineering, or the geotechnical engineers will use the report guidelines by the Oregon State Board of Geology Examiners to ensure the hazards are addressed using state of practice methods. Any codes that will be used need to be clearly stated and up to date. Oregon currently has a new building code and it is likely next year that the state of Oregon will adopt the new building code. DOGAMI asks to keep in mind that when this project goes forward, there might be a different building code in place. For the site specific geotechnical work, DOGAMI wants to be sure there are no active faults that are nearby or through the property, this should be addressed in the design. Site specific response spectra need to be conducted. The project area is pretty far away from the Cascadia subduction zone but look at any tall structures that could be affected in the long-period by the Cascadia, this needs to be analyzed and addressed for safety purposes. DOGAMI asks the Certificate Holder to address all earthquake faults that could negatively impact the property, not just faults "nearby or through the property." DOGAMI asks the Certificate Holder to discuss long-period ground motion hazards, and how the Certificate Holder plans to design, engineer, and construct the Facility to avoid dangers to human safety and the environment presented by those hazards.

- The design response spectra were developed for the wind farm in 2012. Does it need to be revised for the solar array? DOGAMI stated that if it was done in the 2012 timeframe, then it should be updated. There have been several large earthquakes worldwide, which need to be considered. Those were not likely considered in the 2012 Exhibit H because the earthquake data are slow to come out.
- On another project, the repower for Vancycle II, we cited structural standards and current information was used to inform design. NEER will ensure that the most current state codes along with the IBC are used. DOGAMI asks the Certificate Holder to be explicit about what codes and standards are being used for design (e.g., National Electric Safety Code for transmission lines) for the Facility, including specific components (e.g., IEEE 693 for power transformers), and its related and supporting facilities.
- The current 2014 code refers to 2012 IBC and ASCE7-7. Next year, the State of Oregon is expected to adopt the 2019 Oregon Structural Specialty Code, which will refer to different ASCE7. Refer to the code and year you are using.
- Building permit applications are a while out; the project still needs to be put out to bid and award. But at the same time, we have to have minimum site design requirements to get the site certificate reviewed and approved; then it will go through the county specific permits.
- DOGAMI suggested to have the engineers run both; run current and what is likely to be adopted next year. Regardless of what code is current, DOGAMI wants to be sure the site specific geotechnical analysis includes quaternary active faults (not just USGS database), map and table of major faults, maximum considered earthquake, site-specific response spectra, and address landslide hazards. DOGAMI expects with landslide hazards where the area is densely tree covered, Lidar will be used. DOGAMI expects due diligence with respect to public safety. NEER will have aerial photography with 1-ft contours or less. DOGAMI reiterated that Lidar is standard of practice and it might be available on the DOGAMI website for this area, especially where there are active faults and dense tree coverage. Section 3.1.4 of Exhibit H will be updated; significant earthquake history does not need to be updated. DOGAMI needs to know if site-specific work is done to estimate the ground motion, long duration energy in design spectrum.
- This project will not be in construction until spring 2020, so that will give the engineers time to catch up with updates in the code so that when the applications are finalized, they will be consistent with 2019. RFA 4 for solar will be consistent for 2019 and beyond, which will catch anything that may not be adequately described in the site certificate.
- For disaster resilience and future climate change discussion for the solar facility, NEER suggested that we look at the language used in the response provided to DOGAMI's RFIs on the Vansycle II height change amendment. This was the first time NEER encountered the new requirement for additional disaster resilience discussion and NEER thought that the Vansycle II response could provide some guidance. DOGAMI asks the Certificate Holder to provide a more complete discussion of disaster resilience design and designing for future

climate conditions, as discussed during the consultation, to address Division 21 requirements.

- DOGAMI wants to know if anything is being designed above code. For example, it will lesson damage with extreme loading. If you can recover your operations quickly, then we need to know. Include a new paragraph in Exhibit H addressing how you will design to integrate disaster resilience to ensure recovery after a disaster. For example, installing emergency generators, study excess wind loading, ice loading, etc. Yumei emailed the DOGAMI Scope of Review for EFSC, which has examples of how this information can be included.
- As the project moves forward, let DOGAMI know what work has been done and what is planned in the future, including geotechnical borings, final design, etc. DOGAMI asks the Certificate Holder to provide a description and schedule of site-specific geotechnical work that will be performed before construction for inclusion in the site certificate as conditions.
- NEER will conduct a detailed geotechnical investigation with drilling on each wind turbine pad and at the solar facility, which is adjacent. Collapsible loess will be studied under the geotechnical investigation as well.
- With this RFA 4 for solar, some sections will be incomplete. NEER is trying to submit for commercial reasons to be responsive to PGE on their request for proposal (RFP) for the wind, solar and battery. PGE requested a solar application be submitted and there is a timeline for the application.
- There are site certificate conditions associated with the permit. DOGAMI asked for detail on what kind of investigations will take place, not just that investigations will be done, DOGAMI wants to know details of what will be done. That information will be included. DOGAMI requested that if information is going to be incomplete, just state that it is incomplete and how it will be addressed to be completed. Some applicants just state that they will do the geotechnical work. DOGAMI wants to know what kind of work; for example, site specific geotechnical, spectral response study, Lidar (or if not, Lidar what will be done instead). DOGAMI wants due diligence with respect to public safety.
- NEER we will understand the data gaps before submittal and will explain what and when those data gaps will be covered.
- DOGAMI would like notes as evidence of consultation with DOGAMI, they can also be provided to PGE.
- NEER's portfolio includes over 140 energy facilities across the US and is very busy (109 wind projects and 46 (30 utility and 16 private generation) solar projects). NEER's sister company is Florida Power and Light and together we do about $2-3 billion a year in infrastructure. NEER has a lot of resources and can't turn things around on a dime, but we do our best.

- ODOE stated that it depends on extent of completeness; ODOE will take a couple of months generally to review the RFA. If information is not available during that time, it can be appropriate to condition. This works for some projects and not for others.
- NEER will put together a schedule so you know what is coming and will expect requests for additional information.
- ODOE stated that if you are planning on putting together a geologic report meeting most of the requirements, the site specific geotechnical analysis can be conditioned. I am not too concerned that you will be submitting a skeleton of Exhibit H. NEER is aware of code changes and it will be included into Exhibit H. DOGAMI would much more likely ding you for not taking an incoming code in consideration than to be out of date on a code that is no longer being used.
- DOGAMI asked for an explanation of the difference in RFA 2 is for batteries and RFA 4 battery storage. Mike explained AC coupled versus DC coupled: AC energy would be taken from the solar panels and would be interjected directly into the grid. Any energy not interjected would be put into the battery storage in RFA 2. Without battery storage there would be losses, the DC coupled is individual batteries and inverters at the controller panels themselves; because of the DC battery system, less energy would be lost, and the stored energy is released as energy is demanded. If the losses over the gen-tie line, or if the losses of energy are not that significant, the price differential may not justify the DC system. We are coupling the AC with the wind project and requesting amendments due to the need for flexibility because technology is changing so rapidly.

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Attachment H-2.
Probabilistic Seismic Hazard Deaggregation – 475-Year Return Time

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Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Input

Edition
Dynamic: Conterminous U.S. 201

Spectral Period
Peak ground acceleration

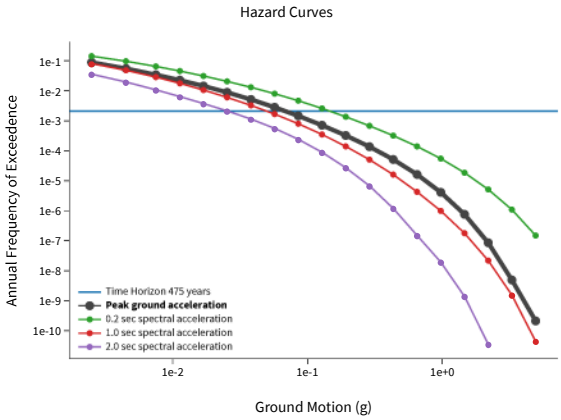
Latitude
Decimal degrees
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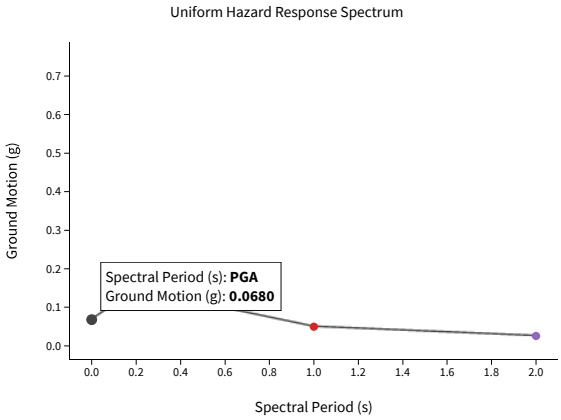
Time Horizon
Return period in years
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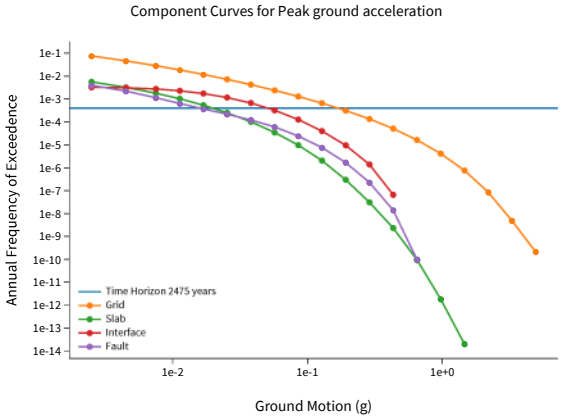
Longitude
Decimal degrees, negative values for western lo…
-119.598669

