September 18, 2013

Ms. Jill Rolfe
Planning Director
Coos County Planning Department
225 North Adams Street
Coquille, OR 97423

Re: PCGP Alternate Alignments: HBCU 13-04
Supplemental Evidence in Support of Application

Dear Ms. Rolfe:

This letter is written on behalf of Williams Pacific Connector Gas Operator, LLC ("Williams") in support of the application submitted by Pacific Connector Gas Pipeline Company, LP ("Pacific Connector") regarding the proposed alternate alignments for segments of the Pacific Connector Gas Pipeline ("PCGP") alignment approved in the Prior Decisions. As then established, Williams will manage the construction and operation of the PCGP and will manage its day-to-day business affairs as a contractor for the owners.

This letter provides additional evidence in support of the supplemental narrative previously submitted by the applicant on September 13, 2013 (the "Supplemental Application Narrative"). Specifically, this letter addresses certain criteria applicable to the pipeline in the CBEMP zoning districts 20-CA & 20-RS where the proposed Brunschmid alternate alignment will be located. Please make this letter a part of the record of the County's review proceedings.

The Supplemental Application Narrative submitted on September 13, 2013, provides the applicant's preliminary responses and analysis regarding how the proposed Brunschmid alternate alignment complies with the standards, objectives and policies applicable to the two CBEMP zoning districts that the Brunschmid alternate alignment will cross, namely 20-CA and 20-RS. The applicable county criteria regarding resource protection in the aquatic areas are set forth in the management objectives that are applicable to each of the CBEMP zoning districts that the Brunschmid alternate alignment will traverse. The applicable management objectives require Pacific Connector to do the following: (a) protect fish habitat (20-CA); and (b) manage for rural uses and recreational access (20-RS).
In addition to the information and responses provided in the Supplemental Application Narrative, the applicant, in separate proceedings, must also demonstrate compliance with a multitude of state and federal environmental permitting programs. Attached as Exhibit A to this letter is a list of the state and federal permits, approvals and consultations required to be obtained prior to the construction and operation of the PCGP, including the proposed alternate alignments. These environmental permits generally require that the project avoid, minimize and mitigate project impacts to the environment during project construction and operation within the various zoning districts that the PCGP crosses in Coos County. The issuance of those permits will ensure that the construction and operation of the PCGP and the proposed Brunschmid alternate alignment will not significantly impact the resource productivity and natural character of the related CBEMP zoning districts, consistent with the management objectives and policies applicable within CBEMP zoning districts 20-CA and 20-RS.

With respect to waterbody crossings, Pacific Connector will select an alignment and construction methods to avoid and minimize impacts. For example, pipeline crossings of perennial waterbodies will be made nearly perpendicular to the access of the waterbody channel, and where possible, Pacific Connector has located its temporary extra work areas so that they are no closer than 50 feet from waterbody boundaries. Where possible, Pacific Connector will utilize the most advanced techniques to accomplish waterbody crossings with the least potential for impacts. With respect to the proposed crossing of the Coos River to achieve the Brunschmid alternate alignment, the alignment has been selected to affect a crossing that is nearly perpendicular to the axis of the Coos River Channel. In addition, Pacific Connector proposes to use a horizontal directional drilling (HDD) methodology. I attach a copy of January 15, 2013 letter to Pacific Connector from GeoEngineers which presents a feasibility study for the proposed Coos River HDD crossing methodology as part of the Brunschmid alternative alignment. The report concludes that the HDD method of installation at this site is feasible. A copy of the report is attached as Exhibit B.

Regarding wetland crossings, Pacific Connector will utilize and be consistent with FERC's Wetland and Waterbody Procedures. Those procedures include, where feasible, the limitation of the width of the construction right-of-way through jurisdictional wetlands to 75 feet or less with waterbody crossings. All temporary extra work areas have been located at least 50 feet away from wetland boundaries, except where site-specific conditions prevent the setback. During construction, clearing of buffer vegetation between the temporary extra work areas and the edge of the wetland will not occur. All vegetation clearing will be restricted to the certificated construction right-of-way. Where possible, the only access roads that will be used in wetlands are those existing roads that can be used with no modifications and without impacting the wetlands. To further minimize impacts associated with the proposed project, Pacific Connector will utilize the measures addressed in FERC's Wetland and Waterbody Construction and Mitigation Procedures, as specified in Resource Report 2, with a copy of the pertinent portion attached as Exhibit C.
During pipeline operation, Pacific Connector will maintain wetland vegetation in wetlands in accordance with the post-construction maintenance measures addressed in FERC's Wetland and Waterbody Procedures, Section VI.D. See Exhibit C.

With respect to the Brunschmid alternate alignment, the related crossings of wetlands in CBEMP zoning district 20-RS will be consistent with the above-stated measures and procedures.

Thank you for the opportunity to provide additional evidence in support of the proposed alternate alignments for the PCGP. As stated above, the alternate alignments will utilize appropriate measures and procedures for construction and post-construction operations to affect the crossings of waterbodies and wetlands in CBEMP zoning districts 20-CA and 20-RS.

Sincerely,
Williams Pacific Connector Gas Operator, LLC

W. Randall Miller
Project Environmental Lead

MDW:lcr
Enclosures
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<td>U.S. Army Corps of Engineers</td>
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<td>Heidi Firstencel Regulatory Project Manager 541-465-6765 <a href="mailto:heidi.firstencel@usace.army.mil">heidi.firstencel@usace.army.mil</a> Eugene Field Office 1600 Executive Parkway, Ste. 210 Eugene, OR 97401-2156</td>
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<td>Doug Young Energy Program Manager 503-231-6179 <a href="mailto:doug_young@fws.gov">doug_young@fws.gov</a> Oregon Fish and Wildlife Office 2500 SE 99th Ave., Ste. 100 Portland, OR 97266</td>
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<td>Chuck Wheeler Fisheries Biologist 541-957-3379 <a href="mailto:chuck.wheeler@noaa.gov">chuck.wheeler@noaa.gov</a> 2900 NW Stewart Parkway Roseburg, OR 97470</td>
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<td>USDI Bureau of Land Management</td>
<td>Right-of-Way Grant Application Plan of Development</td>
<td>Lorraine Salas National Project Manager 575-525-4388 <a href="mailto:lslas@blm.gov">lslas@blm.gov</a> 1800 Marquess St. Las Cruces, NM 88005</td>
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<td>USDA Forest Service</td>
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<td>Wes Yamamoto 541-825-3150 <a href="mailto:wyamamoto@fs.fed.us">wyamamoto@fs.fed.us</a> Tiller Ranger District - Umpqua National Forest 27812 Tiller Trail Highway Tiller, OR 97484-9720</td>
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<td>Kristen Hiatt 541-880-2577 <a href="mailto:khiatt@usbr.gov">khiatt@usbr.gov</a> Klamath Basin Area Office 6600 Washburn Way Klamath Falls, OR 97603</td>
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<td>Confederated Tribes of Coos, Lower Umpqua, and</td>
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<td>Agnes Castronuevo, Archaeologist 541-888-7513 Fax: 541-888-2853 <a href="mailto:acastronuevo@ctclusi.org">acastronuevo@ctclusi.org</a> 1245 Fulton Avenue Coos Bay, OR 97420</td>
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<td>Siuslaw Indians</td>
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<td>Nicole Norris, Archaeologist 541-756-0904 Fax: 541-756-0847 <a href="mailto:nicolenorris@coquilletribe.org">nicolenorris@coquilletribe.org</a> 3050 Tremont Street North Bend, OR 97459</td>
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<td>Coquille Indian Tribe</td>
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<td>Amy Amoroso 541-677-5575 ext. 5577 Fax: 541-677-5574 <a href="mailto:aamoroso@cowcreek.com">aamoroso@cowcreek.com</a> 2371 Stephens Street, Suite 100 Roseburg, OR 97470</td>
<td>On 12-19-12, FERC submitted letters to all of the tribes. The letter invited them to participate in the FERC process regarding sensitive resources</td>
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<td>Cow Creek Band of Umpqua Indians</td>
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<td>Perry Chookoot Culture &amp; Heritage Director 541-783-2219 Fax: 541-783-2029 <a href="mailto:Perry.Chookoot@klamathtribes.com">Perry.Chookoot@klamathtribes.com</a> P.O. Box 436 Chiloquin, OR 97624</td>
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<td>The Klamath Tribes</td>
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<td>Robert Kentta Cultural Resources Director 800-922-1399 ext 1244 Fax: 541-444-2307 <a href="mailto:rkennta@ctsi.nsns.us">rkennta@ctsi.nsns.us</a> P.O. Box 549 Siletz, OR 97380</td>
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<td>Confederated Tribes of the Siletz Indians</td>
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<td>Eirik Thorsgard Cultural Resources 503-879-1630 Fax: 503-879-1352 <a href="mailto:eirik.thorsgard@grandronde.org">eirik.thorsgard@grandronde.org</a> 9615 Grand Ronde Road Grand Ronde, OR 97347</td>
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<td>Oregon Department of Energy – Energy Facilities</td>
<td>Lead Coordinating State Agency for FERC Pre-Filing Process</td>
<td>Hillary Dobson Federal Projects Coordinator 503-378-4041 <a href="mailto:hillary.dobson@state.or.us">hillary.dobson@state.or.us</a> 625 Marion Street NE Salem, OR 97301</td>
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<td>Oregon Division of State Parks Office of Historic</td>
<td>National Historic Preservation Act – Section 106 Consultation</td>
<td>Dennis Griffin 503-986-0674 <a href="mailto:dennis.griffin@state.or.us">dennis.griffin@state.or.us</a> State Archaeologist 725 Summer St. NE, #C Salem, OR 97301</td>
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| Oregon Department of Environmental Quality | Air Contaminant Discharge Permit for Compression Facilities                      | Phillip Allen  
503.229.6904  
Senior Air Quality Modeler  
AQ Division Oregon DEQ HQ  
811 SW 8th Avenue  
Portland, OR 97204-1590  
Walt West  
541-388-6146  
Oregon DEQ Bend Office  
475 NE Bellevue, Suite 110  
Bend, OR 97701          | 10-14       | 5-15                 |
| Oregon Department of Environmental Quality | CWA 401 Water Quality Certification  
CWA 402 NPDES Stormwater Permit and  
Water Pollution Control Facility (WPCF) – Hydrostatic Test Water | Mary Camarata  
541-687-7435  
camarata.mary@deq.state.or.us  
165 East 7th Ave., Ste. 100  
Eugene, OR 97401             | 6-13       | 6-14                 |
| Oregon Department of Water Resources   | Permit to Appropriate Water                                                     | Jerry K. Sauter  
Water Rights Program Analyst  
jerry.k.sauter@state.or.us  
Water Right Services Division  
725 Summer Street NE, Ste. A  
Salem, OR 97301               | 2-15       | 3-15                 |
| Oregon Department of Fish and Wildlife  | In-Water Blasting Permit                                                        | Art Martin  
Energy/NRDA Coordinator  
Wildlife Division  
art.c.martin@state.or.us  
503-947-6082  
3406 Cherry Avenue NE  
Salem, OR 97303           | 2-15       | 3-15                 |
| Oregon Department of Transportation  | State Highway Crossing Permit                                                    | Judith Callens  
Senior Planner  
Judith.h.callens@odot.state.or.  
US  
555 12th Street NE  
Salem, OR 97301              | 3-14       | 3-15                 |
| Oregon Department of State Lands      | Joint Permit with the USACE Removal/Fill Permit  
Archaeological Permit          | Bob Lobdell  
503-886-5282  
robert.lobdell@dol.state.or.us  
775 Summer Street NE, Ste.  
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Salem, OR 97301               | 6-13       | 8-13                 |

