Attachment G-4

Draft Spill Prevention Control and Countermeasure Plan

ATTACHMENT G-4
SPILL PREVENTION, CONTROL, AND COUNTERMEASURES PLAN

Spill Prevention, Control, and Countermeasures Plan

Boardman to Hemingway Transmission Line Project

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ACRONYMS AND ABBREVIATIONS

BLM	Bureau of Land Management
CI	Chief Inspector
Contractor	construction contractor
DOT	Department of Transportation
EI	Environmental Inspector
EPA	Environmental Protection Agency
ER Plan	Emergency Response Plan
IPC	Idaho Power Company
kV	kilovolt
MSDS	Material Safety Data Sheets
OAR	Oregon Administrative Rules
Project	Boardman to Hemingway Transmission Line Project
PVC	Polyvinyl chloride
SPCC	Spill Prevention, Control, and Countermeasures Plan
U.S.	United States
USFS	United States Forest Service

1.0 INTRODUCTION

Idaho Power Company (IPC) is proposing to construct, operate, and maintain an approximately 296.6-mile-long electric transmission line between the Longhorn Station near Boardman, Oregon, and the Hemingway Substation located in southwestern Idaho as an extension of IPC's electric transmission system. This length comprises approximately 272.8 miles in Oregon and 23.8 miles in Idaho. The Boardman to Hemingway Transmission Line Project (Project) is primarily a single-circuit 500-kilovolt (kV) electric transmission line, with 270.8 miles of new single-circuit 500-kV electric transmission line, removal of 12 miles of existing 69-kV transmission line, rebuilding of 0.9 mile of a 230-kV transmission line, and rebuilding of 1.1 miles of an existing 138-kV transmission line into a new right-of-way. The Project includes ground-disturbing activities associated with construction of aboveground single- and double-circuit transmission lines involving towers, access roads, multi-use areas, pulling and tensioning sites and pulling and tensioning sites with light-duty fly yards, the station, communication sites, and electrical supply distribution lines. The Project crosses private land and public lands administered by the Bureau of Land Management (BLM), United States Forest Service, and the states of Idaho and Oregon.

IPC prepared this Spill Prevention, Control, and Countermeasures Plan (SPCC Plan) to be implemented during construction of the Project. This SPCC Plan is required by the Environmental Protection Agency (EPA) regulations contained in Title 40 of the Code of Federal Regulations, Part 112 (SPCC Rule). This Plan meets the requirements of the updated rule promulgated by the EPA on November 5, 2009. The State of Oregon does not have specific additional oil handling, operation, or design requirements. Hazardous waste management is regulated under Division 100 of the Oregon Administrative Rules (OAR); oil spill contingency planning under Division 141; and oil and hazardous materials emergency response requirements under Division 142.

This SPCC Plan outlines preventive 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. This SPCC Plan restricts the location of fuel storage, fueling activities, and construction equipment maintenance along the construction right-of-way and provides procedures for these activities. Training and lines of communication to facilitate the prevention, response, containment, and cleanup of spills during construction activities are also described. Additionally, this plan identifies the roles and responsibilities of key IPC personnel and contractors (i.e., primary and subcontractors) that will be involved in construction of the Project. This SPCC Plan will be included in construction bid and contract documents as contractual requirements to the contractor.

All contractor and subcontractor personnel working on the IPC right-of-way are responsible for implementation of the measures and procedures defined in this SPCC Plan.

1.1 Responsibilities Under this Plan

1.1.1 Idaho Power Company Representatives

The Chief Inspector (CI) will evaluate and approve each construction contractor's (Contractor) submittal under this SPCC Plan. The project Environmental Inspector(s) (EI) will oversee implementation of the SPCC Plan and of the Contractor's plans and submittals incorporated by reference. The EI will conduct regular inspections of Contractor activities and identify any issues that may require correction. The EI has the authority to stop construction to correct issues, if necessary. The CI, Contractor, Subcontractor, and EI will be required to maintain a copy of this SPCC Plan on-site available to all personnel.

Table 1-1. **Boardman to Hemingway Project Idaho Power Representatives [To be completed prior to construction]**

Function	Name	Location	Telephone Number
IPC Project Manager			
Chief Inspector			
Environmental Inspector			
Emergency Response Coordinator: Primary			
Emergency Response Coordinator: Secondary			
Emergency Response Contractors (Company/Responsibility)			
Spill Response			
Transportation Services			
Site Remediation			

1.1.2 Contractor Responsibilities

The Contractor will prepare plans and submittals under this SPCC Plan that will include activities of the Contractor and its Subcontractors. The Contractor will ensure that such documents are maintained current and complete, and that this SPCC Plan is fully implemented.

Table 1-2. **Boardman to Hemingway Project Primary Contractor Representatives *[To be completed prior to construction]***

Function	Name	Location	Telephone Number
Contractor			
On-Site Foreman			
Emergency Response Coordinator: Primary			
Emergency Response Coordinator: Secondary			
Environmental Contact			
Safety Representative			

Table 1-3. **Boardman to Hemingway Project Subcontractor Representatives *[To be completed prior to construction]***

Function	Name	Location	Telephone Number
Contractor			
On-Site Foreman			
Emergency Response Coordinator: Primary			
Emergency Response Coordinator: Secondary			
Environmental Contact			
Safety Representative			

Responsibilities identified as "Contractor" in subsequent sections of this SPCC Plan apply to each Contractor and Subcontractor.

2.0 SPILL PREVENTION PRACTICES

2.1 Site Selection

Site selection for project staging areas where hazardous materials and hazardous wastes may be present has considered and avoided environmentally sensitive areas. These sites are located at least 100 feet from streams (including intermittent and perennial), wetlands (including dry or seasonal wetlands) and other waterbodies (e.g., lakes, ponds and reservoirs); 200 feet from any private water well; and 400 feet from any municipal or community water supply well. Hazardous materials and wastes may not be sorted, handled, or used in an area that has not been approved for that purpose by the CI.

2.2 Hazardous Materials and Waste Management

Each Contractor is required to develop a detailed, site-specific Hazardous Materials Management Plan prior to construction. The Plan will identify the legal requirements that apply and Contractor requirements, and the best management practices for Project-specific spill prevention procedures, and other stipulations and methods to address spill prevention, response and cleanup procedures for the Project. A Hazardous Materials Management Plan Framework is included in Appendix A. Each Contractor is required to identify the hazardous materials that the Contractor will use and the wastes that the Contractor may generate during project activities. This information includes Material Safety Data Sheets (MSDS) or waste designation information, quantities, locations of storage and use, the container or tank used secondary containment, and inspection procedures. The Contractor must keep a copy of this plan on-site for the duration of all construction-related activities.

2.2.1 Hazardous Materials

No new hazardous material may enter the job site without an amendment to the Contractor's Hazardous Materials Management Plan and without the express approval of the EI.

Usable hazardous materials will be removed by the Contractor for future use upon completion of work on-site.

2.2.2 Wastes

Each waste generated will be evaluated by the EI for appropriate waste designation and appropriate disposal.

2.2.2.1 Rights-of-Way and Sites Owned or Leased by the Project

Wastes generated on the right-of-way and at sites owned or leased by IPC that have the potential of being hazardous waste will be returned to the approved staging point, whereupon the EI will be notified. As necessary, the Contractor will sample wastes and request assistance of the EI in waste management.

The Project EI is responsible for designation of hazardous waste, universal waste, special waste, or recyclable hazardous materials in accordance with applicable state and federal regulations, including OAR, Division 100.

Regulated wastes will be placed in IPC-approved containers, maintained in good condition, and appropriately labeled. Containers will be in an approved area and the EI will be notified of the waste activity. IPC representatives will arrange for appropriate disposal of regulated wastes.

2.2.2.2 Domestic Sewage

Domestic sewage will be handled during construction by means of portable self-contained toilets, which will be stationed at central locations and reasonable distances throughout the work area.

2.2.2.3 Waste Disposal On-Site Prohibited

In no case will any waste material be disposed of at the job site, right-of-way location, or adjacent property.

2.3 Spill Prevention

The Contractor will store, handle, and transfer fluids used during construction so as to prevent the release or spill of oil or other hazardous materials. Materials that are likely to be used in construction equipment include gasoline, diesel fuel, hydraulic fluid, and lubricating oils.

2.3.1 Tank and Container Specifications

Specifications for tanks and containers must meet generally approved standards (including but not limited to supplier's recommendations and specifications of the U.S. Department of Transportation (DOT)). In meeting these standards, tanks and containers must continuously be of integrity and condition to be acceptable for storage and transportation.

2.3.2 Dispensing and Transfer

Dispensing and transfer of hazardous materials and wastes must occur in accordance with nationally recognized standards. This includes bonding or grounding during transfer of flammable liquids. The Contractor will inspect transfers of hazardous materials and waste.

Transfer of liquids and refueling will occur only at approved locations that are at least 100 feet away from any wetlands or surface waters, 200 feet from any private water well, and 400 feet from any municipal or community water well, with certain exceptions noted below (see Section 2.3.4).

Crews must have adequate spill response equipment available at the dispensing or transfer location.

Repair/overhaul of equipment will not occur on the right-of-way or temporary work space except for emergency-type repair of short duration. Any liquids will be collected in suitable containers and appropriately disposed of.

When materials are transferred from a storage tank or container to a vehicle, the Contractor will:

- operate during daylight hours or where lighting is adequate to illuminate the area;
- monitor the transfer operations at all times;
- refuel at least 100 feet from wetlands or surface waters and at least 200 feet from potable water supplies, with certain exceptions noted below;
- keep sufficient spill control materials on-site; and
- in the event of a spill, implement the spill response procedures.

2.3.3 Materials Storage

When materials are stored in a fuel storage tank, the Contractor will:

- locate the tank at least 100 feet from wetlands, 200 feet from private water wells, and 400 feet from municipal water supply wells, with certain exceptions noted below (see Section 2.3.4);
- install a temporary earthen berm around the tank and line it with plastic to provide containment;
- inspect the tank, berm, and liner daily;
- inspect the tank after refilling;
- correct any conditions that could result in a spill, leak, or compromise the integrity of the secondary containment;
- plug or close all tank openings when not in use;
- remove any precipitation from the bermed area with a pump and spray in surrounding upland area (note: inspect precipitation for an oil sheen and, if sheen is present, collect the liquid for disposal); and
- keep sufficient spill control materials on-site.

When materials are stored in a container, the Contractor will:

- store containers at least 100 feet from wetlands and surface waters with certain exceptions noted below (see Section 2.3.4);
- use small containers that are in good condition (maximum capacity 55 gallons);
- protect the containers from the elements and physical damage;
- replace any leaking or damaged containers;
- close containers when not in use; and
- keep sufficient spill control materials on-site.

2.3.4 Setback Exceptions

The dispensing and transfer (e.g., refueling) setbacks identified above may not be practical for certain construction activities in certain locations. Exceptions may only be allowed for:

- areas such as rugged terrain or steep slopes where movement of equipment to refueling stations would cause excessive disturbances to the surface of the right-of-way;
- construction sites where moving equipment to refueling stations is impractical or where there is a natural barrier from the waterbody or wetland (e.g., road or railroad);
- locations where the waterbody or wetland is located adjacent to a road crossing from which the equipment can be serviced; and
- refueling and fuel storage for immobile equipment.

All exceptions to the required setbacks must be approved by the EI.

In these situations, the Contractor shall exercise extreme caution during fueling and lubrication of equipment and all other oil and hazardous materials transfers. Only a fuel truck with a maximum of 300 gallons of fuel may enter restricted areas to refuel construction equipment. Two trained personnel will be present during refueling to reduce the potential for spill or accidents. Adequate spill containment equipment suitable to the refueling activities as described in Section 3.2.1.2 will be maintained at designated setback locations during refueling.

2.3.5 Other Material-Specific Measures

Paint containers will be tightly sealed and stored in a designated area. Excess paint will be properly disposed of according to manufacturer's instructions and federal, state, and local regulations. All paint tools will be cleaned in a designated area located at least 100 feet from all wetlands and surface waters.

Concrete trucks will be allowed to wash out or discharge surplus concrete or drum wash water on the site in designated areas. The designated area will include sediment controls installed around the perimeter and will be located 100 feet away from wetlands or surface waters. After construction, the concrete washout area will be restored to pre-construction conditions.

2.3.6 Equipment for Safe Tank Operation

Tanks will be equipped with all standard safety equipment required for the specification packaging and its use.

2.3.7 Separation of Incompatible Materials

Incompatible materials will be stored in areas separated in accordance with nationally recognized standards. Incompatible materials will not be consecutively placed into a container or tank. In addition, sources of ignition will be prohibited in hazardous materials areas and waste areas.

2.3.8 Labeling, Marking and Placarding

Each cylinder, container, and tank will be appropriately identified with contents as per Occupational Safety and Health Administration requirements (see samples in Appendix B). Containers and tanks used for transport of hazardous materials and wastes will be marked and labeled in accordance with DOT requirements (e.g., Proper Shipping Name, UN/NA Number, Hazard Class labels or placards). In addition, tanks will be labeled in accordance with National Fire Protection Association, where required by the local jurisdiction.

Approved areas for hazardous materials and waste will be secured against unauthorized entry and vandalism.

2.4 Secondary Containment

2.4.1 Approved Secondary Containment

Approved secondary containment will be provided for each tank and each container with a capacity of 5 gallons or more.

2.4.2 Minimum Standards for Secondary Containment

2.4.2.1 Containers

Secondary containment for containers with 5 or more gallons of capacity may include a temporary containment area with temporary earthen berms and contiguous 10 mil polyethylene containment; or it may consist of a portable containment system constructed of polyvinyl chloride (PVC) or other suitable material.

Secondary containment volume will be at least 110 percent of the volume of the larger tank of hazardous materials and wastes stored. If earthen berms are utilized, they will be constructed with slopes no steeper than 3:1 (horizontal to vertical) to limit erosion and provide structural stability.

Polyethylene drum spill skids will be used for storage of 55-gallon drums of fuel or hazardous materials that may be placed temporarily in the immediate work area.

2.4.2.2 Tanks

Secondary containment for tanks will be provided that includes the tank and the dispensing area. Secondary containment volume will be 110 percent of the volume of the largest tank of hazardous materials and wastes stored. Tanks should be elevated a minimum of 2 feet above grade.

2.4.2.3 Contractor's Secondary Containment

Secondary containment provided by the Contractor must meet these minimum standards and must be implemented as proposed in the Contractor's Hazardous Materials Management Plan.

2.5 Regular Inspections

The Contractor will conduct daily inspections at locations where hazardous materials and wastes are stored, handled, and dispensed. The Contractor will also inspect aboveground tanks after refilling. Inspections will follow site-specific procedures in the approved Contractor's Hazardous Materials Management Plan. The source of any container or tank leak will be stopped immediately and residual wastes will be aggregated, designated, and properly disposed of. Any leaking container will be immediately overpacked.

All vehicles (e.g., trucks, side-booms, dozers, etc.) shall be:

- inspected daily for leaks or signs of deterioration that could result in a leak;
- repaired when defective tanks, hoses, fittings, etc. are found; and
- parked at least 100 feet from wetlands or surface waters, with certain exceptions noted above (see Section 2.3.4).

The EI will provide oversight to the Contractor's activities on hazardous materials and waste management.

3.0 EMERGENCY PREPAREDNESS

Each Contractor is required to develop a Contractor's Emergency Response Plan (ER Plan) (see Appendix C) for environmental emergency preparedness and response. The ER Plan is appropriate for the hazardous materials and wastes used and generated. The initial ER Plan will be approved by the Chief Inspector. This ER Plan will be maintained current; subsequent revisions may be approved by the EI.

The Contractor will maintain adequate resources, including:

- emergency response coordinators;
- fire-fighting equipment (such as portable fire extinguishers);
- spill control and cleanup equipment (absorbent materials such as pads, pillows, booms and socks, non-sparking shovels, etc.);
- appropriate personal protective equipment; and
- the Contractor's ER Plan.

3.1 Emergency Responders

The Contractor will designate personnel responsible for incident or emergency response, in the event of a release to the environment. The Contractor will ensure that emergency responders identified will have appropriate training in environmental emergency or incident preparedness, prevention, and response. The Contractor's emergency contact information will be maintained current.

In addition, IPC will designate primary and secondary Emergency Response Coordinators. IPC Emergency Response Coordinators will have the authority to commit necessary resources to respond to environmental releases and to conduct cleanup.

3.2 Emergency Response Equipment

3.2.1 Contractor's Spill Containment and Cleanup Resources

3.2.1.1 On-site Equipment

The Contractor will have available, adequate spill containment and cleanup resources that are appropriate to their activities and to the hazardous materials and wastes handled. Minimum standards are identified on Appendix C. The following additional materials will be available at a central location on each multi-use area and light-duty fly yards:

- boom(s);
- cleanup rags;
- 55-gallon DOT-approved containers;
- replacement parts and equipment for repair of tanks, hoses, nozzles, etc.;
- fire extinguisher, Type B, C;
- two bags of chemical sorbent material (e.g., kitty litter);
- three 17-inch x 17-inch chemical pillows;
- four 48-inch x 3-inch chemical socks;
- twenty 18-inch x 18-inch x 3/8-inch sorbent pads;
- twenty 30-gallon 6-mil polyethylene bags;
- two 30-gallon polyethylene open-head drums;
- 10 pairs of polypropylene gloves;
- two, each type, waste labels;
- two 8' x 10' polyethylene tarps;
- one cooler;
- one quart jar;
- one trowel; and
- 20 hay bales.

The Contractor will be prepared to clean up, characterize, and dispose of spill debris. IPC will have additional contractors available for associated emergency spill response, transportation, remediation, and disposal activities.

3.2.1.2 Vehicle Response Equipment

The Contractor will maintain a supply of spill materials as descried below.

Any vehicle used to transport lubricants and fuel will be equipped with:

- one 20-pound fire extinguisher (Type: B, C);
- 50 pounds of oil absorbent (e.g., Speedy Dry or equivalent);
- ten 48-inch x 3-inch oil socks;
- five 17-inch x 17-inch oil pillows;
- two 10-foot x 4-inch oil booms;
- twenty 24-inch x 24-inch x 3/8-inch oil absorbent pads;
- twenty 30-gallon 6-mil polyethylene bags;
- one roll of 10-mil plastic sheeting;
- two shovels;
- 10 pairs of polypropylene gloves;
- one 55-gallon (or equivalent capacity) DOT-approved container; and
- two, each type, waste label.

All foremen's vehicles and heavy equipment will be equipped with:

- absorbent pads;
- heavy duty plastic bags; and
- one shovel.

3.2.2 Maintaining Emergency Response Equipment

The Contractor will inspect emergency response equipment weekly to ensure that all equipment identified in the Contractor's ER Plan is available in quantities and locations identified. After response to an incident or emergency release, any equipment used will be replaced or decontaminated and returned to inventory.

4.0 INCIDENT OR EMERGENCY RESPONSE

4.1 Environmental Release Notification

The Contractor will notify the IPC Emergency Response Coordinator on call in the event that a spill occurs during project activities. **There will be immediate notification in the event of a release of 1 pound or more of any hazardous material or any amount of hazardous waste.** The Contractor is required to complete the Spill Report Form (Appendix D) and submit the form to the Project Manager and EI. The Contractor will be considered the Waste Generator for all spills caused by construction.

If agency notification is required, IPC representatives will notify the Project Manager and appropriate agencies in accordance with IPC policies. IPC will provide 48-hour advance notification to surface water intake operators of public drinking water source areas regarding construction through the waterbodies where their intakes are located. Appendix E will contain a description of the Project, including maps, flow diagrams, and topographical maps as necessary, which will be updated prior to construction.

4.2 Incident Response

If an environmental release occurs and is an incident that can be handled with available resources, the Contractor may be requested to perform the following, under direction of the IPC Emergency Response Coordinator.

- Stop the source of release. This may mean plugging a container or tank, turning off a valve, etc.
- Remove all sources of ignition from the area.
- Contain the spill. Use an approved container, or create a lined, covered containment area.
- Collect spilled materials. Block off drains. Create/expand containment areas using available means. Use appropriate neutralizers, sorbents, pigs, and pads. Create barriers to protect sensitive areas. Personal protective equipment will be worn as recommended on the MSDS of the specific product.
- Remove all contaminated soil or other material and cover with a plastic sheet.
- Contain contaminated material and temporarily store in a secured area 100 feet away from any wetland or surface water.
- Perform any necessary sampling of waste material.
- Conduct preliminary cleanup of the site.

4.2.1 Wetland or Waterbody Response

Regardless of size, the following conditions apply if a spill occurs near or in a stream, wetland, or other waterbody.

- For spills in standing water, floating booms, skimmer pumps, and holding tanks shall be used as appropriate by the Contractor to recover and contain released materials in the surface of the water.
- For a spill threatening a waterbody, berms and/or trenches will be constructed to contain the spill before it reaches the waterbody. Deployment of booms, sorbent materials, and skimmers may be necessary if the spill reaches the water. The spilled product will be collected and the affected area cleaned up in accordance with appropriate state or federal regulations.
- Contaminated soils in wetlands must be excavated, and placed on and covered by plastic sheeting in approved containment areas a minimum of 100 feet away from the wetland or surface water. Contaminated soil will be disposed of as soon as possible in accordance with appropriate state or federal regulations.

4.2.2 Emergency Response

The Emergency Response Coordinator will act as Incident Commander, overseeing emergency release response actions taken.

If additional resources are needed, the IPC Emergency Response Coordinator will retain emergency response contractors and/or request assistance of local emergency responders (including fire, police, hazardous materials teams, ambulance or hospitals, and highway patrol) and will coordinate all emergency response activities. As necessary, the IPC Emergency Response Coordinator will signal evacuation of site personnel.

Where site cleanup is necessary, IPC Emergency Response Coordinator will coordinate cleanup actions with appropriate agency representatives. IPC Representatives will provide guidance on appropriate waste management and disposal.

The Oregon Office of Emergency Management (1-800-452-0311) serves as the coordinator of spill response in the State of Oregon. The Office of Emergency Management determines the severity of spills and contacts the appropriate agency.

5.0 TRAINING

IPC will require that all Contractor employees involved with transporting or handling fueling equipment or maintaining construction equipment be required to complete spill training before they commence work on the Project. IPC will audit Contractor compliance with this requirement. Spill training will also be required for Contractor supervisory personnel prior to commencement of work. These training sessions will provide information concerning pollution control laws; inform personnel concerning the proper operation and maintenance of fueling equipment; and inform personnel of spill prevention and response requirements. Measures, responsibilities, and provisions of this SPCC Plan, and identification of response team individuals, will be incorporated into the training.

Training of other workers will be provided through ongoing weekly safety meetings. Topics will include spill handling and personal responsibility for initiating and adhering to appropriate procedures, and the required spill containment supplies to be maintained with each construction crew. These weekly sessions will be held by the Contractor as crew “tailgate” meetings. IPC will audit the Contractor compliance with this requirement to ensure the meetings are conducted.

APPENDIX A
CONTRACTOR'S HAZARDOUS WASTE MANAGEMENT FORMS

CONTRACTOR'S HAZARDOUS MATERIALS MANAGEMENT

IPC Project:	Description:	Chief Inspector's Name:	Tel. No./Location:	IPC Project Number/Accounting :
Contractor:	Firm Name:	Contact Name/Tel. No.:	Address:	
	Project Dates:	Number of Contractor Personnel On-site:	Work Schedule:	

HAZARDOUS MATERIALS			STORAGE AND HANDLING PROCEDURES						
Material Name	Manufacturer	MSDS Reference[1] (Attach)	Estimated Quantity Needed for Job (Units)	Quantity On-Site (Units)	Location(s) at Job Site	Marking/Labeling/ Placarding (Discuss or Attach)[4]	Tank/ Container Size(s)/ Type(s)	Secondary Containment (Discuss or Attach[2])	Inspection Procedure (Discuss or Attach[3])

Comments:

Attachments:	[1] Provide MSDSs. [2] Describe secondary containment for containers of 5 gallons or more capacity.	[3] Describe inspection procedures. [4] Describe tank/drum marking, labeling and placarding procedures.

CONTRACTOR'S HAZARDOUS, UNIVERSAL AND SPECIAL WASTE and RECYCLABLE HAZARDOUS MATERIALS MANAGEMENT

WASTE DESCRIPTION[1]		WASTE ACCUMULATION AND HANDLING PROCEDURES				
Waste Type and Description	Estimated Monthly Generation Quantity/Unit(s)	Accumulation Area Location(s)[2] On-Site	Tank/Container Size(s)/Type(s)	Marking/Labeling/ Placarding (Discuss or Attach)[3]	Secondary Containment (Discuss or Attach)[4]	Inspection Procedure (Discuss or Attach)[5]
Process Generating Waste(s):						
Contractor's Staging Point Location:						
Comments:						

Attachments:	[1] If Contractor intends to completely use or re-use hazardous materials on-site or off-site and no hazardous waste will be generated, please discuss.	[4] Describe secondary containment for containers of 5 gallons or more capacity.
	[2] Note: Locations may be established on site during mobilization.	[5] Describe inspection procedures, inspection frequency, title of inspector.
	[3] Describe tank/drum marking, labeling and placarding procedures.	

Distribution:	Original:	Informational Copies:		Revision Date (by Contractor):	
	Chief Inspector/IPC File	IPC Environmental Inspector: ___________			
		Safety-Training: _______________			
		Others: ________________			

APPENDIX B
LABELS FOR WASTE CONTAINERS

"MATERIALS IDENTIFICATION LABEL" (all containers)

<table>
<tr><td colspan="4">Boardman to Hemingway Project</td></tr>
<tr><td colspan="4">MATERIALS IDENTIFICATION LABEL</td></tr>
<tr><td colspan="2" rowspan="5">Boardman to Hemingway Project:</td><td colspan="2">Description:</td></tr>
<tr><td colspan="2">Facility/Location:</td></tr>
<tr><td colspan="2">Chief Inspector:</td></tr>
<tr><td colspan="2">Environmental Inspector:</td></tr>
<tr><td colspan="2">IPC Project Number/Account:</td></tr>
<tr><td colspan="2" rowspan="3">Contractor:</td><td colspan="2">Contractor Name:</td></tr>
<tr><td colspan="2">Environmental Contact Name:</td></tr>
<tr><td colspan="2">Telephone No.:</td></tr>
<tr><td colspan="4">Process:</td></tr>
<tr><td colspan="2">Materials Description:</td><td colspan="2">Quantity: ____pounds
____gallons</td></tr>
<tr><td colspan="2">Container Type (drum, tank, etc.):</td><td colspan="2">Container Location:</td></tr>
<tr><td colspan="2">Container Number:</td><td colspan="2">Date of Accumulation:</td></tr>
<tr><td colspan="2" rowspan="6">Status of Material:
(if sampling and analysis are required)</td><td colspan="2">Sample Number:</td></tr>
<tr><td colspan="2">Sample Date:</td></tr>
<tr><td colspan="2">Analytical Laboratory:</td></tr>
<tr><td colspan="2">Analysis Date:</td></tr>
<tr><td colspan="2">Report Date:</td></tr>
<tr><td colspan="2">Analytical Results:</td></tr>
</table>

"RECYCLABLE MATERIAL/WASTE" CONTAINER LABEL

Boardman to Hemingway Project

RECYCLABLE MATERIAL/WASTE LABEL

Facility Name: ______________________

Address: ______________________

State/Zip: ______________________

Contact: ______________________

Type: ☐ **USED OIL**

UNIVERSAL WASTE:

☐ Universal Waste – Batteries

☐ Universal Waste – Lamps

☐ Universal Waste – Mercury Thermostats

☐ **SPECIAL WASTE**

☐ **RECYCLABLE MATERIAL**

Description: ______________________

Accumulation Date: ______________________

DOT Proper Shipping Name: ______________________

____

____

UN/NA Number: ______________________

HAZARDOUS WASTE "WORKPLACE ACCUMULATION CONTAINER" LABEL

WORKPLACE ACCUMULATION CONTAINER

Proper D.O.T Shipping Name: ____________________
____

UN/NA# ____________________

Generator: ____________________

Facility: ____________________

Address: ____________________

Phone: __________ **City:** __________

State: __________ **Zip:** __________

EPA ID No: ____________________

Workplace Accumulation Start Date: ____________________

HAZARDOUS WASTE

STATE AND FEDERAL LAW PROHIBITS IMPROPER DISPOSAL. IF FOUND, CONTACT THE NEAREST POLICE OR PUBLIC SAFETY AUTHORITY, THE U.S. ENVIRONMENTAL PROTECTION AGENCY, OR THE OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY

HANDLE WITH CARE!

Composition: ____________________
____

Physical State of Waste:

Solid __________ **Liquid** __________

Hazardous Properties: ☐ **Toxic**

☐ **Flammable** ☐ **Corrosive**

☐ **Reactivity** ☐ **Other** __________

EPA Waste No. ____________________

CA Waste No. ____________________

Date Placed in Hazardous Waste Storage Area: ____________________

Manifest Document Number:
____

“USED OIL” CONTAINER LABEL

USED **OIL**

APPENDIX C
CONTRACTOR'S EMERGENCY RESPONSE PLAN FORM

CONTRACTOR'S EMERGENCY RESPONSE PLAN

IPC SPCC/Emergency Response Plan Reviewed: (Y/N)

Emergency Response Coordinator

Name	**Title**	**Telephone** (Office/Job Site)	**Address**
Primary			
Secondary			

Incident/Emergency Response Equipment

Emergency Response Equipment	**Type**	**Capability**	**Quantity**	**Location**
Fire Fighting	Fire Extinguishers	Type: B, C?		Jobsite Crew Staging Area
Incident Response Kit	Chemical sorbent material (e.g., kitty litter)	Chemical Spill Response	2 bags	Project Staging Area
	17” x 17” chemical pillows	“	3	“
	48” x 3” chemical socks	“	4	“
	Sorbent pads 18” x 18” x 3/8”	“	20	“
	6 mil polyethylene bags	“	20, 30-gal.	“
	Polyethylene open-head drum	“	2, 30-gal.	“
	Polypropylene gloves	“	10 pair	“
	Waste Labels	“	2 Each	“
	8’ x 10’ Polyethylene Tarp	“	2	“
Release Response Kit	48”x3” oil socks	Fuel/Oil Spill Response	10	Each Fuel/Oil Truck
	17” x 17” oil pillows	“	5	“
	10’ x 4” oil boom	“	2	“
	24” x 24” x 3/8” oil mats	“	20	“
	6 mil polyethylene bags	“	20, 30-gal.	“
	Polypropylene Gloves	“	10 pair	“
	Propylene open-head drum	“	1, 55-gallon	“
	Waste Labels	“	2 Each	“
Sample Kit	Cooler, Quart Jars, Trowel	Sampling of solids	1	Project Staging Area
Spill Containment	8’ x 10’ Polyethylene Tarp	Contain Spill Debris	2	Project Staging Area
	Hay Bales	“	20	“

Evacuation Procedures

Distribution:	Original:	Informational Copies:
	Chief Inspector/IPC File	IPC Environmental Inspector: ___________
		Safety-Training: _______________
		Others: ________________

Revision Date (by Contractor):	

APPENDIX D
SPILL REPORT FORM

Boardman to Hemingway
Spill Report Form

General Information

Date/time of spill: ______________________________

Date/time of spill discovery: ______________________________

Name and title of discoverer: ______________________________

Milepost/Legal Description: ______________________________

Spill Source and Site Conditions

Material spilled/Estimated volume: ______________________________

Unique qualifier, if relevant, such as manufacturer: ______________________________

Media in which the release exists: (circle: sand, silt, clay, upland, wetland, surface water, other):
____

Topography and surface conditions of spill site: ______________________________
____

Proximity to wetlands and surface waters (including ditches): ______________________________
____

Proximity to private or public water supply wells: ______________________________
____

Directions from nearest community: ______________________________
____

Weather conditions at the time of release: ______________________________

Describe the causes and circumstances resulting in the spill: ______________________________
____
____
____

Describe the extent of observed contamination, both horizontal and vertical (i.e., spill-stained soil in a 5-foot radius to a depth of 1 inch): ______________________________
____
____
____

Boardman to Hemingway Project
Spill Report Form

Spill Control and Clean-up

Describe immediate spill control and/or cleanup methods used and implementation schedule:

____
____
____

Location of any excavated/stockpiled contaminated soil:

____

Describe the extent of spill-related injuries and remaining risk to human health and environment:

____
____
____

Name, company, and telephone number of party causing spill (e.g., contractor):

____
____
____

Current status of cleanup actions:

____
____
____

Contact Information

Name and company for the following:

Construction Superintendent (Contractor): ____________________ ____________________	Spill Coordinator: ____________________ ____________________
Environmental Inspector: ____________________ ____________________	Chief Inspector (IPC) ____________________ ____________________
Landowner notified (if appropriate): ____________________	Form completed by: ____________________
Date: ____________	Date: ____________

Government agency notified **(to be completed by IPC or IPC's Representative)**:____________

____

Date: ____________

Spill Coordinator must complete this form for any spill, regardless of size, and submit the form to the IPC Representative and Environmental Inspector within 24 hours of the occurrence.

APPENDIX E
PROJECT DESCRIPTION AND SITE MAPS

[Site maps will be provided prior to construction]

Attachment G-5

Draft Framework Blasting Plan

ATTACHMENT G-5
DRAFT AMENDED FRAMEWORK BLASTING PLAN

Draft Framework Blasting Plan

Boardman to Hemingway Transmission Line Project

Prepared By

IDAHO POWER

1221 West Idaho Street
Boise, Idaho 83702

Modified by the Oregon Department of Energy and Energy Facility Siting Council

September 2022

Agency Review Process

The agency review process outlined in this section aligns with the OAR 345-025-0016 agency consultation process applicable to monitoring and mitigation plans.

As described in the draft Framework Blasting Plan, blasting may be required in areas of rocky terrain, if determined necessary following the site-specific geotechnical investigation for transmission line structure foundation and access road locations. If blasting is required, the draft Framework Blasting Plan will be finalized, as described throughout the plan. In addition, the plan may be amended at any time during construction, subject to the agency review process outlined below.

To afford an adequate opportunity for applicable local, state and federal agencies to review the draft plan prior to finalization and implementation, and any future plan amendments, the certificate holder shall implement the following agency review process.

Step 1: Certificate Holder's Initial Notification to the Department of Potential Blasting: In the electronic transmittal of the pre-construction Geotechnical Investigation to the Department (Structural Standard Condition 1(b)), the certificate holder shall identify whether blasting activities are recommended for facility construction, and shall identify, in table and map format, potential blasting locations including tower number, milepost and county.

Step 2: Certificate Holder's Update of Draft Plan or Future Plan Amendment: The certificate holder may develop one Blasting Plan to cover all blasting activities for the entire facility; or, may develop individual plans per county, segment or phase, as best suited for facility construction. Based on the draft Framework Blasting Plan included as Attachment G-5 of the Final Order on the ASC, the certificate holder shall update the draft plan(s) identifying applicable regulatory requirements, including any necessary blasting or explosive permits. If the plan(s) are amended following finalization, the certificate holder shall clearly identify and provide basis for any proposed changes.

Step 3: Certificate Holder and Department Coordination on Appropriate Review Agencies and Agency Review Conference Call(s): Prior to submission of the updated draft plan, or any future amended plans, the certificate holder shall coordinate with the Department's Compliance Officer to identify the appropriate federal, state and local agencies to be involved in the plan review process. In this instance, "appropriate" federal agencies are based on landownership where blasting is recommended or planned; "appropriate" state agencies are based on landownership where blasting is recommended or planned, as well as the Department of Geology and Mineral Industries (DOGAMI) and Oregon State Fire Marshal. "Appropriate" local agencies include the local planning department of the jurisdiction blasting is recommended or planned to occur. Once appropriate federal, state and local agency contacts are identified by the Department and certificate holder, the Department's Compliance Officer will initiate coordination between agencies to schedule review/planning conference call(s). If blasting is recommended within multiple counties, the Department and certificate holder may agree to schedule separate conference calls per county.