Site Class
760 m/s (B/C boundary)

Hazard Curve





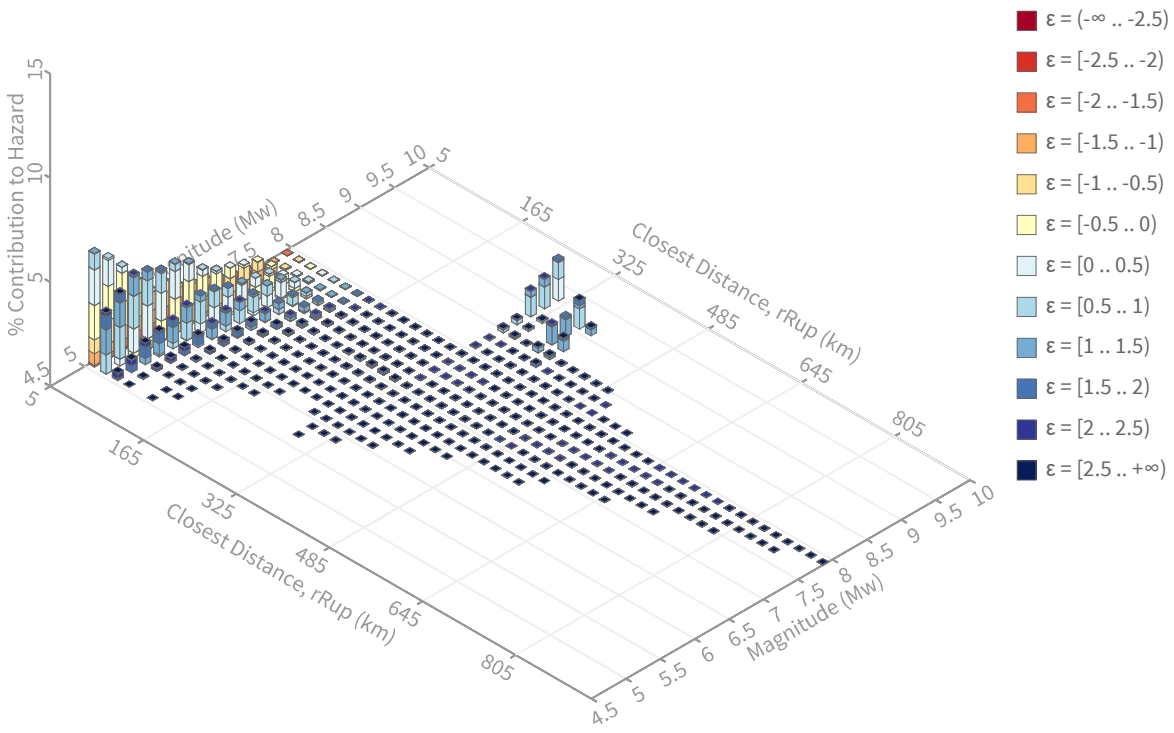


View Raw Data

Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 475 yrs
Exceedance rate: 0.0021052632 yr^{-1}
PGA ground motion: 0.068042606 g

Recovered targets

Return period: 480.39 yrs
Exceedance rate: 0.002081642 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.82 %

Mean (for all sources)

r: 69.14 km
m: 6.41
ε_0: 0.17 σ

Mode (largest r-m bin)

r: 12.18 km
m: 5.1
ε_0: -0.12 σ
Contribution: 5.45 %

Mode (largest ε_0 bin)

r: 14.97 km
m: 5.11
ε_0: 0.24 σ
Contribution: 1.7 %

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
WUSmap_2014_fixSm.ch.in (opt)	Grid							11.60
noPuget_2014_fixSm.ch.in (opt)	Grid							11.60
WUSmap_2014_fixSm.gr.in (opt)	Grid							11.45
noPuget_2014_fixSm.gr.in (opt)	Grid							11.45
noPuget_2014_adSm.ch.in (opt)	Grid							7.75
WUSmap_2014_adSm.ch.in (opt)	Grid							7.74
noPuget_2014_adSm.gr.in (opt)	Grid							7.66
WUSmap_2014_adSm.gr.in (opt)	Grid							7.65
sub0_ch_bot.in	Interface							4.46
Cascadia Megathrust - whole CSZ Characteristic		307.65	9.11	0.71	123.413° W	46.300° N	286.44	4.46
sub0_ch_mid.in	Interface							3.09
Cascadia Megathrust - whole CSZ Characteristic		360.99	8.92	1.13	124.137° W	46.300° N	284.38	3.09
WUSmap_2014_fixSm_M8.in (opt)	Grid							2.83
noPuget_2014_fixSm_M8.in (opt)	Grid							2.83
noPuget_2014_adSm_M8.in (opt)	Grid							1.89
WUSmap_2014_adSm_M8.in (opt)	Grid							1.89

Attachment H-3.
Probabilistic Seismic Hazard Deaggregation – 2,475-Year Return Time

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Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Input

Edition
Dynamic: Conterminous U.S. 201

Spectral Period
Peak ground acceleration

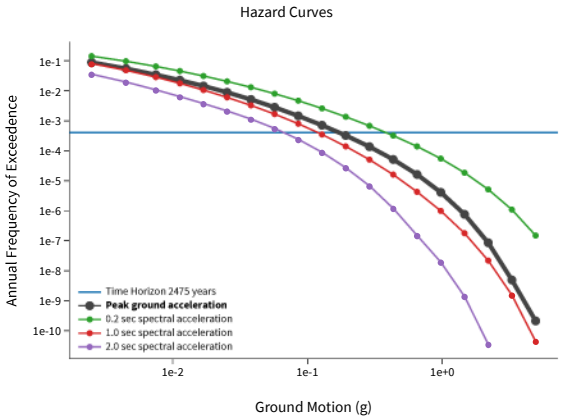
Latitude
Decimal degrees
45.585514

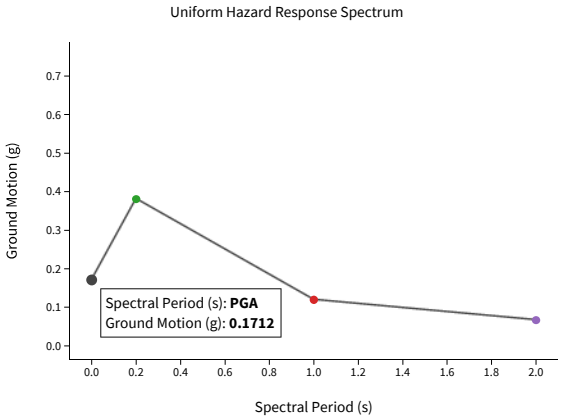
Time Horizon
Return period in years
2475

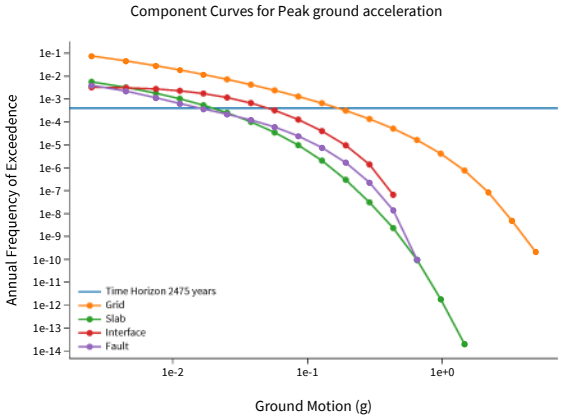
Longitude
Decimal degrees, negative values for western lo…
-119.598669