Exhibit A-3
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<td>Juna Hickner 503-373-0050 x 253 <a href="mailto:juna.hickner@state.or.us">juna.hickner@state.or.us</a> 635 Capitol Street, Suite 150 Salem, Oregon 97301-2540</td>
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<td>Scott Swearingen Assistant to Area Director 541-440-3412x132 <a href="mailto:sswarningen@odf.state.or.us">sswarningen@odf.state.or.us</a> 1758 NE Airport Road Roseburg, OR 97470-1499</td>
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<td>Coos County Planning Department</td>
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<td>Jill Rolfe 541-396-3121x210 <a href="mailto:jrolfe@co.coos.or.us">jrolfe@co.coos.or.us</a> Coos County Planning Department 225 N. Adams Coquille, OR 97423</td>
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<td>Douglas County Planning Department</td>
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<td>Cheryl Goodhue Planning Department 541-440-4289 <a href="mailto:cagoodhu@co.douglas.or.us">cagoodhu@co.douglas.or.us</a> Douglas County Courthouse Justice Building - Room 100 Roseburg, OR 97470</td>
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<td>Jackson County Planning Department</td>
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<td>Francisco Hernandez Planner 541-774-6903(7) <a href="mailto:hemanfm@jacksoncounty.org">hemanfm@jacksoncounty.org</a> 10 S. Oakdale, Room 100 Medford, OR 97501</td>
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<td>Klamath County Planning Department</td>
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<td>Bill Adams Director 541-883-5121x3083 <a href="mailto:badams@co.klamath.or.us">badams@co.klamath.or.us</a> 305 Main Street Klamath Falls, OR 97601</td>
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Exhibit A-4
January 15, 2013

Williams Pacific Connector Gas Pipeline, LLC
295 Chipeta Way
Salt Lake City, Utah 84108

Attention: Bethany Green

Subject: HDD Feasibility Study
    Coos River HDD
    Coos Bay, Oregon
    File No. 16724-008-00

GeoEngineers, Inc. (GeoEngineers) is pleased to submit this Horizontal Directional Drilling (HDD) Feasibility Study for the proposed Coos River HDD as part of the Brunschmid route alternative of the Pacific Connector Gas Pipeline Project in Coos Bay, Oregon. The Vicinity Map, Figure 1, shows the site location with respect to topography and the surrounding area.

Williams Pacific Connector Gas Pipeline, LLC (Williams) is considering constructing a new 36-inch high-pressure natural gas pipeline by means of HDD methods across the Coos River, near Coos Bay, Oregon. Jared Ellsworth requested that we provide this study to assess the feasibility of installing the proposed pipeline beneath the Coos River using HDD construction methods.

PURPOSE AND SCOPE OF SERVICE

The purpose of our services was to evaluate the existing surface and subsurface soil and groundwater conditions at the site in order to evaluate the feasibility of using HDD installation methods to install the proposed pipeline beneath the Coos River. Our specific scope of services included the following:

1. Completed a site reconnaissance to observe surface conditions and locate borings.
2. Prepared a preliminary HDD profile to assist in choosing appropriate depths for the exploratory borings.
3. Coordinated utility locating near the proposed boring locations by the public “One Call” utility locating service.
4. Explored subsurface conditions at the site as follows:
   a. Four drilled borings along the conceptual HDD alignment using mud rotary drilling techniques and rock coring, as appropriate.
b. Obtained samples at representative intervals from the borings using split spoon samples and standard penetration tests (SPT).

c. Classified soils encountered in the borings in general accordance with ASTM International (ASTM) Standard Practice D 2488. We maintained a log of the materials encountered in each exploration.

5. Performed index tests necessary to characterize the subsurface materials. Testing included:
   a. Thirteen Atterberg limits determinations in general accordance with ASTM D 4318.
   b. One grain size determination in general accordance with ASTM C 136.
   c. Ten percent fines determinations in general accordance with ASTM D 1140.

6. Evaluated HDD risks and considerations. We evaluated risks and considerations with respect to: 1) length, diameter and geometry; 2) hydraulic fracture and inadvertent drilling fluid returns potential; 3) hole stability; and 4) construction layout, property acquisitions and easements.

7. Prepared this report summarizing the findings of our exploration program, laboratory testing, and feasibility evaluation.

SITE DESCRIPTION

Surface Conditions

The proposed HDD alignment is oriented in a generally northwest-southeast (entry to exit) direction, as shown in Figure 2. The north side (entry) of the proposed HDD is situated on a gently sloping (less than 10 percent) field between approximately Elevation 8 feet and 17 feet above mean sea level (MSL). The south side (exit) is located on a relatively flat alluvial valley floor at about Elevation 5 feet. The north bank of the Coos River is approximately 500 feet south of the entry point and the south bank is approximately 650 feet north of the exit point. Two relatively short berms are located on either side of the river between approximately Elevation 10 and 15 feet. Coos River Highway parallels the river on the north side and South Coos River Highway parallels the river on the south side.

The open field on the north side of the HDD is located adjacent to Coos River Highway and is approximately 250-feet wide measured parallel to the highway and is approximately 550-feet long. The field is vegetated with low grass and a few deciduous trees on the north end. The ground surface was soft due to recent rains saturating the near surface soils. The surface of the site on the south side of the HDD is relatively flat and vegetated with low grasses.
Subsurface Conditions

Site Geology

The geologic mapping we reviewed (Beaulieu and Baldwin, 1973) shows the site underlain by quaternary aged marsh and peat deposits overlying the Tertiary aged Floumoy Formation. The peat and marsh is described as unconsolidated organic soils of silt, clay and sand. The Floumoy Formation is described as rhythmically bedded siltstone and sandstone.

Subsurface Explorations

We explored subsurface conditions at the site between the dates of December 6, 2012 and December 7, 2012 by advancing four drilled borings to maximum depths of 101.5 feet bgs at the locations shown in Figure 2. A representative from GeoEngineers maintained logs of the materials encountered in each boring and collected disturbed soil samples at 5-foot intervals. Appendix A presents the boring logs and a description of the subsurface exploration and laboratory-testing programs. Laboratory-testing results are shown in the boring logs in Appendix A.

The materials encountered in our borings were consistent with the geologic mapping for the site. In general, the borings completed on the north side of the crossing encountered fat clay with organic matter, organic clay, and clayey sand overlying siltstone at depths of 48 to 96 feet below ground surface (bgs). The borings completed on the south side of the crossing generally encountered interbedded silt, silty sand, sand with silt, and fat clay to the maximum depths explored. Refer to the boring logs for more details on the subsurface conditions encountered in each boring.

Groundwater

During our subsurface explorations we were not able to measure groundwater levels due to presence of drilling fluid. However, based on the observed relative moisture content of the samples, we estimate that groundwater was at or near the ground surface at the time of drilling. We anticipate that groundwater levels will fluctuate with precipitation, site utilization and other factors. During heavy prolonged precipitation, and probably during most of the winter months, we expect that groundwater will be near or at the surface of the site.

HDD PLAN AND PROFILE

We developed the conceptual HDD plan and profile based on the general centerline of the Brunschmid route alternative provided to us by Williams, as shown in Figure 2. The proposed HDD has a horizontal design length of approximately 1,602 feet. The conceptual entry and exit points were selected to allow for adequate depth of cover beneath the Coos River Highway and the Coos River as shown in Figure 2.

We designed the entry and exit angles at 10 degrees, and 8 degrees respectively, with a bottom tangent elevation of -65 feet MSL to achieve a minimum depth of cover of 43.6 feet below the Coos River.

HDD FEASIBILITY CONCLUSIONS

Based on our evaluation, it is our opinion that the HDD method of installation at this site is feasible. The following section provides a discussion of the considerations for design and construction.
Hole Stability

In general, the alluvial soils encountered by our borings along the proposed HDD alignment have a low risk of hole instability.

Hydraulic Fracture and Inadvertent Returns

In general, it is our opinion that there is a relatively high risk of hydraulic fracture along the conceptual HDD profile. The risk of inadvertent surface returns is considered moderate along the alignment. However, the risk of inadvertent surface returns increases to high within approximately 150 feet of entry and exit.

The contractor’s means and methods, effectiveness at cleaning cuttings from the pilot and reamed holes, and the ability to maintain drilling fluid returns will be instrumental in reducing the risk of hydraulic fracture and inadvertent returns during construction.

Workspace Considerations

There is not adequate area for a pipe stringing and fabrication workspace on the northwest side of the proposed HDD. Therefore, the Coos River HDD must be drilled from the northwest (entry) side to the southeast (exit) side so that the stringing area will be to the southeast. Depending on temporary workspace that can be obtained on the southeast side of the conceptual HDD, there may be enough linear area for a pipe stringing and fabrication workspace that will allow assembly of a single product pipe string. However, in order to achieve pullback with a single product pipe string, it will need to be curved slightly to the south.

There is adequate area for workspaces at the conceptual entry and exit points as shown in Figure 2. Grading will not likely be required to prepare entry and exit workspaces in these areas. Near the conceptual entry and exit points, it will likely be necessary to provide a stable working platform such as a timber matted or gravel workspace and an entrance road during construction, particularly if construction is completed during the wet winter season, or when heavy prolonged precipitation occurs. In addition, construction roads will be required to access the entry and exit points and the product pipe stringing area, unless construction is completed during the latter part of the dry summer months when precipitation has not recently occurred and groundwater levels are at their lowest point throughout the year.

LIMITATIONS

We have prepared this report for use by Williams, their authorized agents and other approved members of the design team involved with this project. GeoEngineers’ report is not intended for use by others, and the information contained herein is not applicable to other sites. Our report, conclusions and interpretations should not be construed as a warranty of the subsurface conditions.

Variations in subsurface conditions are possible between the explorations. Subsurface conditions may also vary with time. A contingency for unanticipated conditions should be included in the project budget and schedule for such an occurrence. We recommend completing a HDD design for this project should it move forward, and that sufficient monitoring, testing and consultation be provided by GeoEngineers during construction to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes should the conditions revealed during the
work differ from those anticipated, and to evaluate whether earthwork and pipeline installation activities comply with contract plans and specifications.

The scope of our services does not include services related to construction safety precautions. Our recommendations are not intended to direct the contractor's methods, techniques, sequences or procedures, except as specifically described in our report for consideration in design.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in this area at the time the report was prepared. No warranty or other conditions, express, written or implied, should be understood.

