Appendix E

Biological Opinion and Biological Assessment

United States Department of the Interior
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May 3, 2019

U.S. Coast Guard Headquarters
Attn: Shelly Sugarman, CG-BRG-2
2703 Martin Luther King Jr. Avenue, SE STOP 7418
Washington, District of Columbia 20593-7418

Subject: BNSF Sandpoint Junction Connector Project, Bonner County, Idaho Biological Opinion
In Reply Refer to: 01EIFW00-2019-F-0369

Dear Ms. Shelly Sugarman:

Enclosed is the U.S. Fish and Wildlife Service's (Service) Biological Opinion (Opinion) with the United States Coast Guard's determination of effect on species listed under the Endangered Species Act (Act) of 1973, as amended, for the proposed Burlington Northern Santa Fe (BNSF) Sandpoint Junction Connector Project (Project) in Bonner County, Idaho. In a letter dated October 3, 2018, and received by the Service on October 3, 2018, the United States Coast Guard (USCG) requested formal consultation on the determination under section 7 of the Act that the proposed Project is likely to adversely affect bull trout (*Salvelinus confluentus*) and its designated critical habitat. The USCG also determined that the proposed project will have no effect on the grizzly bear (*Ursus arctos horribilis*), Canada lynx (*Lynx canadensis*), wolverine (*Gulo luscus*), or woodland caribou (*Rangifer tarandus caribou*). The regulations implementing section 7 of the Act do not require the Service to review or concur with no effect determinations.

The enclosed Opinion and concurrence are based primarily on our review of the proposed action, as described in your October 3, 2018 Biological Assessment (Assessment), and the anticipated effects of the action on listed species, and were prepared in accordance with section 7 of the Act. Our Opinion concludes that the proposed project will not jeopardize the survival and recovery of bull trout or adversely modify its designated critical habitat. A complete record of this consultation is on file at this office.

Clean Water Act Requirement Language:

This Opinion is also intended to address section 7 consultation requirements for the issuance of any project-related permits required under section 404 of the Clean Water Act. Use of this letter to document that the Army Corps of Engineers (Corps) has fulfilled its responsibilities under section 7 of the Act is contingent upon the following conditions:

1. The action considered by the Corps in their 404 permitting process must be consistent with the proposed project as described in the Assessment such that no detectable difference in the effects of the action on listed species will occur.

2. Any terms applied to the 404 permit must also be consistent with conservation measures and terms and conditions as described in the Assessment and addressed in this letter and Biological Opinion. Thank you for your continued interest in the conservation of threatened and endangered species. Please contact Marshall Williams at (509) 893-8038 if you have questions concerning this Opinion.

Sincerely,

Patricia C. Johnson-Hughes

for Gregory M. Hughes
State Supervisor

Enclosure

cc: IDEQ, Coeur d’Alene (Berquist)
IDFG, Coeur d’Alene (Corsi)

BIOLOGICAL OPINION
FOR THE
BNSF Sandpoint Connector Project

01EIFW00-2019-F-0369

U.S. FISH AND WILDLIFE SERVICE
IDAHO FISH AND WILDLIFE OFFICE
BOISE, IDAHO

Patricia C. Johnson-Hughes

for Gregory M. Hughes
State Supervisor

Date May 3, 2019

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1. BACKGROUND AND INFORMAL CONSULTATION

1.1 Introduction

The U.S. Fish and Wildlife Service (Service) has prepared this Biological Opinion (Opinion) of the effects of the BNSF Sandpoint Connector Project on bull trout (*Salvelinus confluentus*). In a letter dated October 3, 2018, and received on October 3, 2018, the United States Coast Guard (USCG) requested formal consultation with the Service under section 7 of the Endangered Species Act (Act) of 1973, as amended, for its proposal to carry out the action. The USCG determined that the proposed action is likely to adversely affect bull trout. As described in this Opinion, and based on the Biological Assessment (Assessment) developed by the USCG and other information, the Service has concluded that implementation of the Project, as proposed, is not likely to jeopardize the continued existence of bull trout.