The intent of the conference call(s) are to provide the certificate holder, or its contractor, an opportunity to describe blasting locations, details of the updated draft or amended plan; and, agency plan review schedule. Agencies may provide initial feedback on requirements to be included in the plan during the call, or may provide written comments during the 14-day comment period. The Department will request that any comments provided be supported by an analysis and local, state or federal regulatory requirement (citation).

The certificate holder may coordinate with appropriate review agencies, in advance of or outside of the established agency review process; however, this established agency review process is necessary under OAR 345-025-0016 and may result in more efficient plan finalization and amendment if managed in a consolidated process, utilizing the Department's Compliance Officer as the lead Point of Contact.

Step 4: Agency Review Process: Either with, or prior to, the agency conference call(s), the certificate holder shall distribute electronic copies of the draft, or future amended, plan(s) requesting that the Department coordinate agency review comments within 14-days of receipt, or as otherwise determined feasible. Following the 14-day agency review period, the Department will consolidate comments and recommendations into the draft, or amended, plan(s), using a Microsoft Word version of the plan provided by certificate holder. Within 14-days of receipt of the agency review comments, the certificate holder shall provide an updated final version of the plan, incorporating any applicable regulatory requirements, as identified during agency review or must provide reasons supporting exclusion of recommended requirements. Final plans will be distributed to applicable review agencies by the Department, including the certificate holder's assessment of any exclusions of agency recommendations, and a description of their opportunity for dispute resolution.

Step 5: Dispute Resolution: If any review agency considers the final, or amended, plan(s) not to adhere to applicable state, federal or local laws, Council rules, Council order, or site certificate condition or warranty, the review agency may submit a written request of the potential violation to the Department's Compliance Officer or Council Secretary, requesting Council review during a regularly scheduled Council meeting. The Council would, as the governing body, review the violation claim and determine, through Council vote, whether the claim of violation is warranted and identify any necessary corrective actions.

TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS

CIC	Compliance Inspection Contractor
IPC	Idaho Power Company
ODOE	Oregon Department of Energy
POD	Plan of Development
Project	Boardman to Hemingway Transmission Line Project
U.S.	United States

1.0 INTRODUCTION

The Blasting Plan Framework outlines methods to mitigate risks and potential impacts associated with blasting procedures that may be required for construction of the Boardman to Hemingway Transmission Project (Project). Also included in this section is a preliminary outline for the Blasting Plan to be prepared by the Construction Contractor(s) and submitted to Idaho Power Company (IPC) if blasting is required. The Compliance Inspection Contractor (CIC) and the appropriate agencies will be notified in advance of any required blasting so the area can be cleared. If blasting is to occur on federal lands, IPC will submit the Blasting Plan to the federal land-management agencies for final review and approval.

1.1 Plan Framework Updates

This plan framework will support the Project sufficiently to complete and execute the Oregon Department of Energy (ODOE) site certificate. This plan framework serves as baseline document to guide development of the complete Blasting Plan developed with the Plan of Development before issuance of the site certificate and commencement of construction. The complete Blasting Plan will be developed by the Construction Contractor(s) in consultation with IPC as detailed engineering design of the Project is completed and will contain the detailed information necessary for site-specific guidance. This plan framework provides Project-specific guidance for development of the complete Blasting Plan by identifying treatments and measures required to avoid, minimize, and mitigate Project-related impacts; prevent unnecessary degradation of the environment; ensure blasting activities comply with federal, state, or other agency requirements; and meet any stipulations of the Site Certificate. The Construction Contractor(s) will be responsible for preparing and implementing the complete Blasting Plan.

1.2 Blasting Plan Purpose

Once completed, the Blasting Plan will provide construction crews, the CIC, and environmental monitors with Project-specific information concerning blasting procedures, including the safe use and storage of explosives. The objective of the Blasting Plan is to prevent adverse impacts on human health and safety, property, and the environment that could potentially result from the use of explosives during Project construction.

Blasting may be needed in certain areas with rocky terrain to excavate tower footings, prepare station pads, and to construct access roads. Blasting will be used only in areas where traditional excavation and earth-moving equipment and practices are unable to accomplish the excavation. If hard rock is encountered within the planned drilling depth, blasting may be required to loosen or fracture the rock to reach the required depth to install the structure foundations. Precise locations where blasting is expected will be identified based on a site-specific geotechnical investigation carried out as part of detailed design. In addition, the Construction Contractor(s) may elect to use implosive sleeves during line-stringing activities to fuse conductor wire together.

2.0 REGULATORY COMPLIANCE AND PROCEDURES

The Construction Contractor(s) will be responsible for preparing and implementing the Blasting Plan and must comply with all applicable federal, state, and local laws and regulations. No blasting operations will be undertaken until approval and appropriate permits have been obtained from the applicable agencies. Failure to comply with such laws could result in substantial financial penalty and/or imprisonment.

The Construction Contractor(s) will use qualified, experienced, and licensed blasting personnel who will perform blasting using current and professionally accepted methods, products, and procedures to maximize safety during blasting operations. Blasting procedures will be carried out according to, and in compliance with, applicable laws and will be closely monitored by the CIC.

3.0 BLASTING PLAN GUIDANCE

Prior to blasting, the Construction Contractor(s) shall prepare a Blasting Plan for review and approval by IPC, ODOE, CIC, and any other relevant jurisdictional organization, as applicable. The plan will address safety as well as design for production and controlled blasting. The Blasting Plan also will contain the full details of the drilling and blasting patterns, as well as the controls the Construction Contractor proposes to use for both controlled and production blasting. Review of the plan by the parties shall not relieve the Construction Contractor(s) of the responsibility for the accuracy and adequacy of the Blasting Plan when implemented in the field. A minimum of 2 weeks should be allowed for review and approval of the Blasting Plan by ODOE and other appropriate agencies. If at any time changes are proposed to the Blasting Plan, the Construction Contractor(s) shall submit them to IPC, who will then submit the proposed changes to ODOE and other appropriate agencies and the CIC for review and approval.

3.1 Overview of Blasting Principles

3.1.1 Locations

The Construction Contractor(s) will avoid blasting in potential rockslide/landslide areas to the maximum extent possible and will consult with a geologist before blasting in such areas. A common practice for fusing conductor wire together is the use of implosive sleeves, which use explosive materials. The Construction Contractor(s) should be knowledgeable about this practice and should coordinate with the CIC, particularly with regard to the locations of these practices.

3.1.2 Materials

The Construction Contractor(s) will determine the specific materials needed for blasting operations. These materials will be included on the hazardous materials list for the Project, and their use and storage will comply with applicable federal, state, and local laws and regulations.

3.2 Blasting Plan Components

The Blasting Plan prepared by the Construction Contractor(s) shall contain the following minimum information in the following format:

1. Purpose
2. Scope of the Blasting
3. Definitions
4. Responsibilities
    - 4.1 Management Organization
    - 4.2 Authority Responsibility
    - 4.3 Blaster in Charge (licensed in Idaho and Oregon)

5. Location of Blasting Area
    - 5.1 Description of Blasting Area
    - 5.2 Description of Bedrock and Geological Problems
    - 5.3 Description of Adjacent Utility Facilities
6. Environmental Considerations
7. Safety Considerations
    - 7.1 General
    - 7.2 Warning Signs and Signals
    - 7.3 Procedures around Adjacent Utility Facilities
    - 7.4 Traffic Control
    - 7.5 Emergency Blast Initiation
    - 7.6 Safety Publications
    - 7.7 Fire Prevention
    - 7.8 Safety Hazards
    - 7.9 Emergency Services and Communication
    - 7.10 Minor or Nonemergency Medical Care
    - 7.11 First Aid
8. Risk Management
    - 8.1 Protection of Adjacent Utility Facilities
    - 8.2 Lightning
    - 8.3 Flyrock (Note: Flyrock will be controlled with blasting mats.)
    - 8.4 Carbon Monoxide
    - 8.5 Ground Vibrations
    - 8.6 Seismically Sensitive Receptors and Monitoring Plan

      Description of seismic monitoring to ensure ground vibration does not exceed the maximum limit in 2018 NFPA 495 Figure 11.2.1 at the nearest structures or buildings. Where seismic monitoring is not provided, explosive use shall be limited to the “scaled distance factors” at the nearest structure as identified in 2018 NFPA 495 Table 11.2.2
    - 8.7 Preblast Survey and Inspection
    - 8.8 Post Monitoring and Seismic Report
    - 8.9 Blast Damage Complaints
    - 8.10 Airblast
    - 8.11 Bond or insurance certificate

Demonstration that contractor has bond or insurance certificate for blasting activities in an amount not less than $1,000,000. The Fire Marshal may determine that more coverage is necessary for certain projects

9. Blast Design Concept

   9.1 Station limits of proposed shot

   9.2 Plan and section views of proposed drill pattern, including free face, burden, blasthole spacing, blasthole diameter, blasthole angles, lift height, and sub-drill depth

9.3 Loading diagram showing type and amount of explosives, primers, initiators, and location and depth of stemming

9.4 Initiation sequence of blastholes, including delay times and delay system

9.5 Manufacturers' data sheets for all explosives, primers, and initiators to be employed

10. Procedures

10.1 Delivery of Explosives

10.2 Storage of Explosives and Blasting Agents

10.3 Blast Hole Drilling

10.4 General Handling of Explosives

10.5 Blast Hole Loading

10.6 Notification

10.7 Initiation of Blast

10.8 Misfire Management

10.9 Test Blasting

11. Records

12. Attachments

3.3 Safety Procedures

Safe storage and use of explosive materials will be a top priority during construction. The safety measures discussed in this section are intended to prevent theft and/or vandalism of the explosive materials, protect against fire, and prevent personal injury and property damage. These measures are intended as general guidelines and specific safety requirements will be identified by the construction contractor prior to construction.

3.3.1 Storage

Explosives must be stored in an approved structure (magazine) and kept cool, dry, and well-ventilated. IPC's Construction Contractor(s) will provide the respective states' Bureau of Alcohol, Tobacco, Firearms, and Explosives office with a list of dates and locations for the explosives and blasting-agent storage facilities to be used on the Project at least 14 days before the establishment of such storage facilities.

At a minimum, the following storage requirements will be implemented:

- Explosives must be stored in an approved structure (magazine), and storage facilities will be bullet, weather, theft, and fire resistant.
- Magazine sites will be located in remote (out-of-sight) areas with restricted access; will be kept cool, dry, and well ventilated; and will be properly labeled and signed.
- Detonators will be stored separately from other explosive materials.

- The most stringent spacing between individual magazines will be determined according to the guidelines contained in the Bureau of Alcohol, Tobacco, Firearms, and Explosives publication or state or local explosive storage regulations.
- Both the quantity and duration of temporary onsite explosives storage will be minimized.

The Construction Contractor(s) will handle and dispose of dynamite storage boxes in accordance with relevant federal, state, and local laws.

3.3.2 Blasting Notification and Safety Procedures

The Construction Contractor(s) will obtain a permit from the appropriate county as needed, for the period when blasting may occur.

At least 14-days prior to any blasting necessary during construction of the facility, certificate holder shall ensure that its Construction Contractor identifies all landowners of record and occupants within 1,250 feet of blasting actions and provide notification to those landowners and occupants of the blasting schedule, certificate holder or construction contractor contact information, potential risks/hazards and of measures that will be taken to monitor and minimize any ground shaking impacts.

Construction Contractor(s) will comply with the following additional requirements developed by the federal land-management agencies:

- The Construction Contractor(s) shall publish a proposed blasting schedule in the local newspaper 1 week prior to any blasting taking place. The schedule shall identify the location, dates, and times blasting will occur. No blasting shall occur outside of the published schedule, except in emergency situations.
- The Construction Contractor(s) shall post warning signs at all entry points for the Project. Warning signs shall include information on blasting, including the general hours blasting might take place, and audible signals to be used warning of impending blasting and to indicate the site is all clear.
- Access points to areas where blasting will take place will be blocked to prevent access by the public at least 30 minutes prior to blasting. The site shall be swept 5 minutes prior to blasting to ensure no unauthorized personnel have wandered onto the site. An audible warning signal, capable of carrying for 0.5 mile, shall be used at least 2 minutes prior to blasting. An “all-clear” signal will be given once it has been determined the area is safe.
- Blasting in the vicinity of pipelines will be coordinated with the pipeline operator and will follow operator-specific procedures, as needed.
- Damages that result solely from the blasting activity will be repaired or the owner fairly compensated.

A determination that the blasting area is all clear of danger will be derived once the blasting area has been inspected for undetonated or misfired explosives. The blasting area also will be inspected for hazards, such as falling rock and rock slides. Once the area has been inspected and these issues have been addressed, the all-clear signal as described above will sound and persons will be able to safely re-enter the blast zone. Additional safety precautions will be developed to address site-specific conditions at the time of the blast. Special attention will be given to preventing potential hazards in the blasting area resulting from flying rock, destabilized walls or structures, presence of low flying aircraft, and dispersion of smoke and gases.

3.3.3 Fire Safety

The presence of explosive materials on the Project site could potentially increase the risk of fire during construction. Special precautions will be taken to minimize this risk, including the following:

- Prohibiting ignition devices within 50 feet of explosives storage areas
- Properly maintaining magazine sites so they are clear of fuels and combustible materials, well ventilated, and fire-resistant
- Protecting magazines from wildfires that could occur in the immediate area

- Posting fire suppression personnel at the blast site during high-fire danger periods
- Prohibiting blasting during extreme fire danger periods

3.3.4 Transportation of Explosives

Transportation of explosives will comply with all applicable federal, state, and local laws, including Title 49 of the Code of Federal Regulations, Chapter III. These regulations are administered by the United States (U.S.) Department of Transportation and govern the packaging, labeling, materials compatibility, and safety of transported explosives, as well as driver qualifications. In general, these regulations require vehicles carrying explosive materials be well-maintained, properly marked with placards, and have a non-sparking floor. Materials in contact with the explosives will be non-sparking, and the load will be covered with a fire- and water-resistant tarpaulin. Vehicles also must be equipped with fire extinguishers and a copy of the Emergency Response Guidebook (U.S. Department of Transportation 2008). Every effort will be made to minimize transportation of explosives through congested or heavily populated areas.

Prior to loading an appropriate vehicle for carrying explosives, the vehicle shall be fully fueled and inspected to ensure its safe operation. Refueling of vehicles carrying explosives shall be avoided. Smoking shall be prohibited during the loading, transporting, or unloading of explosives. In addition, the following specific restrictions apply to transport of other items in vehicles carrying explosives:

- Tools may be carried in the vehicle, but not in the cargo compartment.
- Detonation devices can, in some cases, be carried in the same vehicle as the explosives, but they must be stored in a specially constructed compartment(s).
- Batteries and firearms shall never be carried in a vehicle with explosives.
- Vehicle drivers must comply with the specific laws related to the materials being transported.

Vehicles carrying explosives shall not be parked or left unattended except in designated parking areas with approval of the State Fire Marshall. When traveling, vehicles carrying explosives will avoid congested areas to the maximum extent possible.

3.4 Design Features of the Project for Environmental Protection

This section will serve as the baseline measures for inclusion in the complete Blasting Plan to be developed by the Construction Contractor(s). Design features of the Project for environmental protection are applied Project-wide and will address many of the concerns associated with blasting. Design Features of the Project for Environmental Protection are developed in accordance with ODOE and other appropriate agency standards. Following is a description of design features of the Project for environmental protection that relate to blasting during the construction and operation of Project facilities.

Design Feature 14. State standards for abandoning drill holes will be adhered to where groundwater is encountered.

Design Feature 21. Hazardous material will not be discharged onto the ground or into streams or drainage areas. Enclosed containment will be provided for all waste. All construction waste (i.e., trash and litter, garbage, other solid waste, petroleum products, and other potentially hazardous materials) will be removed to a disposal facility authorized to accept such materials within 1 month of Project completion, except for hazardous waste which will be removed within 1 week of Project completion.

Refueling and storing potentially hazardous materials will not occur within a 200-foot radius of all identified private water wells, and a 400-foot radius of all identified municipal or community water wells. Spill prevention and containment measures will be incorporated as needed.

Design Feature 32. If, based on landowner consultation, on parcels that contain a natural spring or well and on which blasting will be conducted, the certificate holder shall conduct pre-blasting flow measurements to establish a baseline for potential impacts to the spring or well. Watering facilities (tanks, natural springs and/or developed springs, water lines, wells, etc.) will be repaired or replaced if they are damaged or destroyed by construction and/or maintenance activities to their predisturbed condition as required by the landowner or land-management agency. Should construction and/or maintenance activities prevent use of a watering facility while livestock are grazing in that area, then the Applicant will provide alternate sources of water and/or alternate sources of forage where water is available.

3.5 Literature Cited

U.S. Department of Transportation. 2008. Emergency Response Guidebook. Available at http://www.ehso.com/hmerg.php.

Attachment H-1

Proposed Site Specific Geotechnical Work

Attachment H-1: Proposed Site Specific Geotechnical Work

PROPOSED SITE-SPECIFIC GEOTECHNICAL WORK

The following sections provide a generalized exploration program for the proposed alignments and describe proposed geotechnical exploration methods based on anticipated geologic conditions. The proposed schedule for site-specific geotechnical work, as required by OAR 345-021-0010(1)(h)(C), is provided in the main Exhibit H text, along with evidence of consultation with the DOGAMI regarding the appropriate site-specific geotechnical work, as required by OAR 345-021-0010(1)(h)(B).

3.0 Geotechnical Exploration Plan

Shannon & Wilson reviewed the proposed project alignments with respect to aerial photographs, topographic maps, existing geologic mapping, soils mapping, landslide mapping, and limited reconnaissance data (compiled by Shannon & Wilson and Shaw) to select preliminary proposed boring locations. Some proposed boring locations were adjusted slightly away from proposed tower locations based on known access or permitting considerations communicated to us by Tetra Tech, via HDR. Preliminary locations of the proposed borings are summarized in Table C1 in Appendix C. These locations are also shown on the Geologic Map sheets in Appendix A and the Landslide Inventory maps in Appendix E. In general, criteria for boring placement included borings at the following:

- A maximum spacing of approximately 1 mile along the alignments in areas anticipated to have variable ground conditions, and a maximum spacing of approximately 2 miles along the alignments in areas anticipated to have uniform ground conditions;
- Dead-end structures;
- Corners or significant changes in alignment heading (angle points);
- Crossings of highways, major roads, rivers, railroads, and utilities such as power transmission lines, natural gas pipelines, and canals;
- Locations necessary to verify anticipated lithologic changes and/or geologic hazards such as landslides, steep slopes, or soft soil areas;
- Locations of towers nearest to where Quaternary faults cross the alignment; and
- Locations for potential geo-seismic hazards such as liquefaction, lateral spreading, and seismic slope instability.

The desired boring locations were compared with areas that have already been surveyed for cultural, biological, or environmental sensitivity; and where the necessary right of entry permits have already been granted by land owners. Where complete access clearance at a borehole location was not expected by the year 2019, the desired borehole location was removed from this preliminary exploration list.

The preliminary summary table provided in Appendix C presents 342 proposed boring locations, as well as information regarding the anticipated subsurface geology, anticipated drilling rig type, and justification for each boring. This information will need to be verified during a detailed field reconnaissance of the entire alignment, to be performed prior to drilling. The list of proposed borings currently includes 315 boreholes along the IPC Proposed Route; 3 boreholes for the West of Bombing Road Alternative 1; 2 boreholes for the West of Bombing Road Alternative 2; and 22 boreholes for the Morgan Lake Alternative.

The current list of proposed borings is preliminary and will change as the project progresses. Borings may be added, repositioned, or removed from the list based on future site reconnaissance, conditions encountered as the exploration program is performed, and site access constraints. Current borehole designations, based on the designation of the nearest tower, are also preliminary and subject to future revision. It should be expected that an initial phase of drilling will not have as many borings as currently shown in Table C1.

The depth of each boring will generally be no more than 50 feet below the designed finish grade of the transmission line centerline. Depths for drilling into hard soil or competent rock will vary depending on the information needed for design. Borings may be terminated at shallower depths if the blow counts (the number of blows required to advance a split-spoon sampler 12 inches) in soil materials exceed 50 blows per foot for a minimum of three consecutive samples taken at 5-foot intervals (a total depth interval of 15 feet). Borings may also be terminated at less than 50 feet when they have been advanced 10 feet into unweathered, competent rock, as determined by a field representative from examination of the recovered rock core.

3.1.1 Geotechnical Drilling Methods

The purpose of the geotechnical drilling will be to evaluate the foundation conditions for the proposed transmission towers and substations. Geotechnical drilling will be accomplished using a variety of drilling methods, which will vary depending on the type of soil and rock expected within the anticipated completion depth of each boring. Some of the various methods anticipated to be implemented are discussed below.

3.1.1.1 Hollow Stem Auger Drilling

Hollow Stem Auger (HSA) drilling consists of rotating and pushing a hollow drill stem with a continuous helical fin on the outside into the subsurface. The lead auger has a toothed bit at the bottom with a hole in the middle. During drilling, a center rod with a plug at the bottom is left inside the auger drill string to keep the center free of cuttings. The cuttings are brought to the surface on the outside of the augers by rotation of the helical fin. For sampling, the internal rod is withdrawn, and the plug is removed from the end of the rod and replaced with a soil sampler. The sampler is then inserted through the hollow auger stem and placed at the bottom of the borehole.

HSA drilling does not require water or drilling mud, making it ideal for work in remote areas where available water is scarce. It is also easier to determine the depth to groundwater, if it is encountered, as compared with other drilling methods. Another advantage is that the hole is essentially cased during drilling, so loose or caving materials do not inhibit drilling progress or sample quality. Augers can be used as casing in combination with mud rotary drilling or rock coring to temporarily support a borehole across loose materials. The principal disadvantage of HSA drilling is the potential for soil heave into the augers and/or unreliable blow counts when sampling in soft or loose soils below the water table. Under such conditions, mud rotary drilling is preferable. HSA generally cannot penetrate very dense gravels, large cobbles, or hard rock.

3.1.1.2 Mud Rotary Drilling

Mud rotary borings are typically advanced using a smooth-walled hollow drill stem and a tri-cone bit, through which a fluid bentonite drilling mud is pumped. The drilling mud serves to cool the bit, keep the borehole open, and flush the cuttings to the surface. Returning drilling mud is typically passed through a screen and into a tub over the borehole. The screen collects the cuttings and the tub collects the mud for recirculation back into the hole. If a borehole cannot be kept open using mud alone, casing (such as a hollow stem auger) may be set to facilitate advancement of the hole. Mud rotary drilling requires a water source or a supply vehicle which may have difficulty accessing some boring locations. Also, due to the presence of drilling fluid, groundwater levels are often difficult to discern during drilling.

3.1.1.3 Rock Coring

Rock core drilling is typically used to advance a borehole through rock and, at the same time, retrieve sample cores of the rock. This can be done using a conventional coring system, where the core barrel with a diamond-impregnated bit is attached to a string of smaller diameter drilling rods. To retrieve the core sample, the entire string of drill rods must be pulled from the borehole. Today, wireline systems are more commonly used for rock coring. The wireline system also advances a core barrel behind a diamond-impregnated bit, but differs from the convention system in that the drill rods have a larger inside diameter and the core barrel contains an inner barrel. This inner barrel is inserted and retracted through the string of drill rods using a winch and a wireline system, while the rods and outer core barrel remain in the borehole. Clean water or water mixed with polymer is used to lubricate the casing, cool the bit, and flush fine cuttings from the hole.

3.1.2 Types of Drill Rigs

The drilling techniques described above can be performed using rigs mounted on road-legal trucks, tracked vehicles, or mobile platforms. Truck-mounted drilling rigs will be used at all locations not inhibited by access restrictions. The other drilling rigs are proposed for areas where the truck-mounted drilling rigs cannot be used due to steep terrain and/or difficult access. Other vehicles and equipment may also be mobilized to each boring location and could include a water truck or support vehicle, an air compressor, the field representative’s pickup truck or utility vehicle, and possibly another support pickup truck. In some areas, a dozer or grading equipment may be required to assist with access to boring locations.

3.1.2.1 Truck-Mounted Drilling Rigs

Truck-mounted drilling rigs are road-legal, heavy trucks that require access to be relatively flat (5 percent grade or less). They travel on existing roadways and two-track trails as close as possible to boring locations and then overland on firm ground. Truck rigs are typically 30 feet long, 8.5 feet wide, 12 feet high with mast down, and 25 to 35 feet high with the mast up. The gross vehicle weight of a truck rig is typically about 30,000 to 40,000 pounds.

3.1.2.2 Track-Mounted Drilling Rigs

Track-mounted drilling rigs are another alternative drill rig type for borings where there are softer ground conditions and/or up to 20 percent grade. These rigs are approximately 8,000 to 15,000 pounds with rubber tracks, resulting in approximately 10 psi ground pressure. This type of rig yields the lowest relative ground disturbance for mobile rigs on soft ground. Tracked rigs are typically 12 to 24 feet long, 6 to 8 feet wide, and 12 to 28 feet high with mast up. They are transported as close as possible to exploration sites on low-boy trailers, using existing roadways and two-track trails. From there, they track overland to boring locations.

While these rigs can traverse steeper terrain than truck rigs, most models still require a relatively flat area to set up for drilling. In some areas along the proposed alignment, this may require some minor grading and site preparation using an excavator or dozer. Some drilling contractors have track-mounted water haulers available, which facilitates mud rotary drilling and rock coring on track rigs in remote areas, away from water sources.

3.1.2.3 Platform Drilling Rigs

Platform drilling rigs will be utilized to access areas that are too steep for the mobile drilling rigs (described above) to access. Platform rigs will generally be transported to the boring locations by helicopter, in 8 to 10 pieces, and assembled on site. Where tower sites are located high on steep slopes above existing roadways, platform drilling equipment can also be lifted into place using mobile cranes.

Platform rigs are approximately 6,000 to 7,000 pounds when assembled, and up to 32 feet high with the mast up. They generally have base dimensions on the order of 8 to 15 feet by 6 feet and have roughly 5-foot-long stabilizer legs that extend from all sides of the base to level the platform on slopes.

For helicopter transport, staging areas near existing roadways will be required to load the equipment to the helicopter.

For crane transport, staging areas will be required along roadways adjacent to the slopes where the rigs will be placed. Traffic control may be required if shoulder widths are insufficient.

3.1.3 Sampling Methods

During drilling operations, samples will generally be taken at 2.5- to 5-foot depth intervals. Most soil sampling will be performed using split-spoon samplers. Thin-walled tubes may be used to sample fine-grained or cohesive soils. HQ or NQ core will generally be used to advance through and sample rock. These sampling methods are described further in the following subsections.

3.1.3.1 Split-Spoon Sampling

Disturbed samples in borings are typically collected using a standard 2-inch outside diameter (O.D.) split spoon sampler in conjunction with Standard Penetration Testing. In a Standard Penetration Test (SPT, ASTM D1586), the sampler is driven 18 inches into the soil using a 140-pound hammer dropped 30 inches. The number of blows required to drive the sampler the last 12 inches is defined as the standard penetration resistance, or N-value. The SPT N-value provides a measure of in situ relative density of granular soils (silt, sand, and gravel), and the consistency of fine-grained, cohesive soils (silt and clay). All disturbed samples are visually identified and described in the field, sealed to retain moisture, and returned to the laboratory for additional examination and testing. In some cases, it may be necessary to use a larger sampler, such as a 3.25-inch O.D. Dames & Moore sampler, to collect a representative quantity of soil that contains coarse gravels.

3.1.3.2 Thin-Walled Tubes

Relatively undisturbed samples of fine-grained and/or cohesive soils encountered in the borings may be obtained by pushing a 3-inch outside-diameter, thin-walled tube sampler (also known as Shelby tube sampler, ASTM D1587) a distance of approximately 2 feet into the bottom of the borehole using a hydraulic ram. After a thin-wall tube sample is recovered from the boring, it is sealed at both ends to prevent moisture loss and carefully transported back to the laboratory. Care is taken to keep the sample upright and to avoid dropping, jarring, or rough handling.

3.1.3.3 Coring

HQ or NQ coring is typically used to advance through and sample rock. Core runs are typically 5 feet long. Core samples are photographed in a split tube immediately after extraction from the core barrel. The core is evaluated in the field to determine the percentage of the run recovered, as well as the Rock Quality Designation (RQD), defined as the sum of the length of core pieces 4 inches or more in length and divided by the total length of the drilled core run. The degree of weathering, soundness, joints and structural discontinuities, and other rock characteristics are documented on the boring logs. Rock core samples which are sensitive to moisture loss may be individually wrapped in the field with plastic wrap. All core is stored in waxed cardboard or plastic corrugated boxes which are labeled with the boring designation and depth intervals.

3.1.4 Boring Logs

A field representative will be present during all drilling activities. The field representative will locate the boreholes, collect samples, and maintain logs of the materials encountered. The logs will include sample locations and types, sample descriptions, and notes regarding drilling methods, drill action, fluid loss, problems encountered during drilling, and the depth to groundwater (if observed). The boring logs will present a description of the soil and rock materials encountered at each boring and the approximate depths at which material changes were observed. Soil samples will be described and identified visually, in general accordance with ASTM D2488, the Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).

3.1.5 Laboratory Testing

Laboratory testing will be performed on soil and rock samples obtained from the borings to refine field descriptions and to provide index properties for use in engineering design. Laboratory tests for soils may include natural water content and density analyses, Atterberg Limits tests, particle-size analyses, and analytical testing for corrosivity potential. Testing on rock may include point load, unconfined compressive strength testing, and slake durability testing. All laboratory testing will be performed in accordance with applicable ASTM International (ASTM) or U.S. Army Corps of Engineers (USACE) standard test procedures.

3.1.6 Geophysical Surveys

In addition to geotechnical drilling, non-invasive geophysical surveys may be conducted at substation expansion areas and remote areas that cannot be accessed by the previously described drilling equipment. Geophysical survey techniques may include electrical resistivity testing for grounding design or seismic refraction surveys, often used to profile depths to bedrock contacts.

3.2 Geotechnical Reporting

Once the field explorations and laboratory testing are completed and engineering evaluation of the acquired data has been accomplished, a geotechnical report will be prepared in accordance with *Guidelines for Preparing Engineering Geologic Reports* (Oregon State Board of Geologist Examiners, 2014).

4.0 SEISMIC HAZARDS

OAR 345-021-0010(1)(h)(E) states, "*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,*

Attachment H-2

Summary of Proposed Boring Locations

Attachment H-2: Summary of Proposed Boring Locations

APPENDIX C

SUMMARY OF PROPOSED BORING LOCATIONS

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APPENDIX C

SUMMARY OF PROPOSED BORING LOCATIONS

C.1 GENERAL

Shannon & Wilson, Inc., reviewed the proposed project alignments with respect to aerial photographs, topographic maps, existing geologic mapping, soils mapping, landslide mapping, and limited reconnaissance data (compiled by Shannon & Wilson and Shaw) to select preliminary proposed boring locations. Some proposed boring locations were adjusted slightly away from proposed tower locations, based on access or permitting considerations communicated to us by Tetra Tech, via HDR. Preliminary locations of the proposed borings are summarized in Table C1 in this appendix. These locations are also shown on the geologic map sheets in Appendix A and the Landslide Inventory maps in Appendix E. In general, criteria for boring placement included borings at the following:

- A maximum spacing of approximately 1 mile along the alignments in areas anticipated to have variable ground conditions, and a maximum spacing of approximately 2 miles along the alignments in areas anticipated to have uniform ground conditions;
- Dead end structures;
- Corners or significant changes in alignment heading (angle points);
- Crossings of highways, major roads, rivers, railroads, and utilities such as power transmission lines, natural gas pipelines, and canals;
- Locations necessary to verify anticipated lithologic changes and/or geologic hazards, such as landslides, steep slopes, or soft soil areas;
- Locations of towers nearest to where Quaternary faults cross the alignment; and
- Locations for potential geo-seismic hazards such as liquefaction, lateral spreading, and seismic slope instability.

The desired boring locations were compared with areas that have already been surveyed for cultural, biological, or environmental sensitivity; and where the necessary right of entry permits have already been granted by land owners. Where complete access clearance at a borehole location was not expected by the year 2019, the desired borehole location was removed from this preliminary exploration list.

The preliminary summary table provided in this appendix presents 342 proposed boring locations, as well as information regarding the anticipated subsurface geology, anticipated drilling rig type, and justification for each boring. This information will need to be verified during a detailed field reconnaissance of the entire alignment, to be performed prior to drilling.

The current list of proposed borings is preliminary and will change as the project progresses. Borings may be added, repositioned, or removed from the list based on future site reconnaissance, conditions encountered as the exploration program is performed, and site access constraints. Current borehole designations, based on the designation of the nearest tower, are also preliminary and subject to future revision.

The depth of each boring will generally be no more than 50 feet below the designed finish grade of the transmission line centerline. Borings may be terminated at shallower depths if the blow counts (the number of blows required to advance a split-spoon sampler 12 inches) in soil materials exceed 50 blows per foot for each consecutive sample taken in a minimum 15-foot interval. Borings may also be terminated at less than 50 feet when they have been advanced 10 feet into unweathered, competent rock, as determined by a field representative from examination of the recovered rock core. Depths for drilling into hard soil or competent rock will vary, depending on the information needed for design.

Potential methods for geotechnical drilling and sampling are discussed in the main Attachment H-1 text.