Any electronic form, facsimile or hard copy of the original document (email, text, table and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, and will serve as the official document of record.

Please refer to Appendix B, titled “Report Limitations and Guidelines for Use,” for additional information pertaining to use of this report.

REFERENCES

We appreciate the opportunity to provide services to you for this project. Please contact us if you have any questions or wish to discuss this report.

Sincerely,
GeoEngineers, Inc.

Andrew E. Sparks, PE
Senior Geotechnical Engineer

Trevor N. Hoyles, PE
Principal

Attachments:
- Figure 1. Vicinity Map
- Figure 2. Conceptual Plan and Profile
- Appendix A. Field Exploration and Laboratory Testing Program
- Appendix B. Report Limitations and Guidelines for use

Disclaimer: Any electronic form, facsimile or hand copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

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Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and context of electronic files. The master file is held by GeoEngineers, Inc. and will serve as the official record of this communication.

CONCEPTUAL SITE PLAN AND PROFILE
COOS RIVER HDI
COOS COUNTY, OREGON

FIGURE 2

EXHIBIT B
APPENDIX A
Field Exploration and Laboratory Testing Program
APPENDIX A
FIELD EXPLORATION AND LABORATORY TESTING PROGRAM

We explored subsurface conditions at the site by drilling four borings with a track-mounted drill rig using mud rotary drilling methods. Western States Soil Conservation of Hubbard, Oregon drilled the borings up to depths of 101.5 feet bgs. Figure 2 shows the approximate boring locations. A representative from our office observed field activities, classified the soil and rock encountered, obtained representative samples, observed groundwater conditions where possible and prepared a log of each exploration. The borings were backfilled with a bentonite and cement grout mixture at the conclusion of each exploration.

Soil samples were obtained by performing standard penetration tests (SPTs) in general accordance with ASTM test method D 1586. The sampler was driven with a 140-pound hammer falling 30 inches. The number of blows required to drive the sampler 1 foot, or as otherwise indicated, into the soils is shown adjacent to the sample symbols on the boring logs. Disturbed samples were obtained from the split barrel sampler for subsequent classification and index testing.

Soils encountered in the borings were classified in the field by a GeoEngineers representative in general accordance with ASTM D 2488, the Standard Practice for the Classification of Soils (Visual- Manual Procedure) which is described in Figure A-1. The boring logs are presented in Figures A-3 through A-6. Soil classifications and sampling intervals are shown in the boring logs. Inclined lines at the material contacts shown on the log indicate uncertainty as to the exact contact elevation, rather than the inclination of the contact itself.

The relative density of the SPT samples recovered at each interval was evaluated based on correlations with lab and field observations in general accordance with the values outlined in Table A-1 below.

| TABLE A-1. CORRELATION BETWEEN BLOW COUNTS AND RELATIVE DENSITY * |
|-------------------------|----------------|---------------|---------------|----------------|----------------|----------------|
| Cohesive Soils (Clay/Silt) |
| Parameter | Very Soft | Soft | Medium Stiff | Stiff | Very Stiff | Hard |
| Blows, N | < 2 | 2 - 4 | 4 - 8 | 8 - 16 | 16 - 32 | >32 |
| Cohesionless Soils (Gravel/Sand/Silty Sand) ** |
| Parameter | Very Loose | Loose | Medium Dense | Dense | Very Dense |
| Blows, N | 0 - 4 | 4 - 10 | 10 - 30 | 30 - 50 | > 50 |

Notes:
** Classification applies to soils containing additional constituents: that is, organic clay, silty or clayey sand, etc.

Laboratory Testing

General

Samples obtained from the explorations were transported to our Portland, Oregon laboratory and examined to confirm or modify field classifications, as well as to evaluate engineering properties of the samples. Representative soil samples were selected for laboratory testing consisting of percent fines and Atterberg limits determinations, and sieve analyses. The laboratory-testing procedures are discussed in more detail below.
Percent Fines Determinations

Percent fines determinations were performed on ten soil samples obtained from the borings. The tests were used to evaluate the relative amounts of coarse and fine grained particles present in the samples and were completed in general accordance with the ASTM D 1140 test procedure. The results of the testing are presented on the boring logs at their respective sample depths.

Sieve Analyses

Sieve analyses were performed on selected soil samples to evaluate the grain size characteristics of selected soil samples. We completed the sieve analyses in general accordance with ASTM C 136. The results of the sieve analyses are shown in Figures A-7 through A-9.

Atterberg Limits Testing

Atterberg limits were performed on selected soil samples. The tests were used to classify and evaluate index properties of the soil. The liquid limit and the plastic limit were estimated through a procedure performed in general accordance with ASTM D 4318. The results of the Atterberg limits testing are shown in Figures A-10 through A-12.
### Soil Classification Chart

<table>
<thead>
<tr>
<th>Major Divisions</th>
<th>Symbols</th>
<th>Typical Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gravel and Gravelly Soils</td>
<td>GW</td>
<td>Well-graded Gravels, Gravel - Sand Mixtures</td>
</tr>
<tr>
<td>Gravels with Fines</td>
<td>GP</td>
<td>Poorly-graded Gravels, Gravel - Sand Mixtures</td>
</tr>
<tr>
<td>Sand and sandy soils</td>
<td>GM</td>
<td>Silty Gravels, Gravel - Sand - Silt Mixtures</td>
</tr>
<tr>
<td>Sands with Fines</td>
<td>GC</td>
<td>Clayey Gravels, Gravel - Sand - Clay Mixtures</td>
</tr>
<tr>
<td>Fine Grained Soils</td>
<td>SW</td>
<td>Well-graded Sands, Gravely Sand</td>
</tr>
<tr>
<td>Silts and clays</td>
<td>SP</td>
<td>Poorly-graded Sands, Gravely Sand</td>
</tr>
<tr>
<td>Silts and clays</td>
<td>SM</td>
<td>Silty Sands, Sand - Silt Mixtures</td>
</tr>
<tr>
<td>Silts and clays</td>
<td>SC</td>
<td>Clayey Sands, Sand - Clay Mixtures</td>
</tr>
<tr>
<td>Silts and clays</td>
<td>ML</td>
<td>Inorganic Silts, Rock Flour, Clayey Silts with Silt Grittiness</td>
</tr>
<tr>
<td>Silts and clays</td>
<td>CL</td>
<td>Inorganic Clays of low to Medium Plasticity, Gravely Clays, Sandy Clays, Silty Clays, Lean Clays</td>
</tr>
<tr>
<td>Silts and clays</td>
<td>OL</td>
<td>Organic Silts and Organic Silty Clays of Low Plasticity</td>
</tr>
<tr>
<td>Silts and clays</td>
<td>MH</td>
<td>Inorganic Silts, Micaceous or Diatomaceous Silty Soils</td>
</tr>
<tr>
<td>Silts and clays</td>
<td>CH</td>
<td>Inorganic Clays of High Plasticity</td>
</tr>
<tr>
<td>Peat, Humus, Swamp Soils with high organic contents</td>
<td>PT</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Multiple symbols are used to indicate borderline or dual soil classifications.

### Additional Material Symbols

<table>
<thead>
<tr>
<th>Symbols</th>
<th>Typical Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC</td>
<td>Asphalt Concrete</td>
</tr>
<tr>
<td>CC</td>
<td>Cement Concrete</td>
</tr>
<tr>
<td>CR</td>
<td>Crushed Rock/Quarry Spalls</td>
</tr>
<tr>
<td>TS</td>
<td>Topsoil/Duff/Sod</td>
</tr>
</tbody>
</table>

### Groundwater Contact
- Measured groundwater level in exploration, well, or piezometer
- Groundwater observed at time of exploration
- Perched water observed at time of exploration
- Measured free product in well or piezometer

### Graphic Log Contact
- Distinct contact between soil strata or geologic units
- Approximate location of soil strata change within a geologic soil unit

### Material Description Contact
- Distinct contact between soil strata or geologic units
- Approximate location of soil strata change within a geologic soil unit

### Laboratory / Field Tests
- %F | Percent fines
- AL | Alterberg limits
- CA | Chemical analysis
- CP | Laboratory compaction test
- CS | Consolidation test
- DS | Direct shear
- HA | Hydrometer analysis
- MC | Moisture content
- MD | Moisture content and dry density
- OC | Organic content
- PM | Permeability or hydraulic conductivity
- PP | Pocket penetrometer
- PPM | Parts per million
- SA | Sieve analysis
- TX | Triaxial compression
- UC | Unconfined compression
- VS | Vane shear

### Sheen Classification
- NS | No Visible Sheen
- SS | Slight Sheen
- MS | Moderate Sheen
- HS | Heavy Sheen
- NT | Not Tested

### Key to Exploration Logs

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*Figure A-1*

**Exhibit B**
EXPLANATION OF BEDROCK TERMS

Scale of Relative rock Weathering (ODOT; 1987)

<table>
<thead>
<tr>
<th>Designation</th>
<th>Field Identification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh</td>
<td>Crystals are bright. Discontinuities may show some minor surface staining. No</td>
</tr>
<tr>
<td></td>
<td>discoloration in rock fabric.</td>
</tr>
<tr>
<td>Slightly Weathered</td>
<td>Rock mass is generally fresh. Discontinuities are stained and may contain clay.</td>
</tr>
<tr>
<td></td>
<td>Some discoloration in rock fabric. Decomposition extends up to 1 inch into rock.</td>
</tr>
<tr>
<td>Moderately Weathered</td>
<td>Rock mass is decomposed 50% or less. Significant portions of rock show discoloration</td>
</tr>
<tr>
<td></td>
<td>and weathering effects. Crystals are dull and show visible chemical alteration.</td>
</tr>
<tr>
<td></td>
<td>Discontinuities are stained and may contain secondary mineral deposits.</td>
</tr>
<tr>
<td>Predominantly</td>
<td>Rock mass is more than 50% decomposed. Rock can be excavated with geologist's pick.</td>
</tr>
<tr>
<td>Decomposed</td>
<td>All discontinuities exhibit secondary mineralization. Complete discoloration of rock</td>
</tr>
<tr>
<td></td>
<td>fabric. Surface of core is friable and usually pitted due to washing out of highly</td>
</tr>
<tr>
<td></td>
<td>altered minerals by drilling water.</td>
</tr>
<tr>
<td>Decomposed</td>
<td>Rock mass is completely decomposed. Original rock &quot;fabric&quot; may be evident. May be</td>
</tr>
<tr>
<td></td>
<td>reduced to soil with hand pressure.</td>
</tr>
</tbody>
</table>

Scale of Relative Rock Hardness (ODOT, 1987)