Site Class
760 m/s (B/C boundary)

Hazard Curve





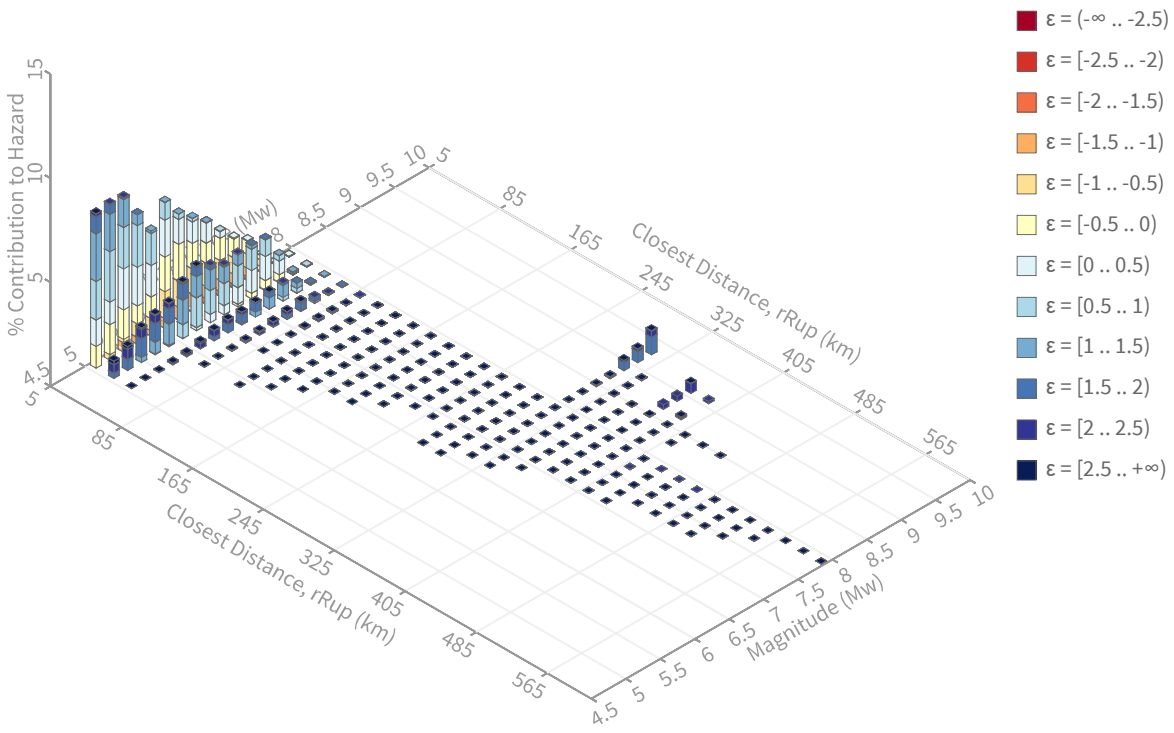


View Raw Data

Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs
Exceedance rate: 0.0004040404 yr^{-1}
PGA ground motion: 0.17118233 g

Recovered targets

Return period: 2541.2382 yrs
Exceedance rate: 0.00039350897 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.37 %

Mean (for all sources)

r: 31.18 km
m: 6.28
ε_0: 0.52 σ

Mode (largest r-m bin)

r: 10.7 km
m: 5.3
ε_0: 0.61 σ
Contribution: 7.48 %

Mode (largest ε_0 bin)

r: 11.12 km
m: 5.3
ε_0: 0.74 σ
Contribution: 2.43 %

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
WUSmap_2014_fixSm.ch.in (opt)	Grid							12.67
PointSourceFinite: -119.599, 45.698		12.47	5.92	0.26	119.599° W	45.698° N	0.00	1.47
PointSourceFinite: -119.599, 45.599		5.27	5.63	-0.60	119.599° W	45.599° N	0.00	1.36
noPuget_2014_fixSm.ch.in (opt)	Grid							12.67
PointSourceFinite: -119.599, 45.698		12.47	5.92	0.26	119.599° W	45.698° N	0.00	1.47
PointSourceFinite: -119.599, 45.599		5.27	5.63	-0.60	119.599° W	45.599° N	0.00	1.36
WUSmap_2014_fixSm.gr.in (opt)	Grid							12.63
PointSourceFinite: -119.599, 45.698		12.47	5.92	0.26	119.599° W	45.698° N	0.00	1.47
PointSourceFinite: -119.599, 45.599		5.27	5.63	-0.60	119.599° W	45.599° N	0.00	1.36
noPuget_2014_fixSm.gr.in (opt)	Grid							12.63
PointSourceFinite: -119.599, 45.698		12.47	5.92	0.26	119.599° W	45.698° N	0.00	1.47
PointSourceFinite: -119.599, 45.599		5.27	5.63	-0.60	119.599° W	45.599° N	0.00	1.36
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PointSourceFinite: -119.599, 45.698		12.47	5.92	0.26	119.599° W	45.698° N	0.00	1.02
WUSmap_2014_fixSm_M8.in (opt)	Grid							3.13
noPuget_2014_fixSm_M8.in (opt)	Grid							3.13
sub0_ch_bot.in	Interface							2.21
Cascadia Megathrust - whole CSZ Characteristic		307.65	9.15	1.82	123.413° W	46.300° N	286.44	2.21
noPuget_2014_adSm_M8.in (opt)	Grid							2.12

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
WUSmap_2014_adSm_M8.in (opt)	Grid							2.11

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Attachment H-4.
Response Spectrum – Site Class C

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Design Maps Summary Report

User–Specified Input

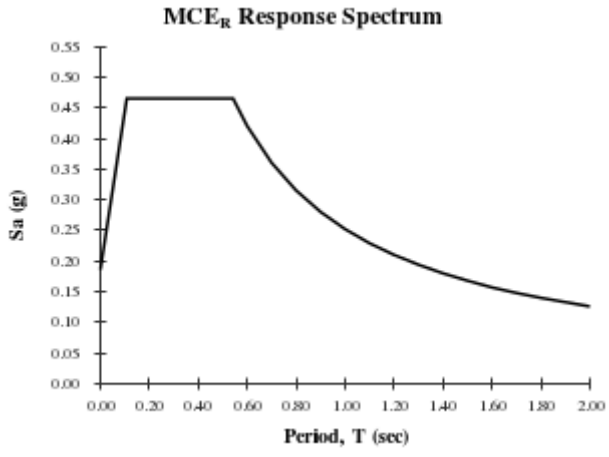
Report Title	Wheatridge Solar Project Tue October 30, 2018 21:37:17 UTC
Building Code Reference Document	2012/2015 International Building Code (which utilizes USGS hazard data available in 2008)
Site Coordinates	45.58551°N, 119.59867°W
Site Soil Classification	Site Class C – "Very Dense Soil and Soft Rock"
Risk Category	I/II/III

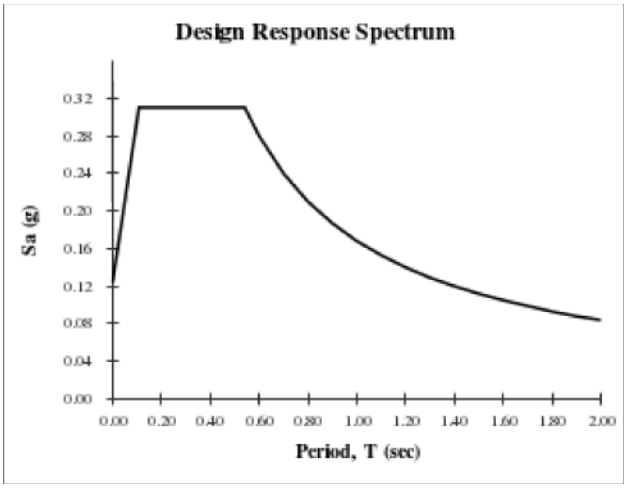


USGS–Provided Output

S_S =	0.387 g	S_{MS} =	0.465 g	S_{DS} =	0.310 g
S_1 =	0.153 g	S_{M1} =	0.252 g	S_{D1} =	0.168 g

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.





Although this information is a product of the U.S. Geological Survey, we provide no warranty, expressed or implied, as to the accuracy of the data contained therein. This tool is not a substitute for technical subject-matter knowledge.