TABLE C1: SUMMARY OF PROPOSED BORINGS

Boring Designation / Tower	Northing (meters)	Easting (meters)	Map Sheet Number (Appendix A)	Mapped Geologic Unit*	Assumed Rig Type (pending future reconnaissance)	Purpose												
						General	End	Angle Change Along Alignment	Slope Stability / Landslide	Geo-Seismic Hazard (i.e., liquefaction, lateral spreading, seismic slope instability)	Fault Crossing	Highway Crossing	Road Crossing	River Crossing	Railroad Crossing	Utility Crossing (Electric)	Utility Crossing (Natural Gas)	Canal Crossing
1/2	5080304	296625	2	Qe	truck	x												
1/3	5080216	296337	2	Qe	truck			x							x			
1/5	5079645	296276	2	Qe	truck			x							x			
1/6	5079193	296303	2	Qe	truck			x				x						
2/1	5078787	296297	2	Qe	truck			x				x						
2/2	5078288	296200	2	Qe	truck			x					x					
2/3	5078064	296192	2	Qe	truck								x					
3/3	5076559	296232	2	Qe	truck	x												
4/3	5075056	296199	3	Qe	truck	x												
5/3	5073478	296151	3	Qe	truck	x												
6/4	5071859	296079	3	Qe	truck	x												
7/4	5070257	296053	4	Qe	truck	x												
8/4	5068739	296017	4	Qe	truck	x												
9/4	5066882	295951	5	Qmf	truck	x												
10/1	5066207	295930	5	Qmf	truck	x												
10/7	5064783	295875	5	Qmf	truck			x										
12/4	5062224	295762	6	Qmf	truck or track	x												
BR1-1/1	5064478	295847	5	Qmf	truck or track			x										
BR1-3/6	5060130	295688	6	Qmf	truck or track	x												
BR1-4/3	5059215	295656	6	Qmf	truck or track	x												
BR2-2/6	5061811	295747	6	Qe	truck or track			x										
BR2-4/3	5058911	295645	6	Qmf	truck or track			x										
17/1	5054975	296108	7	Qmf	truck or track	x												
18/1	5053342	296057	8	Qf	track	x			x	x								
18/4	5051995	296014	8	Qf	track				x	x			x					
19/1	5051719	296005	8	Qf	track			x	x	x			x					
20/2	5050117	297093	9	Qf	truck or track			x	x	x								
22/1	5050008	300070	9	Qf	truck or track				x	x		x						
33/2	5046935	317796	13	Tgn2	track					x								
34/1	5046921	318534	14	Tgn2	track	x												
35/1	5046404	320090	14	Tgn2	track			x		x			x	x				
35/2	5045877	320291	14	Tgn2	track or platform			x		x			x	x				
36/1	5044996	320706	14	Tgn2	track	x												
59/2	5030315	349741	23	Tgn2	track or platform					x			x	x				
59/3	5030296	350386	23	Tgn2	track or platform					x			x	x				
60/4	5030263	351457	23	Tgn2	track or platform					x			x	x				
60/5	5030240	352102	23	Tgn2	track					x			x	x				
64/2	5030106	357468	25	Tgn2	track			x										
65/1	5029310	358923	25	Tgr2	track or platform			x		x								
65/2	5029315	359419	25	Tgr2	track or platform			x		x			x	x				
66/2	5030163	359997	25	Tgn2	track or platform			x										
67/2	5030369	362081	26	Tgn2	track			x										
67/3	5030633	362728	26	Tgn2	track			x										
68/2	5030637	363874	26	Tgn2	track					x								

TABLE C1: SUMMARY OF PROPOSED BORINGS

Boring Designation / Tower	Northing (meters)	Easting (meters)	Map Sheet Number (Appendix A)	Mapped Geologic Unit*	Assumed Rig Type (pending future reconnaissance)	Purpose												
						General	End	Angle Change Along Alignment	Slope Stability / Landslide	Geo-Seismic Hazard (i.e., liquefaction, lateral spreading, seismic slope instability)	Fault Crossing	Highway Crossing	Road Crossing	River Crossing	Railroad Crossing	Utility Crossing (Electric)	Utility Crossing (Natural Gas)	Canal Crossing
69/1	5030636	364390	26	Tgn2	track													
72/2	5031981	369232	27	Tgn2	track			x										
72/4	5032013	370017	28	Tgn2	track			x										
73/4	5032898	371239	28	Tgn2	track			x										
74/2	5033326	372037	28	Tgn2	track or platform			x										
74/3	5033514	372840	28	Tgn2	track or platform			x										
78/4	5038134	377039	30	Tf	track			x										
78/5	5038135	377038	30	Tf	track			x										
79/3	5037952	378376	30	Tf	track			x										
80/2	5038624	379097	30	Tf	track			x										
81/1	5038614	380306	30	Tf	track or platform	x												
82/1	5038603	381668	31	Tf	track or platform			x										
82/4	5038350	382773	31	Tf	track	x												
82/5	5038280	383083	31	Tf	track	x												
83/4	5037949	384531	31	Tf	track			x										
84/4	5037018	385953	32	Tgn2	track					x								
85/1	5036793	386296	32	Tgn2	truck or track	x												
86/1	5035840	387751	32	Tgn2	track			x										
87/1	5034452	388090	33	Tgn2	track	x				x								
87/4	5033449	388333	33	Tgn2	track			x		x								
88/3	5032279	389073	33	Tcgn2	truck or track			x										
89/3	5031632	390432	33	Tcgn2	truck or track			x										
90/1	5031618	391132	34	Tcgn2	truck or track				x	x								
90/2	5031612	391457	34	Tcgn2	truck or track				x	x			x		x		x	
90/3	5031603	391943	34	Tcgn2	track			x					x		x		x	
90/5	5031257	392398	34	Tcgn2	track			x										
91/5	5029981	393252	34	Tcgn2	track			x										
92/1	5029923	393684	34	Tcgr2	track or platform			x		x								
92/2	5029699	393780	34	Tcgr2	track			x		x								
92/4	5029267	394214	34	Tcgr2	track			x		x								
93/3	5028042	395028	35	Tcgn2	track			x										
94/4	5026094	395992	35	Tcgn2	track			x	x	x								
95/3	5025547	396962	36	Tcgn2	track			x	x	x			x		x			
95/4	5025203	397274	36	Tcgf	truck or track			x					x		x			
96/4	5024493	398360	36	Tcgf	track	x												
96/5	5024274	398707	36	Tcgn2	truck or track			x										
97/1	5023907	398787	36	Tcgn2	truck or track			x										
98/1	5022721	400096	37	Tms	track	x												
98/3	5022196	400680	37	Tms	truck or track	x												
99/1	5021918	400982	37	Tms	track	x				x								
99/4	5020988	401989	37	Tcgn2	track			x										
100/2	5020492	402645	37	Tcgn2	track or platform							x		x				
ML-1/4	5020095	402268	37	Tcgn2	track or platform			x				x		x				
ML-1/5	5019736	402747	37	Tcgn2	track							x		x				

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						General	End	Angle Change Along Alignment	Slope Stability / Landslide	Geo-Seismic Hazard (i.e., liquefaction, lateral spreading, seismic slope instability)	Fault Crossing	Highway Crossing	Road Crossing	River Crossing	Railroad Crossing	Utility Crossing (Electric)	Utility Crossing (Natural Gas)	Canal Crossing
100/3	5019977	403329	38	Tcgn2	track			x				x		x		x		
101/1	5019872	403749	38	Tcgn2	truck or track			x								x		
ML-2/3	5019097	403597	38	Tcgf	track or platform			x		x								
ML-4/1	5018608	405956	38	Tcgf	track									x			x	
ML-4/2	5018508	406437	38	Qls	track				x	x				x			x	
ML-4/3	5018431	406813	38	Tcgf	track or platform					x							x	
103/3	5019150	407641	39	Tpb	track				x	x								
104/3	5018820	409418	39	Tpa	track	x												
105/4	5018528	410993	39	Tcgf	track	x				x								
ML-5/4	5018088	408464	39	Tcgf	track or platform			x										
ML-6/3	5017021	409984	39	Tpb	track			x										
106/3	5018301	412218	40	Tcgn2	track or platform			x	x	x						x		
110/2	5014185	416461	41	Tpa	track			x	x	x	x							
110/3	5014036	416655	41	Qdf	track				x	x								
112/4	5010964	418134	42	Tpa	track				x	x								
113/1	5010223	418432	42	Tpa	track or platform				x	x								
113/5	5009039	418908	42	Qdf	track or platform			x	x	x	x							
115/1	5007154	420261	43	Tpd	track			x				x						
116/3	5005442	420597	43	Tcgf	truck					x		x						
116/4	5004844	420711	43	Tcgf	track							x						
117/2	5004118	420876	44	Tcgf	track			x										
ML-17/2	5004119	419549	44	Tpd	track				x	x								
ML-19/1	5002097	421158	44	Tcgf	track			x										
ML-7/2	5016442	410615	45	Tpa	track			x									x	
ML-7/3	5016203	410873	45	Tpa	track			x									x	
ML-9/4	5013425	413244	46	Tpa	track			x										
ML-10/2	5013080	414052	46	Tpa	track			x										
ML-12/3	5010256	415769	47	Tpa	track	x												
ML-13/2	5009095	416312	47	Tpa	track	x												
ML-13/5	5008250	416923	47	Tpa	track			x										
ML-14/3	5007368	417082	47	Tpa	track			x										
ML-15/2	5006078	416914	48	Tcgn2	track			x										
ML-15/4	5005601	417579	48	Tcgr2	track or platform			x					x	x				
ML-16/1	5005359	418082	48	Tcgn2	track or platform								x	x				
ML-16/4	5004947	418938	48	Tpd	track			x										
120/3	5000198	423759	49	Tpgd	track			x				x					x	
121/2	4999095	424450	49	Tpgd	track			x										
122/2	4997929	425692	49	Tpgd	track	x												
125/3	4994561	429283	51	Qal	track					x				x				
125/4	4994272	429590	51	Qal	track					x				x				
126/1	4993959	429924	51	Tbf	track					x				x				
127/1	4992672	431295	51	TRPwc	track			x										
127/3	4992062	431455	51	Tpb	track							x						
134/2	4982071	435301	54	Qal	track	x				x								

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						General	End	Angle Change Along Alignment	Slope Stability / Landslide	Geo-Seismic Hazard (i.e., liquefaction, lateral spreading, seismic slope instability)	Fault Crossing	Highway Crossing	Road Crossing	River Crossing	Railroad Crossing	Utility Crossing (Electric)	Utility Crossing (Natural Gas)	Canal Crossing
135/1	4980757	435809	54	Ta	track	x				x								
136/1	4979322	436363	54	Ta	track	x												
137/1	4977581	437036	55	TRPv	track or platform					x								
137/2	4977222	437174	55	TRPv	track or platform	x				x								
138/2	4975944	437668	55	Tan	track	x												
139/3	4974337	438289	56	Tob	truck or track					x			x					
139/4	4973977	438427	56	Tob	truck or track					x			x					
140/2	4972845	438865	56	Tob	truck or track	x												
141/2	4971304	439460	56	Tob	truck or track	x				x	x							
142/4	4969358	440212	57	Tob	track			x		x	x							
143/3	4967951	440317	57	Qal	truck or track					x	x	x						
143/4	4967585	440345	57	Qal	truck or track			x		x	x	x						
144/3	4966831	440816	58	Tob	track or platform			x		x						x		
144/4	4966558	441051	58	Tob	track			x		x						x		
147/2	4962906	440626	58	Tgo	track			x		x								
147/3	4962517	440494	59	Tgo	track or platform					x		x						
147/4	4962239	440322	59	Tgo	track or platform			x		x		x						
148/2	4961521	440424	59	KJi	truck			x		x								
150/2	4958931	439946	59	Tob	track	x				x	x							
151/1	4957785	438982	60	Tob	track			x		x								
152/1	4956443	439359	60	Tob	track			x			x							
152/4	4955540	439361	60	Tob	track			x										
153/1	4954941	439148	60	Tb	track or platform			x			x							
154/1	4953250	439154	61	Tb	track or platform			x		x								
154/3	4952659	439023	61	Tst	track			x										
154/4	4952450	439397	61	Tst	track					x								
155/3	4951680	440778	61	Tst	track			x		x								
156/4	4951000	442253	62	Tst	track											x		
156/5	4950730	442932	62	Tst	track			x								x		
157/5	4950320	444162	62	Tst	track			x								x	x	
158/1	4950010	444189	62	Tst	track			x								x	x	
159/1	4949515	445677	62	Tst	truck or track	x												
160/2	4948874	447599	63	TRPbe	track			x								x		
161/4	4948287	449841	63	TRPbe	track	x												
162/4	4947757	451432	64	TRPbi	track			x										
164/2	4947136	453646	64	TRPbi	track or platform			x		x								
165/3	4945652	454897	65	TRPbi	track			x								x		
165/4	4945395	455094	65	TRPbi	track											x		
166/4	4944226	455987	65	TRPbi	track											x		
166/5	4944042	456127	65	TRPbi	track or platform			x				x		x	x	x	x	
168/1	4942331	456754	66	Tst	track			x										
168/5	4941203	457374	66	TRgb	track or platform	x												
169/3	4940199	457924	66	TRgb	track or platform			x										
170/4	4938289	457937	67	TRgb	track			x										

TABLE C1: SUMMARY OF PROPOSED BORINGS

Boring Designation / Tower	Northing (meters)	Easting (meters)	Map Sheet Number (Appendix A)	Mapped Geologic Unit*	Assumed Rig Type (pending future reconnaissance)	Purpose												
						General	End	Angle Change Along Alignment	Slope Stability / Landslide	Geo-Seismic Hazard (i.e., liquefaction, lateral spreading, seismic slope instability)	Fault Crossing	Highway Crossing	Road Crossing	River Crossing	Railroad Crossing	Utility Crossing (Electric)	Utility Crossing (Natural Gas)	Canal Crossing
171/1	4937527	457601	67	Tfls	track					x								
171/2	4937092	457409	67	Tfls	track or platform				x	x								
171/3	4936674	457224	67	mg/md	track			x	x	x								
171/4	4936420	457166	67	mg/md	track or platform								x	x				
172/1	4935587	456975	67	p	platform			x	x	x			x	x				
173/2	4934272	457005	68	p	platform			x										
173/3	4933940	457399	68	p	track								x					
174/1	4933306	458154	68	p	track or platform	x							x					
174/2	4932822	458731	68	p	track			x										
175/1	4932277	459452	68	g	track or platform			x										
175/2	4932007	459692	68	Tfs	track				x	x								
176/1	4931094	460506	69	g	track or platform			x										
177/2	4930190	461641	69	gb	track	x												
177/3	4929749	462194	69	gb	track or platform	x												
178/3	4928726	463478	70	kgd	track	x												
179/2	4927727	464751	70	kgd	track or platform	x												
180/5	4926462	466418	70	Jw	track or platform			x										
181/3	4925782	467411	71	Jw	track or platform			x										
182/1	4925201	468060	71	Jw	track or platform			x										
183/3	4924049	469781	71	Jw	track or platform			x										
184/1	4923397	470682	72	Jw	platform	x			x	x								
186/2	4921560	473311	72	Jw	track			x					x	x				
187/2	4919638	473634	73	Tob	track or platform			x	x	x						x	x	
188/1	4918343	473484	73	Tst	track			x										
188/2	4917662	473497	73	Qls	track				x	x								
188/3	4917146	473507	73	Jw	track				x	x								
189/2	4916184	473525	74	Qls	track			x	x	x								
190/1	4915423	474135	74	Jw	track or platform			x										
190/3	4914844	474583	74	Tg	track				x	x								
190/4	4914609	474776	74	Qls	track				x	x								
191/1	4914213	475101	74	Qls	track or platform				x	x								
191/4	4913177	475951	74	Tg	track or platform			x										
192/1	4912952	476115	74	Tg	track			x								x	x	
192/2	4912418	476075	75	Tg	track or platform			x								x	x	
194/2	4909345	476975	75	Tst	track	x				x								
195/1	4908155	477324	76	Tst	track or platform			x		x								
195/5	4907325	478171	76	Tst	truck or track					x								
196/1	4907061	478441	76	Qal	track	x				x								
197/1	4905770	479760	76	Tst	track			x										
198/2	4904526	480980	77	Tst	track			x										
200/3	4902056	483216	78	Tst	track			x										
201/4	4900316	483524	78	Tst	track	x												
202/3	4898839	483786	78	Tst	track or platform	x												
203/5	4896983	484114	79	Tst	track or platform			x					x					

TABLE C1: SUMMARY OF PROPOSED BORINGS

Boring Designation / Tower	Northing (meters)	Easting (meters)	Map Sheet Number (Appendix A)	Mapped Geologic Unit*	Assumed Rig Type (pending future reconnaissance)	Purpose												
						General	End	Angle Change Along Alignment	Slope Stability / Landslide	Geo-Seismic Hazard (i.e., liquefaction, lateral spreading, seismic slope instability)	Fault Crossing	Highway Crossing	Road Crossing	River Crossing	Railroad Crossing	Utility Crossing (Electric)	Utility Crossing (Natural Gas)	Canal Crossing
203/6	4896745	484085	79	Tst	track					x			x					
204/2	4896194	484016	79	Tst	track				x	x								
204/4	4895537	483933	79	Tst	track				x	x								
205/1	4894803	483841	79	Qls	track			x	x	x								
205/3	4894093	483823	79	Tst	track				x	x								
206/4	4892140	483772	80	Tst	truck or track					x			x					
207/1	4891767	483763	80	Tst	track								x					
208/1	4889872	483713	80	Tst	track	x												
209/5	4887037	483640	81	Qal	truck or track	x				x								
210/1	4886758	483633	81	Qal	truck or track					x								
211/1	4885254	483593	82	Qal	track	x												
211/5	4883890	483558	82	Tst	track	x												
212/3	4882930	483533	82	Tst	track or platform			x										
214/2	4881697	480987	83	Tst	track	x												
214/3	4881511	480575	83	Tst	track	x												
215/1	4881067	479600	83	Tst	track			x										
216/2	4880378	477933	83	Qal	truck or track			x		x			x					
216/4	4880387	477211	83	Qal	truck			x		x			x					x
217/3	4879913	476020	84	Qal	track					x		x				x		
218/2	4879438	474871	84	Qal	truck or track			x		x			x					
218/4	4878859	474692	84	Qal	truck			x		x								
219/2	4878559	473603	84	Tst	track			x										
220/2	4878503	472123	85	Tst	truck or track	x												
222/1	4878399	469352	85	Tst	track	x												
222/3	4878374	468695	86	Tst	track			x										
223/3	4877685	467048	86	Tst	track	x												
224/1	4877320	466174	86	Tst	track	x												
224/3	4877054	465539	86	Tst	track			x			x							
225/4	4876846	463719	87	Tst	track or platform			x										
227/1	4876227	461652	87	Tst	track			x										
227/3	4875607	461360	87	Tst	track	x												
232/4	4867486	462375	89	Qls	track or platform				x	x				x	x			
233/1	4867012	462498	89	Qls	track				x	x				x	x			
233/2	4866742	462655	89	Qls	track or platform			x	x	x								
233/4	4866003	462562	90	Tbcu	track			x										
235/1	4863941	463188	90	Tbcu	track			x										
236/3	4862017	464434	91	Tic	track	x												
237/2	4861090	465171	91	Qas1	track			x				x						
237/3	4860865	465373	91	Qas1	truck or track							x						
238/2	4859901	466237	91	Tic	track	x												
239/1	4858972	467070	92	Tic	track			x										
239/3	4858740	467760	92	Qas1	track			x		x								
240/3	4858541	469602	92	Qas1	track					x				x				
240/4	4858496	470021	92	Tic	track					x				x				

SHANNON & WILSON, INC.

TABLE C1: SUMMARY OF PROPOSED BORINGS

Boring Designation / Tower	Northing (meters)	Easting (meters)	Map Sheet Number (Appendix A)	Mapped Geologic Unit*	Assumed Rig Type (pending future reconnaissance)	Purpose												
						General	End	Angle Change Along Alignment	Slope Stability / Landslide	Geo-Seismic Hazard (i.e., liquefaction, lateral spreading, seismic slope instability)	Fault Crossing	Highway Crossing	Road Crossing	River Crossing	Railroad Crossing	Utility Crossing (Electric)	Utility Crossing (Natural Gas)	Canal Crossing
241/4	4858434	471433	93	Tic	track	x												
242/2	4858418	472260	93	Qas1	track			x										
243/3	4857710	474120	93	Qal	track			x		x								
243/5	4857304	474665	93	Tic	track			x										
244/4	4856769	475935	94	Qas1	track			x		x								
245/4	4856066	477029	94	Qas1	track			x		x								
246/1	4855350	477681	94	Qas1	track					x								
246/2	4855121	477889	94	Qal	track			x		x								
247/2	4853897	478402	97	Qas1	track			x										
248/1	4852661	479025	97	Qas1	track			x		x								
248/3	4852081	479267	97	Qas1	truck or track	x												
250/1	4849830	480205	98	Qas1	truck or track			x		x								
250/4	4848782	480726	98	Qas1	truck or track	x				x								
252/3	4846168	482024	99	Tbou	track	x				x								
253/1	4845493	482359	99	Tbou	track	x												
253/2	4845111	482549	99	Tig	track			x		x								
254/1	4844370	483650	99	Tig	platform			x										
255/1	4843437	484860	99	Tbcl	track			x										
257/3	4841542	487801	100	Tic	track or platform				x	x								
257/5	4841072	488078	100	Qas	track			x										
258/2	4840518	488265	101	Tbcm	track											x		
258/3	4840243	488357	101	Tbcm	truck or track											x		
259/4	4837950	489130	101	Qas	track	x				x								
260/3	4836715	489546	101	Qas	track	x				x								
261/2	4835718	489882	102	Tbcm	track	x												
261/4	4835170	490067	102	Tbcm	track					x								
262/2	4834137	490415	102	Tic	track			x										
263/2	4832608	491081	102	Tic	track	x												
264/1	4831475	491575	103	Qas	track	x												
265/1	4830236	492114	103	Tic	track			x										
266/1	4828670	492836	103	Tic	truck or track	x												
266/5	4827461	493125	104	Tic	track					x						x		
267/1	4827084	493131	104	Tic	track											x		
267/2	4826752	493136	104	Tstl	track			x										
267/5	4826110	493879	104	Tstl	track									x				
268/1	4825866	494161	104	Qas1	track									x				
270/1	4823501	495774	105	Tstl	track			x		x								
271/1	4822391	497089	105	Tbtv	track or platform	x												
271/5	4821505	498200	106	Tpd	truck or track	x												
272/4	4820584	499353	106	Tpd	truck or track									x				
274/2	4819282	501273	106	Tmf	track			x		x								
274/4	4818708	501935	107	Tpd	track					x								
275/1	4818405	502286	107	Tmf	track	x				x								
275/3	4817905	502863	107	Tmf	track or platform			x		x								

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						General	End	Angle Change Along Alignment	Slope Stability / Landslide	Geo-Seismic Hazard (i.e., liquefaction, lateral spreading, seismic slope instability)	Fault Crossing	Highway Crossing	Road Crossing	River Crossing	Railroad Crossing	Utility Crossing (Electric)	Utility Crossing (Natural Gas)	Canal Crossing
276/5	4816297	504132	107	Tpd	truck or track			x		x	x							
277/1	4815832	504287	108	Tmf	track			x			x			x				
277/2	4815487	504547	108	Tmf	track or platform			x			x			x				
278/3	4815537	506205	108	Tpd	track					x								x
278/5	4815558	506903	108	Qa	track			x					x	x				
279/1	4815303	507254	108	Tpd	truck or track					x			x	x				
279/4	4814693	508098	108	Tpd	truck or track	x				x								
280/5	4813736	509422	109	Tpd	truck or track	x												
281/5	4812838	510664	109	Tpd	track					x	x	x						
282/1	4812583	511017	109	Tpd	truck or track			x				x	x					
282/2	4812303	511316	109	Tpd	track								x					
283/3	4811006	512563	110	Tpd	track				x	x								
283/5	4810445	512786	110	Tpd	track			x										
284/3	4809724	513961	110	Tpd	truck or track									x				
285/1	4809374	514539	110	Tpd	truck or track	x												
285/3	4808973	515184	111	Tpd	track or platform	x												
286/3	4808185	516468	111	Tmf	track			x										
288/1	4806763	518277	111	Tmf	truck or track			x										
288/3	4806081	518525	112	Tmf	truck or track			x										
289/1	4805614	519420	112	Tmf	track					x			x					
289/2	4805442	519749	112	Tmf	track								x					
289/4	4805131	520344	112	Tmf	track or platform			x										
290/2	4804385	521042	112	Tpd	track					x				x				
290/3	4804155	521258	112	Tpd	track								x	x				
290/4	4803901	521496	112	Tpd	truck or track			x		x			x					
292/1	4802827	523406	113	Tpd	track			x					x					
292/4	4802096	524063	113	Tpd	truck or track			x										
293/1	4801951	524658	113	Tpd	truck or track								x					
293/2	4801892	524900	113	Tpd	truck or track						x					x		
293/3	4801846	525090	113	Tpd	track									x		x		
294/2	4801460	526674	114	Qa	track			x		x								
294/4	4800850	527089	114	Qa	truck or track	x												
295/1	4800576	527275	114	Qa	truck or track					x			x	x				
295/2	4800128	527580	114	Qa	truck or track			x		x			x	x				

* See Appendix A, Table A2 and Table A3 for defenitions of geologic unit abbreviations.

Attachment H-3

Seismic Tables and Maps

Attachment H-3: Seismic Tables and Maps

APPENDIX D

SEISMIC TABLES AND MAPS

SHANNON & WILSON, INC.

TABLES

FIGURES

TABLE D1: SUMMARY OF QUATERNARY FAULTS WITHIN 5 MILES OF THE PROPOSED ALIGNMENTS

Fault Name	Fault ID	Primary County, State	Time of Most Recent Deformation[1]	Slip Rate (mm/yr)	Slip Sense[2]	Dip Direction	Length (km)
Owyhee Mountains fault system	636	Owyhee County, ID	<1.6 Ma	<0.2	Normal	NE	206
South Grande Ronde Valley faults	709	Union County, OR	<750 ka	<0.2	Normal	SW / NE	23
Unnamed East Baker Valley faults	712	Baker County, OR	<750 ka	<0.2	Normal	SW	27
West Baker Valley faults	804	Baker County, OR	<130 ka	<0.2	Normal	NE	33
Cottonwood Mountain fault	806	Malheur County, OR	<15 ka	<0.2	Normal, Sinistral	NE	42
Faults near Owyhee Dam (Class B)	808	Malheur County, OR	<1.6 Ma	<0.2	Normal	E / W	37
West Grande Ronde Valley fault zone, Mount Emily section	802a	Union County, OR	<15 ka	<0.2	Normal, Dextral	E	29
West Grande Ronde Valley fault zone, La Grande section	802b	Union County, OR	<15 ka	<0.2	Normal, Dextral	NE	15
West Grande Ronde Valley fault zone, Craig Mountain section	802c	Union County, OR	<15 ka	<0.2	Normal, Dextral	NE / SW	10
Hite fault system, Thorn Hollow section	845c	Umatilla County, OR	<130 ka	<0.2	Sinistral, Normal	NW	44
Hite fault system, Agency section	845d	Umatilla County, OR	<1.6 Ma	<0.2	Sinistral, Normal	NW	28

1. Ma = million years ago; ka = thousand years ago
2. Sense of movement on a fault is based on the angle of the dip of the fault plane and the relative direction of movement across the fault. Terms used to describe the sense of movement include dip-slip, normal, reverse, thrust, strike-slip, dextral (right-lateral), sinistral (left-lateral), and oblique.

TABLE D2: EARTHQUAKES REPORTED TO CAUSE GREATER THAN MMI III

Year	Month	Day	Hour	Minute	Second	Lattitude	Longitude	Depth (kilometers)	Magnitude	MMI	City Where Felt	State	City Lat.	City Lon.	Distance to Epicenter (kilometers)
1893	3	7	1	3	0	46.000	-119.000			7	UMATILLA	OR	45.92	-119.34	27
1916	5	13	2	30	0	43.700	-116.200			4	IDAHO CITY	ID	43.83	-115.83	33
1916	5	25	13	36	0	43.567	-115.967			5					
1916	5	26	6	36	0	43.800	-116.000			4	PAYETTE	ID	43.97	-116.72	60
1921	9	14	11	0	0	46.067	-118.333			6					
1924	1	6	13	9	0	46.067	-118.333			4					
1924	1	6	23	10	0	45.833	-118.333			5					
1924	5	27	0	19	0	46.067	-118.333			4					
1926	4	23	13	56	0	46.067	-118.333			4					
1927	4	9	5	0	0	44.800	-117.200			5	HALFWAY	OR	44.88	-117.11	11
1927	4	9	7	0	0	44.833	-117.317			4					
1927	4	9	9	30	0	44.817	-117.083			4					
1927	4	9	14	0	0	44.750	-117.233			4					
1936	7	16	7	7	48	46.000	-118.500		5.8	4	BOVILL	ID	46.86	-116.4	187
1936	7	18	16	30	0	46.000	-118.300			5					
1936	7	30	11	20	0	45.933	-118.317			4					
1936	8	4	9	19	0	45.917	-118.783			5					
1936	8	28	4	39	0	45.950	-118.317			5					
1937	2	9	22	20	0	46.067	-118.333			4					
1937	6	4	14	43	0	46.067	-118.333			4					
1938	8	11	18	52	0	45.950	-118.300			4					
1938	10	27	23	10	0	45.950	-118.283			4					
1939	1	26	7	59	0	45.667	-118.667			4					
1941	12	23	17	48	0	44.750	-117.000			4					
1941	12	23	22	20	0	44.667	-117.100			4					
1942	6	12	9	30	0	44.900	-117.100			5	EAGLE VALLEY	OR	44.75	-117.3	22
1944	9	2	2	25	14	46.067	-118.333			4					
1944	9	20	3	0	0	43.200	-117.083			4					
1945	9	23	3	40	0	46.067	-118.333			4					
1948	12	20	16	18	0	45.050	-120.167			4					
1951	1	7	22	45	0	45.917	-119.233			5					
1959	1	21	7	15	0	46.067	-118.333			4					
1959	11	9	21	10	0	45.333	-119.533			4					
1971	7	13	23	29	25	44.800	-117.900	33.0	3.9	4	HAINES	OR	44.91	-117.94	12

TABLE D2: EARTHQUAKES REPORTED TO CAUSE GREATER THAN MMI III

Year	Month	Day	Hour	Minute	Second	Lattitude	Longitude	Depth (kilometers)	Magnitude	MMI	City Where Felt	State	City Lat.	City Lon.	Distance to Epicenter (kilometers)
1978	4	3	10	10	8	44.050	-116.360	5.0	3.6	4	SWEET	ID	43.97	-116.32	9
1979	4	8	7	29	38	46.000	-118.450	5.0	4.1	4	MILTON FREEWATER	OR	45.93	-118.39	9
1981	9	29	5	39	48	44.690	-116.990	5.0	3.3	4	CAMBRIDGE	ID	44.57	-116.68	27
1983	3	22	12	47	3	46.000	-118.440	4.0	3.9	4	HELIX	OR	45.85	-118.66	23
1984	8	10	7	26	38	44.990	-116.950	5.0	4.0	4	HALFWAY	OR	44.88	-117.11	17
1985	2	10	20	29	32	45.700	-119.630	18.0	3.9	4	HERMISTON	OR	45.84	-119.28	31

Data Sources: National Geophysical Data Center (NGDC), 1985, Earthquake Intensity Database Search, 1638 – 1985, NOAA Satellite and Information Service: http://www.ngdc.noaa.gov/hazard/earthqk.shtml; Johnson, A.G., Scofield. D.H., 1993, Earthquake Database for Oregon, 1833 through October 25, 1993: Oregon Department of Geology and Mineral Industries Open-File Report 94-04; and Advanced National Seismic System (ANSS), 2016, Composite Catalog: http://earthquake.usgs.gov/earthquakes/search/.

TABLE D3: EARTHQUAKES ESTIMATED TO CAUSE MMI III OR GREATER

Year	Month	Day	Hour	Minute	Second	Epicenter		EQ Depth (kilometers)	Magnitude	Estimated MMI
						Lattitude	Longitude			
1986	2	4	1	59	7	46.044	-118.810	7.80	3.2	III
1987	9	8	5	2	16	45.184	-120.085	1.00	3.1	III
1988	9	29	8	9	20	45.850	-120.260	13.89	3.5	III
1989	3	27	20	17	22	45.816	-120.262	12.25	3.1	III
1989	5	30	22	7	37	43.762	-116.930	11.00	3.1	III
1989	7	20	13	50	50	44.173	-117.184	5.00	3.7	III
1989	12	20	8	52	46	44.620	-117.073	5.00	3.2	III
1990	1	4	18	1	5	44.701	-117.887	20.40	3.2	III
1991	11	28	1	8	59	45.990	-118.317	9.47	4.3	IV
1991	12	15	22	14	53	45.995	-118.329	7.98	3.3	III
1992	1	26	5	35	48	45.019	-116.808	5.00	3.2	III
1992	6	16	12	31	17	44.827	-117.022	6.80	3.9	III - IV
1992	7	14	20	1	51	45.993	-118.309	11.62	4.1	IV
1992	8	7	17	23	18	45.860	-119.590	0.57	3.9	III - IV
1992	10	1	11	7	38	45.561	-117.311	3.40	3.3	III
1993	3	10	14	39	42	44.383	-116.255	11.10	3.2	III
1993	12	16	12	21	34	45.196	-120.090	6.69	3	III
1993	12	24	11	21	3	44.934	-117.303	5.00	3	III
1994	4	19	23	8	6	44.806	-116.890	6.80	3.1	III
1994	8	12	19	3	48	44.571	-116.670	10.00	3.5	III
1994	10	25	17	55	48	44.835	-117.009	10.00	3.1	III
1994	10	27	3	35	54	44.814	-117.001	10.00	4	IV
1995	3	16	16	44	55	44.802	-116.905	8.20	3.3	III
1995	6	12	1	48	24	46.404	-119.263	0.95	3.3	III
1995	8	29	13	2	49	46.208	-119.906	15.34	3.1	III
1995	11	2	14	30	14	46.150	-119.564	21.30	3.1	III
1997	1	27	19	10	44	44.821	-117.020	6.50	3.3	III

TABLE D3: EARTHQUAKES ESTIMATED TO CAUSE MMI III OR GREATER

Year	Month	Day	Hour	Minute	Second	Epicenter		EQ Depth (kilometers)	Magnitude	Estimated MMI
						Lattitude	Longitude			
1997	3	22	6	5	35	45.197	-120.067	0.83	3.9	III - IV
1997	3	23	4	39	51	45.195	-120.051	0.02	3.1	III
1997	3	23	4	40	13	45.246	-120.049	17.96	3.1	III
1997	4	17	17	30	37	45.188	-120.082	3.19	3.2	III
1997	10	13	15	45	34	46.114	-120.376	17.86	3.1	III
1997	11	18	1	53	6	46.143	-120.471	15.63	3.9	III - IV
1997	11	18	9	55	11	46.137	-120.461	15.83	3.3	III
1998	2	3	23	45	14	45.814	-120.192	16.29	3.1	III
1998	3	18	0	52	20	44.980	-116.924	7.90	3.4	III
1998	7	19	18	34	45	44.847	-117.015	11.50	3.5	III
1998	7	20	1	48	46	44.849	-117.015	12.20	3.7	III
1998	7	20	3	38	35	44.850	-117.016	11.50	3.3	III
1998	7	20	21	1	21	44.842	-117.021	10.60	3.6	III
1998	7	21	23	13	31	44.841	-117.017	11.40	3.5	III
1999	3	3	8	15	38	45.285	-117.076	10.00	3.5	III
1999	3	3	8	25	3	45.230	-117.100	5.00	3.5	III
1999	5	23	3	57	49	44.945	-116.976	10.00	3.1	III
1999	6	11	15	44	8	44.506	-116.333	18.30	3.3	III
1999	8	31	23	3	7	45.186	-120.091	3.55	3.5	III
1999	9	19	4	21	44	46.441	-119.626	19.88	3.1	III
1999	9	19	11	11	53	46.392	-120.106	12.38	3.2	III
2000	1	30	19	10	23	45.197	-120.125	0.03	4.1	IV
2000	1	30	20	46	6	45.183	-120.103	0.03	3.4	III
2000	2	1	0	11	8	45.190	-120.113	0.02	3.6	III
2000	2	27	22	26	24	44.310	-116.250	10.00	3.1	III
2000	7	13	22	29	59	44.451	-118.246	67.50	3.1	III
2000	8	17	1	58	24	45.312	-120.042	15.07	3.2	III