<table>
<thead>
<tr>
<th>Term</th>
<th>Hardness Designation</th>
<th>Field Identification</th>
<th>Approximate Unconfined Compressive Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extremely Soft</td>
<td>R0</td>
<td>Can be indented with difficulty by thumbnail. May be moldable or friable with finger pressure.</td>
<td>&lt; 100 psi</td>
</tr>
<tr>
<td>Very Soft</td>
<td>R1</td>
<td>Crumbles under firm blows with point of a geology pick. Can be peeled by a pocket knife. Scratched with fingernail.</td>
<td>100-1000 psi</td>
</tr>
<tr>
<td>Soft</td>
<td>R2</td>
<td>Can be peeled by a pocket knife with difficulty. Cannot be scratched with fingernail. Shallow indentation made by firm blow of geology pick.</td>
<td>1000-4000 psi</td>
</tr>
<tr>
<td>Medium Hard</td>
<td>R3</td>
<td>Can be scratched by knife or pick. Specimen can be fractured with a single firm blow of hammer/geology pick.</td>
<td>4000-8000 psi</td>
</tr>
<tr>
<td>Hard</td>
<td>R4</td>
<td>Can be scratched with knife or pick only with difficulty. Several hard hammer blows required to fracture specimen.</td>
<td>3000-16000 psi</td>
</tr>
<tr>
<td>Very Hard</td>
<td>R5</td>
<td>Cannot be scratched by knife or sharp pick. Specimen requires many blows of hammer to fracture or chip. Hammer rebounds after impact.</td>
<td>&gt; 16000 psi</td>
</tr>
</tbody>
</table>

Rock Quality Designation (RQD)

<table>
<thead>
<tr>
<th>RQD (Percent)</th>
<th>Description of Rock Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 25</td>
<td>Very Poor</td>
</tr>
<tr>
<td>25 to 50</td>
<td>Poor</td>
</tr>
<tr>
<td>50 to 75</td>
<td>Fair</td>
</tr>
<tr>
<td>75 to 90</td>
<td>Good</td>
</tr>
<tr>
<td>90 to 100</td>
<td>Excellent</td>
</tr>
</tbody>
</table>

RQD is a modified core recovery measurement which expresses the number of hard and sound rock pieces of 4" or more in size as a percentage of the total length of core run.

Discontinuity Spacing (ODOT; 1987)

<table>
<thead>
<tr>
<th>Description for Bedding, Foliation, or Flow Banding</th>
<th>Spacing</th>
<th>Description of Joints, Faults, or Other Fractures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Thickly</td>
<td>&gt; 10 feet</td>
<td>Very Widely</td>
</tr>
<tr>
<td>Thickly</td>
<td>3-10 feet</td>
<td>Widely</td>
</tr>
<tr>
<td>Medium</td>
<td>1-3 feet</td>
<td>Moderately Close</td>
</tr>
<tr>
<td>Thinny</td>
<td>2-12 inches</td>
<td>Closely</td>
</tr>
<tr>
<td>Very Thinny</td>
<td>&lt; 2 inches</td>
<td>Very Closely</td>
</tr>
</tbody>
</table>
Log of Boring CR-1

Project: Coos River HDD Feasibility
Project Location: Coos Bay, Oregon
Project Number: 16724-001-08

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Figure A-3
Sheet 1 of 2

EXHIBIT B
<table>
<thead>
<tr>
<th>Elevation (feet)</th>
<th>Interval</th>
<th>Depth Recovered (in)</th>
<th>Borehole-foot</th>
<th>Collected Sample</th>
<th>Layer Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>12</td>
<td>20</td>
<td>Blue-gray fat clay with some gravel and occasional organic matter (stiff, wet)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25</td>
<td>40</td>
<td>6</td>
<td>Becomes orange-gray-blue mottled, very stiff (weakly to moderately cemented)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>26</td>
<td>45</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>50</td>
<td>50/2&quot;</td>
<td>Orange-gray siltstone; predominantly decomposed, very soft</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>55</td>
<td>50/2&quot;</td>
<td>Becomes gray, fresh, very soft</td>
</tr>
</tbody>
</table>

Note: See Figure A-1 for explanation of symbols.
**FIELD DATA**

<table>
<thead>
<tr>
<th>Elevation (feet)</th>
<th>Depth (feet)</th>
<th>Recovery (%)</th>
<th>Sample Name</th>
<th>Water Level</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>10</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>15</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>20</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>25</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>30</td>
<td>30</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>35</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**MATERIAL DESCRIPTION**

<table>
<thead>
<tr>
<th>Group</th>
<th>Classification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OH</td>
<td></td>
<td>Dark brown organic clay (very soft, wet)</td>
</tr>
<tr>
<td>SC</td>
<td></td>
<td>Gray clayey fine to coarse sand with trace fine gravel (very loose, wet)</td>
</tr>
<tr>
<td>CL</td>
<td></td>
<td>Gray fine to coarse sandy lean clay (soft, wet)</td>
</tr>
<tr>
<td>OH</td>
<td></td>
<td>Dark brown organic silt with sand (woody debris) (very soft, wet)</td>
</tr>
</tbody>
</table>

**REMARKS**

- AL; PI = 108
- SA; %F = 47
- %Gravel = 1
- %F = 56

Note: See Figure A-1 for explanation of symbols.
<table>
<thead>
<tr>
<th>Elevation (feet)</th>
<th>Depth (feet)</th>
<th>Interval Recovered (in)</th>
<th>Blown or Feet</th>
<th>Collected Sample</th>
<th>Water Level</th>
<th>Graphic Log</th>
<th>Group Classification</th>
<th>Material Description</th>
<th>Moisture Content, %</th>
<th>Dry Density, (pcf)</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
<td>2</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td>OH</td>
<td>Dark brown organic silt with sand (woody debris) (very soft, wet)</td>
<td>94</td>
<td></td>
<td>AL; PI = 67</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>3</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td>CH</td>
<td>Gray fat clay with trace organic matter (soft, wet)</td>
<td>41</td>
<td></td>
<td>AL; PI = 36</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>8</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Becomes medium stiff</td>
<td></td>
<td></td>
<td>AL; PI = 34</td>
</tr>
<tr>
<td></td>
<td>60</td>
<td>7</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>With fine sand</td>
<td></td>
<td></td>
<td>AL; PI = 35</td>
</tr>
<tr>
<td></td>
<td>70</td>
<td>9</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Becomes orange-gray mottled, stiff (weakly to moderately cemented)</td>
<td>39</td>
<td></td>
<td>AL; PI = 35</td>
</tr>
</tbody>
</table>

Note: See Figure A-1 for explanation of symbols.
<table>
<thead>
<tr>
<th>Interval</th>
<th>Sample Name</th>
<th>Testing</th>
<th>Water Level</th>
<th>Graphic Log</th>
<th>Group Classification</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>80-120</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CH</td>
<td>Orange-gray mottled fat clay with fine sand and trace organic matter (stiff, wet) (weakly to moderately cemented)</td>
</tr>
<tr>
<td>65-60</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>With gravel, very stiff</td>
</tr>
<tr>
<td>50-40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Becomes gray</td>
</tr>
<tr>
<td>25-0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CLG</td>
<td>Brown-gray siltstone; fresh, very soft</td>
</tr>
</tbody>
</table>

**Note:** See Figure A-1 for explanation of symbols.

**Log of Boring CR-2 (continued)**

**Project:** Coos River HDD Feasibility  
**Project Location:** Coos Bay, Oregon  
**Project Number:** 16724-001-08  

Figure A-4  
Sheet 3 of 3

**EXHIBIT B**
Log of Boring CR-3

Project: Coos River HDD Feasibility
Project Location: Coos Bay, Oregon
Project Number: 16724-001-08

Note: See Figure A-1 for explanation of symbols.
<table>
<thead>
<tr>
<th>Elevation (feet)</th>
<th>Depth (feet)</th>
<th>Interval Recovered (in)</th>
<th>Boxed / foot</th>
<th>Collected Sample</th>
<th>Water Level</th>
<th>Graphic Log</th>
<th>Group Classification</th>
<th>Material Description</th>
<th>Moisture %</th>
<th>Dry Density (pcf)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>35</td>
<td>12</td>
<td>14</td>
<td>7</td>
<td>SM</td>
<td></td>
<td></td>
<td>Gray silty fine to medium sand with trace organic matter (medium dense, wet)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>12</td>
<td>13</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td>Lacks organic matter</td>
<td>34</td>
<td>SA; %F = 19</td>
<td></td>
</tr>
<tr>
<td></td>
<td>45</td>
<td>12</td>
<td>11</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td>With trace coarse sand</td>
<td>36</td>
<td>SA; %F = 19</td>
<td></td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>12</td>
<td>10</td>
<td>10</td>
<td>SA</td>
<td></td>
<td></td>
<td></td>
<td>46</td>
<td>SA; %F = 29</td>
<td></td>
</tr>
<tr>
<td></td>
<td>55</td>
<td>18</td>
<td>15</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td>Lacks medium and coarse sand</td>
<td>33</td>
<td>SA; %F = 23</td>
<td></td>
</tr>
<tr>
<td></td>
<td>60</td>
<td>18</td>
<td>14</td>
<td>12</td>
<td>SA</td>
<td></td>
<td></td>
<td>Becomes dense</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: See Figure A-1 for explanation of symbols.

Log of Boring CR-3 (continued)

GEOENGINEERS

Project: Coos River HDD Feasibility
Project Location: Coos Bay, Oregon
Project Number: 16724-001-08

Figure A-5
Sheet 2 of 3

EXHIBIT B
Log of Boring CR-4

Project: Coos River HDD Feasibility
Project Location: Coos Bay, Oregon
Project Number: 15724-001-08
<table>
<thead>
<tr>
<th>Elevation (feet)</th>
<th>Depth (feet)</th>
<th>Internal Resistance (V)</th>
<th>Borehole Dia.</th>
<th>Sample Name</th>
<th>Testing</th>
<th>Water Level</th>
<th>Material Description</th>
<th>Group Classification</th>
<th>Moisture Content</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>18</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>SM Gray silty fine to medium sand with trace organic matter (loose, wet)</td>
<td>SM</td>
<td>53</td>
<td>SA; %F = 49</td>
</tr>
<tr>
<td>40</td>
<td>18</td>
<td>3</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td>ML Gray fine sandy silt (soft, wet)</td>
<td>ML</td>
<td>53</td>
<td>%F = 53</td>
</tr>
<tr>
<td>45</td>
<td>18</td>
<td>3</td>
<td>9 %F</td>
<td></td>
<td></td>
<td></td>
<td>Becomes very soft with decreased sand content</td>
<td></td>
<td>57</td>
<td>%F = 76</td>
</tr>
<tr>
<td>50</td>
<td>18</td>
<td>3</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td>Becomes brownish gray, very soft</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>18</td>
<td>0</td>
<td>11 %F</td>
<td></td>
<td></td>
<td></td>
<td>SM Gray silty fine sand (very loose, wet)</td>
<td>SM</td>
<td>57</td>
<td>%F = 76</td>
</tr>
<tr>
<td>60</td>
<td>18</td>
<td>2</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td>SP-6M Gray fine sand with silt (medium dense, wet)</td>
<td>SP-6M</td>
<td></td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>18</td>
<td>4</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td>SP Gray fine to medium sand (medium dense, wet)</td>
<td>SP</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: See Figure A-1 for explanation of symbols.