The USCG has also determined that implementation of the Project will have no effect on Canada lynx (*Lynx canadensis)*, grizzly bear (*Ursus arctos horribilis*), North American wolverine (*Gulo luteus*), or woodland caribou (*Rangifer tarandus caribou*).

1.2 Consultation History

The USCG is the lead federal agency associated with this action and is consulting with the Service regarding potential Project-related effects to federally listed species and designated critical habitat. Jacobs Engineering Group Inc. (Jacobs) has had informal, technical assistance discussions with the Service to review impacts, methodology, and mitigation opportunities, including phone calls and email communications beginning in 2017 (Cousins, *in litt*; Siitari, *in litt*).

An Assessment was submitted to the USCG on December 21, 2017, as part of the bridge permit application packet for the new Sand Creek and LPO BNSF bridges. The Assessment was updated on April 10, 2018, and was included in the formal Joint Application Public Notice for the U.S. Army Corps of Engineers (USACE) 404 and Section 10 permitting review and the Idaho Department of Lands (IDL) Encroachment Permit process.

Informal meetings and communications with the Service between March and June 2018 culminated with a pre-Biological Assessment technical assistance meeting on July 20, 2018, at the Service’s Idaho Fish and Wildlife Office-Spokane located in Spokane, Washington.

Participants in that meeting (in person) included Marshall Williams and Katy Fitzgerald with the Service and Craig Broadhead, Sue PaDelford, and Diane Williams with Jacobs. Attendees via a teleconference line included Kris Swanson, Austin Hurst, and Matt Keim with BNSF and Shelly Sugarman, Steve Fischer, Danny O’Keefe, John Greene, and Kate O’Dell with the USCG.

Additional phone conversations and email correspondence occurred for clarification or requests for additional information were submitted.

June 7, 2018: Per e-mail, the Service clarified for the USCG the extent of bull trout critical habitat (CH) that includes the Lake Pend Oreille inlet leading to the mouth of the Sand Creek tributary. Bull trout CH is delineated on the Service IPaC website, and the mouth of Sand Creek was confirmed with a U.S. Geological Survey quad map. The clarification was needed to show that both the temporary and permanent 3.1 Bridges were within designated bull trout CH areas and would require appropriate conservation measures.

August 3, 2018: Per e-mail, the Service provide feedback to the USCG to ensure they address impacts to migratory birds and eagles under the Migratory Bird Treaty Act and the Bald and Gold Eagle Protection Act respectively. The Service also expressed concern over the potential for toxic metal mobilization in the lake sediments from legacy mining and smelting complexes from the Clark Fork River. This led to further discussion on mitigation measures to reduce potential exposure through minimization measures. The Service also suggested that the USCG review past hydroacoustic data from impact pile driving on Lake Pend Oreille to assist with the Assessment analysis.

November 21, 2018: Per e-mail from the USGS and Jacobs Engineering, the Service received an errata memorandum outlining minor corrections to the Assessment, revised on August 22, 2018.

November 21, 2018: Per e-mail, the Service requested additional information on the temporary threshold shift due to elevated sound pressure levels (SPLs) and the potential effects and duration of those effects to foraging and spawning success. The Service received the detailed response on November 30, 2018.

December 4, 2018: Per phone call, the Service queried the USCG about why the Assessment did not specifically state the Project would employ Best Management Practices for pile driving, to include the use of cushion blocks to help mitigate elevated SPLs. The Service received a response on December 7, stating that the use of cushion blocks for 24- and 36-inch piles is logistically problematic and that the cushion breaks early in the process and makes them ineffective. The Project will employ vibratory pile driving to the greatest extent possible to help mitigate elevated SPLs.

February 7, 2019: Per e-mail, the Service queried the USCG on the potential to use isolation casings as a mitigation measure for elevated SPLs during impact pile driving during construction of the temporary bridges; currently only turbidity curtains were planned. The Service received a response on February 12, 2019 that revised the Project so that bubble curtains in conjunction with turbidity curtains would be used during all impact pile driving operations in CH where the water is greater than 3 feet in depth. Since the 3 foot depth was different than that outlined in the Assessment, further clarification for the deviation was requested. The USCG replied on February 21, 2019, stating that the use of bubble and turbidity curtains for impact pile driving would remain at the recommended depth of 2 feet or greater water depth.