TABLE D3: EARTHQUAKES ESTIMATED TO CAUSE MMI III OR GREATER

Year	Month	Day	Hour	Minute	Second	Epicenter		EQ Depth (kilometers)	Magnitude	Estimated MMI
						Lattitude	Longitude			
2000	8	27	21	20	26	44.667	-117.511	23.50	3.5	III
2000	9	6	6	54	17	46.075	-118.365	0.05	3	III
2002	10	4	0	56	6	44.434	-116.268	10.00	4	IV
2002	11	6	16	4	41	45.193	-117.078	10.00	3.1	III
2002	11	16	0	46	59	45.034	-116.942	15.20	3.5	III
2002	11	16	9	24	58	45.018	-116.942	8.90	3.1	III
2002	11	16	9	37	38	45.024	-116.952	16.20	3.2	III
2003	10	1	13	27	35	44.656	-117.730	10.00	3.6	III
2004	2	28	2	1	48	46.036	-119.021	1.00	3.3	III
2004	12	14	15	49	9	44.524	-116.312	3.50	3.6	III
2004	12	15	0	17	15	44.539	-116.300	7.00	3.8	III
2005	2	4	13	10	23	44.523	-116.282	14.30	3	III
2005	3	27	6	16	18	44.507	-116.287	3.00	3.1	III
2006	12	20	9	43	27	46.095	-118.513	13.57	3.4	III
2006	12	22	16	43	0	44.777	-116.647	9.50	3	III
2008	5	18	22	19	55	46.168	-119.550	20.10	3.7	III
2008	11	4	22	39	30	44.816	-117.053	14.60	3.5	III
2009	5	4	10	47	43	46.413	-119.273	0.40	3	III
2009	7	25	8	57	23	44.289	-117.655	7.60	3.8	III
2010	7	30	13	51	9	44.809	-117.072	16.70	3.3	III
2011	5	1	4	13	55	46.404	-119.255	1.91	3.3	III
2011	9	4	4	13	40	46.411	-119.260	1.77	3.7	III
2011	10	15	6	11	29	46.408	-119.262	1.43	3.4	III
2012	4	10	4	43	35	46.045	-118.712	14.36	3.2	III
2013	11	17	14	47	6	46.411	-119.271	0.00	3.2	III
2013	12	23	2	55	46	45.360	-118.206	8.70	3	III
2014	11	3	16	43	58	45.351	-117.189	3.90	3.4	III

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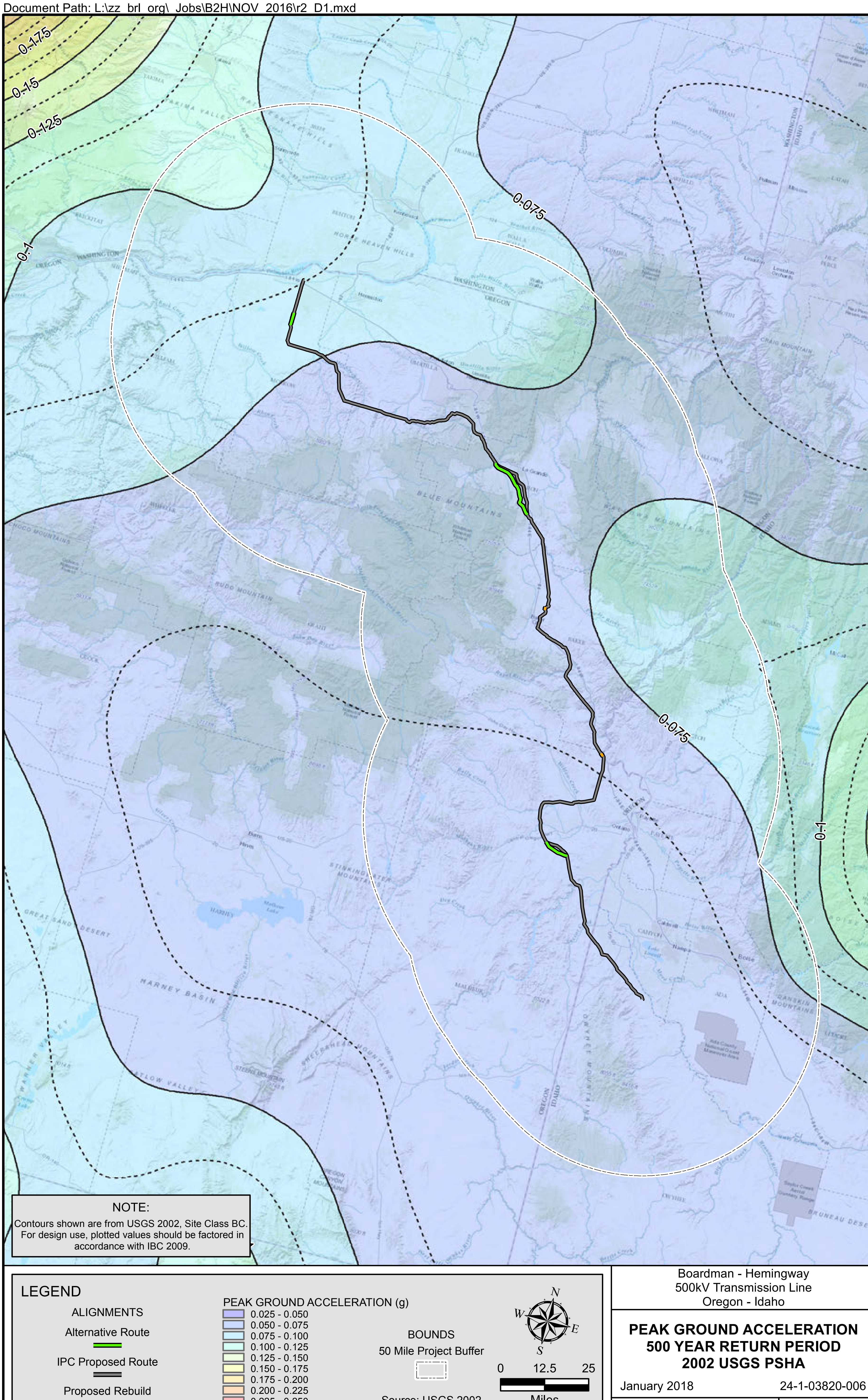
TABLE D3: EARTHQUAKES ESTIMATED TO CAUSE MMI III OR GREATER

Year	Month	Day	Hour	Minute	Second	Epicenter		EQ Depth (kilometers)	Magnitude	Estimated MMI
						Lattitude	Longitude			
2015	1	23	13	47	52	45.711	-118.550	20.62	3.6	III
2015	4	24	3	49	14	44.943	-116.740	4.70	3.2	III

Data Source: Advanced National Seismic System (ANSS), 2016, Composite Catalog: http://earthquake.usgs.gov/earthquakes/search/.

Document Path: L:\zz_brl_org_Jobs\B2H\NOV_2016\r2_D1.mxd



Boardman - Hemingway
500kV Transmission Line
Oregon - Idaho

PEAK GROUND ACCELERATION
500 YEAR RETURN PERIOD
2002 USGS PSHA

January 2018 24-1-03820-006

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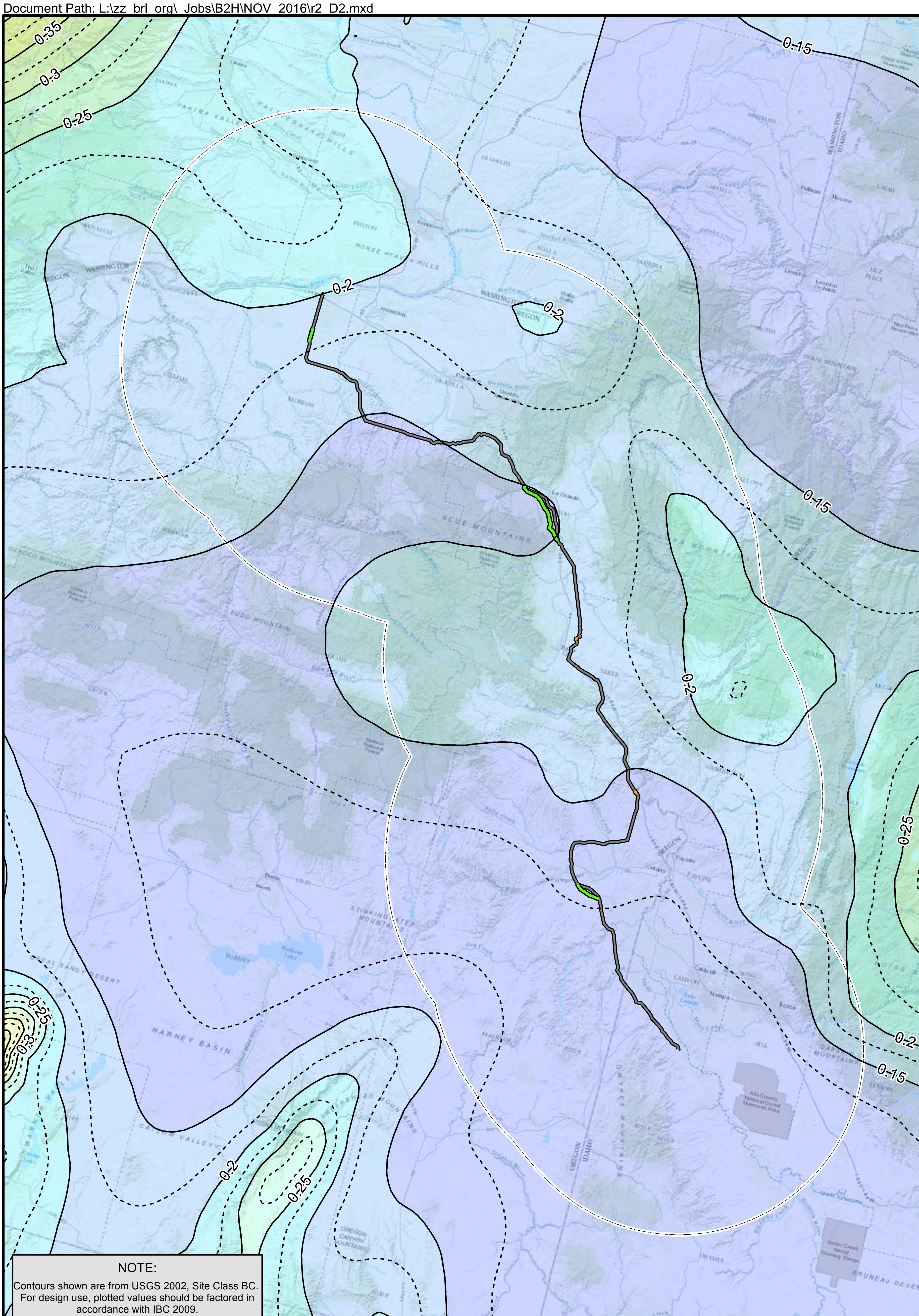
FIG. D1

Document Path: L:\zz_brl_org_Jobs\B2H\NOV_2016\r2_D2.mxd



NOTE:
Contours shown are from USGS 2002, Site Class BC. For design use, plotted values should be factored in accordance with IBC 2009.

LEGEND

ALIGNMENTS

- Alternative Route
- IPC Proposed Route
- Proposed Rebuild

PEAK GROUND ACCELERATION (g)

- 0.05 - 0.10
- 0.10 - 0.15
- 0.15 - 0.20
- 0.20 - 0.25
- 0.25 - 0.30
- 0.30 - 0.35
- 0.35 - 0.40
- 0.40 - 0.45
- 0.45 - 0.50
- 0.50 - 0.55
- 0.55 - 0.60

BOUNDS

50 Mile Project Buffer

Source: USGS 2002

N W E S

0 12.5 25
Miles

Boardman - Hemingway
500kV Transmission Line
Oregon - Idaho

PEAK GROUND ACCELERATION
2,500 YEAR RETURN PERIOD
2002 USGS PSHA

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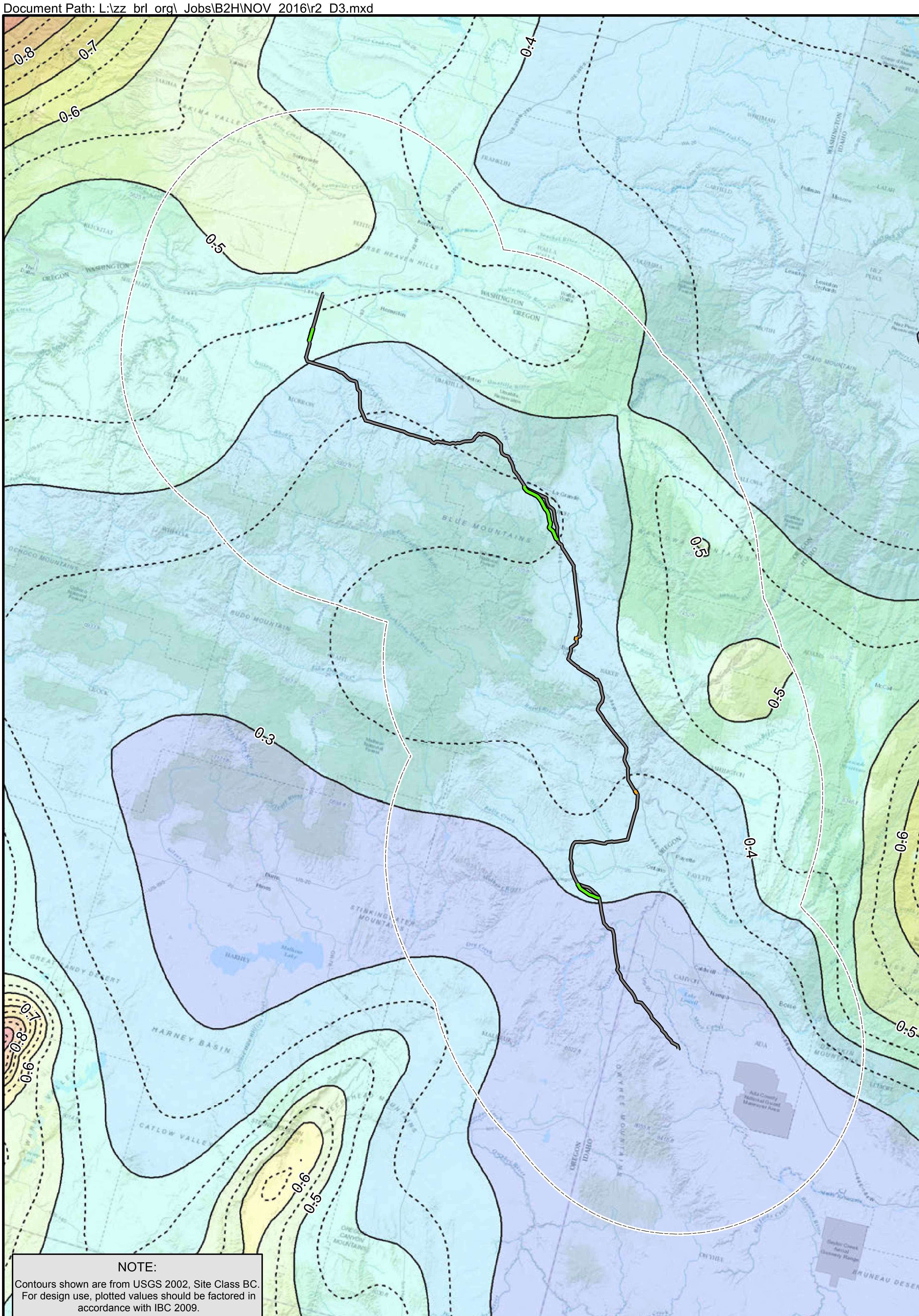
FIG. D2

Document Path: L:\zz_brl_org_Jobs\B2H\NOV_2016\r2_D3.mxd



NOTE:
Contours shown are from USGS 2002, Site Class BC. For design use, plotted values should be factored in accordance with IBC 2009.

LEGEND

ALIGNMENTS
Alternative Route
IPC Proposed Route
Proposed Rebuild

SPECTRAL ACCELERATION (g)
0.1 - 0.2
0.2 - 0.3
0.3 - 0.4
0.4 - 0.5
0.5 - 0.6
0.6 - 0.7
0.7 - 0.8
0.8 - 0.9
0.9 - 1.0

BOUNDS
50 Mile Project Buffer

Source: USGS 2002

0 12.5 25
Miles

Boardman - Hemingway
500kV Transmission Line
Oregon - Idaho

0.2 SEC PERIOD
SPECTRAL ACCELERATION
2,500 YEAR RETURN PERIOD
2002 USGS PSHA

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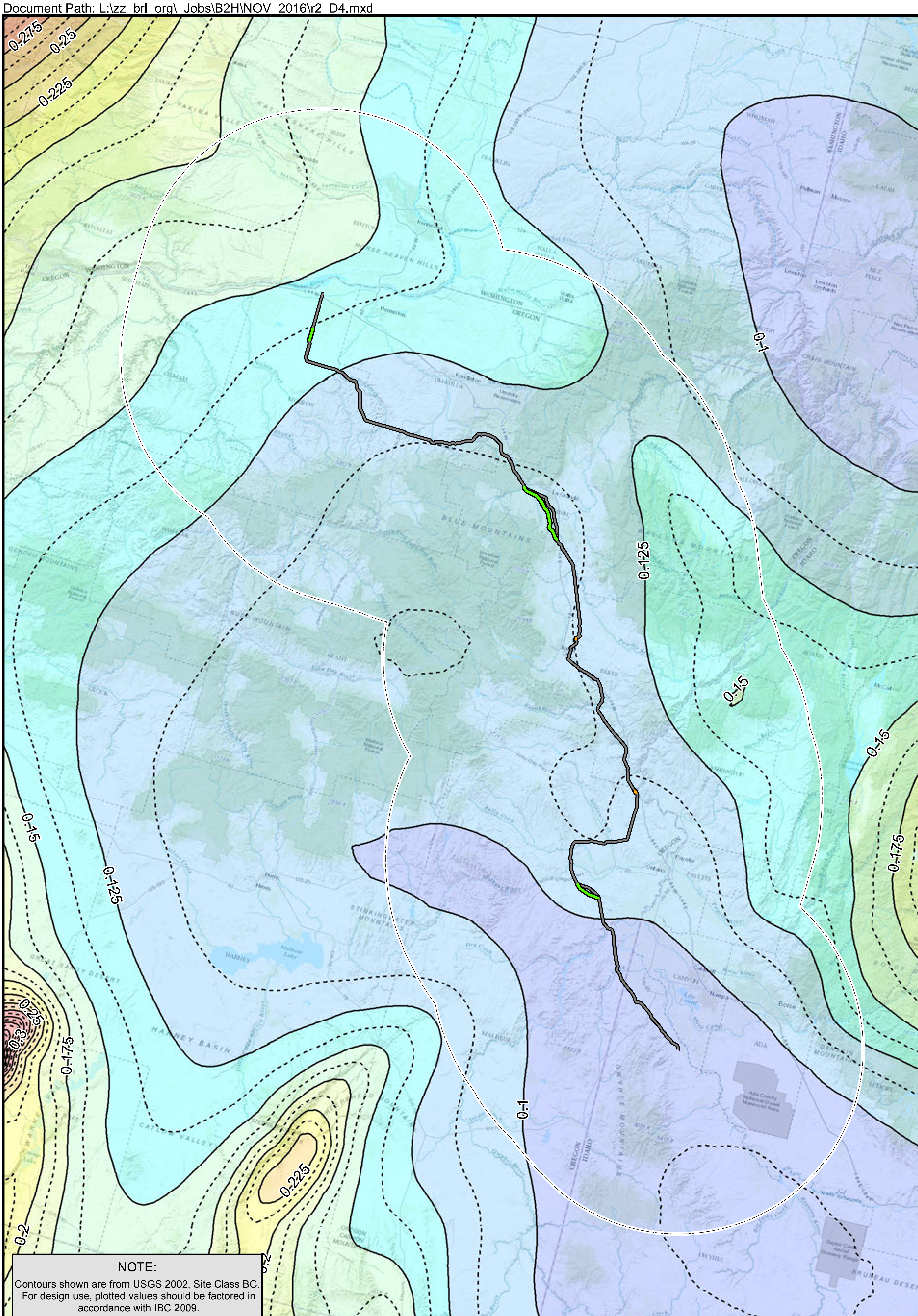
FIG. D3

Document Path: L:\zz_brl_org_Jobs\B2H\NOV_2016\r2_D4.mxd



NOTE:
Contours shown are from USGS 2002, Site Class BC.
For design use, plotted values should be factored in accordance with IBC 2009.

LEGEND

ALIGNMENTS
- Alternative Route
- IPC Proposed Route
- Proposed Rebuild

SPECTRAL ACCELERATION (g)
- 0.050 - 0.075
- 0.075 - 0.100
- 0.100 - 0.125
- 0.125 - 0.150
- 0.150 - 0.175
- 0.175 - 0.200
- 0.200 - 0.225
- 0.225 - 0.250
- 0.250 - 0.275
- 0.275 - 0.300
- 0.300 - 0.350

BOUNDS
- 50 Mile Project Buffer

Source: USGS 2002

N W E S

0 12.5 25
Miles

Boardman - Hemingway
500kV Transmission Line
Oregon - Idaho

1.0 SEC PERIOD
SPECTRAL ACCELERATION
2,500 YEAR RETURN PERIOD
2002 USGS PSHA

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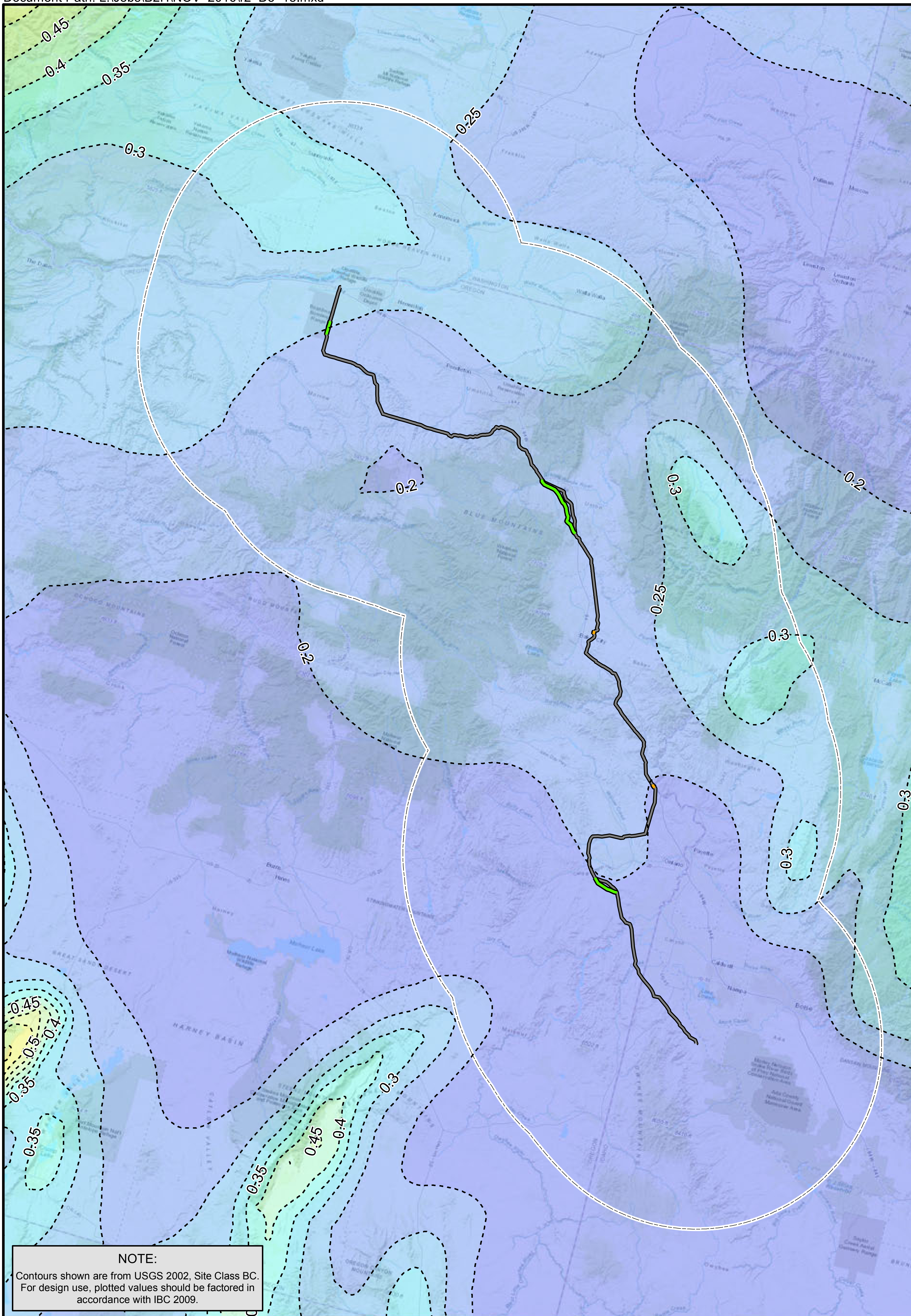
FIG. D4

Document Path: L:\Jobs\B2H\NOV_2016\r2_D5_18.mxd



NOTE:
Contours shown are from USGS 2002, Site Class BC. For design use, plotted values should be factored in accordance with IBC 2009.

LEGEND

ALIGNMENTS
- Alternative Route
- IPC Proposed Route
- Proposed Rebuild

PEAK GROUND ACCELERATION (g)
- 0.10
- 0.2
- 0.3
- 0.4
- 0.5
- 0.6
- 0.7
- 0.8

BOUNDS
50 Mile Project Buffer

Source: USGS 2002

N E S W

0 12.5 25
Miles

Boardman - Hemingway
500kV Transmission Line
Oregon - Idaho

PEAK GROUND ACCELERATION
5000 YEAR RETURN PERIOD
2002 USGS PSHA

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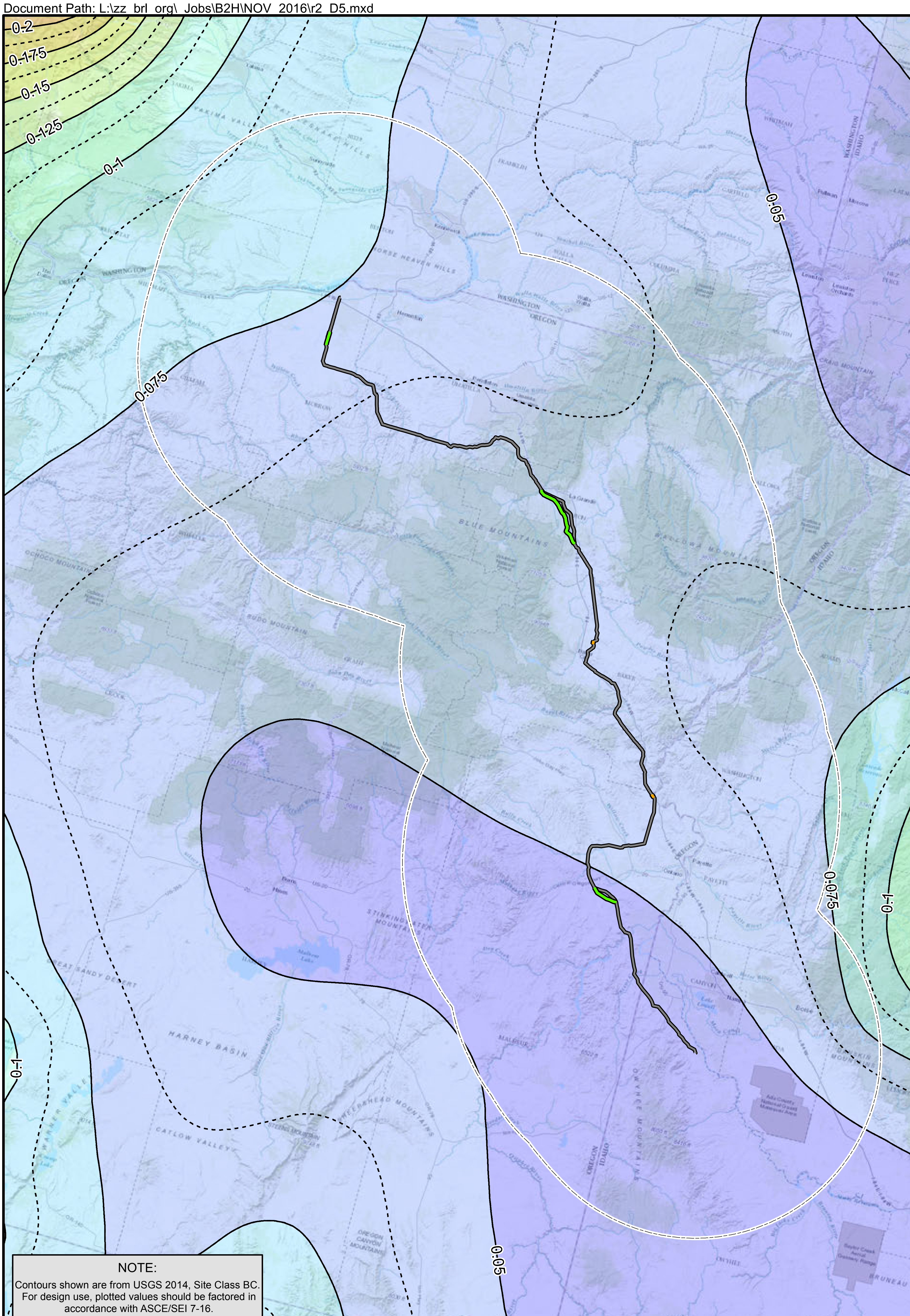
FIG. D5

Document Path: L:\zz_brl_org_Jobs\B2H\NOV_2016\r2_D5.mxd



NOTE:
Contours shown are from USGS 2014, Site Class BC.
For design use, plotted values should be factored in accordance with ASCE/SEI 7-16.

LEGEND

ALIGNMENTS
- Alternative Route
- IPC Proposed Route
- Proposed Rebuild

PEAK GROUND ACCELERATION (g)
- 0.025 - 0.050
- 0.050 - 0.075
- 0.075 - 0.100
- 0.100 - 0.125
- 0.125 - 0.150
- 0.150 - 0.175
- 0.175 - 0.200
- 0.200 - 0.225
- 0.225 - 0.250

BOUNDS
50 Mile Project Buffer

Source: USGS 2014

N W E S

0 12.5 25
Miles

Boardman - Hemingway
500kV Transmission Line
Oregon - Idaho

**PEAK GROUND ACCELERATION
500 YEAR RETURN PERIOD
2014 USGS PSHA**

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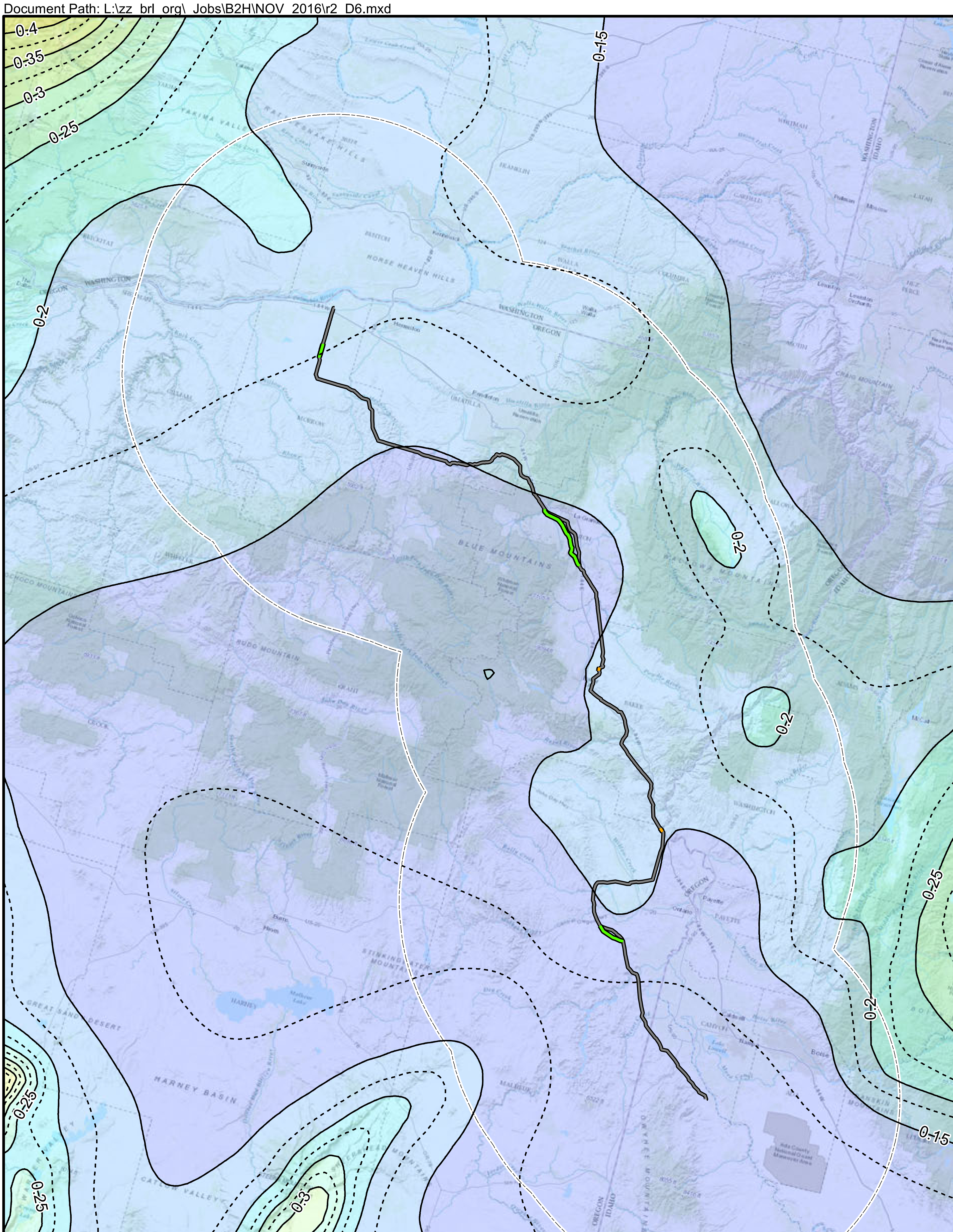
FIG. D6

Document Path: L:\zz_brl_org_Jobs\B2H\NOV_2016\r2_D6.mxd



NOTE:
Contours shown are from USGS 2014, Site Class BC. For design use, plotted values should be factored in accordance with ASCE/SEI 7-16.