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Attachment H-5.
Response Spectrum – Site Class C Mapped Acceleration Parameters

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Design Maps Detailed Report

2012/2015 International Building Code (45.58551°N, 119.59867°W)

Site Class C – "Very Dense Soil and Soft Rock", Risk Category I/II/III

Section 1613.3.1 — Mapped acceleration parameters

Note: Ground motion values provided below are for the direction of maximum horizontal spectral response acceleration. They have been converted from corresponding geometric mean ground motions computed by the USGS by applying factors of 1.1 (to obtain S_s) and 1.3 (to obtain S_1). Maps in the 2012/2015 International Building Code are provided for Site Class B. Adjustments for other Site Classes are made, as needed, in Section 1613.3.3.

From Figure 1613.3.1(1) [1]	S_s = 0.387 g
From Figure 1613.3.1(2) [2]	S_1 = 0.153 g

Section 1613.3.2 — Site class definitions

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class C, based on the site soil properties in accordance with Section 1613.

2010 ASCE-7 Standard – Table 20.3-1
SITE CLASS DEFINITIONS

Site Class	$\overline{v}_s$	$\overline{N}$ or $\overline{N}_{ch}$	$\overline{s}_u$
A. Hard Rock	>5,000 ft/s	N/A	N/A
B. Rock	2,500 to 5,000 ft/s	N/A	N/A
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff Soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf
	Any profile with more than 10 ft of soil having the characteristics: • Plasticity index PI > 20, • Moisture content w ≥ 40%, and • Undrained shear strength $\overline{s}_u$ < 500 psf		
F. Soils requiring site response analysis in accordance with Section 21.1	See Section 20.3.1		

For SI: 1ft/s = 0.3048 m/s 1lb/ft² = 0.0479 kN/m²

Section 1613.3.3 — Site coefficients and adjusted maximum considered earthquake spectral response acceleration parameters

TABLE 1613.3.3(1)
VALUES OF SITE COEFFICIENT F_a

Site Class	Mapped Spectral Response Acceleration at Short Period				
	$S_S \le 0.25$	$S_S = 0.50$	$S_S = 0.75$	$S_S = 1.00$	$S_S \ge 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of S_S

For Site Class = C and S_S = 0.387 g, F_a = 1.200

TABLE 1613.3.3(2)
VALUES OF SITE COEFFICIENT F_v

Site Class	Mapped Spectral Response Acceleration at 1–s Period				
	$S_1 \le 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 \ge 0.50$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of S_1

For Site Class = C and S_1 = 0.153 g, F_v = 1.647

Equation (16-37):	$S_{MS} = F_a S_S = 1.200 \times 0.387 = 0.465$ g
Equation (16-38):	$S_{M1} = F_v S_1 = 1.647 \times 0.153 = 0.252$ g

Section 1613.3.4 — Design spectral response acceleration parameters

Equation (16-39):	$S_{DS} = ⅔ S_{MS} = ⅔ \times 0.465 = 0.310$ g
Equation (16-40):	$S_{D1} = ⅔ S_{M1} = ⅔ \times 0.252 = 0.168$ g

Section 1613.3.5 — Determination of seismic design category

TABLE 1613.3.5(1)
SEISMIC DESIGN CATEGORY BASED ON SHORT-PERIOD (0.2 second) RESPONSE ACCELERATION

VALUE OF S_{DS}	RISK CATEGORY		
	I or II	III	IV
$S_{DS} < 0.167g$	A	A	A
$0.167g \le S_{DS} < 0.33g$	B	B	C
$0.33g \le S_{DS} < 0.50g$	C	C	D
$0.50g \le S_{DS}$	D	D	D

For Risk Category = I and S_{DS} = 0.310 g, Seismic Design Category = B

TABLE 1613.3.5(2)
SEISMIC DESIGN CATEGORY BASED ON 1-SECOND PERIOD RESPONSE ACCELERATION

VALUE OF S_{D1}	RISK CATEGORY		
	I or II	III	IV
$S_{D1} < 0.067g$	A	A	A
$0.067g \le S_{D1} < 0.133g$	B	B	C
$0.133g \le S_{D1} < 0.20g$	C	C	D
$0.20g \le S_{D1}$	D	D	D

For Risk Category = I and S_{D1} = 0.168 g, Seismic Design Category = C

Note: When S_1 is greater than or equal to 0.75g, the Seismic Design Category is **E** for buildings in Risk Categories I, II, and III, and **F** for those in Risk Category IV, irrespective of the above.

Seismic Design Category ≡ "the more severe design category in accordance with Table 1613.3.5(1) or 1613.3.5(2)" = C

Note: See Section 1613.3.5.1 for alternative approaches to calculating Seismic Design Category.

References

1. *Figure 1613.3.1(1)*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/IBC-2012-Fig1613p3p1(1).pdf
2. *Figure 1613.3.1(2)*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/IBC-2012-Fig1613p3p1(2).pdf

Attachment H-6. Sample Solar Facility Emergency Action Plan

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1200 Wall Street West
5th Floor
Lyndhurst, NJ 07071

201.933.5541 PHONE
201.933.5601 FAX

www.trcsolutions.com

April 6, 2018

Town of East Hampton Planning Board
300 Pantigo Place, Suite 103
East Hampton, New York 11937

Subject: **Site Plan/Special Permit Application for the Montauk Energy Storage Center, LLC**
SCTM #300-27-4-8.8
10 N Shore Road
Montauk, New York

Dear Planning Board:

TRC Environmental Corporation, on behalf of Montauk Energy Storage Center, LLC, is submitting six copies of the final Emergency Action and Safety Plan for the Montauk Energy Storage Project. This is being submitted to fulfill condition 3.4 of the site plan/special permit approval issued for the project.

Please review the attached submittal. If you have any questions or desire clarification on any aspect of this request, please feel free to call me at 201.508.6956.

Sincerely,
TRC

Marc Lawlor
Senior Project Manager
Planning, Permitting & Licensing

Enclosures

Cc: J. Pahwul, E. Schantz
TRC Project #263750

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1.0 DOCUMENT STORAGE AND INFORMATION 2
2.0 REVISION HISTORY 2
3.0 PURPOSE AND SCOPE 2
4.0 DEFINITIONS 3
5.0 ORGANIZATIONAL CHART 3
6.0 PERSONAL PROTECTIVE EQUIPMENT 3
7.0 RECORDS 3
8.0 PROCEDURE 4
APPENDIX 1 SEVERE WEATHER EVENT PLAN 6
APPENDIX 2 FIRE PREVENTION AND RESPONSE 10
APPENDIX 3 ENIRONMENTAL RELEASE 13

1.0 DOCUMENT STORAGE AND INFORMATION

This Emergency Action Plan is stored in the Power Generation Division Operational Model ("OpModel").

2.0 REVISION HISTORY

Rev #	Revision Description	Approved By Position / Title	Effective Date
0	Emergency Action Plan for the Montauk Energy Storage Project	Ryan McMorrow Engineering & Technical Services Staff Engineer	Commercial Operation

3.0 PURPOSE AND SCOPE

The purpose of this Emergency Action Plan is to establish the planned response actions that will be taken by remote Control Room Operators that oversee the 24/7 operation of the Montauk Energy Storage Project and other emergency personnel. These actions are intended to provide for the safe and reliable operation of the facility.

This procedure serves as guidance and is intended to be a "living" document such that revisions over time, based on experiences, will continue to increase the speed of identification of threats and decrease response time. When applicable, this plan applies to all employees, contractors, vendors and visitors, performing work at the site.

This facility will not be manned on a daily basis and will be remotely operated by the 24/7 manned Fleet and Performance Diagnostic Center (Control Room) located in Juno Beach, Florida. In addition, a communication link is established between the Control Room Operator and first responders.

The Control Room will be provided with a remote monitoring system, as well as, a video surveillance monitoring system that is both internal and external to the buildings.