2. BIOLOGICAL OPINION

2.1 Description of the Proposed Action

2.1.1 Project Summary

BNSF Railway Company (BNSF) proposes to construct the Sandpoint Junction Connector Project (Project). The purpose of the Project is to reduce delay and improve operational efficiency between the two tracks at the north end of the BNSF Algoma main line (MP 5.1) and the BNSF Sandpoint Junction (MP 2.9) where the BNSF and Montana Rail Link (MRL) main lines converge. The proposed Project fulfills this purpose by improving the existing railroad corridor between MP 2.9 and MP 5.1. The Project will consist of a 2.2-mile-long second main line track adjacent to (west of) the existing BNSF main line track. The Project action will consist of constructing a second main line track; upgrading existing access roads, staging areas, tracks, switches and signals; constructing new bridges over Bridge Street (Bridge 3.0), Sand Creek (Bridge 3.1), an inlet of Lake Pend Oreille (LPO), and Lake Pend Oreille (Bridge. 3.9) adjacent to (west of) the existing rail bridges; building temporary construction bridges adjacent to (west of) the new bridges; filling 0.88 acre of permanent nearshore area and 0.38 acre of temporary nearshore area below the jurisdictional ordinary high water mark (OHWM) elevation of 2,062.5 feet, associated with bridge abutments and the south switch; and filling 0.28 acre of wetland south of Bridge 3.1. The improved corridor must be of sufficient width to accommodate a second track that enables safe, adjacent operations for freight and passenger trains within the BNSF right-of-way (ROW). A minimum 15-foot-wide track center is required for adjacent simultaneous train operations on upland rail grade areas, and 30- to 50-foot-wide track centers are needed at bridge locations to ensure that the pile driving for the new bridges does not impact the integrity of the piles for the existing bridges.

The Project is located in the Panhandle Basin, LPO Subbasin, Hydrologic Unit Code 17010214 Pend Oreille Lake, on the BNSF Montana Division, Kootenai River Subdivision, Line Segment 45, within the existing BNSF rights-of-way (ROWs) from MP 2.9+/– to MP 5.1+/– in Bonner County, Idaho (Figure 1).

2.1.2 Existing Conditions and Structures

The current track configuration involves an MRL siding and two main line tracks, BNSF and MRL, meeting at the Sandpoint Junction (BNSF MP 2.9) just north of the Sandpoint Amtrak Station, becoming a single main line track through Sandpoint and over Sand Creek and LPO to the BNSF Algoma (East) main line track (BNSF MP 5.1) where the single main line transitions to two main lines. Key features of the Project corridor are described below:

- The north end of the Project (BNSF MP 2.9) is within the City of Sandpoint and is designated as an Urban Transportation Corridor.
- From BNSF MP 2.9 to 3.9, the existing BNSF main line track is surrounded by a BNSF maintenance road, the Sandpoint Amtrak Depot, U.S. Highway 95 (US 95), and the Sandpoint Marina to the west and Sandpoint Avenue, the Seasons of Sandpoint

Condominiums, the Best Western Edgewater Resort, the Sandpoint Edgewater RV Park, and a portion of the Sandpoint City Beach Marina to the east.

- BNSF Bridge 3.0 spans Bridge Street in Sandpoint.
- BNSF Bridge 3.1 spans Sand Creek in Sandpoint.
- BNSF Bridge 3.9 spans the open water of LPO from MP 3.9–4.9.
- The south end of the Project (BNSF MP 5.1) is designated as a Rural-Residential Transportation Corridor.

The existing BNSF Bridge 3.1 over Sand Creek is a fixed, single-track bridge measuring 155 feet long and 19 feet wide with four concrete piers, two of which are abutments. It was originally constructed in 1902 but was modified in 1990 with replacement of the superstructure, concrete pier caps, deck, and walk. The existing Bridge 3.9 is a fixed bridge that has both open-deck and ballast-deck spans and measures 4,769 feet long with 88 piers. Thirty-two of the original over 100-year-old, single-column concrete piers on wood pilings (16 on the north end and 16 on the south end of the bridge) were replaced in 2007 to 2008 with steel bents, each composed of six closed-end steel pipe piles. The existing bridge also has a non-operable swing span over the two existing, published 76.6-foot-wide navigation channels.