LEGEND

ALIGNMENTS
Alternative Route
IPC Proposed Route
Proposed Rebuild

PEAK GROUND ACCELERATION (g)
0.05 - 0.10
0.10 - 0.15
0.15 - 0.20
0.20 - 0.25
0.25 - 0.30
0.30 - 0.35
0.35 - 0.40
0.40 - 0.45
0.45 - 0.50
0.50 - 0.55
0.55 - 0.60

BOUNDS
50 Mile Project Buffer

Source: USGS 2014

0 12.5 25
Miles

Boardman - Hemingway
500kV Transmission Line
Oregon - Idaho

PEAK GROUND ACCELERATION
2,500 YEAR RETURN PERIOD
2014 USGS PSHA

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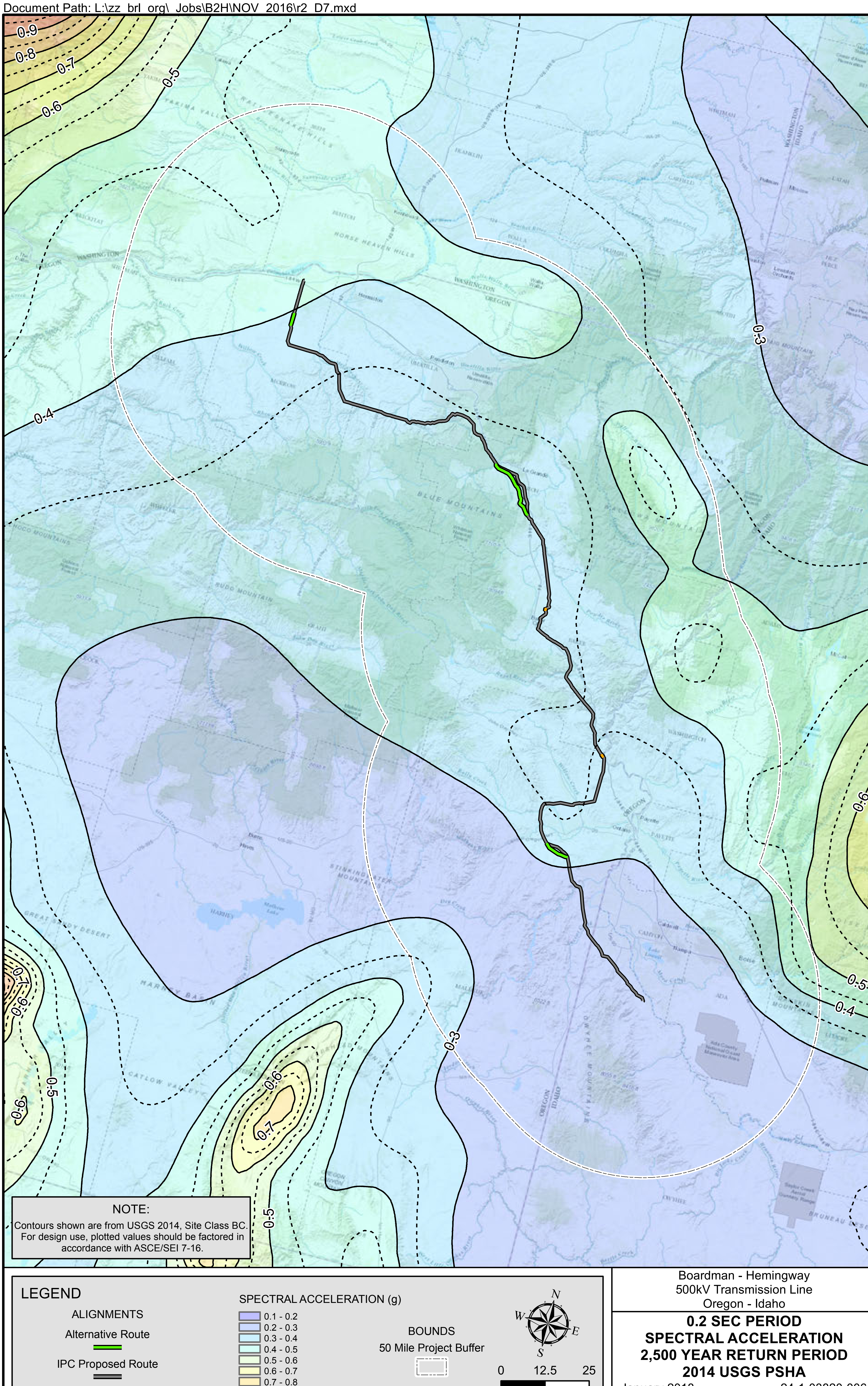
FIG. D7

Document Path: L:\zz_brl_org_Jobs\B2H\NOV_2016\r2_D7.mxd



NOTE:
Contours shown are from USGS 2014, Site Class BC. For design use, plotted values should be factored in accordance with ASCE/SEI 7-16.

LEGEND

ALIGNMENTS
- Alternative Route
- IPC Proposed Route
- Proposed Rebuild

SPECTRAL ACCELERATION (g)
- 0.1 - 0.2
- 0.2 - 0.3
- 0.3 - 0.4
- 0.4 - 0.5
- 0.5 - 0.6
- 0.6 - 0.7
- 0.7 - 0.8
- 0.8 - 0.9
- 0.9 - 1.0

BOUNDS
50 Mile Project Buffer

Source: USGS 2014

0 12.5 25
Miles

Boardman - Hemingway
500kV Transmission Line
Oregon - Idaho

0.2 SEC PERIOD
SPECTRAL ACCELERATION
2,500 YEAR RETURN PERIOD
2014 USGS PSHA

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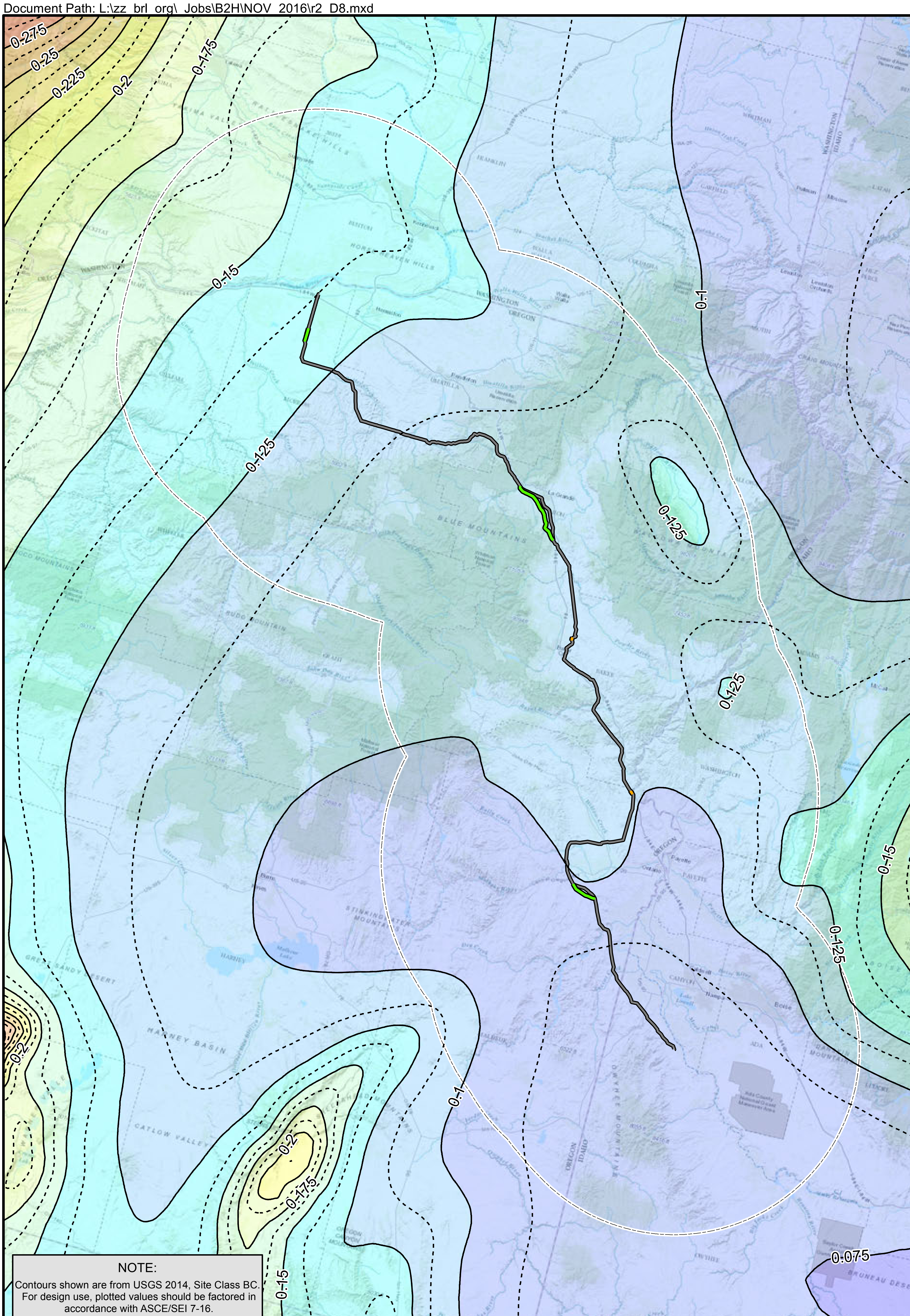
FIG. D8

Document Path: L:\zz_brl_org_Jobs\B2H\NOV_2016\r2_D8.mxd



LEGEND

ALIGNMENTS

Alternative Route

IPC Proposed Route

Proposed Rebuild

SPECTRAL ACCELERATION (g)

- 0.050 - 0.075
- 0.075 - 0.100
- 0.100 - 0.125
- 0.125 - 0.150
- 0.150 - 0.175
- 0.175 - 0.200
- 0.200 - 0.225
- 0.225 - 0.250
- 0.250 - 0.275
- 0.275 - 0.300
- 0.300 - 0.350

BOUNDS

50 Mile Project Buffer

Source: USGS 2014

0 12.5 25

Miles

Boardman - Hemingway
500kV Transmission Line
Oregon - Idaho

1.0 SEC PERIOD
SPECTRAL ACCELERATION
2,500 YEAR RETURN PERIOD
2014 USGS PSHA

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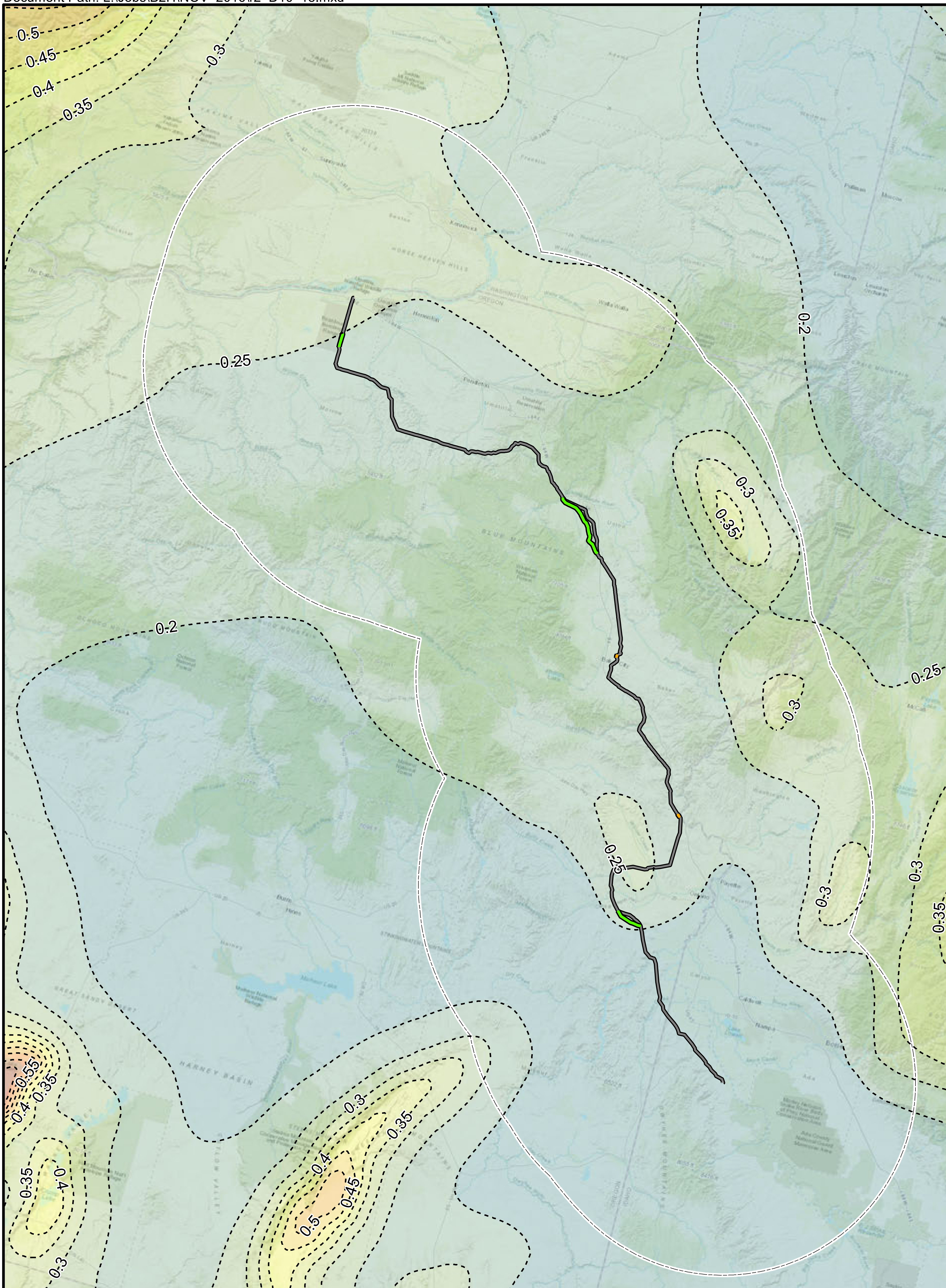
FIG. D9

Document Path: L:\Jobs\B2H\NOV_2016\r2_D10_18.mxd



NOTE:
Contours shown are from USGS 2014, Site Class BC. For design use, plotted values should be factored in accordance with ASCE/SEI 7-16.

LEGEND

ALIGNMENTS
Alternative Route
IPC Proposed Route
Proposed Rebuild

PEAK GROUND ACCELERATION (g)
0.05 - 0.10
0.10 - 0.15
0.15 - 0.20
0.20 - 0.25
0.25 - 0.30
0.30 - 0.35
0.35 - 0.40
0.40 - 0.45
0.45 - 0.50
0.50 - 0.55
0.55 - 0.60

BOUNDS
50 Mile Project Buffer

Source: USGS 2014

0 12.5 25
Miles

Boardman - Hemingway
500kV Transmission Line
Oregon - Idaho

PEAK GROUND ACCELERATION
5,000 YEAR RETURN PERIOD
2014 USGS PSHA

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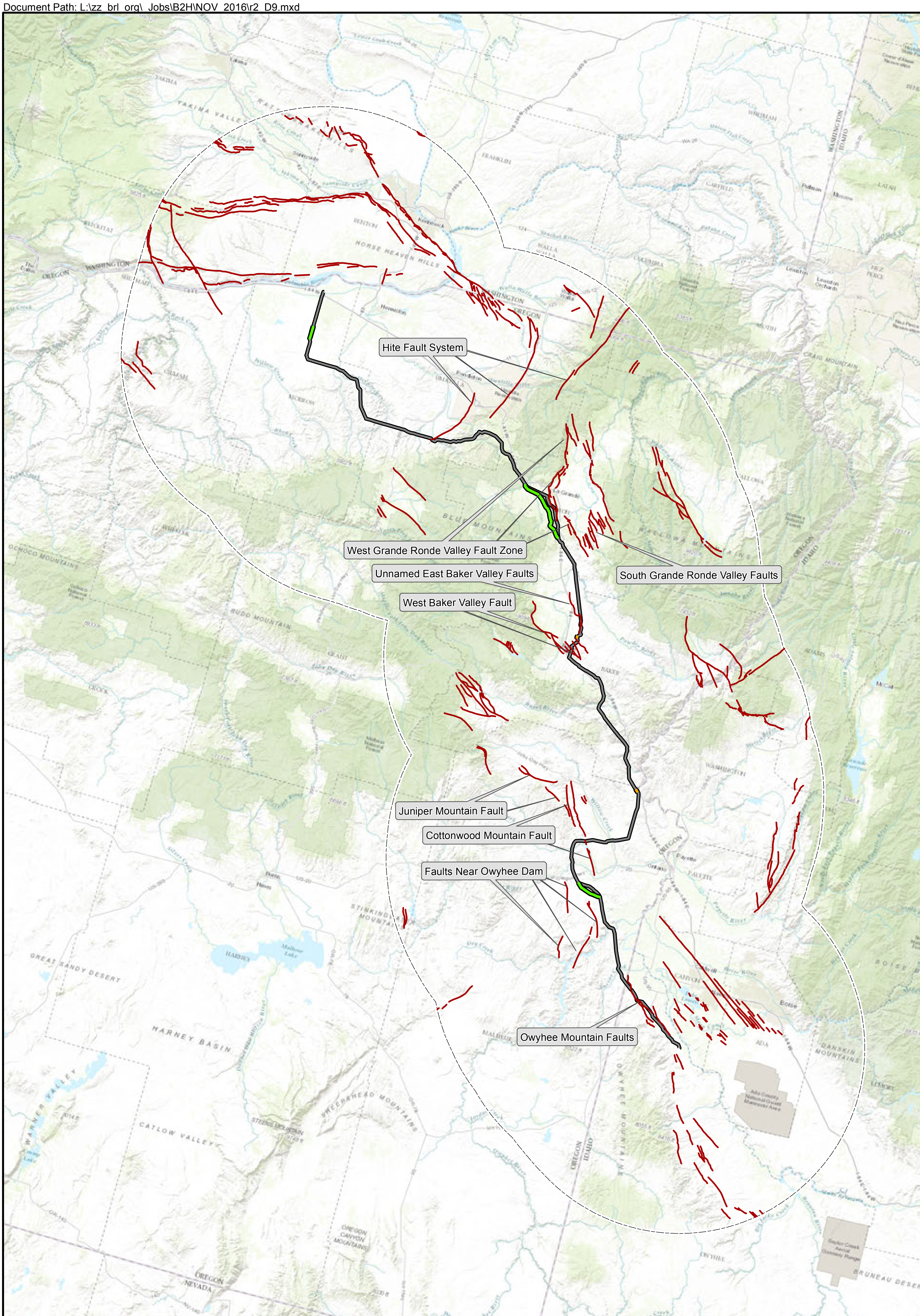
FIG. D10

Document Path: L:\zz_brl_org_Jobs\B2H\NOV_2016\r2_D9.mxd



LEGEND

ALIGNMENTS

Alternative Route

IPL Proposed Route

Proposed Rebuild

FEATURES

50 Mile Project Buffer

Fault

Source:
USGS Quternary Fault and Fold Database of the United States.

0 12.5 25
Miles

Boardman - Hemingway
500kV Transmission Line
Oregon - Idaho

QUATERNARY FAULTS

January 2018 24-1-03820-006

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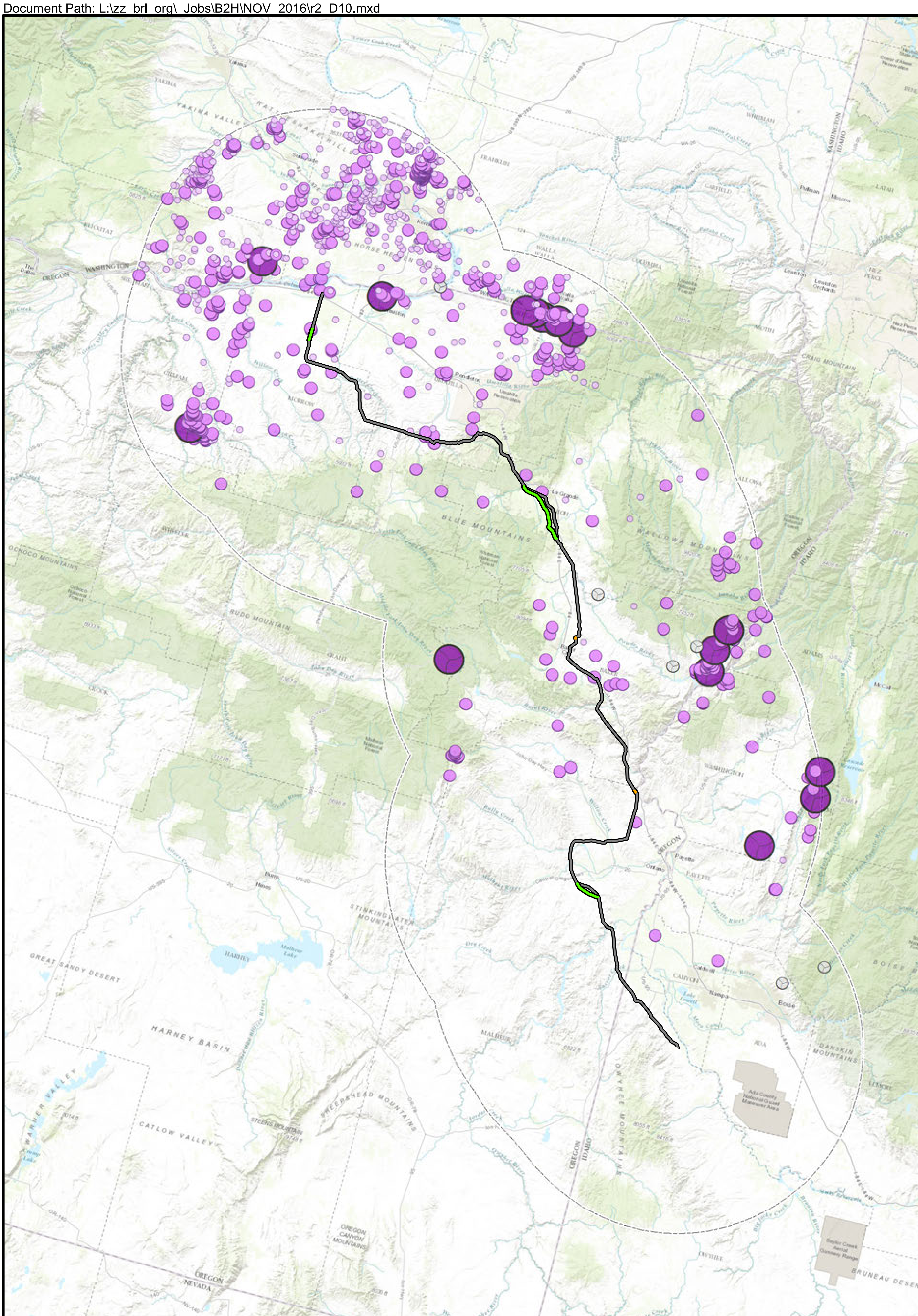
FIG. D11

Document Path: L:\zz_brl_org_Jobs\B2H\NOV_2016\r2_D10.mxd



LEGEND

ALIGNMENTS
Alternative Route
IPL Proposed Route
Proposed Rebuild

MAGNITUDE
Unknown
Less Than 2.0
2.1 - 3.9
Greater Than 4.0

BOUNDS
50 Mile Project Buffer

Source: USGS

0 12.5 25
Miles

Boardman - Hemingway
500kV Transmission Line
Oregon - Idaho

HISTORICAL EARTHQUAKES

January 2018 24-1-03820-006

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FIG. D12

Attachment H-4

Landslide Inventory

Attachment H-4 Landslide Inventory

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APPENDIX E

LANDSLIDE INVENTORY

TABLE OF CONTENTS

TABLES

FIGURES

SHANNON & WILSON, INC.

APPENDIX E

LANDSLIDE INVENTORY

E.1 INTRODUCTION

This appendix presents summary information and site maps of each landslide that was identified along the proposed alignments that could potentially affect the stability of proposed tower foundations or associated work areas or multi-use areas. This landslide inventory was compiled from review of published literature and limited field reconnaissance.

The proposed alignments reviewed include the IPC Proposed Route; Proposed 230 kV Rebuild; Proposed 138 kV Rebuild; West of Bombing Range Road Alternative 1; West of Bombing Range Road Alternative 2; Morgan Lake Alternative; and Double Mountain Alternative. Shaw Environmental & Infrastructure, Inc. (Shaw) reviewed the majority of the transmission line route and compiled identified landslides in their Desktop Geotechnical Report, dated January 19, 2012. Landslides along subsequent new alignments and changes to the previous alignments were compiled by Shannon & Wilson, Inc. In this appendix, Shannon & Wilson has integrated the relevant data compiled by both Shannon & Wilson and Shaw. The landslide inventory was compiled from the following data sources:

- Review of GIS files compiled by Oregon Department of Geology and Mineral Industries (DOGAMI) in the Statewide Landslide Information Database for Oregon (SLIDO), version 3.4 (Burns and Watzig, 2017); the review included landslides within a 1-mile wide route corridor; initial work by Shaw utilized SLIDO, version 2 (Burns and others, 2011);
- Review of existing geologic maps, including Engineering Geology of the La Grande Area, Union County, Oregon, by Schlicker and Deacon (1971); the maps were compiled and geo-referenced in GIS along the alignment to confirm the location of each SLIDO landslide along the route and to check that each mapped landslide was included in the SLIDO database;
- Site reconnaissance (by Shaw) along portions of the original alignment, conducted on October 26-28 and November 15-18, 2011;
- Site reconnaissance (by Shannon & Wilson) along portions of new alignment alternatives and select alignment changes, conducted July 30 through August 2, 2012, and October 16-18, 2013;
- Review of aerial photography (Shaw reviewed 1:24,000 scale aerial photographs provided by 3Di, LLC, of Eugene, Oregon (3Di), and the ESRI Microsoft Virtual Earth

layer in GIS; Shannon & Wilson reviewed aerial photographs from both ESRI and Google Earth);

- Review of Digital Terrain Models (DTMs) along 1-mile-wide route corridors; and
- DOGAMI LiDAR Data Viewer (relevant LiDAR data was only available for portions of the Meacham Lake, Huron, Kamela SE, Hilgard, LaGrande SE, Glass Hill, Craig Mountain, North Powder, Telocaset, Baker, Virtue Flat, and Owyhee Dam quadrangles); No LiDAR data was available in Idaho.

A summary description is presented below for each identified landslide feature that intersects one of the alignments, as well as for landslide features that are near the alignments and oriented in such a way that they could be reasonably suspected of having the capacity to impact proposed structures. The text is followed by map sheets that show the locations of mapped landslides relative to the proposed alignment features.

The Landslide Inventory Index Map (Sheet 1) shows the entire project alignment and locations of subsequent Landslide Inventory maps (Sheets 2 through 26). Where map sheets are not shown along the alignment on the Landslide Inventory Index Map (Sheet 1), relevant landslides were not identified based on the data sources reviewed. All recognized landslide features are shown within the limits of each map sheet. However, discussions are only provided for those features judged potentially capable of impacting proposed structure stability. The map sheets and landslide descriptions are arranged from north to south, beginning in Morrow County, Oregon, and ending in Malheur County, Oregon.

Table E1 presents landslide data for multi-use areas located away from the proposed alignment such that they fall outside the boundaries of the maps presented. Table E1 includes all multi-use areas not shown on the landslide map sheets for which a SLIDO feature or suspected landslide is identified within a half mile.

Mapped features were given designations based on their source. Features identified in the SLIDO database are preceded by “SLIDO.” Features that were identified from published geologic maps, but not included in the SLIDO database, were designated with an arbitrary number, preceded by “MLS.” Features identified from field reconnaissance or review of LiDAR or aerial imagery were designated with an arbitrary number, preceded by “PLS.” Each description below is preceded by a header that provides UTM coordinates (in meters) for a point near the geographic center of discussed feature.

In the time since Shaw issued their Desktop Geotechnical Report in 2012, SLIDO has changed the identification labels of some landslides in its database multiple times. The current version of

SLIDO-3.4 uses identification labels that contain both an abbreviation of the data source and a number. In the Landslide Inventory maps and landslide descriptions below, we abbreviate the landslide identification labels by using only the number following the data source. For example, we refer to SLIDO-3.4 landslide “MadiIP2007_43” as “SLIDO 43.” Full SLIDO-3.4 identification labels are provided in the headers for each description.

E.2 LANDSLIDE DESCRIPTIONS

E.2.1 SLIDO 43

SLIDO-3.4 MadiIP2007_43
Northing: 5051807
Easting: 298836
Sheets 2, 3

SLIDO 43 intersects the alignment between towers 17/1 and 23/1. It is a broad, gently sloping alluvial fan and is not a landslide. A site visit was conducted on November 18, 2011.

E.2.2 PLS-001

PLS-001
Northing: 5031371
Easting: 391097
Sheet 4

PLS-001 is an approximately 230-acre potential landslide that was identified from available LiDAR data. PLS-001 has not been verified in the field and should not be considered a landslide based solely on interpretation of the LiDAR data. This IPC Proposed Route crosses this potential landslide between towers 89/4 and 90/3, potentially affecting the stability of towers 89/4 through 90/2, and associated work areas. A field reconnaissance of this area should be performed as part of the geotechnical exploration program.

E.2.3 PLS-002

PLS-002
Northing: 5026719
Easting: 396357
Sheet 5, 6

PLS-002 is an approximately 460-acre potential landslide that was identified in available LiDAR data. PLS-002 has not been verified in the field and should not be considered a landslide based solely on interpretation of the LiDAR data. The IPC Proposed Route passes above this potential landslide between towers 93/5 and 95/3, potentially affecting the stability of those proposed towers and associated work areas. A field reconnaissance along this portion of the alignment should be performed as part of the geotechnical exploration program.

E.2.4 SLIDO 10

SLIDO-3.4 BussC2006_10
Northing: 5022505
Easting: 397680
Sheet 6

SLIDO 10 is referenced at a scale of 1:100,000 (Buss, 2006), and it's located over 2,000 feet southwest of the IPC Proposed Route, near tower 96/3. It is mapped as talus/colluvium and will not likely impact the proposed alignment or any associated work areas or multi-use areas. A field reconnaissance of this area should be performed as part of the geotechnical exploration program.

E.2.5 SLIDO 134

SLIDO-3.4 FernML2010_134
Northing: 5018900
Easting: 406277
Sheet 8

SLIDO 134 is referenced at a scale of 1:100,000 from Ferns et al., 2010. The same limits of this landslide (Holocene Qls) were mapped at the scale of 1:24,000 by Barrash and others (1980), covering approximately 132 acres. Schlicker and Deacon (1971) mapped slightly different extents of the same feature at a scale of 1:24,000. IPC Proposed Route towers 102/1 and 102/2 and associated work areas are on the margins of the mapped landslide limits, and Morgan Lake Alternative tower ML-4/2 and its associated work area are within the mapped landslide limits.

Review of aerial photos, the DTM, and LiDAR images suggest that most of this landslide has not recently been active. However, a field reconnaissance of this area should be performed as part of the geotechnical exploration program.

E.2.6 SLIDO 129

SLIDO-3.4 FernML2010_129
Northing: 5019127
Easting: 407892
Sheet 9

SLIDO 129 is referenced at a scale of 1:100,000 (Ferns et al., 2010) and its mapped extents intersect the IPC Proposed Route between towers 103/3 and 103/4. The slide appears to be contained within a drainage spanned by the two towers and is therefore unlikely to affect the proposed towers or work areas. A field reconnaissance of this area should be performed as part of the geotechnical exploration program.

E.2.7 SLIDO 127

SLIDO-3.4 FernML2010_127
Northing: 5018167
Easting: 411384
Sheets 9, 11

SLIDO 127 is referenced at a scale of 1:100,000 (Ferns et al., 2010) and is located about 200 feet south of the IPC Proposed Route, between towers 105/5 and 106/1. It is mapped as a landslide, but does not appear to be recently active, based on review of aerial photographs. Proposed towers 105/5 and 106/1, and associated work areas, are in the proximity of the mapped debris fan, and a field reconnaissance of this area should be performed as part of the geotechnical exploration program.

E.2.8 Schlicker and Deacon, 1971

Northing: 5018552
Easting: 412472
Sheets 11

Schlicker and Deacon (1971) mapped several landslides in the areas west and south of La Grande at a scale of 1:24,000. The majority of the landslide features mapped by Schlicker and Deacon (1971) were similarly mapped as landslides or alluvial fans in Ferns and others (2010), which is locally the basis of the current SLIDO database. While the two map sets generally agree, there are differences in the mapped limits of some landslide and alluvial fan areas. One of the landslides mapped by Schlicker and Deacon (1971), not included in SLIDO, intersects the IPC Proposed Route between towers 106/3 and 106/4. Based on review of topography and aerial photographs, this mapped landslide may impact the proposed work areas around tower 106/4. A field reconnaissance of this area should be performed as part of the geotechnical exploration program.

E.2.9 SLIDO 380, 33

SLIDO-3.4 FernML2010_380
Northing: 5016237
Easting: 414116
Sheets 11, 12

SLIDO-3.4 WalkGW2002_33
Northing: 5016237
Easting: 414116
Sheets 11, 12

SLIDO 380 and 33 appear to refer to the same landslide feature and are referenced at scales of 1:100,000 and 1:500,000, respectively (Ferns et al., 2010; Walker, 2002). The IPC Proposed Route crosses the mapped limits of the slide between towers 108/2 and 109/2, and may affect stability at towers 108/3 through 109/2, along with associated work areas. Schlicker and Deacon (1971) mapped slightly different extents of the same features at a scale of 1:24,000. In the Schlicker and Deacon (1971) map, the extents of one slide area are about 650 feet southeast of tower 107/4 and 465 feet northeast of tower 107/5. A field reconnaissance of all these areas should be performed as part of the geotechnical exploration program.

E.2.10 SLIDO 225

SLIDO-3.4 FernML2010_225
Northing: 5013877
Easting: 417421
Sheets 12, 13

SLIDO 225 is mapped as a landslide referenced at a scale of 1:100,000 (Ferns et al., 2010). It intersects the IPC Proposed Route between towers 110/2 and 112/2, and may affect stability at towers 110/1 through 112/1, along with associated work areas. A field reconnaissance of this area should be performed as part of the geotechnical exploration program. Schlicker and Deacon (1971) mapped slightly different extents of the same feature at a scale of 1:24,000.

E.2.11 SLIDO 115

SLIDO-3.4 FernML2010_115
Northing: 5010654
Easting: 418706
Sheet 13

SLIDO 115 is referenced at a scale of 1:100,000 (Ferns et al., 2010), and its mapped extents intersect the IPC Proposed Route between towers 112/5 and 113/1. The feature is mapped as an alluvial fan, not a landslide; and the material appears to be contained within a drainage spanned by the two towers. The feature is unlikely to affect the proposed towers or associated work areas. However, a field reconnaissance of this area should be performed as part of the geotechnical exploration program.

E.2.12 SLIDO 114

SLIDO-3.4 FernML2010_114
Northing: 5009120
Easting: 419492
Sheets 13, 14

SLIDO 114 is mapped as a landslide and referenced at a scale of 1:100,000 (Ferns et al., 2010). It intersects the IPC Proposed Route between towers 113/3 and 114/3, and may affect stability at towers 113/4, 113/5, 114/2, along with associated work areas. A field reconnaissance of this area should be performed as part of the geotechnical exploration program.

E.2.13 SLIDO 117

SLIDO-3.4 FernML2010_117
Northing: 5007537
Easting: 417623
Sheet 15

SLIDO 117 is referenced at the scale of 1:100,000 (Ferns et al., 2010). The feature is located approximately 1,000 feet east of the Morgan Lake Alternative alignment, near towers ML-14/2 and ML-14/3. A landslide is not shown at this location on the 1:24,000 scale *Geologic Map of the Glass Hill Quadrangle* (Barrash et al., 1980), and landslide deposit features are not apparent on the DTM or on aerial photos. Landslide deposits are shown on the Barrash et al. (1980) map approximately 2,500 east of SLIDO 117, further away from the alignment, and it may be possible that SLIDO 117 was inaccurately geo-referenced. A field reconnaissance of the area around SLIDO 117 should be performed as part of the geotechnical exploration program.

E.2.14 SLIDO 112

SLIDO-3.4 FernML2010_112
Northing: 5004077
Easting: 419720
Sheet 15

SLIDO 112 is referenced at the scale of 1:100,000 (Ferns et al., 2010), but no landslide is shown at the location of SLIDO 112 on the 1:24,000 scale *Geologic Map of the Glass Hill Quadrangle* (Barrash et al., 1980). The mapped limits of SLIDO 112 intersect the Morgan Lake Alternative alignment between towers ML-17/2 and ML-17/3, with the limits of the feature being approximately 150 feet southeast of tower ML-17/2. The OGDC geologic map shows a contact between the Dacite of Mount Emily (Tpd) and the Grande Ronde Basalt (Tcgf) at this location. Review of the DTM and aerial photos shows no evidence of a landslide, but the upper contact of the Grande Ronde Basalt is known to be landslide prone. A field reconnaissance of this area should be performed as part of the geotechnical exploration program.

E.2.15 SLIDO 48

SLIDO-3.4 WalkGW2002_48
Northing: 5002373
Easting: 419983
Sheet 16

SLIDO 48 is mapped as a landslide and referenced at a scale of 1:500,000 (Walker, 2002). A landslide is not shown at this location on the 1:100,000 scale map by Ferns et al. (2010) or the 1:24,000 scale map by Barrash et al. (1980). Review of the DTM and aerial photographs does not suggest the presence of a landslide, but field reconnaissance of this area should be performed as part of the geotechnical exploration program.