Site Postings: The following will be posted conspicuously on-site:

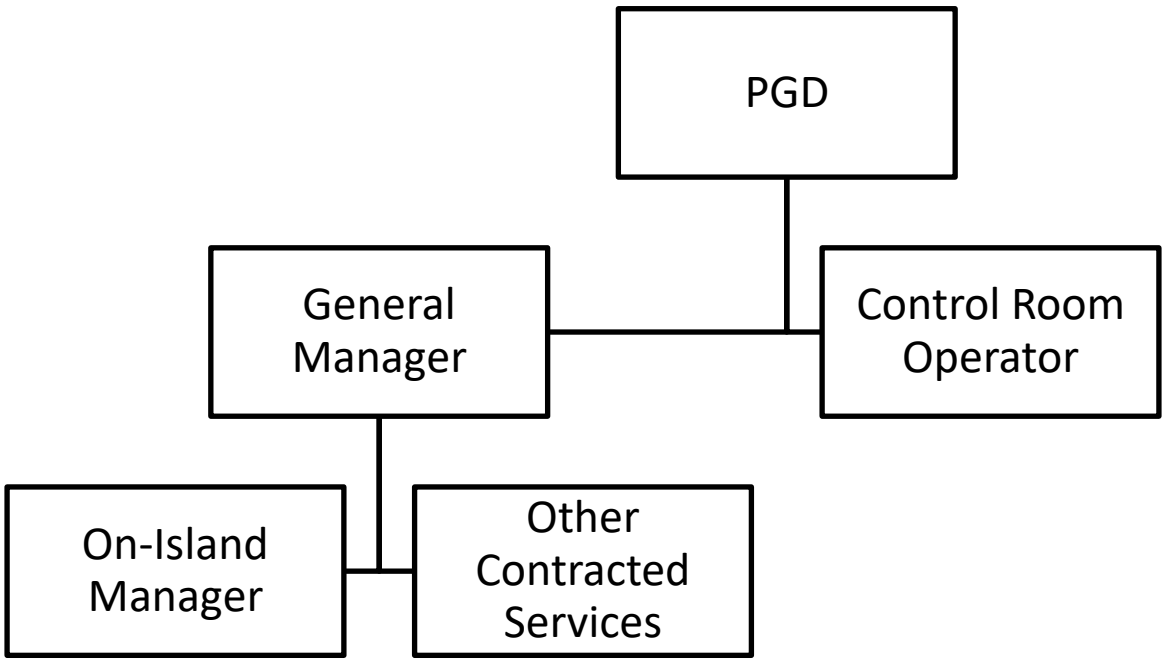
- Emergency phone numbers:
  Control Room
  On-Island Manager
  Local Fire Department

- A diagram indicating location of fire extinguishers, standpipes and fire hydrants will be posted at entrances of the facility.
- Instructions on-site personnel need to follow during emergencies, as a result of injury or in response to environmental releases or security issues.

4.0 DEFINITIONS

PGD – Power Generation Division
FPDC – Fleet Performance and Diagnostic Center (“Control Room”)
O&M – Operations and Maintenance
OSHA – Occupational Safety and Health Administration
PPE – Personal Protective Equipment

5.0 ORGANIZATIONAL CHART



General Manager - will have overall responsibility for the Montauk Energy Storage Project.
On-Island Manager – will have delegated decision authority in emergency situations.
Control Room Operator – will have delegated decision authority in emergency situations.

6.0 PERSONAL PROTECTIVE EQUIPMENT

The appropriate Personal Protective Equipment (PPE) shall be used by O&M workers and contractors according to the task. The requirements for PPE are dictated based upon the expected hazards of the task. These may include hard hats, safety shoes, safety glasses and work gloves.

7.0 RECORDS

An electronic copy of this plan will also be accessible online.

This plan will be reviewed upon implementation, whenever revisions are made, and at least annually by the On-Island Manager.

Copies of this plan will also be kept on-site and at the offices of the On-Island Manager.

8.0 PROCEDURE

TRAINING

1. All O&M personnel that may work at the site that will have access to the facility shall receive training on this Emergency Action Plan initially and whenever it is modified.

    - A listing of personnel with current training on this plan will be maintained by the On-Island Manager and in Juno Beach, Florida for reference purposes.

2. Postings will be placed at the site near telephones and at exits clearly indicating the telephone number of the Control Room and any instructions to follow during emergencies or as a result of injury to people on-site.

FACILITY LOCATION INFORMATION FOR OUTSIDE EMERGENCY RESPONDERS

1. The Montauk Energy Storage Project is located at 10 North Shore Road, Hamlet of Montauk, Town of East Hampton, Suffolk County, NY 11954. Outside responders can gain access to the facility by accessing the driveway.

PLANT / SITE GENERAL EMERGENCY PROCEDURE

1. This emergency plan was developed for the following plausible contingencies that could transpire at the facility:

    - Severe Weather Event Plan (APPENDIX 1)
    - Fire Prevention and Response (APPENDIX 2)
    - Environmental Event (APPENDIX 3)

2. It will be the responsibility of the Control Room Operator to assess a developing emergency situation and initiate the appropriate actions in this plan to protect any personnel that may be at the site, the surrounding environment, and plant equipment from adverse impacts.

3. In the event of an on-site emergency, including injury, physical damage, fire, security breach, etc. the on-site personnel, if any, should follow and perform the below actions immediately. For environmental releases, follow the Call Tree in Appendix 3.

    - Contact 911 or Fire Department immediately.
    - Have the Control Room Operator perform an analysis on the requirements for continued safe operation.
    - Initiate site shutdown procedure (if required).
    - Ensure that key personnel are contacted:

Title	Name	Office Phone	Cell Phone
Environmental Response Team	Miller Environmental – Long Island Operations: **George Wallace**	800-394-8606 (24-Hours)	631-369-4900 (Main)
On-Island Manager	Miller Environmental: **George Wallace**	N/A	631-369-4900 (Main)
Project General Manager	**Lynden McKay**	561-691-2344	561-927-8467
Control Room Operator	1) Fleet & Performance Diagnostic Center (FPDC) 2) FPDC Manager: **Kevin McWhorter**	1) 561-694-3636 (24-Hours) 2) 561-691-2515	1) N/A 2) 402-290-9275
Security Operations	1) Fleet & Performance Diagnostic Center (FPDC) 2) FPDC Manager: **Kevin McWhorter**	1) 561-694-3636 (24-Hours) 2) 561-691-2515	1) N/A 2) 402-290-9275

4. If emergency event occurs while maintenance personnel are on-site, all sources of ignition, including hot work, burning cigarettes, portable tools and motor vehicles shall be immediately secured/ceased.

5. Based upon the type and extent of the emergency, if there is anyone on-site, the Control Room Operator should assess whether an evacuation should be initiated. If maintenance personnel are on-site, they along with the Control Room Operator would make the decision to evacuate. The following criteria should be considered in rendering a decision to conduct an evacuation of the facility:

    - The affected parts of the facility and severity of the emergency.
    - Restrictions in egress routes caused by the emergency.
    - Weather.
    - People currently working at the facility (visitors/contractors, etc.)

    a. During the emergency the Control Room Operator will determine the level of system shut down required, if any.

End of Procedure

APPENDIX 1 SEVERE WEATHER EVENT PLAN

Please see following page.

Summary

Storm resistant design features include a pre-engineered, weather tight structure approximately 46’ x 90’ to house the system components. The structure will consist of a metal construction exterior. The facility is designed to meet extreme environmental conditions and structural loading conditions as noted below:

- **Wind load:** ASCE 7-10, Exposure D, Risk category III (Greater than 130MPH)
- **Seismic Load:** ASCE 7-10, Site Class D
- **Snow Load:** ASCE 7-10 for local conditions
- **Protected** for salt laden air

The facility is designed to remain operational and is controlled remotely by the Control Room even in severe weather events. The Control Room provides world class and state-of-the-art remote operating, monitoring, and diagnostic services. Key responsibility areas include:

- Operations & Operational Assistance
- Prevention through Prediction
- Restoration/Troubleshooting
- Communications

The Control Room provides 24/7 operational monitoring, diagnostics, and management of alarms as established by the Power Generation Division engineering and operation teams. Control Room Operators are specifically trained to interact closely with the On-Island Manager, who, together with an O&M and emergency response team, will be retained to resolve site operational and response issues.

This is a copy of the CONTROLLED document.
Documents are required to be verified current with PGD Operational Model prior to use.

Monitoring, Planning, and Preparation

1. Natural emergencies considered in this procedure are associated with weather disturbances such as flooding, hurricanes, blizzards, high wind conditions, and severe thunderstorms. The Control Room Operator and On-Island Manager have various means to monitor potential weather events. These include:

    - Internet access to weather-related web-sites;
    - PGDAPPS WeatherSentry Online
    - Local news stations

2. When information is received that a severe weather watch has been issued for the facility area the following actions shall be taken:

    - The Control Room Operator should notify the General Manager and the On-Island Manager

3. Severe Weather Preparation

    - In the event of a severe weather event, where advance warning is known, such as floods, hurricanes, blizzards, etc., the Control Room Operator shall closely coordinate with the On-Island Manager, during pre and post event activities. The goal is to enable the facility to continue to operate safely and reliably during a severe weather event.