Figure 1. Project Location

2.1.3 Construction Details, Schedule, and Quantities

The Project construction to build the 2.2-mile-long second main line track west of the existing BNSF main line consists of the following general elements:

- Constructing a new main line track west of the existing BNSF main line track.
- Constructing a new bridge over Bridge Street (Bridge 3.0) adjacent to (west of) the existing rail bridge).
- Constructing a new bridge over Sand Creek (Bridge 3.1) adjacent to (west of) the existing rail bridge.

- Constructing a new bridge over LPO (Bridge. 3.9) adjacent to (west of) the existing rail bridge.
- Upgrading tracks, switches, and signals.
- Building and removing temporary construction bridges over LPO and Sand Creek.
- Improving temporary construction material and equipment work staging areas.
- Filling 0.88 acre of permanent and 0.38 acre of temporary nearshore areas below the jurisdictional OHWM elevation of 2,062.50 feet, associated with bridge abutments and the south switch.
- Filling 0.28 acre of wetland in one location between the rail grade and the multiuse public pathway, south of Bridge 3.1.

Construction is expected to go on for approximately three years, beginning in spring 2019. Preliminary work would begin with improving access and staging areas. Work on the bridges would take approximately 12 months, dependent on weather or other interruptions to complete. After a 4-month head start on the work bridges, the new bridges' overall construction would take approximately 36 months or 3 years. This schedule allows for minimal or no production over a 2- to 3-month period each winter. Project elements, timing and duration are provided in table 1. Work vehicles and equipment for upland activities such as grading and rail grade embankment developing would be typical of heavy construction.

Table 1. Project Elements (Estimated Timing and Duration)

No.	Project Element	Timing	Work Description
1	Mobilize and Improve Access Roads and Staging Areas	2019: March, April, May	• Minor expansion/improvement of existing BNSF roads/staging areas • Land clearing for safety and staging
2	Identify Work Limits	2019: March, April, May	• Stake/flag work limits in jurisdictional areas • Stake/flag best management practice (BMP) protection locations
3	Install Environmental BMPs	2019: March, April, May	• Install upland perimeter protection BMPs throughout the Project, and, in particular, adjacent to jurisdictional areas not being impacted by the Project
4	Vegetation Removal	2019: March, April, May	• Riparian vegetation removal in nearshore and wetland fill areas. • Upland vegetation removal for placement of structural rock fill.
5	Nearshore and Wetland Fills	2019: March, April, May	• Place fill during lake drawdown when no water is present in the impacted area: - 0.38-acre temporary nearshore fill - 0.88-acre permanent nearshore fill - 0.28-acre permanent wetland fill • Install perimeter water quality BMP at the edges of fill
6	Upland Work Adjacent to Nearshore and Wetland Fills	2019: May and June	• Upland work associated with bridge abutments • Grading for new rail grade