E.2.16 SLIDO 311

SLIDO-3.4 FernML2010_311
Northing: 5002434
Easting: 421959
Sheet 16

SLIDO 311 is referenced at a scale of 1:100,000 (Ferns et al., 2010), and its mapped extents intersect the IPC Proposed Route between towers 118/4 and 118/6 and the Morgan Lake Alternative alignment between towers ML-19/2 and ML-19/3. While IPC Proposed Route tower 118/5 and its associated work area are within the area mapped as SLIDO 311, the feature is considered as talus/colluvium, not a landslide, and is therefore unlikely to affect either alignment. While review of the DTM and aerial photographs does not suggest the presence of a landslide, a field reconnaissance of the area should be performed as part of the geotechnical exploration program.

E.2.17 SLIDO 2280, 2282, 2279, 2281, 56

SLIDO-3.4 FernML2001a_2280 and FernML2001b_2282
Northing: 5001693
Easting: 421505
Sheets 16

SLIDO-3.4 FernML2001b_2281
Northing: 4999554
Easting: 422283
Sheets 16

SLIDO-3.4 FernML2001a_2279
Northing: 5001494
Easting: 421225
Sheets 16

SLIDO-3.4 WalkGW2002_56
Northing: 4998896
Easting: 421881
Sheet 16

SLIDO 2280 and 2282 are a single small landslide that is located on the boundary between the USGS Glass Hill and Craig Mountain quadrangles. Review of the DTM and aerial photographs suggest that the features of the landslide extend beyond the SLIDO mapped limits, as shown on the Landslide Inventory (Sheet 16). The IPC Proposed Route crosses the apparent landslide limits between towers 118/6 and 119/2. An existing road is present in the apparent head scarp area (near the 2280 and 2282 contact line).

SLIDO 2279 is a small landslide located 300 feet south of SLIDO 2280 and 2282. An existing road is present in the apparent head scarp area. Review of the DTM suggests that SLIDO 2279 represents a debris flow source area for landslide deposits and colluvium that have been deposited in SLIDO 2281 between proposed tower locations 119/1 and 119/2.

SLIDO 56 and 2281 are mapped as the same landslide complex with different boundaries. SLIDO 56 is referenced at a scale of 1:500,000 (Walker et al., 2002), and SLIDO 2281 is referenced at a scale of 1:24,000 (Ferns, et al., 2001b). Portions of this landslide complex are also mapped at a scale of 1:24,000 by Barrash et al. (1980). The northern portion of the landslide complex, where the mapped extents intersect the IPC Proposed Route, was mapped as colluvium by Barrash, et al. (1980). However, landslide debris from SLIDO 2279, 2280, and 2282 are apparent in LiDAR data from this area.

Field reconnaissance between towers 118/6 and 119/3 should be performed as part of the geotechnical exploration program.

E.2.18 SLIDO 1113

SLIDO-3.4 AshlRP1966_1113
Northing: 4937305
Easting: 457071
Sheet 17

SLIDO 1113 is referenced at a scale of 1:21,100 (Ashley, 1966), and its mapped extents intersect the IPC Proposed Route between towers 171/1 and 171/2. The feature is mapped as alluvial fan deposits, not a landslide, and it is spanned between the two towers, so it is unlikely to affect the proposed tower foundations or associated work areas. For confirmation, a field reconnaissance of this area should be performed as part of the geotechnical exploration program.

E.2.19 SLIDO 1115

SLIDO-3.4 AshlRP1966_1115
Northing: 4936808
Easting: 457368
Sheet 17

SLIDO 1115 is referenced at a scale of 1:21,100 (Ashley, 1966), and its mapped extents intersect the IPC Proposed Route between towers 171/2 and 171/3. The feature is mapped as alluvial fan deposits, not a landslide, and it is spanned between the two towers, so it is unlikely to affect the proposed tower foundations or associated work areas. For confirmation, a field reconnaissance of this area should be performed as part of the geotechnical exploration program.

E.2.20 SLIDO 1103

SLIDO-3.4 AshlRP1966_1103
Northing: 4935742
Easting: 459042
Sheets 17

SLIDO 1103 is mapped by Ashley (1966) as stream alluvium and alluvial fans, not a landslide. The IPC Proposed Route crosses the feature between towers 171/4 and 172/1. The proposed tower locations and associated work areas are outside and above the mapped limits of the alluvium, which forms a flood plain along the banks of Burnt River. The area between towers 171/4 and 172/1 was visited on October 18, 2013, and evidence of landslide hazards was not observed.

E.2.21 SLIDO 1677

SLIDO-3.4 AshlRP1966_1677
Northing: 4935755
Easting: 457095
Sheet 17

SLIDO 1677 is referenced at a scale of 1:21,100 (Ashley, 1966), and its mapped extents intersect the IPC Proposed Route between towers 171/4 and 172/1. The feature is approximately 400 feet northeast of proposed tower 172/1 and is mapped as a landslide. Tower 172/1 and its associated work area are located on a ridge, well outside and above the mapped extents; but a field reconnaissance of this area should be performed as part of the geotechnical exploration program.

E.2.22 SLIDO 164, 167

SLIDO-3.4 AshlRP1966_164
Northing: 4932113
Easting: 459313
Sheet 18

SLIDO-3.4 AshlRP1966_167
Northing: 4931951
Easting: 459819
Sheet 18

SLIDO 164 and 167 were mapped as talus or colluvium by Ashley (1966), at a scale of 1:21,100. The IPC Proposed Route crosses the features between towers 175/1 and 175/3, with tower 175/2 and much of its associated work area being within the mapped extents. As the deposits are mapped as talus or colluvium, and not as landslides, and since tower 175/2 is on relatively level ground, the deposits are not likely to threaten the stability of proposed structures or work areas. For confirmation, a field reconnaissance of this area should be performed as part of the geotechnical exploration program.

E.2.23 PLS-005

PLS-005
Northing: 4921189
Easting: 473299
Sheet 20

PLS-005 is a small (approximately 1.7-acre) potential landslide that was identified during field reconnaissance. No evidence of recent movement was observed. The nearest proposed tower location (IPC Proposed Route tower 186/2) is approximately 500 feet uphill of this small potential landslide, and the proposed tower and work area would not be affected by it.

Photo 1: Toe of PLS-005 looking northeast from Dixie Creek Road

E.2.24 MLS-001

MLS 001
Northing: 4919678
Easting: 473265
Sheet 20, 21

MLS-001 is a possible landslide which crosses the IPC Proposed Route between towers 186/4 and 187/4, potentially affecting towers 187/1 to 187/4 and all associated work areas. MLS-001 is not included in SLIDO but is shown in published geologic mapping (Brooks, H.C., 1979). A field reconnaissance of this area should be performed as part of the geotechnical exploration program.

E.2.25 SLIDO 1706

SLIDO-3.4 BrooHC1979a_1706
Northing: 4917799
Easting: 472736
Sheets 21

SLIDO 1706 is referenced at a scale of 1:62,500 as a 387-acre landslide, and is part of a large landslide complex (approximately 3,300 acres) that extends around the north side of Table Rock Butte (Brooks, 1979). The IPC Proposed Route crosses the mapped extents of SLIDO 1706 between tower locations 188/1 and 188/3. A field reconnaissance of this area should be performed as part of the geotechnical exploration program.

E.2.26 SLIDO 1708

SLIDO-3.4 BrooHC1979a_1708
Northing: 4916158
Easting: 473547
Sheet 22

SLIDO 1708 is referenced at a scale of 1:62,500 as a 39-acre landslide on a northwest-facing slope above Goodman Creek (Brooks, 1979). The IPC Proposed Route crosses the landslide between towers 189/1 and 189/3, with tower 189/2 and its associated work area located within the mapped extents. Aerial photographs show existing transmission towers within the mapped limits of SLIDO 1708. The presence of existing transmission towers within this landslide suggests that the site is stable. However, a field reconnaissance of this area should be performed as part of the geotechnical exploration program.

E.2.27 SLIDO 1711

SLIDO-3.4 BrooHC1979a_1711
Northing: 4914501
Easting: 475058
Sheet 22

SLIDO 1711 is referenced at a scale of 1:62,500 as a 133-acre landslide complex (Brooks, 1979). An existing transmission line and access road run parallel to and along the mapped upper boundary of the landslide area. The IPC Proposed Route crosses the landslide below the existing road and transmission line, between proposed towers 190/2 and 191/2. The proposed towers and associated work areas are located at ridge spurs, between the gullies which are potential debris flow pathways. A field reconnaissance of this area should be performed as part of the geotechnical exploration program.

E.2.28 SLIDO 384, 1690, 1691

SLIDO-3.4 WalkGW2002_384
Northing: 4895721
Easting: 483947
Sheet 24

SLIDO-3.4 BrooHC1976_1691
Northing: 4895834
Easting: 484544
Sheet 24

SLIDO-3.4 BrooHC1976_1690
Northing: 4865101
Easting: 483604
Sheet 24

SLIDO 384 is referenced at a scale of 1:500,000 (Walker, 2002) and SLIDO 1690 and 1691 are referenced at a scale of 1:250,000 (Brooks and others, 1976). Brooks (1976) mapped the area as landslide deposits. The proposed locations of IPC Proposed Route towers 204/2 through 205/2 and associated work areas are within the limits of the mapped landslide deposits. On October 17, 2013, a site visit of this landslide area was conducted. It is our opinion that SLIDO 384, 1690, and 1691 map an ancient landslide complex. We observed some eroded (old) scarps, areas of hummocky topography, and generally mature drainages. The lack of fresh scarps and maturity of the drainages suggests that the landslide is old and may not be currently active. If scarps, steep slopes, and loose material are avoided, it may be possible to build tower foundations through the complex. More detailed reconnaissance of the area should be performed as part of the geotechnical explorations.

Photo 2: Looking south into the toe of landslide complex; approximate locations of towers 204/2 through 204/4 shown for reference.

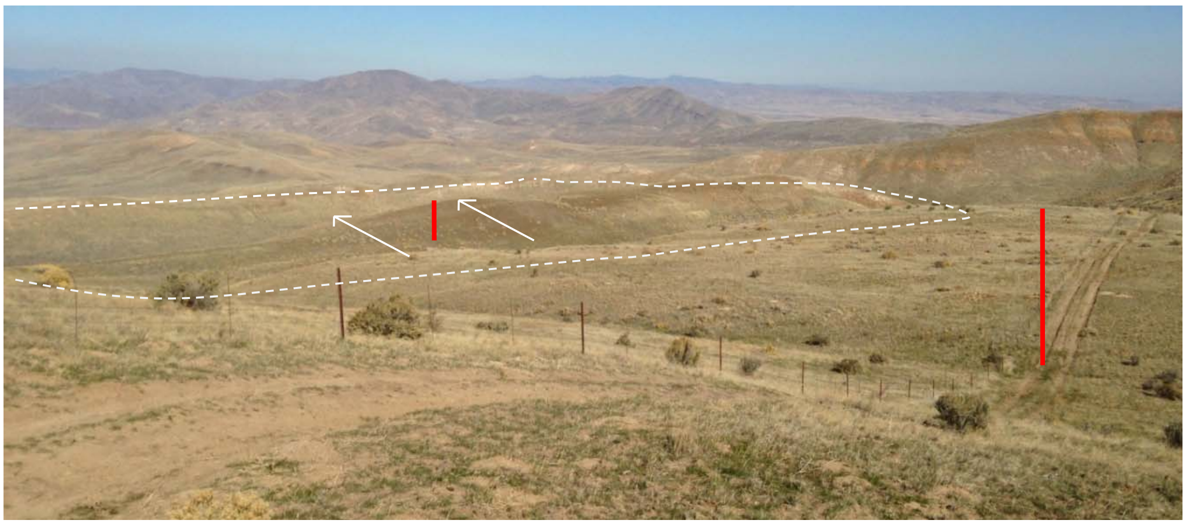


Photo 3: Looking north into the landslide complex; approximate locations of towers 205/2 and 205/3 shown for reference.

E.2.29 SLIDO 2027, 2030

SLIDO-3.4 FernML1993a_2027
Northing: 4866541
Easting: 461275
Sheet 25

SLIDO-3.4 FernML1993a_2030
Northing: 4865497
Easting: 462136
Sheet 25

SLIDO 2027 and 2030 are referenced at the scale of 1:100,000 (Ferns et al., 1993a). However, these landslide deposits (Pleistocene and Holocene Qls) have been mapped at the scale of 1:24,000 (Brooks, 1991). SLIDO 2030 is described as a slumped section of upper-Miocene volcanic rocks over 2 miles long and up to 2,000 feet wide, and SLIDO 2027 is described as a hummocky area underlain by a fragmented sequence of sedimentary deposits with blocks of andesite or basalt (Brooks, 1991). These two landslide areas cover 1,570 acres and are separated by the Malheur River. The IPC Proposed Route crosses the Malheur River Canyon along the northeastern edge of SLIDO 2027 and 2030. Proposed tower 232/3 is located on a bedrock bluff of upper-Miocene volcanic rock. A talus slope is present between the bluff and the Oregon Vale Canal. The canal is located on the landslide deposits (SLIDO 2027) at the base of the talus slope; and proposed tower 232/4 is located in landslide deposits between the canal and the Malheur River. Proposed towers 233/1 to 233/3 are located in the slumped volcanic rocks (SLIDO 2030) on the eastern/southern side of the river.

On November 17, 2011, a site visit of this landslide area was conducted by walking along the access road on the southeast side of the Malheur River from the eastern end of SLIDO 2030. Since the Oregon Canal is constructed on SLIDO 2027, these landslide deposits are potentially relatively stable. More detailed reconnaissance of the area should be performed as part of the geotechnical explorations.

E.2.30 MLS-002

MLS-002
Northing: 4842280
Easting: 486369
Sheet 26

MLS-002 is not included in SLIDO but is on the 1:24,000 scale *Geologic Map of Owyhee Dam Quadrangle* (Ferns, 1989). IPC Proposed Route tower 256/2 and its associated work area are located on the eastern margin of the mapped landslide. This landslide complex was observed from Owyhee Lake Road during a site visit on October 2, 2011. A canal and aqueduct are located on the bluff immediately above the landslide, and a siphon pipe that crosses the Owyhee River Canyon is located along the western edge of the landslide complex. The presence of the water facilities and roads suggests that this landslide is relatively stable. However, more detailed reconnaissance of the area should be performed as part of the geotechnical explorations.

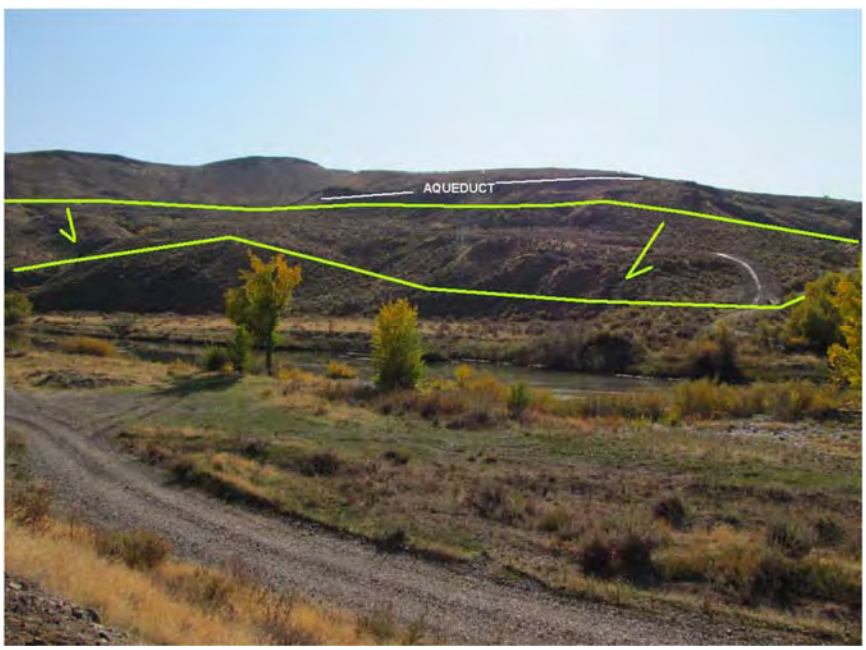
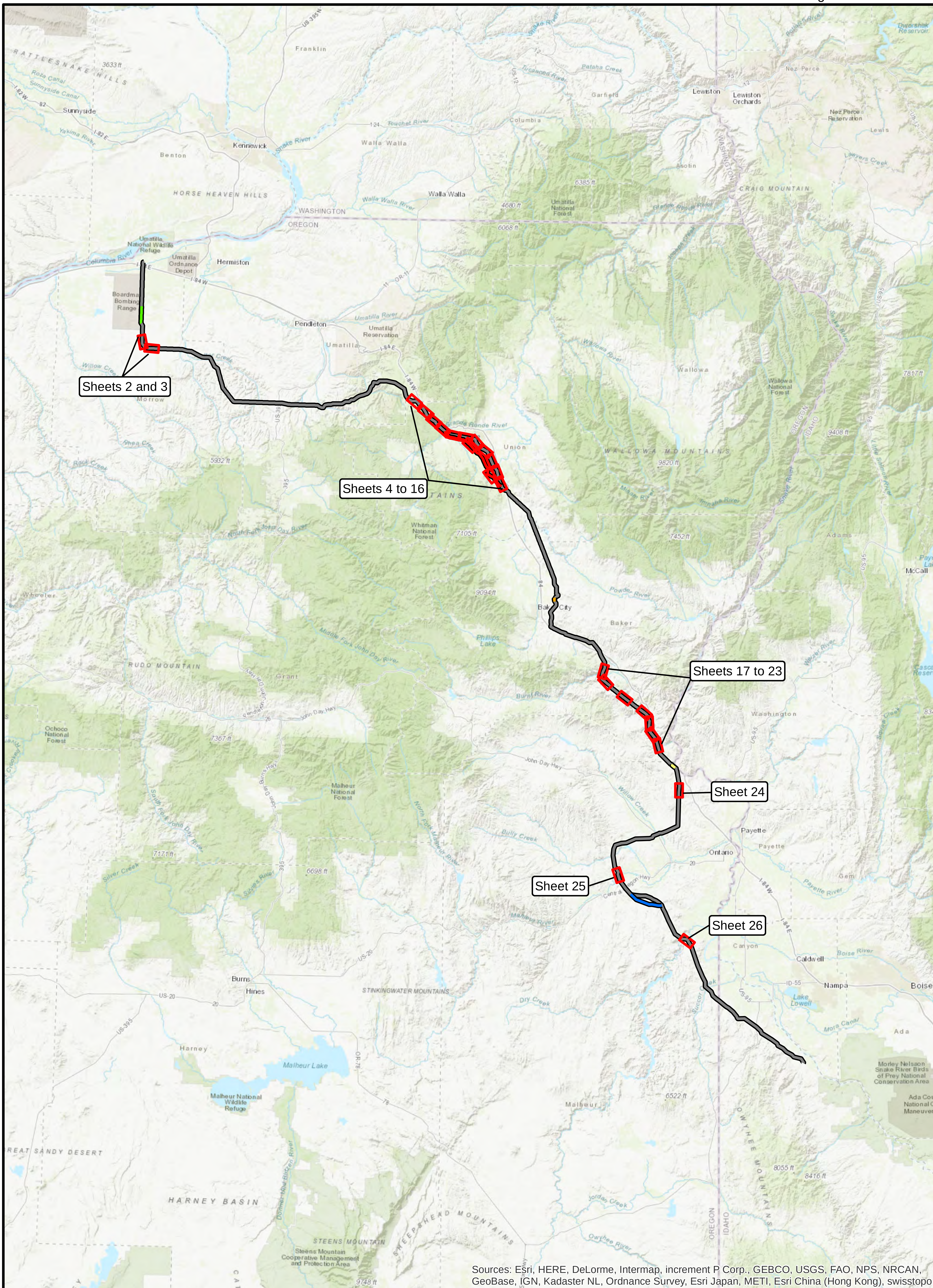


Photo 4: View of MLS-002 looking southeast from Owyhee River Road.

TABLE E1: LANDSLIDE DATA FOR MULTI-USE AREAS LOCATED OUTSIDE MAP BOUNDARIES

Multi-Use Area	Northing (meters)	Easting (meters)	SLIDO ID	Distance to Multi-Use Area (feet)	Direction from Multi-Use Area	Map Unit Label	SLIDO Type	Likely Hazard
MU BA-04	4936252	461150	AshlRP1966_1103	1,800	NW	Qal	Fan	none
MU BA-04	4936252	461150	ProsHJ1967_1148	1,190	N	Qal	Talus-Colluvium	none
MU BA-04	4936252	461150	ProsHJ1967_1149	2,430	SW	Qal	Talus-Colluvium	none
MU BA-05	4921133	473443	BrooHC1979a_1707	1,078	SW	Qls	Landslide	low
MU BA-06	4911097	478177	BrooHC1979a_3463	890	W	Qtg	Talus-Colluvium	none
MU MA-07	4839634	492740	FernML1993a_2070	1,460	SW	Qls	Landslide	none
MU MO-02	5051813	301969	MadiIP2007_43	330	W	Qf	Fan	none



LEGEND

- IPC Proposed Route
- West Bombing Range Road Alternative 1
- West Bombing Range Road Alternative 2
- Morgan Lake Alternative
- Proposed 230-kV Rebuild
- Proposed 138-kV Rebuild
- Double Mountain Alternative
- Map Sheets

0 20 40 Miles

Boardman - Hemingway
500kV Transmission Line
Oregon - Idaho

LANDSLIDE INVENTORY INDEX MAP

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LEGEND

IPC Proposed Route
West of Bombing Range Road - Alternative 1
West of Bombing Range Road - Alternative 2
Morgan Lake Alternative

TRANSMISSION FEATURES

Proposed Boring (HDR, 1/24/18)
Mileposts
Historic Landslides
Construction Disturbance
Multi-Use Areas
Structure Work Areas

ROADS

New, Bladed
New, Primitive
Existing, Moderate to Extensive Improvements
No Substantial Improvements
Primary US and State Highways
Railroad

MAPPED FEATURE ORIGIN

Published Mapping
SLIDO (Pre 3.4)
Field, LiDAR, and Photo Mapping

SLIDO 3.4 CLASSIFICATION

Fan
Landslide
Talus - Colluvium

MAPPED SLIDE FEATURES

Flow Direction
Scarp
Feature Limits

0 1,000 2,000 Feet

Boardman - Hemingway
500kV Transmission Line
Oregon - Idaho

LANDSLIDE INVENTORY

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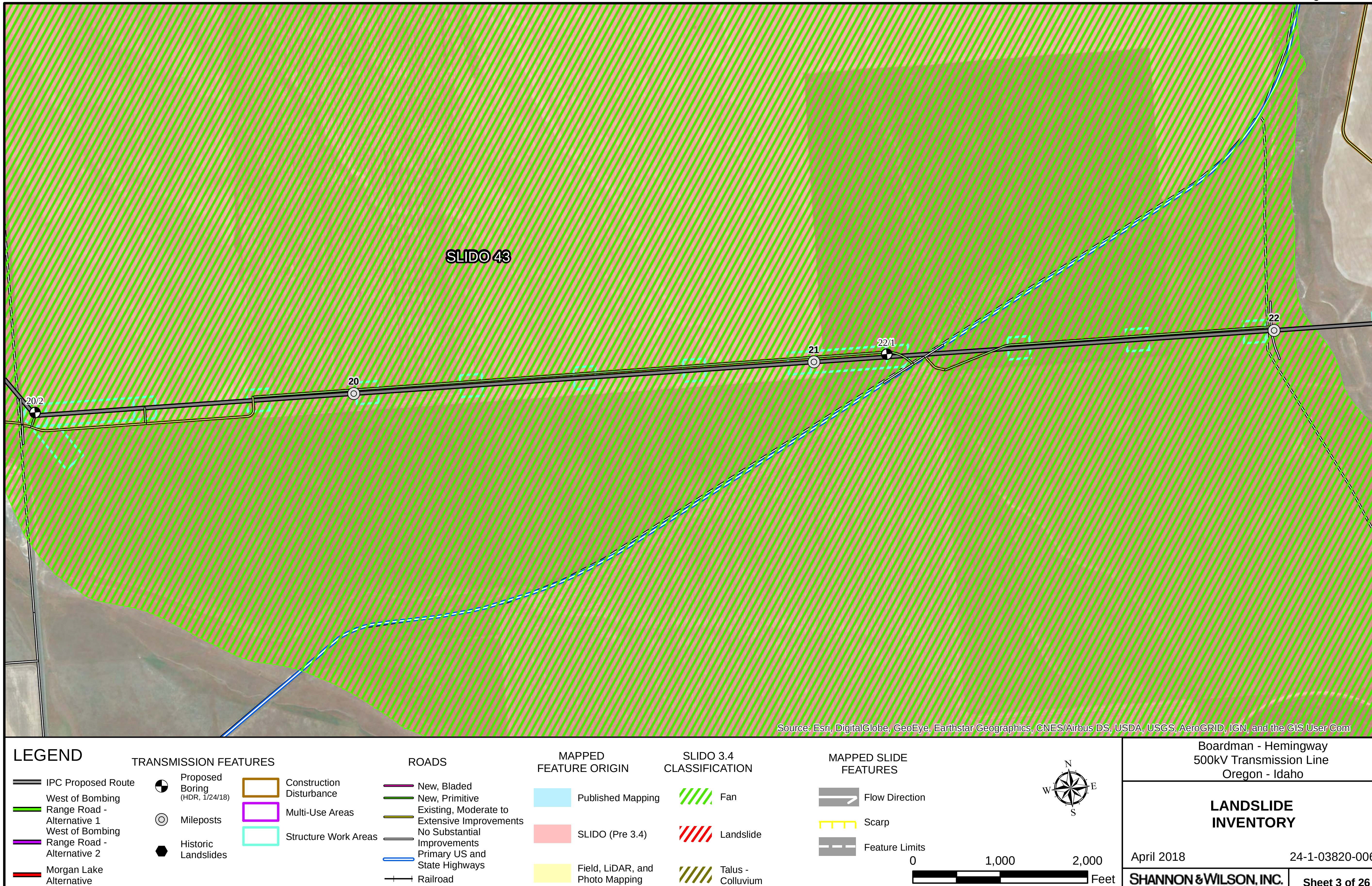

Boardman - Hemingway
500kV Transmission Line
Oregon - Idaho

LANDSLIDE INVENTORY

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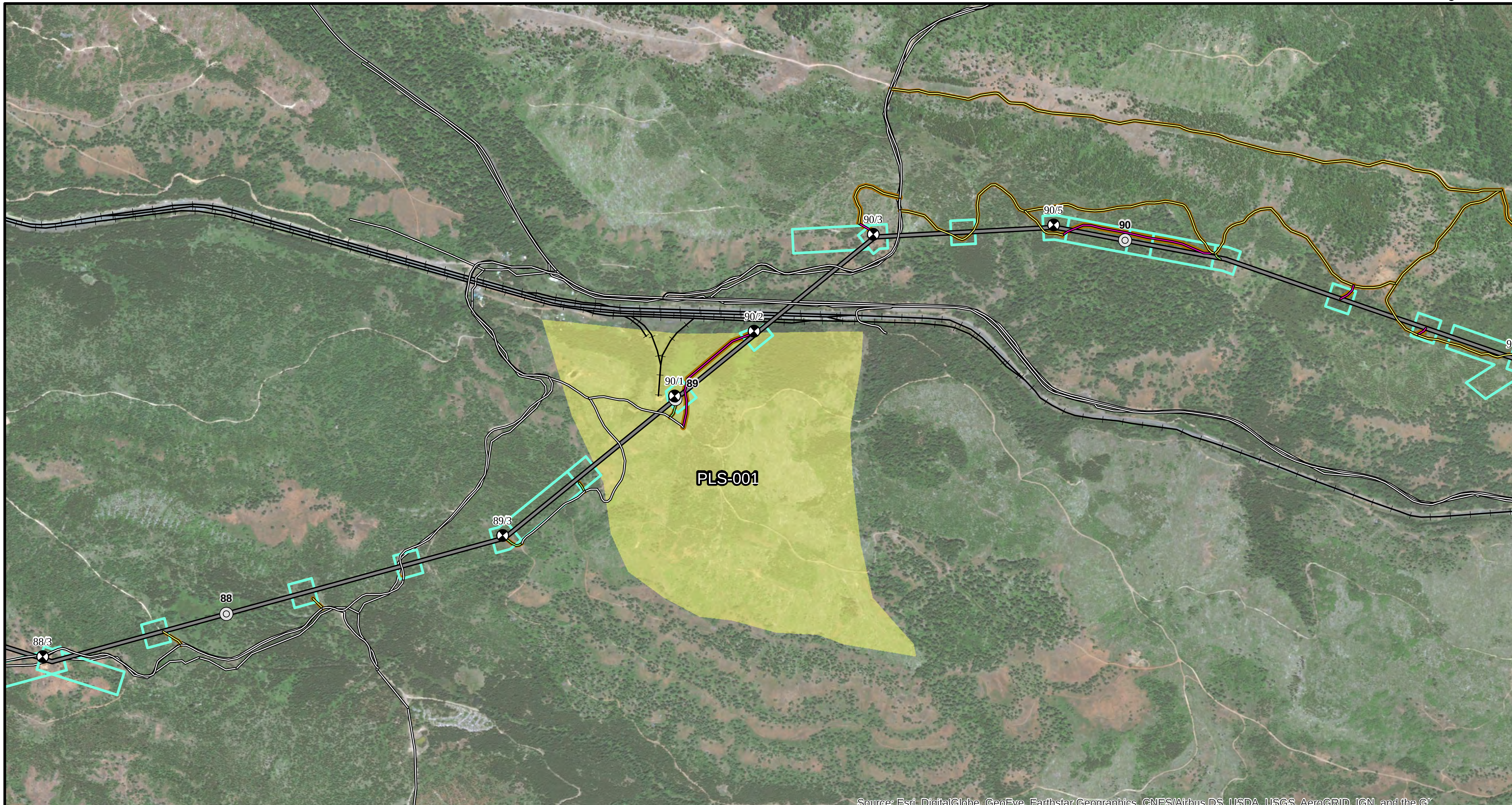

LEGEND

TRANSMISSION FEATURES
- IPC Proposed Route
- West of Bombing Range Road - Alternative 1
- West of Bombing Range Road - Alternative 2
- Morgan Lake Alternative
- Proposed Boring (HDR, 1/24/18)
- Mileposts
- Historic Landslides
- Construction Disturbance
- Multi-Use Areas
- Structure Work Areas

ROADS
- New, Bladed
- New, Primitive
- Existing, Moderate to Extensive Improvements
- No Substantial Improvements
- Primary US and State Highways
- Railroad

MAPPED FEATURE ORIGIN
- Published Mapping
- SLIDO (Pre 3.4)
- Field, LiDAR, and Photo Mapping

SLIDO 3.4 CLASSIFICATION
- Fan
- Landslide
- Talus - Colluvium

MAPPED SLIDE FEATURES
- Flow Direction
- Scarp
- Feature Limits

0 1,000 2,000 Feet

Boardman - Hemingway
500kV Transmission Line
Oregon - Idaho

LANDSLIDE INVENTORY

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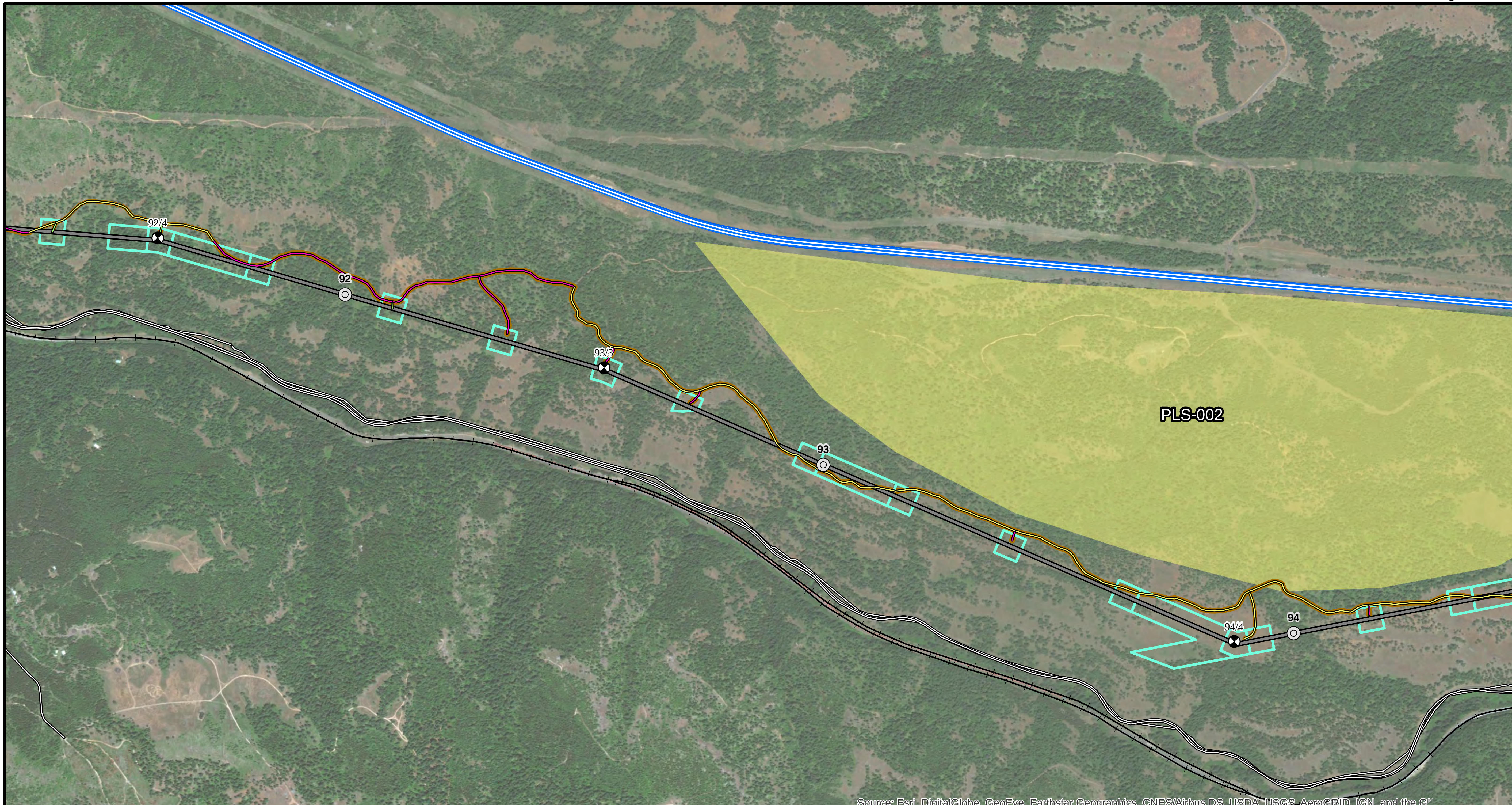

LEGEND

TRANSMISSION FEATURES
- IPC Proposed Route
- West of Bombing Range Road - Alternative 1
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MAPPED FEATURE ORIGIN
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SLIDO 3.4 CLASSIFICATION
- Fan
- Landslide
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MAPPED SLIDE FEATURES
- Flow Direction
- Scarp
- Feature Limits