Log of Boring CR-4 (continued)

Project: Coos River HDD Feasibility
Project Location: Coos Bay, Oregon
Project Number: 16724-001-08

EXHIBIT B
### Sieve Analysis Results

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Sample Depth (feet)</th>
<th>Moisture Content (%)</th>
<th>Grain (%)</th>
<th>Sand (%)</th>
<th>Fines (%)</th>
<th>USCS Class</th>
<th>Soil Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR-2 S-3</td>
<td>15</td>
<td>59</td>
<td>1</td>
<td>51</td>
<td>47</td>
<td>SC</td>
<td>Clayey fine to coarse sand with trace fine gravel</td>
</tr>
<tr>
<td>CR-3 S-3</td>
<td>15</td>
<td>34</td>
<td>0</td>
<td>88</td>
<td>12</td>
<td>SP-SM</td>
<td>Fine to medium sand with silt</td>
</tr>
<tr>
<td>CR-3 S-6</td>
<td>30</td>
<td>42</td>
<td>0</td>
<td>60</td>
<td>40</td>
<td>SM</td>
<td>Silty fine to medium sand</td>
</tr>
<tr>
<td>CR-3 S-8</td>
<td>40</td>
<td>34</td>
<td>0</td>
<td>81</td>
<td>19</td>
<td>SM</td>
<td>Silty fine to medium sand</td>
</tr>
</tbody>
</table>

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**Figure A - 7**
### Sieve Analysis Results

**Coos River HDD Feasibility**

#### Exhibit B

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Sample ID</th>
<th>Sample Depth (Feet)</th>
<th>Moisture Content (%)</th>
<th>Gravel (%)</th>
<th>Sand (%)</th>
<th>Fines (%)</th>
<th>USCS Class</th>
<th>Soil Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CR-3 S-10</td>
<td>60</td>
<td>36</td>
<td>0</td>
<td>81</td>
<td>19</td>
<td>SM</td>
<td>Silty fine to medium sand</td>
</tr>
<tr>
<td></td>
<td>CR-3 S-12</td>
<td>60</td>
<td>46</td>
<td>0</td>
<td>71</td>
<td>29</td>
<td>SM</td>
<td>Silty fine to coarse sand</td>
</tr>
<tr>
<td></td>
<td>CR-3 S-14</td>
<td>70</td>
<td>33</td>
<td>0</td>
<td>77</td>
<td>23</td>
<td>SM</td>
<td>Silty fine sand</td>
</tr>
</tbody>
</table>

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U.S. STANDARD SIEVE SIZE

PERCENT PASSING BY WEIGHT

GRAIN SIZE IN MILLIMETERS

COBBLES

GRAVEL

SAND

SILT OR CLAY

COARSE | FINE

COARSE | MEDIUM | FINE

Symbol | Sample ID | Sample Depth (feet) | Moisture Content (%) | Gravel (%) | Sand (%) | Fines (%) | USCS Class | Soil Classification
--- | --- | --- | --- | --- | --- | --- | --- | ---
| | | | | | | | | |
| CR-3 S-16 | 80 | 37 | 0 | 81 | 19 | SM | Silty fine to coarse sand
| CR-4 S-3 | 15 | 56 | 0 | 59 | 41 | SM | Silty fine sand
| CR-4 S-7 | 35 | 53 | 0 | 51 | 49 | SM | Silty fine to medium sand

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Atterberg Limits Test Results

Coos River HDD Feasibility

EXHIBIT B
### PLASTICITY CHART

![Plasticity Chart Image]

#### Atterberg Limits Test Results

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Sample Depth (feet)</th>
<th>Moisture Content (%)</th>
<th>Liquid Limit (%)</th>
<th>Plasticity Index (%)</th>
<th>USCS</th>
<th>Soil Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR-2 S-1</td>
<td>5</td>
<td>138</td>
<td>239</td>
<td>188</td>
<td>OH</td>
<td>Organic fat clay</td>
</tr>
<tr>
<td>CR-2 S-8</td>
<td>40</td>
<td>94</td>
<td>117</td>
<td>67</td>
<td>OH</td>
<td>Organic silt with fine sand</td>
</tr>
<tr>
<td>CR-2 S-10</td>
<td>50</td>
<td>41</td>
<td>60</td>
<td>36</td>
<td>CH</td>
<td>Fat clay with trace organics</td>
</tr>
<tr>
<td>CR-2 S-12</td>
<td>60</td>
<td>44</td>
<td>58</td>
<td>34</td>
<td>CH</td>
<td>Fat clay with sand and some gravel</td>
</tr>
</tbody>
</table>

---

*Note: This report may not be reproduced, except in full, without written approval of GeoEngineers, Inc. Test results are applicable only to the specific sample on which they were performed, and should not be interpreted as representative of any other samples obtained at other times, depths or locations, or generated by separate operations or processes.*
PLASTICITY CHART

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Sample ID</th>
<th>Sample Depth (feet)</th>
<th>Moisture Content (%)</th>
<th>Liquidity Limit (%)</th>
<th>Plasticity Index (%)</th>
<th>USCS</th>
<th>Soil Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>▲</td>
<td>CR-2</td>
<td>75</td>
<td>39</td>
<td>57</td>
<td>35</td>
<td>CH</td>
<td>Fat clay with sand and gravel</td>
</tr>
<tr>
<td>▲</td>
<td>S-15</td>
<td>85</td>
<td>na</td>
<td>62</td>
<td>40</td>
<td>CH</td>
<td>Fat clay with gravel</td>
</tr>
<tr>
<td>▲</td>
<td>CR-3</td>
<td>95</td>
<td>55</td>
<td>62</td>
<td>32</td>
<td>CH</td>
<td>Fat clay with trace organics</td>
</tr>
</tbody>
</table>

Atterberg Limits Test Results

Coos River HDD Feasibility

Note: This report may not be reproduced, except in full, without written approval of GeoEngineers, Inc. Test results are applicable only to the specific sample or which they were performed and should not be interpreted as representative of any other samples obtained at other times, depths or locations, or generated by separate operations or processes.

EXHIBIT B
Atterberg Limits Test Results

Coos River HDD Feasibility

GEOENGINEERS

Figure A-13

EXHIBIT B
APPENDIX B

Report Limitations and Guidelines for Use
APPENDIX B
REPORT LIMITATIONS AND GUIDELINES FOR USE

This appendix provides information to help you manage your risks with respect to the use of this report.

Geotechnical Services Are Performed for Specific Purposes, Persons and Projects

This report has been prepared for the exclusive use of Williams and their authorized agents. This report is not intended for use by others, and the information contained herein is not applicable to other sites.

GeoEngineers structures our services to meet the specific needs of our clients. For example, a geotechnical or geologic study conducted for a civil engineer or architect may not fulfill the needs of a construction contractor or even another civil engineer or architect that are involved in the same project. Because each geotechnical or geologic study is unique, each geotechnical engineering or geologic report is unique, prepared solely for the specific client and project site. Our report is prepared for the exclusive use of our Client. No other party may rely on the product of our services unless we agree in advance to such reliance in writing. This is to provide our firm with reasonable protection against open-ended liability claims by third parties with whom there would otherwise be no contractual limits to their actions. Within the limitations of scope, schedule and budget, our services have been executed in accordance with our Agreement with the Client and generally accepted geotechnical practices in this area at the time this report was prepared. This report should not be applied for any purpose or project except the one originally contemplated.

A Geotechnical Engineering or Geologic Report Is Based on a Unique Set of Project-specific Factors

This report has been prepared for the proposed Coos River HDD associated with the Pacific Connector Gas Pipeline Project in Coos Bay, Oregon. GeoEngineers considered a number of unique, project-specific factors when establishing the scope of services for this project and report. Unless GeoEngineers specifically indicates otherwise, do not rely on this report if it was:

- not prepared for you.
- not prepared for your project.
- not prepared for the specific site explored.
- completed before important project changes were made.

For example, changes that can affect the applicability of this report include those that affect:

- the function of the proposed structure.
- elevation, configuration, location, orientation or weight of the proposed structure.
- composition of the design team.
- project ownership.

---

1 Developed based on material provided by ASFE, Professional Firms Practicing in the Geosciences; www.asfe.org.
If important changes are made after the date of this report, GeoEngineers should be given the opportunity to review our interpretations and recommendations and provide written modifications or confirmation, as appropriate.

Subsurface Conditions Can Change

This geotechnical or geologic report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time, by manmade events such as construction on or adjacent to the site, or by natural events such as floods, earthquakes, slope instability or groundwater fluctuations. Always contact GeoEngineers before applying a report to determine if it remains applicable.

Most Geotechnical and Geologic Findings Are Professional Opinions

Our interpretations of subsurface conditions are based on field observations from widely spaced sampling locations at the site. Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. GeoEngineers reviewed field and laboratory data and then applied our professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ, sometimes significantly, from those indicated in this report. Our report, conclusions and interpretations should not be construed as a warranty of the subsurface conditions.

Geotechnical Engineering Report Recommendations Are Not Final

Do not over-rely on the preliminary construction recommendations included in this report. These recommendations are not final, because they were developed principally from GeoEngineers' professional judgment and opinion. GeoEngineers' recommendations can be finalized only by observing actual subsurface conditions revealed during construction. GeoEngineers cannot assume responsibility or liability for this report's recommendations if we do not perform construction observation.

Sufficient observation, testing and consultation by GeoEngineers should be provided during construction to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes should the conditions revealed during the work differ from those anticipated, and to evaluate whether or not earthwork activities are completed in accordance with our recommendations. Retaining GeoEngineers for construction observation for this project is the most effective method of managing the risks associated with unanticipated conditions.

A Geotechnical Engineering or Geologic Report Could Be Subject to Misinterpretation

Misinterpretation of this report by other design team members can result in costly problems. You could lower that risk by having GeoEngineers confer with appropriate members of the design team after submitting the report. Also, retain GeoEngineers to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering or geologic report. Reduce that risk by having GeoEngineers participate in pre-bid and preconstruction conferences, and by providing construction observation.
Do Not Redraw the Exploration Logs

Geotechnical engineers and geologists prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering or geologic report should never be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, but recognize that separating logs from the report can elevate risk.

Give Contractors a Complete Report and Guidance

Some owners and design professionals believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering or geologic report, but preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report’s accuracy is limited; encourage them to confer with GeoEngineers and/or to conduct additional study to obtain the specific types of information they need or prefer. A pre-bid conference can also be valuable. Be sure contractors have sufficient time to perform additional study. Only then might an owner be in a position to give contractors the best information available, while requiring them to at least share the financial responsibilities stemming from unanticipated conditions. Further, a contingency for unanticipated conditions should be included in your project budget and schedule.

Contractors Are Responsible for Site Safety on Their Own Construction Projects

Our geotechnical recommendations are not intended to direct the contractor’s procedures, methods, schedule or management of the work site. The contractor is solely responsible for job site safety and for managing construction operations to minimize risks to on-site personnel and to adjacent properties.