        On-island resources: the On-Island Manager shall contact O&M and emergency response teams to notify them of the event and place them on standby. Emergency response team may be dispatched to the facility prior to the event to ensure the facility is physically prepared for the event by:

        - Securing the building
        - Securing all equipment
        - Securing all critical communication components
        - Deploying sandbags, if applicable

        It is not anticipated that personnel would need to access the site during the event. Under no circumstances will personnel be dispatched to the facility until local emergency management indicates it is safe to enter the area. In the event that local flooding could impact access to the site, arrangements previously made for alternative transportation will be implemented.

    - In the event of a natural disaster / sever weather event where advance warning may not be known, the Control Room Operator and the On-Island Manager will take reasonable action to prepare for the event. However, under no circumstances are personnel to place themselves in harm's way.

4. The Control Room Operator or On-Island Manager will:

    - Monitor the weather radio, TV or other monitoring equipment, and report any changes in the situation that could affect any plant / maintenance personnel on site and / or equipment. Radio

or phone communication is established if a tornado or other similar severe weather warning is issued.

5. Operations:

- Operate the plant consistent with instructions provided from the Transmission Operator. If, the instructions cannot be followed, i.e., safety, environmental, reliability, etc., immediately notify the Transmission Operator to discuss and alternative operating actions. Document discussions in the Operators log.

- When conditions are “forecasted” to have high winds associated with a hurricane, or other related conditions such as floods and / or storm surge, equipment shutdown should be taken into consideration to ensure the continued reliable operation before, during, and after the event.

    - The decision to shut down the facility as a precaution or during the event will be made after consultation with the Transmission Operator or if conditions are such that the facility would be damaged or cause a system interruption.

This is a copy of the CONTROLLED document.
Documents are required to be verified current with PGD Operational Model prior to use.

APPENDIX 2 FIRE PREVENTION AND RESPONSE

Preventative Controls

The facility is designed with a number of features designed to prevent system upsets that could lead to a fire.

Battery Management System

Each Battery Cell is continuously monitored by a “Battery Management System”. The Battery Management System will autonomously take action to protect battery cells and prevent over charging, over current or over temperature operation. The supplied Bidirectional Inverters have controls to detect out of specification conditions of the batteries and will autonomously stop operation in the event of overcurrent or out of specification voltage. A site controller continuously monitors all critical parameters and will autonomously disconnect the system in the event of an out of specification condition. The site is continuously monitored by an offsite 24-hour Control Room Operator. In the event of an “off spec” condition, the Control Room Operator has the ability to remotely control the facility.

Circuit Protection

Each Battery Module and Battery Rack are individually protected by overcurrent fuses. These fuses will operate independently of the DC contactor that is opened by the controls discussed above.

Battery Safety Features

Supplied battery cells, modules and racks will be provided with UL testing Certification as documented in UL-Safety Issues for Lithium Ion Batteries-2016.pdf

Fire Fighting Measures

The site will be equipped with an automatic fire suppression system utilizing water. The system will be designed by a licensed engineering firm that specializes in fire protection. Water has been shown to be the most effective fire suppressant for Lithium Ion Batteries due to its ability to both extinguish the fire and remove excess heat. The system will be designed so that the fire suppression activates in any section of the building experiencing a fire.

To facilitate emergency responders the facility is designed with a hydrant located near the entrance driveway.

Response Actions – Automated System Alarm

Should any system monitoring device indicate a fire alarm or the automatic suppression system activate and release, the Control Room Operator will immediately:

a. Verify control logic operated as required including shutting down equipment or isolating the project from the grid

b. Contact local emergency response services and provide the following information:

    1. Location
    2. Type of emergency
    3. Current Status
    4. Any other pertinent information

c. Notify the General Manager and On-Island Manager

d. Continually monitor and use all means necessary as described above to isolate the situation.

e. Contact the System Operator or Transmission Operator if appropriate

Response Actions – Personnel On-site

NOTE: The facility will have fire extinguishers located a strategic points. A diagram indicating location of fire extinguishers, standpipes and fire hydrants will be posted at entrances of the facility.

Any person discovering a fire in its incipient stage should take action as quickly as possible to extinguish the fire. In general, a fire should be considered to be in its incipient stage if it meets two primary criteria:

a. The fire can be extinguished or controlled with a single portable fire extinguisher
b. The person discovering the fire perceives an adequate level of safety in attempting to extinguish the fire.

As long as the fire is in its incipient stage, as defined above, the person discovering the fire should utilize all appropriate and readily available fire extinguishing equipment to extinguish the fire. Fire-fighting efforts beyond the incipient stage will be performed by trained outside responders only.

On-site Response Instructions:

1. For fires in incipient stage use fire extinguisher following manufacturer's instructions to extinguish.
    a. If the fire is extinguished immediately, the on-site personnel shall then notify the Control Room Operator to inform them of the incident.
2. If the fire cannot be contained using an extinguisher then evacuate the building, call 911, then the Control Room Operator.

3. If the site fire detection system is activated all personnel must evacuate the battery building immediately call 911, then the Control Room Operator.

This is a copy of the CONTROLLED document.
Documents are required to be verified current with PGD Operational Model prior to use.

APPENDIX 3 ENVIRONMENTAL RELEASE

The release of transformer oil is a regulated event and must be addressed as soon as possible. Releases into containment areas or to the ground must be reported upon discovery to the Control Room Operator. Containment surrounds all oil filled equipment.

Whether the release is the result of an operational action (e.g., maintenance) or is discovered, site personnel should take action if possible to stop the release or contain the oil. Such action may include closing valves, berming areas with absorbents if available or dirt, or laying down spill absorbent pads. Personnel should only respond at their level of training. Clean-up operations will be performed by a professional response team.

Gather the following information and relay it to the Control Room Operator:

- Transformer leaking oil.
- Whether or not the spill is only in the containment.
- If the source of the spill/release has been stopped.
- Boundaries describing the area of the spill if outside the containment.
- Quantity released (if it can be estimated).
- Environmental Impacts (ground, roadways, etc.).

The Control Room Operator shall make the following notifications:

Organization	Contact Number	Time Notified
Environmental Response Team: Miller Environmental – Long Island Operations: **George Wallace**	Miller Environmental 800-394-8606 (24 hours)	
On-Island Manager: Miller Environmental: **George Wallace**	Cell: 631-369-4900	
NYS Dept. of Environmental Conservation Spill Hotline	1-800-457-7362	Spill Number assigned: _____
Suffolk County Dept of Health Services	1-631-854-2501	
National Response Center (only if impacts water resources)	1-800-424-8802	Incident Number: _____

Exhibit I

Soil Conditions

Wheatridge Wind Energy Facility
June 2019

Prepared for

Prepared by

Tetra Tech, Inc.

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Acronyms and Abbreviations

ASC	Application for Site Certificate
BMP	Best management practices
Certificate Holder	Wheatridge Wind Energy, LLC
Council	Energy Facility Siting Council
DOGAMI	Oregon Department of Geology and Mineral Industries
Facility	Wheatridge Wind Energy Facility
IBC	International Building Code
OAR	Oregon Administrative Rules
RFA	Request for Amendment

1.0 Introduction

The Wheatridge Wind Energy Facility (Facility) is an approved, but not yet constructed, wind energy generation facility consisting of up to 292 turbines with a peak generating capacity of up to 500 megawatts, to be located in an Approved Site Boundary of approximately 13,097 acres in Morrow and Umatilla counties, Oregon. In Request for Amendment 4 (RFA 4) to the Facility Site Certificate, Wheatridge Wind Energy, LLC (Certificate Holder) is proposing to add photovoltaic solar energy generation to the Facility to provide the opportunity for an integrated, renewable energy facility with both wind and solar energy generation, as well as energy storage. In RFA 4, the Certificate Holder is proposing five changes to the approved Facility:

1. Amend the description of the Facility to include photovoltaic solar energy generation equipment to leverage the complementary nature of wind and solar generation to provide more reliable renewable energy generation.
2. Amend the Site Boundary to provide for solar micrositing corridors[1] for the photovoltaic solar energy system.
3. Increase the maximum peak generating capacity for the Facility by up to 150 megawatts of solar energy generation, for a total Facility maximum peak generating capacity of 650 megawatts.
4. Add distributed energy storage as a related or supporting facility for solar energy generation, along with new collector lines connecting the solar arrays, and an expansion of an approved substation.
5. Amend four existing site certificate conditions and increase the approved MW of the turbines by approximately 12 percent, from 2.5 MW to 2.8 MW.