0 1,000 2,000 Feet

Boardman - Hemingway
500kV Transmission Line
Oregon - Idaho

LANDSLIDE INVENTORY

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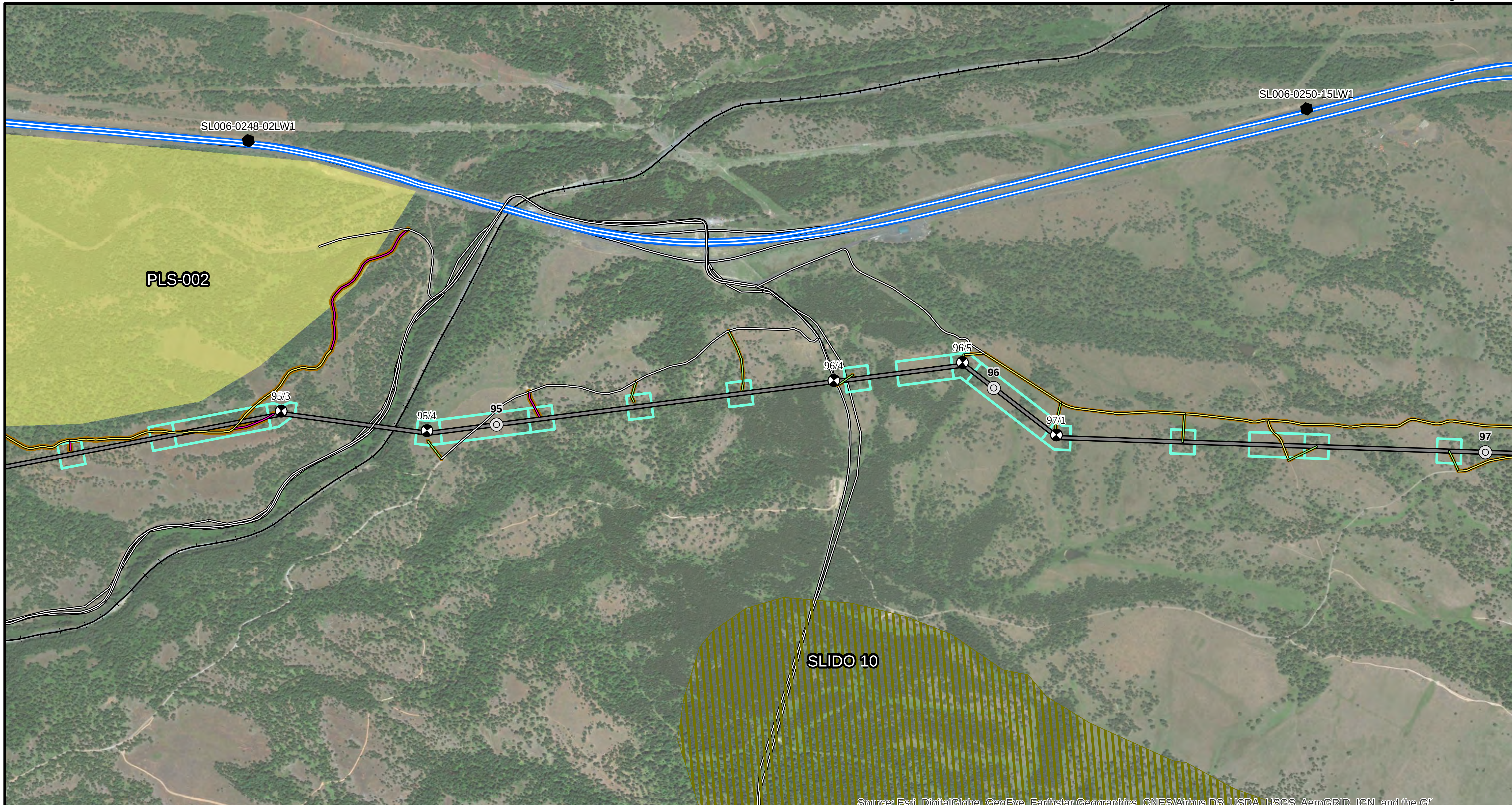

LEGEND

TRANSMISSION FEATURES

- IPC Proposed Route
- West of Bombing Range Road - Alternative 1
- West of Bombing Range Road - Alternative 2
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ROADS

- New, Bladed
- New, Primitive
- Existing, Moderate to Extensive Improvements
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- Primary US and State Highways
- Railroad

MAPPED FEATURE ORIGIN

- Published Mapping
- SLIDO (Pre 3.4)
- Field, LiDAR, and Photo Mapping

SLIDO 3.4 CLASSIFICATION

- Fan
- Landslide
- Talus - Colluvium

MAPPED SLIDE FEATURES

- Flow Direction
- Scarp
- Feature Limits

0 1,000 2,000 Feet

Boardman - Hemingway
500kV Transmission Line
Oregon - Idaho

LANDSLIDE INVENTORY

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LEGEND

TRANSMISSION FEATURES
- IPC Proposed Route
- West of Bombing Range Road - Alternative 1
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MAPPED FEATURE ORIGIN
- Published Mapping
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- Field, LiDAR, and Photo Mapping

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- Landslide
- Talus - Colluvium

MAPPED SLIDE FEATURES
- Flow Direction
- Scarp
- Feature Limits

0 1,000 2,000 Feet

Boardman - Hemingway
500kV Transmission Line
Oregon - Idaho

LANDSLIDE INVENTORY

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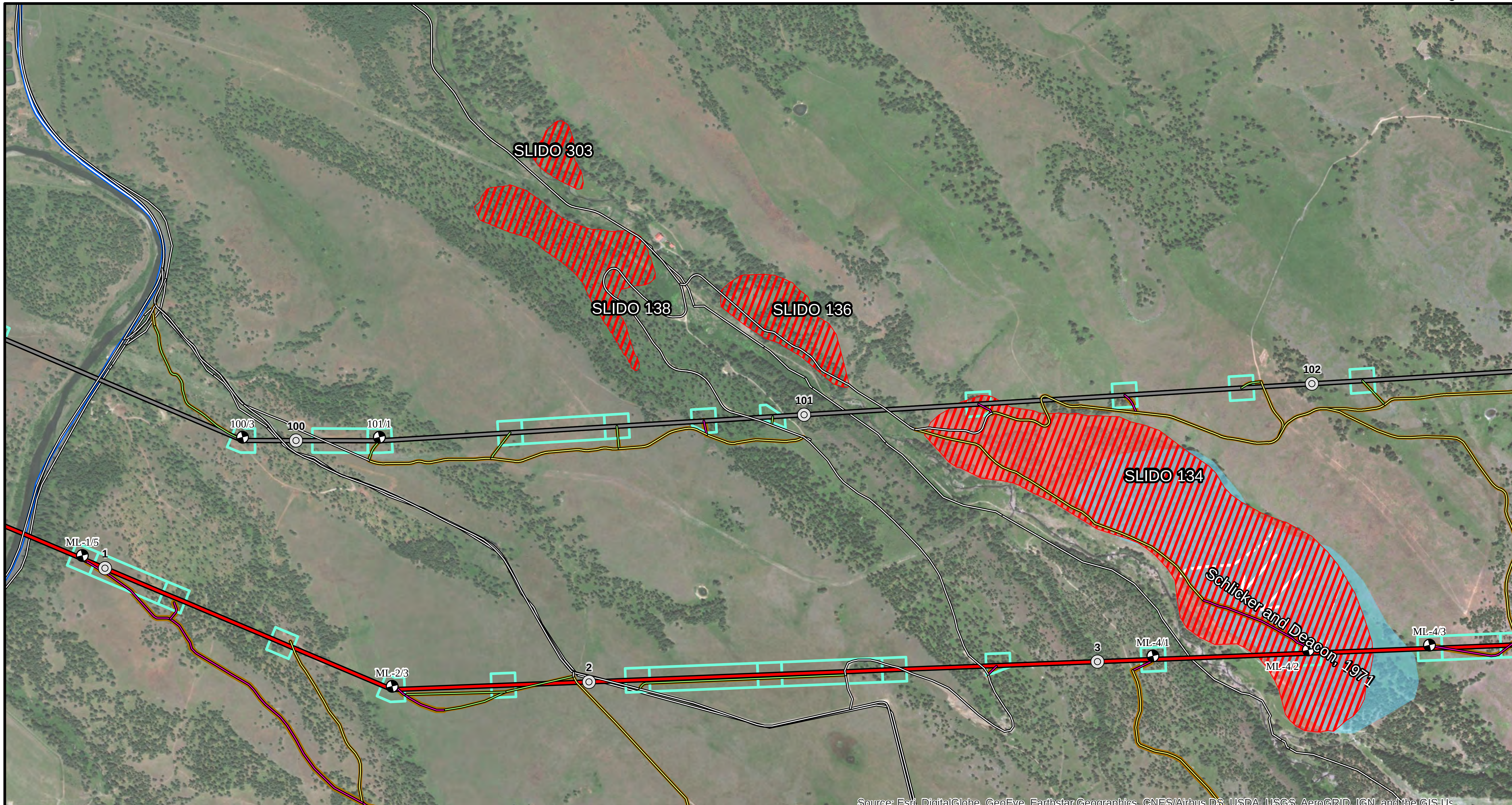

LEGEND

TRANSMISSION FEATURES
- IPC Proposed Route
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MAPPED SLIDE FEATURES
- Flow Direction
- Scarp
- Feature Limits

N E S W

0 1,000 2,000 Feet

Boardman - Hemingway
500kV Transmission Line
Oregon - Idaho

LANDSLIDE INVENTORY

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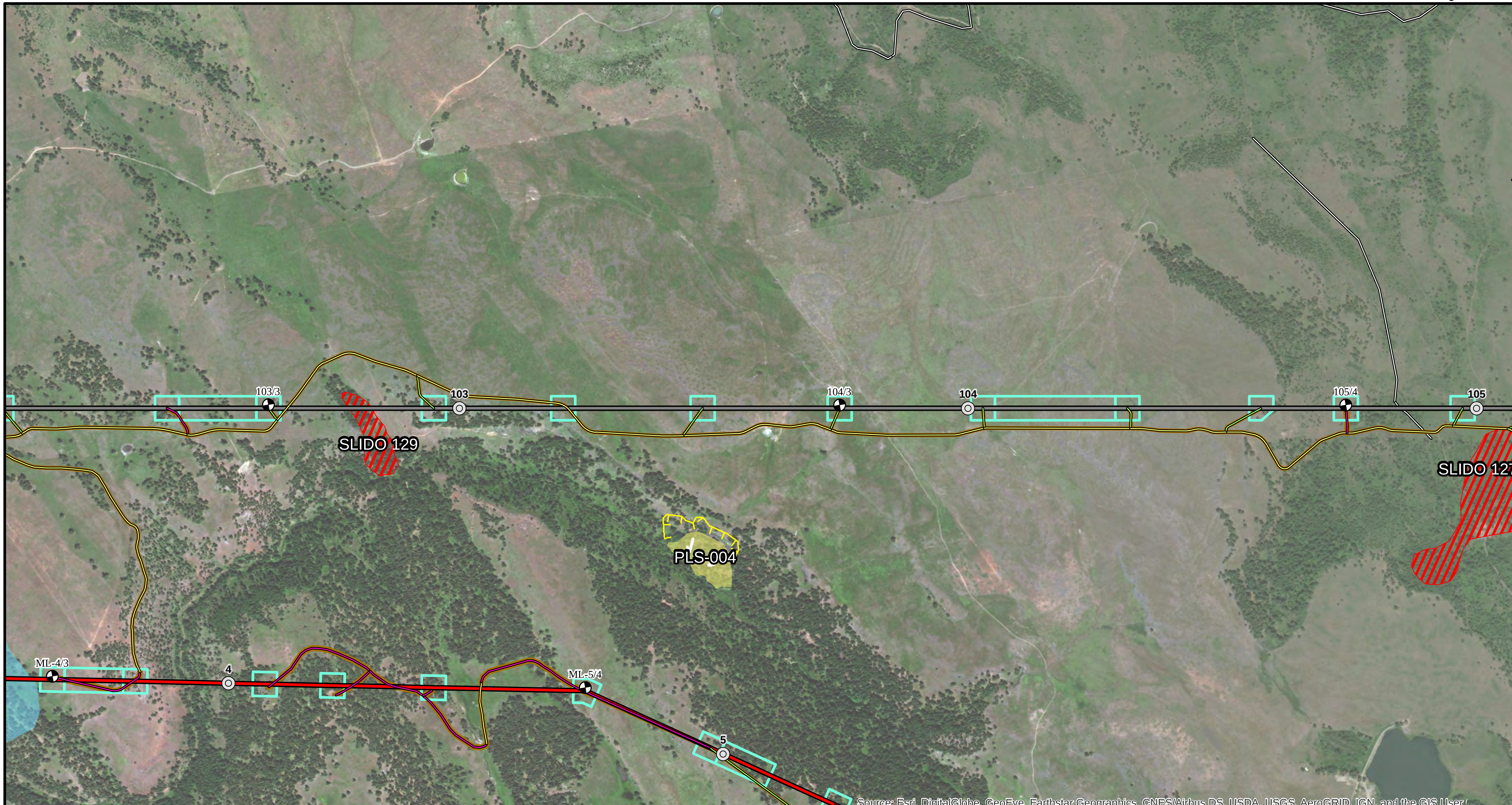

LEGEND

TRANSMISSION FEATURES
- IPC Proposed Route
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SLIDO 3.4 CLASSIFICATION
- Fan
- Landslide
- Talus - Colluvium

MAPPED SLIDE FEATURES
- Flow Direction
- Scarp
- Feature Limits

N W E S

0 1,000 2,000 Feet

Boardman - Hemingway
500kV Transmission Line
Oregon - Idaho

LANDSLIDE INVENTORY

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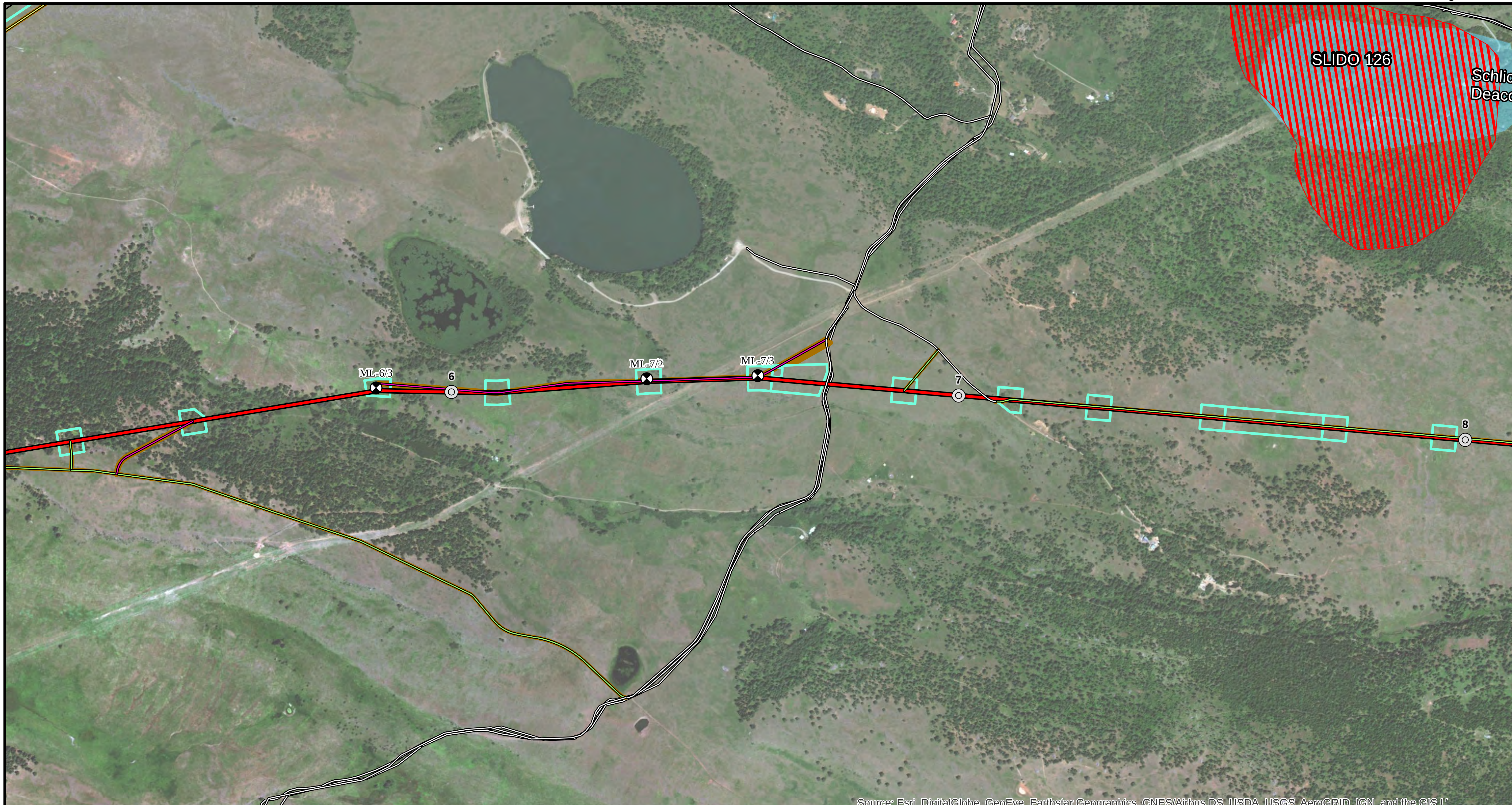

LEGEND

IPC Proposed Route
West of Bombing Range Road - Alternative 1
West of Bombing Range Road - Alternative 2
Morgan Lake Alternative

TRANSMISSION FEATURES
Proposed Boring (HDR, 1/24/18)
Mileposts
Historic Landslides
Construction Disturbance
Multi-Use Areas
Structure Work Areas

ROADS
New, Bladed
New, Primitive
Existing, Moderate to Extensive Improvements
No Substantial Improvements
Primary US and State Highways
Railroad

MAPPED FEATURE ORIGIN
Published Mapping
SLIDO (Pre 3.4)
Field, LiDAR, and Photo Mapping

SLIDO 3.4 CLASSIFICATION
Fan
Landslide
Talus - Colluvium

MAPPED SLIDE FEATURES
Flow Direction
Scarp
Feature Limits

0 1,000 2,000 Feet

Boardman - Hemingway
500kV Transmission Line
Oregon - Idaho

LANDSLIDE INVENTORY

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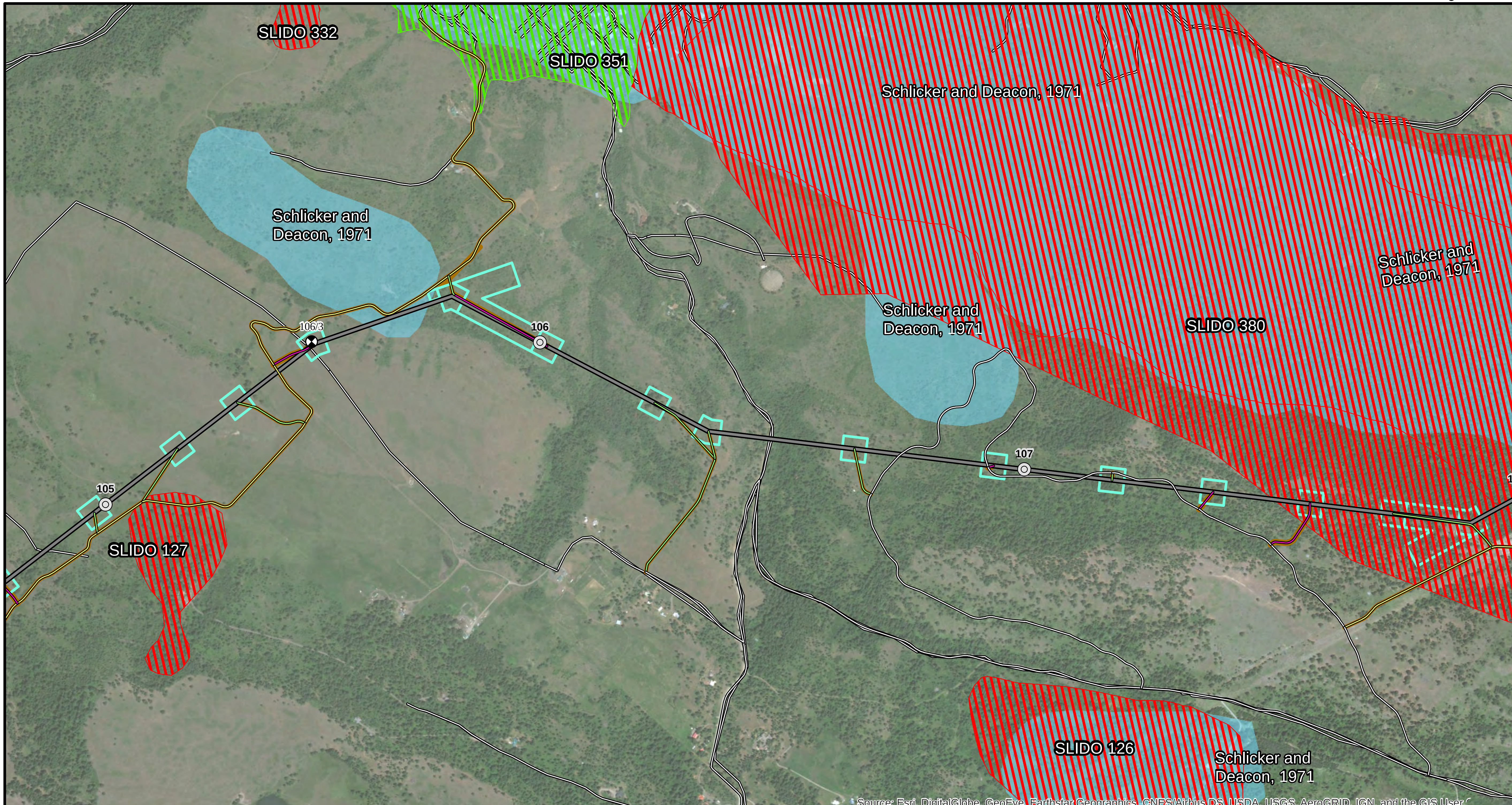

LEGEND

TRANSMISSION FEATURES
- IPC Proposed Route
- West of Bombing Range Road - Alternative 1
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- Railroad

MAPPED FEATURE ORIGIN
- Published Mapping
- SLIDO (Pre 3.4)
- Field, LiDAR, and Photo Mapping

SLIDO 3.4 CLASSIFICATION
- Fan
- Landslide
- Talus - Colluvium

MAPPED SLIDE FEATURES
- Flow Direction
- Scarp
- Feature Limits

0 1,000 2,000 Feet

Boardman - Hemingway
500kV Transmission Line
Oregon - Idaho

LANDSLIDE INVENTORY

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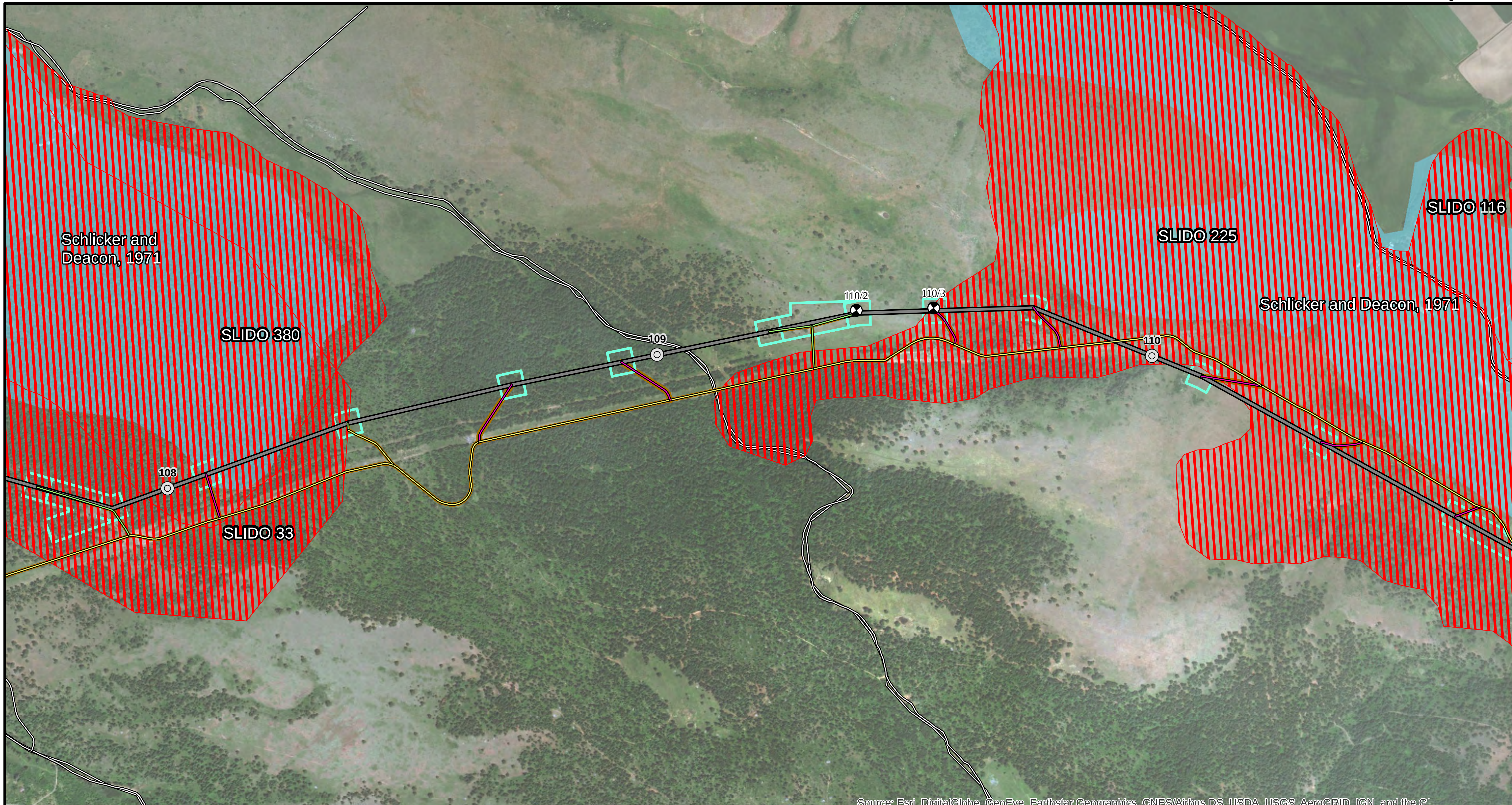

LEGEND

TRANSMISSION FEATURES
- IPC Proposed Route
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- Railroad

MAPPED FEATURE ORIGIN
- Published Mapping
- SLIDO (Pre 3.4)
- Field, LiDAR, and Photo Mapping

SLIDO 3.4 CLASSIFICATION
- Fan
- Landslide
- Talus - Colluvium

MAPPED SLIDE FEATURES
- Flow Direction
- Scarp
- Feature Limits

0 1,000 2,000 Feet

Boardman - Hemingway
500kV Transmission Line
Oregon - Idaho

LANDSLIDE INVENTORY

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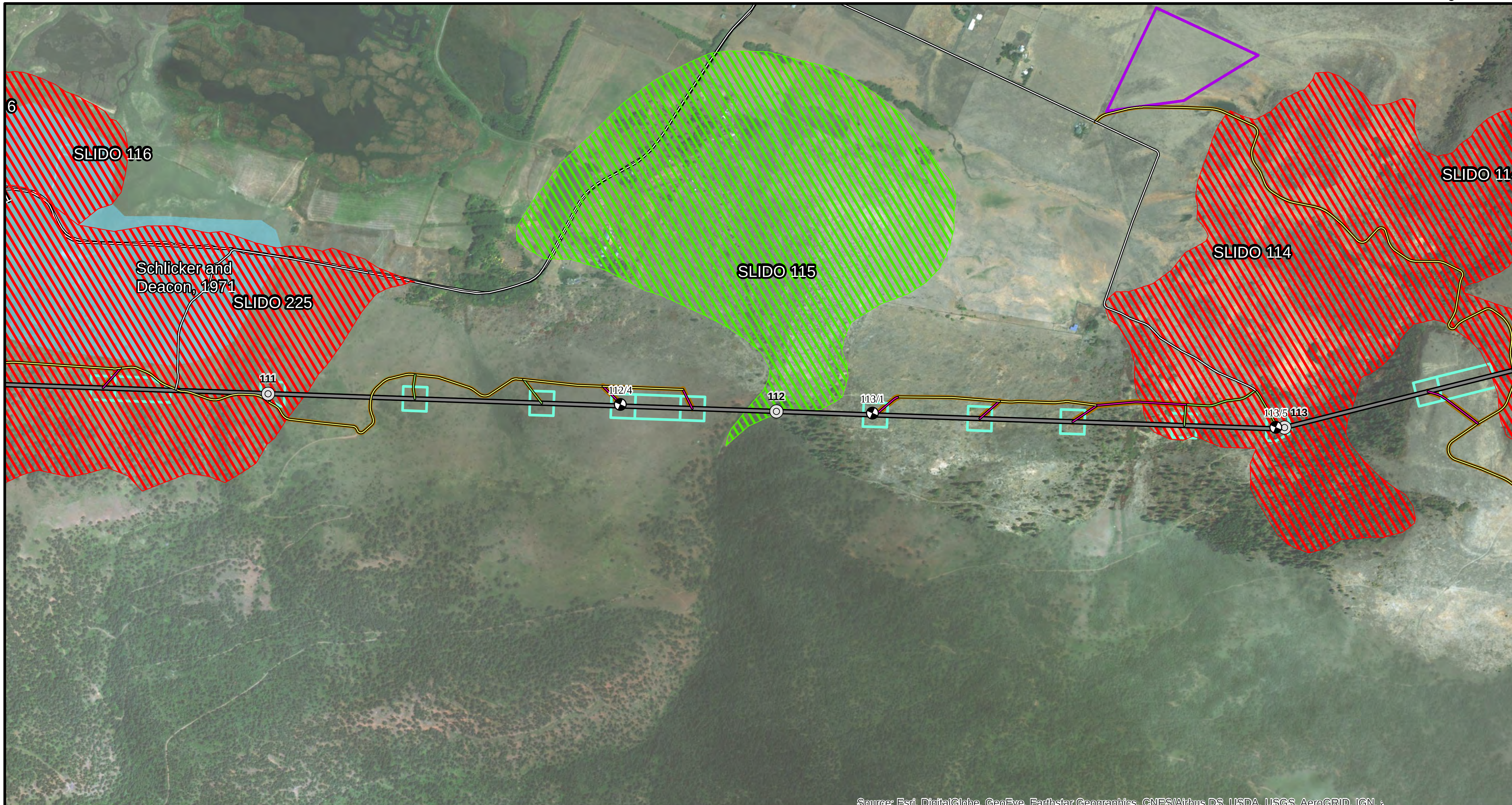

LEGEND

TRANSMISSION FEATURES
- IPC Proposed Route
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MAPPED FEATURE ORIGIN
- Published Mapping
- SLIDO (Pre 3.4)
- Field, LiDAR, and Photo Mapping

SLIDO 3.4 CLASSIFICATION
- Fan
- Landslide
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MAPPED SLIDE FEATURES
- Flow Direction
- Scarp
- Feature Limits

0 1,000 2,000 Feet

Boardman - Hemingway
500kV Transmission Line
Oregon - Idaho

LANDSLIDE INVENTORY

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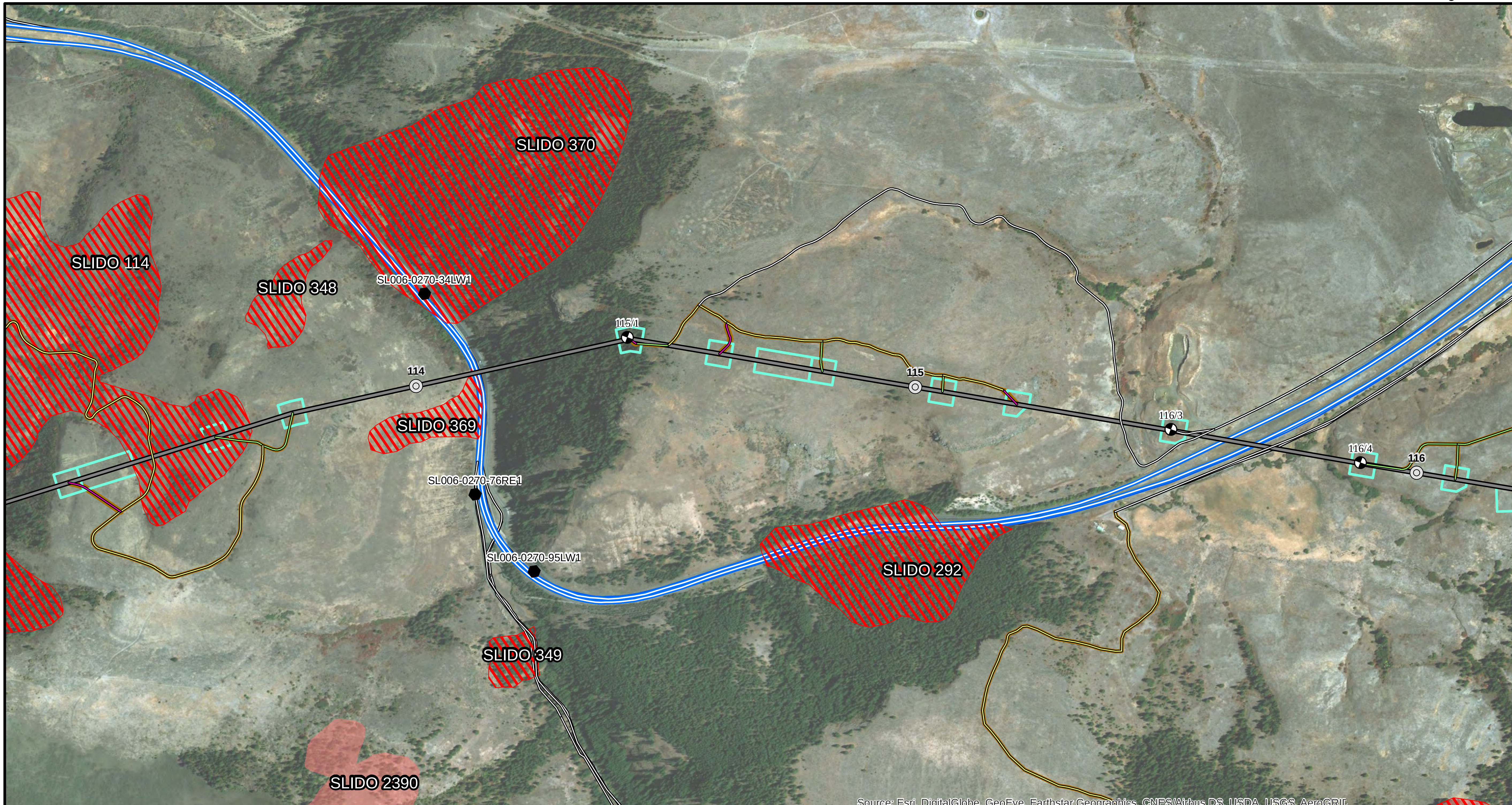

LEGEND

TRANSMISSION FEATURES
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- Railroad

MAPPED FEATURE ORIGIN
- Published Mapping
- SLIDO (Pre 3.4)
- Field, LiDAR, and Photo Mapping

SLIDO 3.4 CLASSIFICATION
- Fan
- Landslide
- Talus - Colluvium

MAPPED SLIDE FEATURES
- Flow Direction
- Scarp
- Feature Limits

0 1,000 2,000 Feet

Boardman - Hemingway
500kV Transmission Line
Oregon - Idaho

LANDSLIDE INVENTORY

April 2018 24-1-03820-006

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LEGEND

TRANSMISSION FEATURES

- IPC Proposed Route
- West of Bombing Range Road - Alternative 1
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- Railroad