Read These Provisions Closely

Some clients, design professionals and contractors may not recognize that the geoscience practices (geotechnical engineering or geology) are far less exact than other engineering and natural science disciplines. This lack of understanding can create unrealistic expectations that could lead to disappointments, claims and disputes. GeoEngineers includes these explanatory “limitations” provisions in our reports to help reduce such risks. Please confer with GeoEngineers if you are unclear how these “Report Limitations and Guidelines for Use” apply to your project or site.

Geotechnical, Geologic and Environmental Reports Should Not Be Interchanged

The equipment, techniques and personnel used to perform an environmental study differ significantly from those used to perform a geotechnical or geologic study and vice versa. For that reason, a geotechnical engineering or geologic report does not usually relate any environmental findings, conclusions or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. Similarly, environmental reports are not used to address geotechnical or geologic concerns regarding a specific project.

GeoEngineers, Inc.

File No. 16724-001-06

EXHIBIT B
Biological Pollutants

GeoEngineers' Scope of Work specifically excludes the investigation, detection, prevention or assessment of the presence of Biological Pollutants. Accordingly, this report does not include any interpretations, recommendations, findings, or conclusions regarding the detecting, assessing, preventing or abating of Biological Pollutants and no conclusions or inferences should be drawn regarding Biological Pollutants, as they may relate to this project. The term “Biological Pollutants” includes, but is not limited to, molds, fungi, spores, bacteria, and viruses, and/or any of their byproducts.

If Client desires these specialized services, they should be obtained from a consultant who offers services in this specialized field.
WETLAND AND WATERBODY CONSTRUCTION AND MITIGATION PROCEDURES
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*May 2013 Version*
WETLAND AND WATERBODY
CONSTRUCTION AND MITIGATION PROCEDURES (PROCEDURES)

I. APPLICABILITY

A. The intent of these Procedures is to assist project sponsors by identifying baseline mitigation measures for minimizing the extent and duration of project-related disturbance on wetlands and waterbodies. Project sponsors shall specify in their applications for a new FERC authorization, and in prior notice and advance notice filings, any individual measures in these Procedures they consider unnecessary, technically infeasible, or unsuitable due to local conditions and fully describe any alternative measures they would use. Project sponsors shall also explain how those alternative measures would achieve a comparable level of mitigation.

Once a project is authorized, project sponsors can request further changes as variances to the measures in these Procedures (or the applicant’s approved procedures). The Director of the Office of Energy Projects (Director) will consider approval of variances upon the project sponsor’s written request, if the Director agrees that a variance:

1. provides equal or better environmental protection;

2. is necessary because a portion of these Procedures is infeasible or unworkable based on project-specific conditions; or

3. is specifically required in writing by another federal, state, or Native American land management agency for the portion of the project on its land or under its jurisdiction.

Sponsors of projects planned for construction under the automatic authorization provisions in the FERC’s regulations must receive written approval for any variances in advance of construction.

Project-related impacts on non-wetland areas are addressed in the staff’s Upland Erosion Control, Revegetation, and Maintenance Plan (Plan).
B. DEFINITIONS

1. "Waterbody" includes any natural or artificial stream, river, or drainage with perceptible flow at the time of crossing, and other permanent waterbodies such as ponds and lakes:
   a. "minor waterbody" includes all waterbodies less than or equal to 10 feet wide at the water’s edge at the time of crossing;
   b. "intermediate waterbody" includes all waterbodies greater than 10 feet wide but less than or equal to 100 feet wide at the water’s edge at the time of crossing; and
   c. "major waterbody" includes all waterbodies greater than 100 feet wide at the water’s edge at the time of crossing.

2. "Wetland" includes any area that is not in actively cultivated or rotated cropland and that satisfies the requirements of the current federal methodology for identifying and delineating wetlands.

II. PRECONSTRUCTION FILING

A. The following information must be filed with the Secretary of the FERC (Secretary) prior to the beginning of construction, for the review and written approval by the Director:

   1. site-specific justifications for extra work areas that would be closer than 50 feet from a waterbody or wetland; and
   2. site-specific justifications for the use of a construction right-of-way greater than 75-feet-wide in wetlands.

B. The following information must be filed with the Secretary prior to the beginning of construction. These filing requirements do not apply to projects constructed under the automatic authorization provisions in the FERC’s regulations:

   1. Spill Prevention and Response Procedures specified in section IV.A;
   2. a schedule identifying when trenching or blasting will occur within each waterbody greater than 10 feet wide, within any designated coldwater fishery, and within any waterbody identified as habitat for federally-listed threatened or endangered species. The project sponsor will revise the schedule as necessary to provide FERC staff at least 14 days advance notice. Changes within this last 14-day period must provide for at least 48 hours advance notice;
3. plans for horizontal directional drills (HDD) under wetlands or waterbodies, specified in section V.B.6.d;

4. site-specific plans for major waterbody crossings, described in section V.B.9;

5. a wetland delineation report as described in section VII.A.1, if applicable; and

6. the hydrostatic testing information specified in section VII.B.3.

III. ENVIRONMENTAL INSPECTORS

A. At least one Environmental Inspector having knowledge of the wetland and waterbody conditions in the project area is required for each construction spread. The number and experience of Environmental Inspectors assigned to each construction spread shall be appropriate for the length of the construction spread and the number/significance of resources affected.

B. The Environmental Inspector’s responsibilities are outlined in the Upland Erosion Control, Revegetation, and Maintenance Plan (Plan).

IV. PRECONSTRUCTION PLANNING

A. The project sponsor shall develop project-specific Spill Prevention and Response Procedures that meet applicable requirements of state and federal agencies. A copy must be filed with the Secretary prior to construction and made available in the field on each construction spread. This filing requirement does not apply to projects constructed under the automatic authorization provisions in the FERC’s regulations.

1. It shall be the responsibility of the project sponsor and its contractors to structure their operations in a manner that reduces the risk of spills or the accidental exposure of fuels or hazardous materials to waterbodies or wetlands. The project sponsor and its contractors must, at a minimum, ensure that:

   a. all employees handling fuels and other hazardous materials are properly trained;

   b. all equipment is in good operating order and inspected on a regular basis;

   c. fuel trucks transporting fuel to on-site equipment travel only on approved access roads;

   d. all equipment is parked overnight and/or fueled at least 100 feet from a waterbody or in an upland area at least 100 feet from a wetland boundary. These activities can occur closer only if the Environmental Inspector determines that there is no reasonable alternative, and the
project sponsor and its contractors have taken appropriate steps (including secondary containment structures) to prevent spills and provide for prompt cleanup in the event of a spill;

e. hazardous materials, including chemicals, fuels, and lubricating oils, are not stored within 100 feet of a wetland, waterbody, or designated municipal watershed area, unless the location is designated for such use by an appropriate governmental authority. This applies to storage of these materials and does not apply to normal operation or use of equipment in these areas;

f. concrete coating activities are not performed within 100 feet of a wetland or waterbody boundary, unless the location is an existing industrial site designated for such use. These activities can occur closer only if the Environmental Inspector determines that there is no reasonable alternative, and the project sponsor and its contractors have taken appropriate steps (including secondary containment structures) to prevent spills and provide for prompt cleanup in the event of a spill;

g. pumps operating within 100 feet of a waterbody or wetland boundary utilize appropriate secondary containment systems to prevent spills; and

h. bulk storage of hazardous materials, including chemicals, fuels, and lubricating oils have appropriate secondary containment systems to prevent spills.

2. The project sponsor and its contractors must structure their operations in a manner that provides for the prompt and effective cleanup of spills of fuel and other hazardous materials. At a minimum, the project sponsor and its contractors must:

a. ensure that each construction crew (including cleanup crews) has on hand sufficient supplies of absorbent and barrier materials to allow the rapid containment and recovery of spilled materials and knows the procedure for reporting spills and unanticipated discoveries of contamination;

b. ensure that each construction crew has on hand sufficient tools and material to stop leaks;

c. know the contact names and telephone numbers for all local, state, and federal agencies (including, if necessary, the U. S. Coast Guard and the National Response Center) that must be notified of a spill; and
d. follow the requirements of those agencies in cleaning up the spill, in excavating and disposing of soils or other materials contaminated by a spill, and in collecting and disposing of waste generated during spill cleanup.

B. AGENCY COORDINATION

The project sponsor must coordinate with the appropriate local, state, and federal agencies as outlined in these Procedures and in the FERC’s Orders.

V. WATERBODY CROSSINGS

A. NOTIFICATION PROCEDURES AND PERMITS

1. Apply to the U.S. Army Corps of Engineers (COE), or its delegated agency, for the appropriate wetland and waterbody crossing permits.

2. Provide written notification to authorities responsible for potable surface water supply intakes located within 3 miles downstream of the crossing at least 1 week before beginning work in the waterbody, or as otherwise specified by that authority.

3. Apply for state-issued waterbody crossing permits and obtain individual or generic section 401 water quality certification or waiver.

4. Notify appropriate federal and state authorities at least 48 hours before beginning trenching or blasting within the waterbody, or as specified in applicable permits.

B. INSTALLATION

1. Time Window for Construction

Unless expressly permitted or further restricted by the appropriate federal or state agency in writing on a site-specific basis, instream work, except that required to install or remove equipment bridges, must occur during the following time windows:

a. coldwater fisheries - June 1 through September 30; and

b. coolwater and warmwater fisheries - June 1 through November 30.

2. Extra Work Areas

a. Locate all extra work areas (such as staging areas and additional spoil storage areas) at least 50 feet away from water’s edge, except where
the adjacent upland consists of cultivated or rotated cropland or other disturbed land.

b. The project sponsor shall file with the Secretary for review and written approval by the Director, site-specific justification for each extra work area with a less than 50-foot setback from the water's edge, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land. The justification must specify the conditions that will not permit a 50-foot setback and measures to ensure the waterbody is adequately protected.

c. Limit the size of extra work areas to the minimum needed to construct the waterbody crossing.

3. General Crossing Procedures

a. Comply with the COE, or its delegated agency, permit terms and conditions.

b. Construct crossings as close to perpendicular to the axis of the waterbody channel as engineering and routing conditions permit.

c. Where pipelines parallel a waterbody, maintain at least 15 feet of undisturbed vegetation between the waterbody (and any adjacent wetland) and the construction right-of-way, except where maintaining this offset will result in greater environmental impact.

d. Where waterbodies meander or have multiple channels, route the pipeline to minimize the number of waterbody crossings.

e. Maintain adequate waterbody flow rates to protect aquatic life, and prevent the interruption of existing downstream uses.

f. Waterbody buffers (e.g., extra work area setbacks, refueling restrictions) must be clearly marked in the field with signs and/or highly visible flagging until construction-related ground disturbing activities are complete.

g. Crossing of waterbodies when they are dry or frozen and not flowing may proceed using standard upland construction techniques in accordance with the Plan, provided that the Environmental Inspector verifies that water is unlikely to flow between initial disturbance and final stabilization of the feature. In the event of perceptible flow, the project sponsor must comply with all applicable Procedure requirements for “waterbodies” as defined in section 1.B.1.
4. Spoil Pile Placement and Control

a. All spoil from minor and intermediate waterbody crossings, and upland spoil from major waterbody crossings, must be placed in the construction right-of-way at least 10 feet from the water’s edge or in additional extra work areas as described in section V.B.2.

b. Use sediment barriers to prevent the flow of spoil or silt-laden water into any waterbody.