The Energy Facility Siting Council (Council) previously found the Certificate Holder has demonstrated an ability to construct, operate, and retire the Facility in compliance with Council standards and conditions of the Site Certificate. Exhibit I identifies the soil conditions and land uses dependent on soil conditions that are in compliance with the soil standard found in Oregon Administrative Rule (OAR) 345-022-0022 and follows the submittal requirements in OAR 345-021-0010 (1)(i) paragraphs (A) through (E). The information summarized in this exhibit and described in RFA 4 demonstrates that the Facility, as proposed, can be designed, engineered, constructed, operated, and retired in a manner that satisfies the applicable Council standards. The proposed changes in RFA 4 do not alter the Certificate Holder's ability to comply with the Council's earlier findings and approved conditions in the previously amended site certificates. Site Certificate conditions applicable to soils include (ODOE 2017):

[1] Per OAR 345-001-0010(32) "micrositing corridor" means a continuous area of land within which construction of facility components may occur, subject to site certificate conditions.

- PRE-SP-01: SPCC construction plans
- PRE-SP-02: Restoration of agricultural soils
- PRE-SP-03: Septic system permitting
- OPR-SP-01: Prevention of erosion, soil disturbance
- CON-SP-01: Erosion and Sediment Control Plan (ESCP)
- CON-SP-02: Best management practices to be included in ESCP
- PRO-SP-01: Submission of operational SPCC

2.0 Analysis Area

The Analysis Area for soil resources is the Site Boundary (the Approved Site Boundary plus the Amended Site Boundary). However, conditions have not changed within the Approved Site Boundary, and no modifications to approved facilities are proposed. Therefore, this exhibit focuses on new information related to the solar arrays and the area within the Amended Site Boundary (Figure I-1).

3.0 Identification and Description of Soil Types – OAR 345-021-0010(1)(i)(A)

OAR 345-021-0010(1)(i) Information from reasonably available sources regarding soil conditions and uses in the analysis area, providing evidence to support findings by the Council as required by OAR 345-022-0022, including:

OAR 345-021-0010(1)(i)(A) Identification and description of the major soil types in the analysis area.

The near-surface soils in the Amended Site Boundary were identified using the Soil Survey Geographic Database for Morrow and Umatilla counties, Oregon (NRCS 2018). The survey describes soil conditions in the upper 5 feet of the subsurface profile and classifies land use. Nine soil units were identified by the Natural Resources Conservation Service within the Amended Site Boundary. A general description of each soil unit mapped in the Amended Site Boundary is provided in Table I-1, below. Figure I-1 shows the soil units for the Amended Site Boundary.

- **Ferguson Very Fine Sandy Loam —** This soil unit consists of very deep, well drained soils formed in volcanic ash over predominantly granitic glaciofluvial deposits. Ferguson soils are on outwash fans. The hazard for erosion is high. Slopes are primarily 30 to 60 percent in the Amended Site Boundary. This soil has moderate to high permeability and low runoff.

- **Gravden Very Gravelly Loam —** This soil unit consists of shallow, well drained soils that formed in alluvium of mixed origin. The hazard for erosion is high. Slopes are primarily 20 to 40 percent in the Amended Site Boundary. This soil has low permeability and high runoff.
- **Lickskillet Very Stony Loam —** This soil consists of shallow, well drained soils that formed in stony colluvium consisting of loess, rock fragments and residuum weathered from basalt and rhyolite. Lickskillet soils are on uplands, and are about 1.4 inches thick. The hazard for erosion is high. Slopes are primarily 7 to 40 percent in the Amended Site Boundary. The soil has low permeability and high runoff.
- **Mues Silt Loam —** This soil consists of very deep, moderately well drained soils formed in mixed alluvium on stream terraces. The hazard for erosion is slight. Slopes are primarily 0-3 percent in the Amended Site Boundary. The soil has moderate permeability and moderately high runoff.
- **Ritzville Silt Loam** — This soil unit consists of soils formed in loess on summit plateaus within the analysis area. Typically, the surface layer and subsoil are each brown very fine sandy loam, about 13 inches thick, respectively. The substratum is a brown silt loam to a depth of 70 inches or more. Effective rooting depth is 60 inches or more. Runoff is slow for slopes less than 7 percent, medium for slopes 7 to 20 percent, and rapid for slopes greater than 20 percent. The hazard of water erosion is moderate to high. The hazard of wind erosion is moderate. Slopes are primarily 2 to 12% in the Amended Site Boundary.
- **Walluski Silt Loam —** This soil consists of very deep, moderately well drained soils formed in moderately fine textured alluvium on terraces. The hazard for erosion is moderately low to moderately high. Slopes are primarily 0 to 7 percent in the Amended Site Boundary. The soil has moderate permeability and moderately high runoff.
- **Quincy Loamy Fine Sand —** This soil consists of very deep, excessively drained soils formed in sands on dunes and terraces. The hazard for erosion is moderate. Slopes are primarily 0 to 5 percent in the Amended Site Boundary. The soil has high permeability and low runoff.
- **Willis Silt Loam —** This soil unit consists of soils formed in loess on summit plateaus within the analysis area. The surface layer is dark brown silt loam about 12 inches thick. The subsoil is dark brown silt loam about 15 inches thick. The substratum is a dark brown silt loam to a depth of approximately 35 inches, and the soil is underlain by cemented alluvium. Effective rooting depth is 20 to 40 inches. Runoff is medium. The hazard of water erosion is high. The hazard of wind erosion is low to moderate. Slopes are primarily 2 to 12 percent in the Amended Site Boundary.

Table I-1. General Description of Mapped Soil Units in Analysis Area

Soil Type ID	Soil Unit	Setting Within Analysis Area	Approximate Thickness	Formation Setting	Permeability	Runoff	Hazard for Erosion
78	Ferguson very fine sandy loam	30 to 60 percent south slopes	>5 feet	Eolian sands and alluvium	Moderate to High	Low	Severe
13E	Gravden very gravelly loam	20 to 40 percent slopes	>5 feet	Gravelly alluvium and colluvium	Low	High	Severe
28E	Lickskillet very stony loam	7 to 40 percent slopes	1.4 feet	Loess mixed with colluvium from basalt	Low	High	Severe
45A	Mues silt loam	0 to 3 percent slopes	>5 feet	Loess mixed with small amounts of volcanic ash	Moderately Low to Moderately High	Moderately High	Slight
45B	Ritzville silt loam	2 to 7 percent slopes	>5 feet	Loess mixed with small amounts of volcanic ash	Moderate to High	Low	Moderate
45C	Ritzville silt loam	7 to 12 percent slopes	>5 feet	Loess mixed with small amounts of volcanic ash	Moderate to High	Low	Severe
47E	Murtip-Caterl complex	30 to 60 percent slopes	4.2	Loess mixed with small amounts of volcanic ash	Moderate to High	Low	Severe
71B	Walluski silt loam	0 to 7 percent slopes	>5 feet	Loess over calcareous lacustrine deposits	Moderately Low to Moderately High	Moderately High	Moderate
75B	Quincy loamy fine sand	0 to 5 percent slopes	>5 feet	Loess over cemented alluvium	High	Low	Moderate
75C	Willis silt loam	5 to 12 percent slopes	>5 feet	Loess over cemented alluvium	Moderately Low to Moderately High	Moderately High	Severe

4.0 Current Land Use within the Analysis Area – OAR 345-021-0010(1)(i)(B)

OAR 345-021-0010(1)(i)(B) Identification and description of current land uses in the analysis area, such as growing crops, that require or depend on productive soils.

The land uses within the Analysis Area consist of private agricultural land generally used for dryland wheat production or rangeland, and is zoned Exclusive Farm Use by Morrow County (see Exhibit K). The Analysis Area does not contain soils defined as High Value Farmland by the Natural Resources Conservation Service (NRCS 2018).

5.0 Facility Soil Impacts – OAR 345-021-0010(1)(i)(C)

OAR 345-021-0010(1)(i)(C) Identification and assessment of significant potential adverse impact to soils from construction, operation and retirement of the facility, including, but not limited to, erosion and chemical factors such as salt deposition from cooling towers, land application of liquid effluent, and chemical spills.

5.1 Soil Impacts During Construction

Construction of the solar arrays will require a variety of activities that have the potential for adversely impacting soils. Activities that may result in potential adverse soil impacts include:

- Clearing and grubbing of vegetation in temporary construction areas, solar array, and new access roads;
- Grading and widening of existing access roads;
- Constructing new access roads;
- Hauling heavy equipment and other truck traffic for the delivery of aggregates, concrete, water, solar components, and construction supplies; and
- Fueling or maintenance of construction equipment or vehicles.