MAPPED FEATURE ORIGIN

- Published Mapping
- SLIDO (Pre 3.4)
- Field, LiDAR, and Photo Mapping

SLIDO 3.4 CLASSIFICATION

- Fan
- Landslide
- Talus - Colluvium

MAPPED SLIDE FEATURES

- Flow Direction
- Scarp
- Feature Limits

0 1,000 2,000 Feet

Boardman - Hemingway
500kV Transmission Line
Oregon - Idaho

LANDSLIDE INVENTORY

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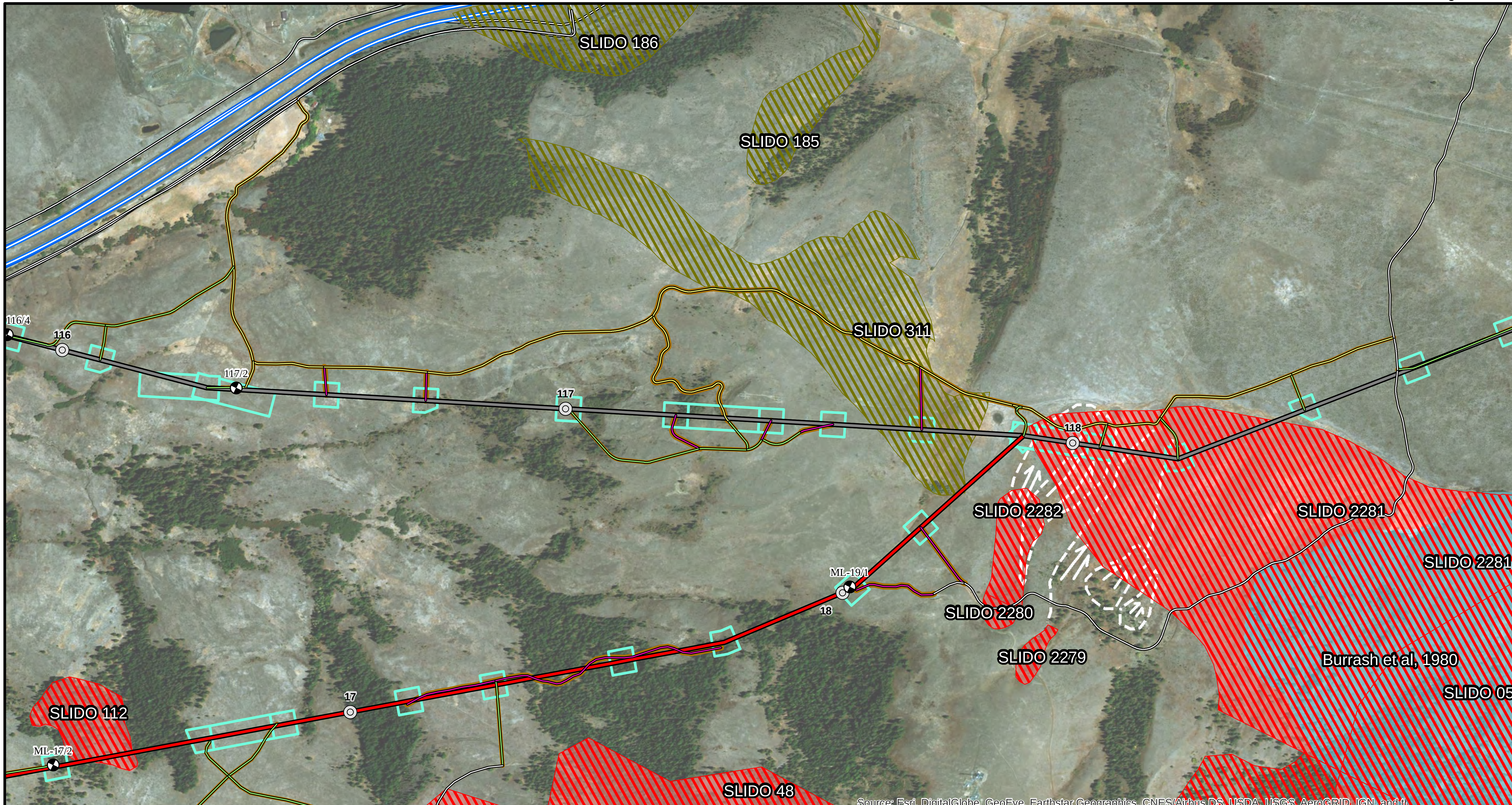

LEGEND

TRANSMISSION FEATURES
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MAPPED FEATURE ORIGIN
- Published Mapping
- SLIDO (Pre 3.4)
- Field, LiDAR, and Photo Mapping

SLIDO 3.4 CLASSIFICATION
- Fan
- Landslide
- Talus - Colluvium

MAPPED SLIDE FEATURES
- Flow Direction
- Scarp
- Feature Limits

0 1,000 2,000 Feet

Boardman - Hemingway
500kV Transmission Line
Oregon - Idaho

LANDSLIDE INVENTORY

April 2018 24-1-03820-006

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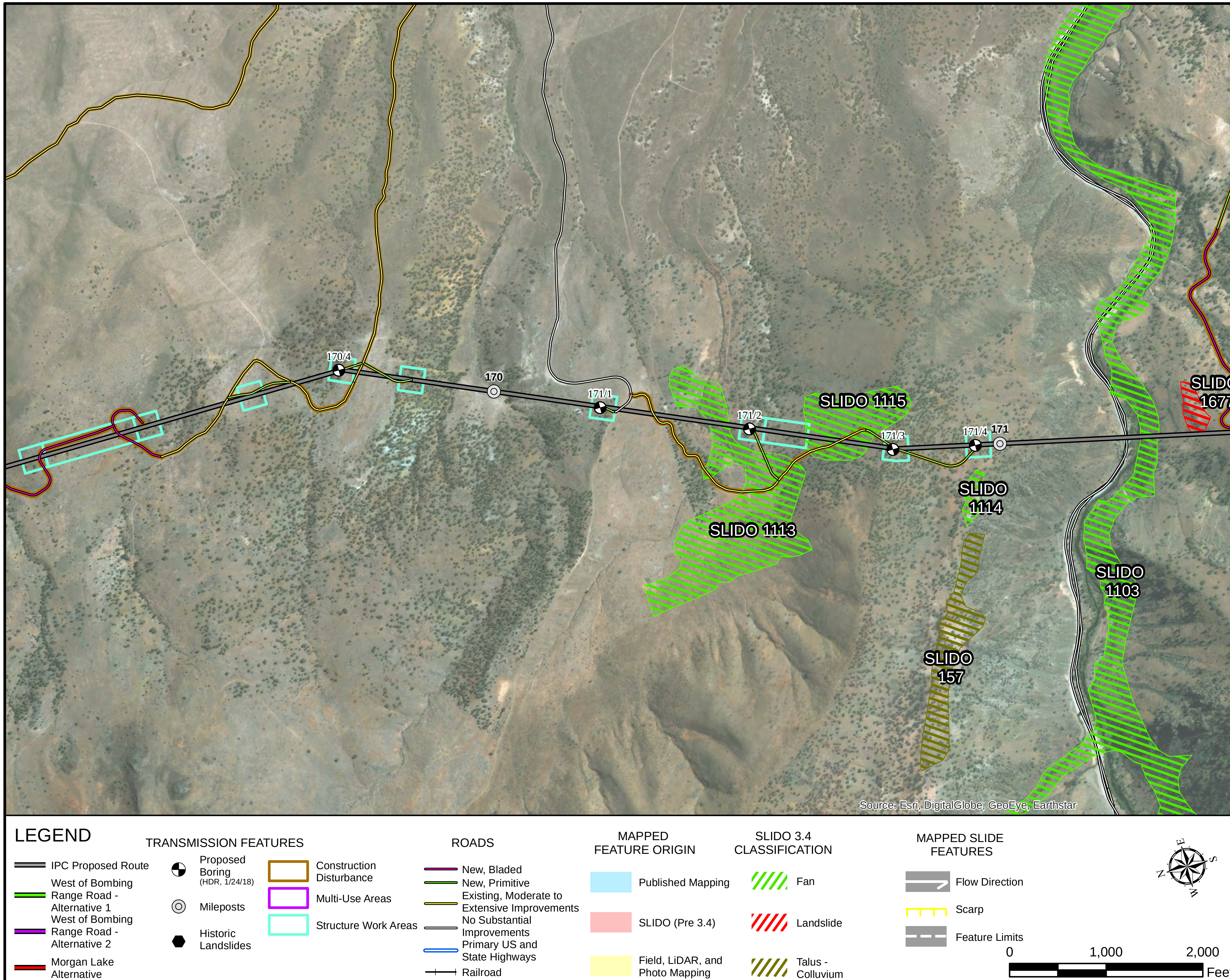

Boardman - Hemingway
500kV Transmission Line
Oregon - Idaho

LANDSLIDE INVENTORY

April 2018 24-1-03820-006

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LEGEND

IPC Proposed Route
West of Bombing Range Road - Alternative 1
West of Bombing Range Road - Alternative 2
Morgan Lake Alternative

TRANSMISSION FEATURES
Proposed Boring (HDR, 1/24/18)
Mileposts
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ROADS
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Existing, Moderate to Extensive Improvements
No Substantial Improvements
Primary US and State Highways
Railroad

MAPPED FEATURE ORIGIN
Published Mapping
SLIDO (Pre 3.4)
Field, LiDAR, and Photo Mapping

SLIDO 3.4 CLASSIFICATION
Fan
Landslide
Talus - Colluvium

MAPPED SLIDE FEATURES
Flow Direction
Scarp
Feature Limits

0 1,000 2,000 Feet

Boardman - Hemingway
500kV Transmission Line
Oregon - Idaho

LANDSLIDE INVENTORY

April 2018 24-1-03820-006

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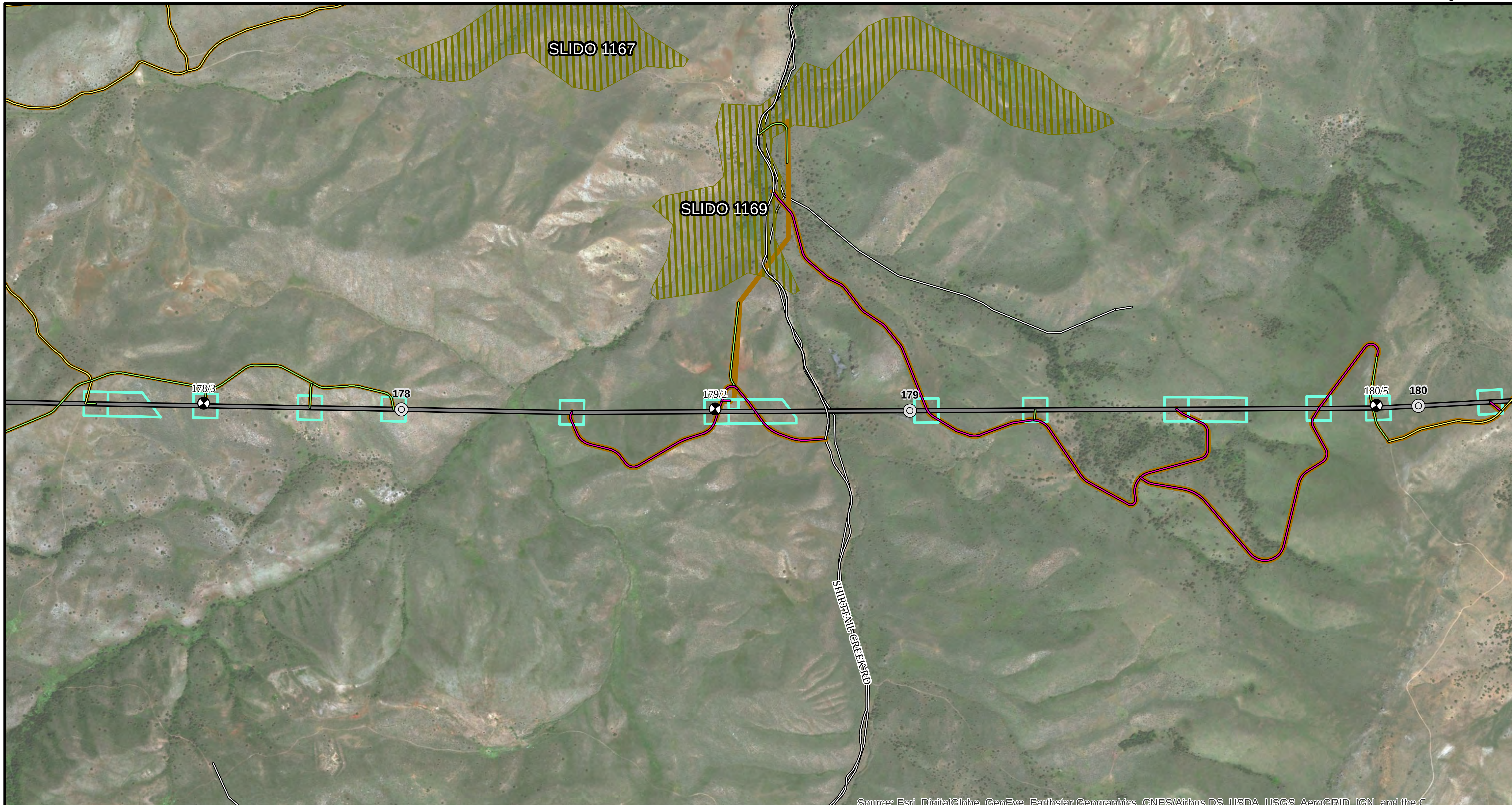

LEGEND

TRANSMISSION FEATURES
- IPC Proposed Route
- West of Bombing Range Road - Alternative 1
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ROADS
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MAPPED FEATURE ORIGIN
- Published Mapping
- SLIDO (Pre 3.4)
- Field, LiDAR, and Photo Mapping

SLIDO 3.4 CLASSIFICATION
- Fan
- Landslide
- Talus - Colluvium

MAPPED SLIDE FEATURES
- Flow Direction
- Scarp
- Feature Limits

0 1,000 2,000 Feet

Boardman - Hemingway
500kV Transmission Line
Oregon - Idaho

LANDSLIDE INVENTORY

April 2018 24-1-03820-006

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LEGEND

TRANSMISSION FEATURES
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MAPPED FEATURE ORIGIN
- Published Mapping
- SLIDO (Pre 3.4)
- Field, LiDAR, and Photo Mapping

SLIDO 3.4 CLASSIFICATION
- Fan
- Landslide
- Talus - Colluvium

MAPPED SLIDE FEATURES
- Flow Direction
- Scarp
- Feature Limits

0 1,000 2,000 Feet

Boardman - Hemingway
500kV Transmission Line
Oregon - Idaho

LANDSLIDE INVENTORY

April 2018 24-1-03820-006

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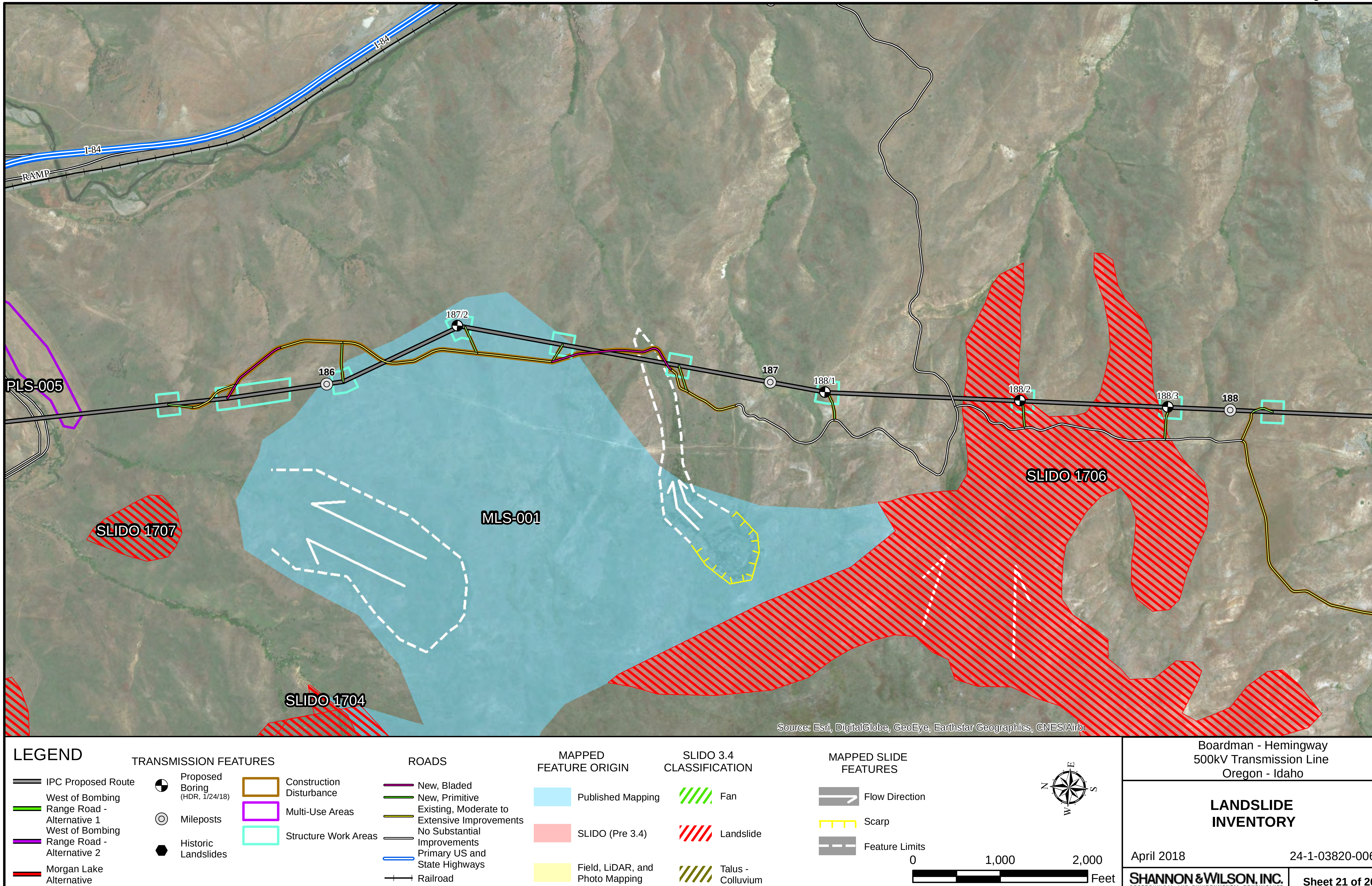

Boardman - Hemingway
500kV Transmission Line
Oregon - Idaho

LANDSLIDE INVENTORY

April 2018
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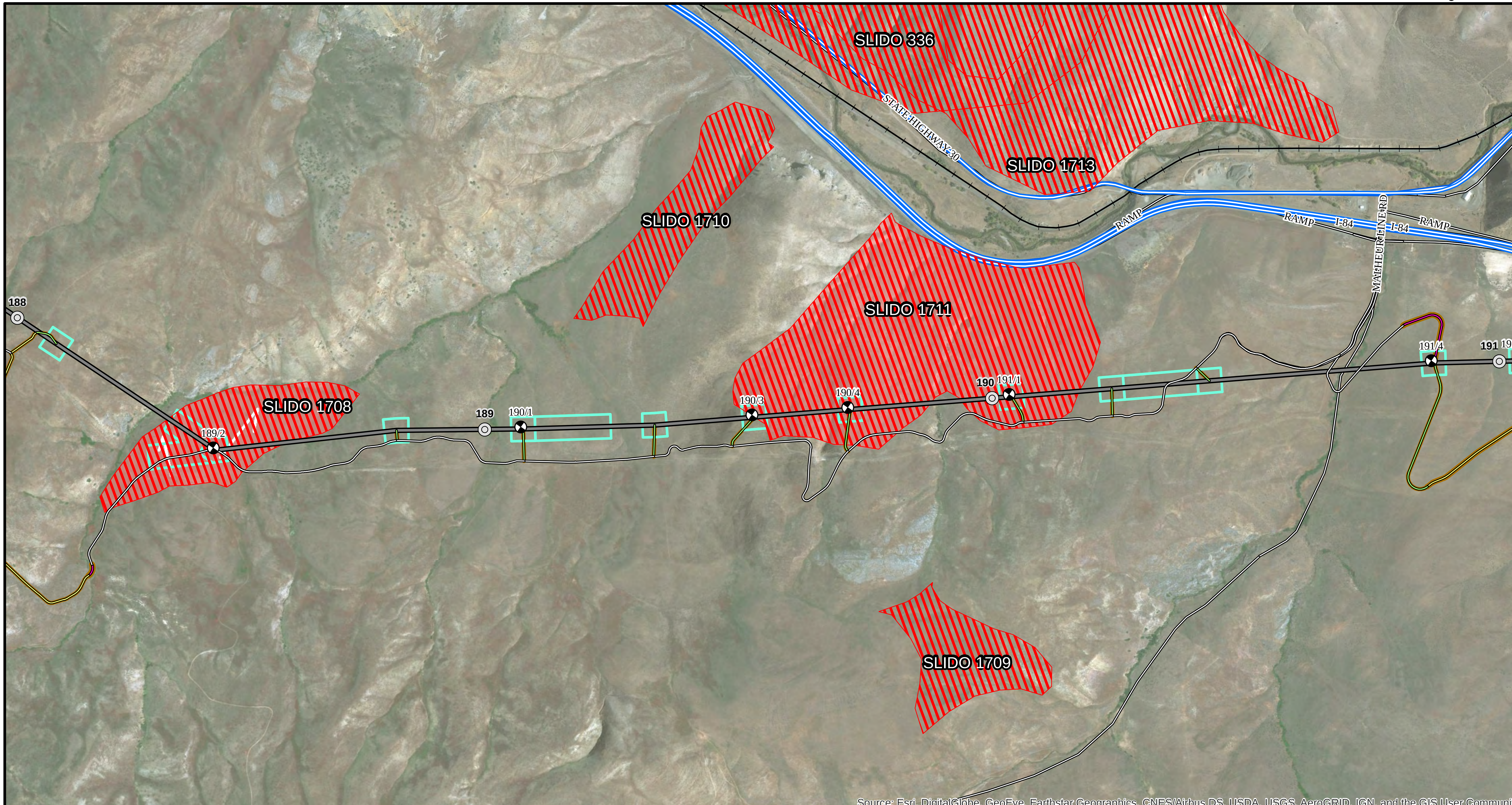

LEGEND

IPC Proposed Route
West of Bombing Range Road - Alternative 1
West of Bombing Range Road - Alternative 2
Morgan Lake Alternative

TRANSMISSION FEATURES
Proposed Boring (HDR, 1/24/18)
Mileposts
Historic Landslides
Construction Disturbance
Multi-Use Areas
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ROADS
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Railroad

MAPPED FEATURE ORIGIN
Published Mapping
SLIDO (Pre 3.4)
Field, LiDAR, and Photo Mapping

SLIDO 3.4 CLASSIFICATION
Fan
Landslide
Talus - Colluvium

MAPPED SLIDE FEATURES
Flow Direction
Scarp
Feature Limits

0 1,000 2,000 Feet

Boardman - Hemingway
500kV Transmission Line
Oregon - Idaho

LANDSLIDE INVENTORY

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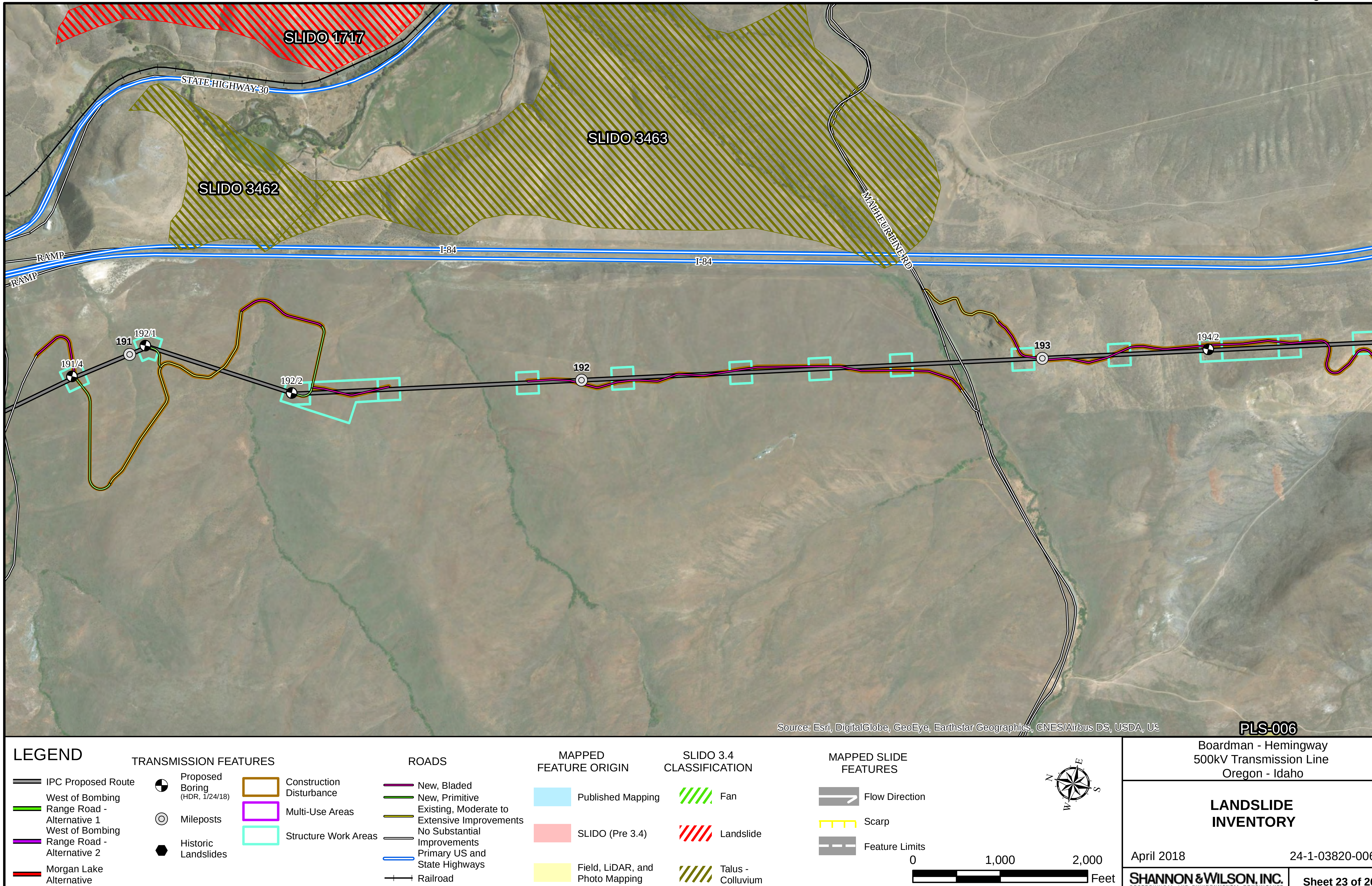

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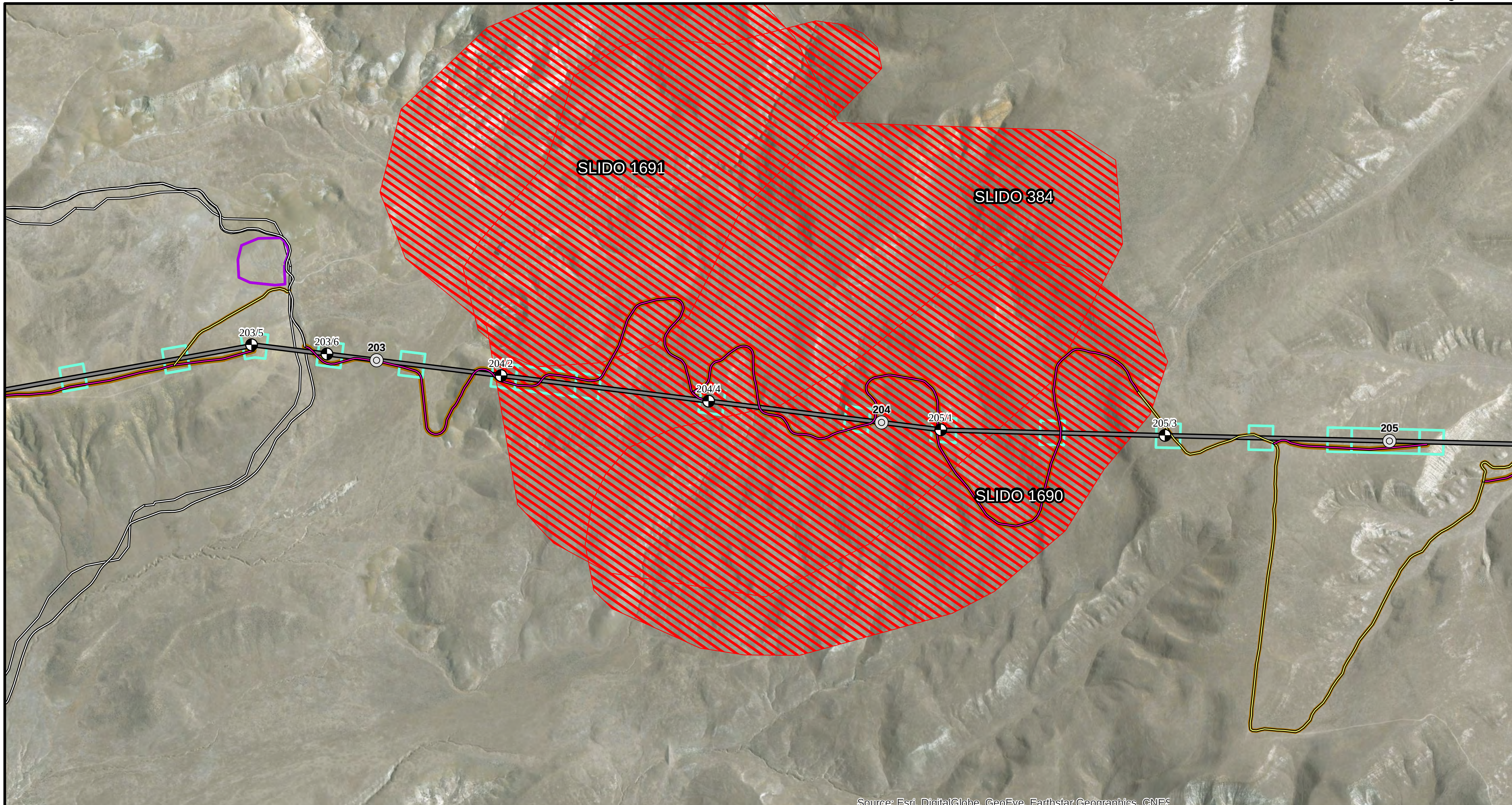

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LEGEND

- IPC Proposed Route
- West of Bombing Range Road - Alternative 1
- West of Bombing Range Road - Alternative 2
- Morgan Lake Alternative

TRANSMISSION FEATURES

- Proposed Boring (HDR, 1/24/18)
- Mileposts
- Historic Landslides
- Construction Disturbance
- Multi-Use Areas
- Structure Work Areas

ROADS

- New, Bladed
- New, Primitive
- Existing, Moderate to Extensive Improvements
- No Substantial Improvements
- Primary US and State Highways
- Railroad

MAPPED FEATURE ORIGIN

- Published Mapping
- SLIDO (Pre 3.4)
- Field, LiDAR, and Photo Mapping

SLIDO 3.4 CLASSIFICATION

- Fan
- Landslide
- Talus - Colluvium

MAPPED SLIDE FEATURES

- Flow Direction
- Scarp
- Feature Limits

0 1,000 2,000 Feet

Boardman - Hemingway
500kV Transmission Line
Oregon - Idaho

LANDSLIDE INVENTORY

April 2018 24-1-03820-006

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GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

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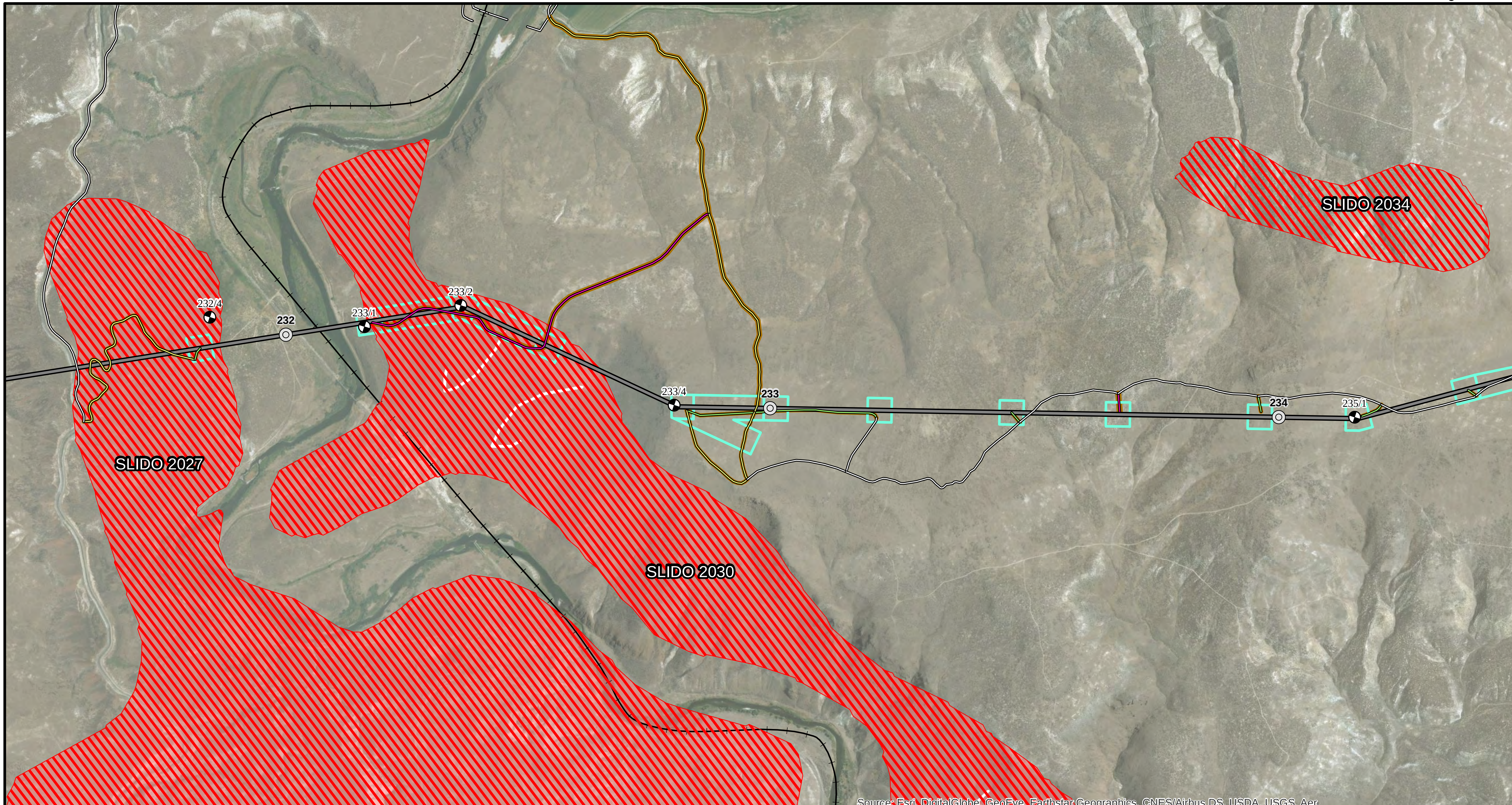

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LEGEND

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