5. Equipment Bridges

a. Only clearing equipment and equipment necessary for installation of equipment bridges may cross waterbodies prior to bridge installation. Limit the number of such crossings of each waterbody to one per piece of clearing equipment.

b. Construct and maintain equipment bridges to allow unrestricted flow and to prevent soil from entering the waterbody. Examples of such bridges include:

   (1) equipment pads and culvert(s);
   (2) equipment pads or railroad car bridges without culverts;
   (3) clean rock fill and culvert(s); and
   (4) flexi-float or portable bridges.

Additional options for equipment bridges may be utilized that achieve the performance objectives noted above. Do not use soil to construct or stabilize equipment bridges.

c. Design and maintain each equipment bridge to withstand and pass the highest flow expected to occur while the bridge is in place. Align culverts to prevent bank erosion or streambed scour. If necessary, install energy dissipating devices downstream of the culverts.

d. Design and maintain equipment bridges to prevent soil from entering the waterbody.

e. Remove temporary equipment bridges as soon as practicable after permanent seeding.

f. If there will be more than 1 month between final cleanup and the beginning of permanent seeding and reasonable alternative access to the right-of-way is available, remove temporary equipment bridges as soon as practicable after final cleanup.
g. Obtain any necessary approval from the COE, or the appropriate state agency for permanent bridges.

6. Dry-Ditch Crossing Methods

a. Unless approved otherwise by the appropriate federal or state agency, install the pipeline using one of the dry-ditch methods outlined below for crossings of waterbodies up to 30 feet wide (at the water’s edge at the time of construction) that are state-designated as either coldwater or significant coolwater or warmwater fisheries, or federally-designated as critical habitat.

b. Dam and Pump

(1) The dam-and-pump method may be used without prior approval for crossings of waterbodies where pumps can adequately transfer streamflow volumes around the work area, and there are no concerns about sensitive species passage.

(2) Implementation of the dam-and-pump crossing method must meet the following performance criteria:

(i) use sufficient pumps, including on-site backup pumps, to maintain downstream flows;

(ii) construct dams with materials that prevent sediment and other pollutants from entering the waterbody (e.g., sandbags or clean gravel with plastic liner);

(iii) screen pump intakes to minimize entrainment of fish;

(iv) prevent streambed scour at pump discharge; and

(v) continuously monitor the dam and pumps to ensure proper operation throughout the waterbody crossing.

c. Flume Crossing

The flume crossing method requires implementation of the following steps:

(1) install flume pipe after blasting (if necessary), but before any trenching;

(2) use sand bag or sand bag and plastic sheeting diversion structure or equivalent to develop an effective seal and to divert stream flow through the flume pipe (some modifications to the stream bottom may be required to achieve an effective seal);
(3) properly align flume pipe(s) to prevent bank erosion and streambed scour;

(4) do not remove flume pipe during trenching, pipelaying, or backfilling activities, or initial streambed restoration efforts; and

(5) remove all flume pipes and dams that are not also part of the equipment bridge as soon as final cleanup of the stream bed and bank is complete.

d. Horizontal Directional Drill

For each waterbody or wetland that would be crossed using the HDD method, file with the Secretary for the review and written approval by the Director, a plan that includes:

(1) site-specific construction diagrams that show the location of mud pits, pipe assembly areas, and all areas to be disturbed or cleared for construction;

(2) justification that disturbed areas are limited to the minimum needed to construct the crossing;

(3) identification of any aboveground disturbance or clearing between the HDD entry and exit workspaces during construction;

(4) a description of how an inadvertent release of drilling mud would be contained and cleaned up; and

(5) a contingency plan for crossing the waterbody or wetland in the event the HDD is unsuccessful and how the abandoned drill hole would be sealed, if necessary.

The requirement to file HDD plans does not apply to projects constructed under the automatic authorization provisions in the FERC’s regulations.

7. Crossings of Minor Waterbodies

Where a dry-ditch crossing is not required, minor waterbodies may be crossed using the open-cut crossing method, with the following restrictions:

a. except for blasting and other rock breaking measures, complete instream construction activities (including trenching, pipe installation, backfill, and restoration of the streambed contours) within 24 hours.
Streambanks and unconsolidated streambeds may require additional restoration after this period;

b. limit use of equipment operating in the waterbody to that needed to construct the crossing; and

c. equipment bridges are not required at minor waterbodies that do not have a state-designated fishery classification or protected status (e.g., agricultural or intermittent drainage ditches). However, if an equipment bridge is used it must be constructed as described in section V.B.5.

8. Crossings of Intermediate Waterbodies

Where a dry-ditch crossing is not required, intermediate waterbodies may be crossed using the open-cut crossing method, with the following restrictions:

a. complete instream construction activities (not including blasting and other rock breaking measures) within 48 hours, unless site-specific conditions make completion within 48 hours infeasible;

b. limit use of equipment operating in the waterbody to that needed to construct the crossing; and

c. all other construction equipment must cross on an equipment bridge as specified in section V.B.5.

9. Crossings of Major Waterbodies

Before construction, the project sponsor shall file with the Secretary for the review and written approval by the Director a detailed, site-specific construction plan and scaled drawings identifying all areas to be disturbed by construction for each major waterbody crossing (the scaled drawings are not required for any offshore portions of pipeline projects). This plan must be developed in consultation with the appropriate state and federal agencies and shall include extra work areas, spoil storage areas, sediment control structures, etc., as well as mitigation for navigational issues. The requirement to file major waterbody crossing plans does not apply to projects constructed under the automatic authorization provisions of the FERC’s regulations.

The Environmental Inspector may adjust the final placement of the erosion and sediment control structures in the field to maximize effectiveness.

10. Temporary Erosion and Sediment Control

Install sediment barriers (as defined in section IV.F.3.a of the Plan) immediately after initial disturbance of the waterbody or adjacent upland.
Sediment barriers must be properly maintained throughout construction and reinstall as necessary (such as after backfilling of the trench) until replaced by permanent erosion controls or restoration of adjacent upland areas is complete. Temporary erosion and sediment control measures are addressed in more detail in the Plan; however, the following specific measures must be implemented at stream crossings:

a. install sediment barriers across the entire construction right-of-way at all waterbody crossings, where necessary to prevent the flow of sediments into the waterbody. Removable sediment barriers (or driveable berms) must be installed across the travel lane. These removable sediment barriers can be removed during the construction day, but must be re-installed after construction has stopped for the day and/or when heavy precipitation is imminent;

b. where waterbodies are adjacent to the construction right-of-way and the right-of-way slopes toward the waterbody, install sediment barriers along the edge of the construction right-of-way as necessary to contain spoil within the construction right-of-way and prevent sediment flow into the waterbody; and

c. use temporary trench plugs at all waterbody crossings, as necessary, to prevent diversion of water into upland portions of the pipeline trench and to keep any accumulated trench water out of the waterbody.

11. Trench Dewatering

Dewater the trench (either on or off the construction right-of-way) in a manner that does not cause erosion and does not result in silt-laden water flowing into any waterbody. Remove the dewatering structures as soon as practicable after the completion of dewatering activities.

C. RESTORATION

1. Use clean gravel or native cobbles for the upper 1 foot of trench backfill in all waterbodies that contain coldwater fisheries.

2. For open-cut crossings, stabilize waterbody banks and install temporary sediment barriers within 24 hours of completing instream construction activities. For dry-ditch crossings, complete streambed and bank stabilization before returning flow to the waterbody channel.

3. Return all waterbody banks to preconstruction contours or to a stable angle of repose as approved by the Environmental Inspector.

4. Install erosion control fabric or a functional equivalent on waterbody banks at the time of final bank recontouring. Do not use synthetic monofilament
mesh/netted erosion control materials in areas designated as sensitive wildlife habitat unless the product is specifically designed to minimize harm to wildlife. Anchor erosion control fabric with staples or other appropriate devices.

5. Application of riprap for bank stabilization must comply with COE, or its delegated agency, permit terms and conditions.

6. Unless otherwise specified by state permit, limit the use of riprap to areas where flow conditions preclude effective vegetative stabilization techniques such as seeding and erosion control fabric.

7. Revegetate disturbed riparian areas with native species of conservation grasses, legumes, and woody species, similar in density to adjacent undisturbed lands.

8. Install a permanent slope breaker across the construction right-of-way at the base of slopes greater than 5 percent that are less than 50 feet from the waterbody, or as needed to prevent sediment transport into the waterbody. In addition, install sediment barriers as outlined in the Plan.

In some areas, with the approval of the Environmental Inspector, an earthen berm may be suitable as a sediment barrier adjacent to the waterbody.

9. Sections V.C.3 through V.C.7 above also apply to those perennial or intermittent streams not flowing at the time of construction.

D. POST-CONSTRUCTION MAINTENANCE

1. Limit routine vegetation mowing or clearing adjacent to waterbodies to allow a riparian strip at least 25 feet wide, as measured from the waterbody’s mean high water mark, to permanently revegetate with native plant species across the entire construction right-of-way. However, to facilitate periodic corrosion/leak surveys, a corridor centered on the pipeline and up to 10 feet wide may be cleared at a frequency necessary to maintain the 10-foot corridor in an herbaceous state. In addition, trees that are located within 15 feet of the pipeline that have roots that could compromise the integrity of the pipeline coating may be cut and removed from the permanent right-of-way. Do not conduct any routine vegetation mowing or clearing in riparian areas that are between HDD entry and exit points.

2. Do not use herbicides or pesticides in or within 100 feet of a waterbody except as allowed by the appropriate land management or state agency.

3. Time of year restrictions specified in section VII.A.5 of the Plan (April 15 – August 1 of any year) apply to routine mowing and clearing of riparian areas.
VI. WETLAND CROSSINGS

A. GENERAL

1. The project sponsor shall conduct a wetland delineation using the current federal methodology and file a wetland delineation report with the Secretary before construction. The requirement to file a wetland delineation report does not apply to projects constructed under the automatic authorization provisions in the FERC's regulations.

   This report shall identify:

   a. by milepost all wetlands that would be affected;

   b. the National Wetlands Inventory (NWI) classification for each wetland;

   c. the crossing length of each wetland in feet; and

   d. the area of permanent and temporary disturbance that would occur in each wetland by NWI classification type.

The requirements outlined in this section do not apply to wetlands in actively cultivated or rotated cropland. Standard upland protective measures, including workspace and topsoiling requirements, apply to these agricultural wetlands.

2. Route the pipeline to avoid wetland areas to the maximum extent possible. If a wetland cannot be avoided or crossed by following an existing right-of-way, route the new pipeline in a manner that minimizes disturbance to wetlands. Where looping an existing pipeline, overlap the existing pipeline right-of-way with the new construction right-of-way. In addition, locate the loop line no more than 25 feet away from the existing pipeline unless site-specific constraints would adversely affect the stability of the existing pipeline.