Up to approximately 893 acres would be permanently impacted by the Amended Site Boundary. Construction would temporarily disturb a total of approximately 8 acres of soil. Impacts to soil, such as erosion, resulting from construction activities would be limited through:

- Avoiding sensitive soil areas to the extent practicable;
- Maintaining a Spill Prevention Control and Countermeasures Plan (Condition PRE-SP-01);
- Implementing appropriate site restoration practices following construction (Condition PRE-SP-02); and

- Implementing the erosion and sediment control best management practices (BMPs) included in the final Erosion and Sediment Control Plan, as required by the National Pollutant Discharge Elimination System Construction Stormwater Discharge General permit 1200-C (Condition PRO-SP-01).

5.2 Soil Impacts During Operation

Operations of the solar arrays would have no impact on soil erosion. As identified in Condition OPR-SP-01, the Certificate Holder will routinely inspect and maintain all Facility components, and as necessary, maintain or repair erosion and sediment control measures. Vehicles will be restricted to constructed access roads to avoid unnecessary compaction, erosion, or spill risk (Condition OPR-SP-01). No additional ground disturbance is anticipated to occur during operation of the solar arrays. Condition OPR-SP-01 also identified that if the Certificate Holder intends to substantially modify an existing road or construct a new road, Council approval will be needed prior to the modification. The potential for soil contamination would be limited by not maintaining substantial supplies of hazardous materials on-site, and by observing appropriate safety measures during maintenance procedures. In addition, Condition CON-SP-01 requires the Certificate Holder to provide a copy of an Oregon Department of Environmental Quality-approved operational Spill Prevention Control and Countermeasures Plan, if required.

5.3 Soil Impacts During Decommissioning

In the event of decommissioning, potential erosion hazards would be similar to those occurring during construction. Measures similar to those employed during construction and operation through required Site Certificate Conditions will be used during decommissioning to prevent and control erosion, to rectify for soil compaction, to prevent spills, and to revegetate disturbed areas.

6.0 Mitigation Measures – OAR 345-021-0010(1)(i)(D)

OAR 345-021-0010(1)(i)(D) A description of any measures the applicant proposes to avoid or mitigate adverse impact to soils.

As described above, there are many Site Certificate Conditions in place which require minimization measures and BMPs be utilized throughout the construction, operation, and decommissioning (if necessary) phases of the Facility. The portions of the Analysis Area that will be graded are expected to result in a balanced cut-and-fill quantity of earthwork to maintain the existing conditions to the extent practical for the protection of the equipment and facilities. The following provide example BMPs, that along with any others identified in the Erosion and Sediment Control Plan, may be implemented, as necessary, to minimize impacts:

- **Stabilized Construction Entrance/Exit –** A stabilized construction entrance/exit will be installed at locations where construction vehicles will access newly constructed roads

and/or disturbed areas from paved roads. The stabilized construction entrance/exits will be inspected and maintained for the life of the Facility.

- **Dust abatement measures –** Compact fill as necessary and implement appropriate dust abatement measures such as restriction of vehicle speeds, watering of active areas, watering of stockpiles, watering on roadways, track-out control at site exits, and other measures.
- **Preserve Existing Vegetation –** To the extent practicable, existing vegetation will be preserved. Where vegetation clearing is necessary, root systems would be conserved if possible.
- **Silt Fencing –** Silt fencing will be installed throughout the construction area as a perimeter control, material stockpile perimeter control, and on the contour down gradient of excavations.
- **Straw Wattles –** Straw wattles may be used to decrease the velocity of sheet flow stormwater to prevent erosion. Wattles will be used along the downgradient edge of access roads adjacent to slopes or sensitive areas.
- **Mulching –** Mulch will be used to immediately stabilize areas of soil disturbance and during reseeding efforts.
- **Stabilization Matting –** Jute matting, straw matting, or turf reinforcement matting may be used in conjunction with mulching to stabilize steep slopes that were exposed during access road installation.
- **Soil Binders and Tackifiers –** Soil binders and tackifiers may be used on exposed slopes to stabilize them until vegetation is established.
- **Concrete Washout Area –** Concrete chutes and trucks will be washed out in dedicated areas near foundation construction locations. This will prevent concrete washout water from leaving a localized area. Soil excavated for the concrete washout area will be used as backfill for the completed footing to ensure that the surface soils maintain infiltration capacity.
- **Stockpile Management –** Soil from excavations will be temporarily stockpiled and used on site. Silt fence will be installed around the stockpile material as a perimeter control. Mulch or plastic sheeting will be used to cover the stockpiled material, if needed. Stockpiles will be watered, if needed to reduce erosion. Soils will be stockpiled and reused, in order to prevent mixing of productive topsoils with deeper subsoils.
- **Revegetation –** At the completion of land disturbing construction activities, the site will be revegetated with an approved seed mix. When required, the seed will be applied in conjunction with mulch and/or stabilization matting to protect the seeds as the grass establishes. Revegetation will take place as soon as practicable following construction.

- **Check Dams and Sediment Traps –** Check dams and sediment traps will be used during the construction of low-impact ford crossings or culvert installations. The check dams and sediment traps will minimize downstream sedimentation during construction of the stream crossings.
- **Pollutant Management –** During construction, source control measures will be implemented to reduce the potential of chemical pollution to surface water or groundwater during construction. Chemical pollution could occur as a release of diesel fuel or lubricating oils, or from improper debris and waste handling. Small quantities of fuels and oils may be maintained on-site during construction and operation, and will be stored in a dedicated area, and construction vehicles will be fueled and maintained only in dedicated areas. Spills would be cleaned up immediately.
- **Construction Timing –** To the extent practicable, construction activities will be scheduled to occur in the dry season, when soils are less susceptible to compaction. Similarly, soil disturbance should be postponed when soils are excessively wet such as following a precipitation event.

7.0 Monitoring Program – OAR 345-021-0010(1)(i)(E)

OAR 345-021-0010(1)(i)(E) The applicant's proposed monitoring program, if any, for adverse impact to soils during construction and operation.

As discussed in Section 5.1, Condition PRO-SP-01 requires implementation of a final Erosion and Sediment Control Plan that will include construction monitoring requirements as approved by Oregon Department of Environmental Quality. In addition, Section 5.2 identified Condition OPR-SP-01, which requires the Certificate Holder to routinely inspect and maintain all Facility components, and as necessary, maintain or repair erosion and sediment control measures.

8.0 Conclusions

The potential for soil erosion and contamination during construction will be minimized by avoiding problematic areas to the extent practical and then by adherence to the Site Certificate Conditions identified above. Specific construction and site restoration practices will be implemented to mitigate construction impacts on soil productivity. There will be no adverse impacts to productive farmland soils except where permanent impacts are proposed. Taking into account the implementation of the existing Site Certificate Conditions, Council may conclude that the design, construction and operation of the Facility, as proposed, is not likely to result in a significant adverse impact to soils.

9.0 References

NRCS (Natural Resources Conservation Service). 2018. United States Department of Agriculture (USDA) Soil Survey Geographic (SSURGO) Database for Oregon. Accessed at: http://soildatamart.nrcs.usda.gov.

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Figures

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Wheatridge Wind Energy Facility Request for Amendment 4

Figure I-1 Exhibit I Soils Map

MORROW COUNTY, OR

Approved Site Boundary (Approved Wind Micrositing Corridors)

Amended Site Boundary (Proposed Solar Micrositing Corridors)

Mapunit Symbol - Mapunit Name

- 13E - Gravden very gravelly loam, 20 to 40 percent slopes
- 28E - Lickskillet very stony loam, 7 to 40 percent slopes
- 45A - Mues silt loam, 0 to 3 percent slopes
- 45B - Ritzville silt loam, 2 to 7 percent slopes
- 45C - Ritzville silt loam, 7 to 12 percent slopes
- 47E - Murtip-Caterl complex, 30 to 60 percent slopes
- 71B - Walluski silt loam, 0 to 7 percent slopes
- 75B - Quincy loamy fine sand, 0 to 5 percent slopes
- 75C - Willis silt loam, 5 to 12 percent slopes
- 78 - Ferguson very fine sandy loam, 30 to 60 percent south slopes

TETRA TECH

NEXTera ENERGY RESOURCES

Reference Map



1:33,461 WGS 1984 UTM Zone 11N

0 0.5 1 2 3 4 Miles

Data sources: Wheatridge Wind Endergy: project facilities / ESRI: roads, political boundaries / NRCS: SSURGO soils

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