3. Limit the width of the construction right-of-way to 75 feet or less. Prior written approval of the Director is required where topographic conditions or soil limitations require that the construction right-of-way width within the boundaries of a federally delineated wetland be expanded beyond 75 feet. Early in the planning process the project sponsor is encouraged to identify site-specific areas where excessively wide trenches could occur and/or where spoil piles could be difficult to maintain because existing soils lack adequate unconfined compressive strength.

4. Wetland boundaries and buffers must be clearly marked in the field with signs and/or highly visible flagging until construction-related ground disturbing activities are complete.
5. Implement the measures of sections V and VI in the event a waterbody crossing is located within or adjacent to a wetland crossing. If all measures of sections V and VI cannot be met, the project sponsor must file with the Secretary a site-specific crossing plan for review and written approval by the Director before construction. This crossing plan shall address at a minimum:

   a. spoil control;
   b. equipment bridges;
   c. restoration of waterbody banks and wetland hydrology;
   d. timing of the waterbody crossing;
   e. method of crossing; and
   f. size and location of all extra work areas.

6. Do not locate aboveground facilities in any wetland, except where the location of such facilities outside of wetlands would prohibit compliance with U.S. Department of Transportation regulations.

B. INSTALLATION

1. Extra Work Areas and Access Roads

   a. Locate all extra work areas (such as staging areas and additional spoil storage areas) at least 50 feet away from wetland boundaries, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land.

   b. The project sponsor shall file with the Secretary for review and written approval by the Director, site-specific justification for each extra work area with a less than 50-foot setback from wetland boundaries, except where adjacent upland consists of cultivated or rotated cropland or other disturbed land. The justification must specify the site-specific conditions that will not permit a 50-foot setback and measures to ensure the wetland is adequately protected.

   c. The construction right-of-way may be used for access when the wetland soil is firm enough to avoid rutting or the construction right-of-way has been appropriately stabilized to avoid rutting (e.g., with timber riprap, prefabricated equipment mats, or terra mats).

In wetlands that cannot be appropriately stabilized, all construction equipment other than that needed to install the wetland crossing shall
use access roads located in upland areas. Where access roads in upland areas do not provide reasonable access, limit all other construction equipment to one pass through the wetland using the construction right-of-way.

d. The only access roads, other than the construction right-of-way, that can be used in wetlands are those existing roads that can be used with no modifications or improvements, other than routine repair, and no impact on the wetland.

2. Crossing Procedures

a. Comply with COE, or its delegated agency, permit terms and conditions.

b. Assemble the pipeline in an upland area unless the wetland is dry enough to adequately support skids and pipe.

c. Use “push-pull” or “float” techniques to place the pipe in the trench where water and other site conditions allow.

d. Minimize the length of time that topsoil is segregated and the trench is open. Do not trench the wetland until the pipeline is assembled and ready for lowering in.

e. Limit construction equipment operating in wetland areas to that needed to clear the construction right-of-way, dig the trench, fabricate and install the pipeline, backfill the trench, and restore the construction right-of-way.

f. Cut vegetation just above ground level, leaving existing root systems in place, and remove it from the wetland for disposal.

The project sponsor can burn woody debris in wetlands, if approved by the COE and in accordance with state and local regulations, ensuring that all remaining woody debris is removed for disposal.

g. Limit pulling of tree stumps and grading activities to directly over the trenchline. Do not grade or remove stumps or root systems from the rest of the construction right-of-way in wetlands unless the Chief Inspector and Environmental Inspector determine that safety-related construction constraints require grading or the removal of tree stumps from under the working side of the construction right-of-way.

h. Segregate the top 1 foot of topsoil from the area disturbed by trenching, except in areas where standing water is present or soils are
saturated. Immediately after backfilling is complete, restore the segregated topsoil to its original location.

i. Do not use rock, soil imported from outside the wetland, tree stumps, or brush riprap to support equipment on the construction right-of-way.

j. If standing water or saturated soils are present, or if construction equipment causes ruts or mixing of the topsoil and subsoil in wetlands, use low-ground-weight construction equipment, or operate normal equipment on timber riprap, prefabricated equipment mats, or terra mats.

k. Remove all project-related material used to support equipment on the construction right-of-way upon completion of construction.

3. Temporary Sediment Control

Install sediment barriers (as defined in section IV.F.3.a of the Plan) immediately after initial disturbance of the wetland or adjacent upland. Sediment barriers must be properly maintained throughout construction and reinstalled as necessary (such as after backfilling of the trench). Except as noted below in section VI.B.3.c, maintain sediment barriers until replaced by permanent erosion controls or restoration of adjacent upland areas is complete. Temporary erosion and sediment control measures are addressed in more detail in the Plan.

a. Install sediment barriers across the entire construction right-of-way immediately upslope of the wetland boundary at all wetland crossings where necessary to prevent sediment flow into the wetland.

b. Where wetlands are adjacent to the construction right-of-way and the right-of-way slopes toward the wetland, install sediment barriers along the edge of the construction right-of-way as necessary to contain spoil within the construction right-of-way and prevent sediment flow into the wetland.

c. Install sediment barriers along the edge of the construction right-of-way as necessary to contain spoil and sediment within the construction right-of-way through wetlands. Remove these sediment barriers during right-of-way cleanup.
4. Trench Dewatering

Dewater the trench (either on or off the construction right-of-way) in a manner that does not cause erosion and does not result in silt-laden water flowing into any wetland. Remove the dewatering structures as soon as practicable after the completion of dewatering activities.

C. RESTORATION

1. Where the pipeline trench may drain a wetland, construct trench breakers at the wetland boundaries and/or seal the trench bottom as necessary to maintain the original wetland hydrology.

2. Restore pre-construction wetland contours to maintain the original wetland hydrology.

3. For each wetland crossed, install a trench breaker at the base of slopes near the boundary between the wetland and adjacent upland areas. Install a permanent slope breaker across the construction right-of-way at the base of slopes greater than 5 percent where the base of the slope is less than 50 feet from the wetland, or as needed to prevent sediment transport into the wetland. In addition, install sediment barriers as outlined in the Plan. In some areas, with the approval of the Environmental Inspector, an earthen berm may be suitable as a sediment barrier adjacent to the wetland.

4. Do not use fertilizer, lime, or mulch unless required in writing by the appropriate federal or state agency.

5. Consult with the appropriate federal or state agencies to develop a project-specific wetland restoration plan. The restoration plan shall include measures for re-establishing herbaceous and/or woody species, controlling the invasion and spread of invasive species and noxious weeds (e.g., purple loosestrife and phragmites), and monitoring the success of the revegetation and weed control efforts. Provide this plan to the FERC staff upon request.

6. Until a project-specific wetland restoration plan is developed and/or implemented, temporarily revegetate the construction right-of-way with annual rye grass at a rate of 40 pounds/acre (unless standing water is present).

7. Ensure that all disturbed areas successfully revegetate with wetland herbaceous and/or woody plant species.

8. Remove temporary sediment barriers located at the boundary between wetland and adjacent upland areas after revegetation and stabilization of adjacent upland areas are judged to be successful as specified in section VII.A.4 of the Plan.
D. POST-CONSTRUCTION MAINTENANCE AND REPORTING

1. Do not conduct routine vegetation mowing or clearing over the full width of the permanent right-of-way in wetlands. However, to facilitate periodic corrosion/leak surveys, a corridor centered on the pipeline and up to 10 feet wide may be cleared at a frequency necessary to maintain the 10-foot corridor in an herbaceous state. In addition, trees within 15 feet of the pipeline with roots that could compromise the integrity of pipeline coating may be selectively cut and removed from the permanent right-of-way. Do not conduct any routine vegetation mowing or clearing in wetlands that are between HDD entry and exit points.

2. Do not use herbicides or pesticides in or within 100 feet of a wetland, except as allowed by the appropriate federal or state agency.

3. Time of year restrictions specified in section VII.A.5 of the Plan (April 15 – August 1 of any year) apply to routine mowing and clearing of wetland areas.

4. Monitor and record the success of wetland revegetation annually until wetland revegetation is successful.

5. Wetland revegetation shall be considered successful if all of the following criteria are satisfied:

   a. the affected wetland satisfies the current federal definition for a wetland (i.e., soils, hydrology, and vegetation);

   b. vegetation is at least 80 percent of either the cover documented for the wetland prior to construction, or at least 80 percent of the cover in adjacent wetland areas that were not disturbed by construction;

   c. if natural rather than active revegetation was used, the plant species composition is consistent with early successional wetland plant communities in the affected ecoregion; and

   d. invasive species and noxious weeds are absent, unless they are abundant in adjacent areas that were not disturbed by construction.

6. Within 3 years after construction, file a report with the Secretary identifying the status of the wetland revegetation efforts and documenting success as defined in section VI.D.5, above. The requirement to file wetland restoration reports with the Secretary does not apply to projects constructed under the automatic authorization, prior notice, or advance notice provisions in the FERC’s regulations.

   For any wetland where revegetation is not successful at the end of 3 years after construction, develop and implement (in consultation with a
professional wetland ecologist) a remedial revegetation plan to actively revegetate wetlands. Continue revegetation efforts and file a report annually documenting progress in these wetlands until wetland revegetation is successful.

VII. HYDROSTATIC TESTING

A. NOTIFICATION PROCEDURES AND PERMITS

1. Apply for state-issued water withdrawal permits, as required.

2. Apply for National Pollutant Discharge Elimination System (NPDES) or state-issued discharge permits, as required.

3. Notify appropriate state agencies of intent to use specific sources at least 48 hours before testing activities unless they waive this requirement in writing.

B. GENERAL

1. Perform 100 percent radiographic inspection of all pipeline section welds or hydrotest the pipeline sections, before installation under waterbodies or wetlands.

2. If pumps used for hydrostatic testing are within 100 feet of any waterbody or wetland, address secondary containment and refueling of these pumps in the project’s Spill Prevention and Response Procedures.

3. The project sponsor shall file with the Secretary before construction a list identifying the location of all waterbodies proposed for use as a hydrostatic test water source or discharge location. This filing requirement does not apply to projects constructed under the automatic authorization provisions of the FERC’s regulations.

C. INTAKE SOURCE AND RATE

1. Screen the intake hose to minimize the potential for entrainment of fish.

2. Do not use state-designated exceptional value waters, waterbodies which provide habitat for federally listed threatened or endangered species, or waterbodies designated as public water supplies, unless appropriate federal, state, and/or local permitting agencies grant written permission.

3. Maintain adequate flow rates to protect aquatic life, provide for all waterbody uses, and provide for downstream withdrawals of water by existing users.

4. Locate hydrostatic test manifolds outside wetlands and riparian areas to the maximum extent practicable.
D. DISCHARGE LOCATION, METHOD, AND RATE

1. Regulate discharge rate, use energy dissipation device(s), and install sediment barriers, as necessary, to prevent erosion, streambed scour, suspension of sediments, or excessive streamflow.

2. Do not discharge into state-designated exceptional value waters, waterbodies which provide habitat for federally listed threatened or endangered species, or waterbodies designated as public water supplies, unless appropriate federal, state, and local permitting agencies grant written permission.