7	Construct Temporary Work Bridge 3.1 (Sand Creek)	2019–2020: start in October; start in 2020 for pile removal and reinstallation in the navigation channel	• 48, 24-inch-diameter steel piles, up to 40 extend below the ordinary high water mark (OHWM) • Vibratory pile driver; 10 piles (1 per pier) to be proofed with an impact hammer • Estimate 1-month duration for pile driving, dependent on weather or other interruptions. • Work to occur during daylight hours • Drive piles below the OHWM during winter pool/low water conditions, where possible • Bubble curtains/turbidity curtains used when pile driving in water 2 feet deep or more (Sugarman 2019, *in litt*) • Remove piles/spans directly over and immediately adjacent to the navigation channel by May 2020 (if still in place at the start of the boating season) and reinstall in October 2020 if needed. • Piles to be slowly vibrated out of creek bed during winter pool/low water conditions and stockpiled in upland staging areas
8	Construct Temporary Work Bridge 3.9 (LPO)	2019–2020: Year round, weather permitting	• 700, 24-inch-diameter steel piles; 600 extend below the OHWM • Vibratory pile driver; 76 piles (1 per pier) to be proofed with an impact hammer • Bubble curtains/turbidity curtains used when pile driving in water 2 feet deep or more (Sugarman 2019, *in litt*) • Estimate 1-year duration for pile driving, dependent on weather or other interruptions. • Work to occur during daylight hours • To remain in place up to 3 years (i.e., 2022)
9	Construct New Bridge 3.1 (Sand Creek)	2019–2020: Assumes two low water, lake drawdown construction seasons	• 64, 24-inch-diameter steel piles; 22 below the OHWM • Piles vibrated to resistance then driven with an impact hammer • Work to occur during daylight hours • Estimate 1-month duration for pile driving, dependent on weather or other interruptions. • Drive piles below the OHWM during winter pool/low water conditions, where possible • Construction primarily during low water season(s) • Bubble curtains/turbidity curtains used when pile driving in water 2 feet deep or more • Pile driving may occur at either end, but likely at the south end towards the north
10	Construct New Bridge 3.9 (LPO)	2020–2022: Year round, weather permitting	• 288, 36-inch-diameter steel piles; all below the OHWM • Piles vibrated to resistance then driven with an impact hammer • Work to occur during daylight hours • Bubble curtains/turbidity curtains used when pile driving in water 2 feet deep or more • Estimate 6-month duration for pile driving, dependent on weather or other interruptions. • Work to start prior to completion of temporary work bridge

			• Piles may be driven simultaneously at either bridge end • Cast-in-place concrete deck
11	Remove Temporary Work Bridge 3.1 (Sand Creek)	2021: February, March, April	• Dismantle temporary bridge spans • Piles to be slowly vibrated out of creek bed during winter pool/low water conditions • Turbidity curtains to be used during pile removal in water 2 feet deep or more • Materials removed to staging areas until Project demobilization
12	Remove Temporary Work Bridge 3.9 (LPO)	2021–2022: Year round, weather permitting; start July/August	• Dismantle temporary bridge spans • Piles to be slowly vibrated out of lakebed • Full containment turbidity curtains to be used during pile removal • Materials removed to staging areas until Project demobilization
13	Remove Temporary Nearshore Fills	2022: October	• Remove in the dry during winter drawdown when no water present in impacted areas: • Install BMPs to prevent sedimentation to LPO or Sand Creek
14	Demobilize and Stabilize/Restore Disturbed Areas	2022: October to November	• Final grading • Removal of access road fills and temporary at-grade crossings • Seeding/mulching and native riparian plantings • Removal of temporary fencing, signage, etc. • Performed during low/no water conditions as necessary • Materials removed from staging areas • Staging areas restored to BNSF standards

2.1.4 Avoidance Measures

Avoidance measures were used to limit in-water impacts since the Project crosses Sand Creek and LPO.

Constructing the Project to the west of the existing track and bridges, rather than to the east, will avoid the placement of an estimated 3.82 to 5.82 additional acres of in-water fill as follows (taking into account a reduction of wetland fill of 0.28 acre south of Bridge 3.1):

- Additional nearshore fill of approximately 2.9 acres from Bridge 3.1 (Sand Creek) to Bridge 3.9 (LPO); approximately 0.5-mile of rail grade was already constructed on the west side of the tracks at the time of the US 95 Sandpoint bypass Project.
- Additional nearshore fill of approximately 1.2 acres for equipment and materials staging that would need to be brought in by barge over LPO (otherwise all Project equipment/materials would be brought in on Bridge Street in Sandpoint).
- Lake bottom excavation and fill of undetermined quantity (estimated up to 2 acres) for a large work barge landing area.

Constructing the Project within the existing BNSF ROW and within the proposed Project area would avoid the following:

- Development of a new transportation corridor outside of the existing BNSF ROW that would still have to cross Sand Creek and LPO.
- Additional environmental impacts at newly acquired properties for a new 100-foot-wide ROW that may have resulted in 13 to 18 acres of aquatic impacts.

Changes to initial Project designs avoided the following:

- Temporary nearshore fill of 0.17 acre by extending the southern-most span of the LPO temporary work bridge.
- Permanent nearshore fill of 1.97 acres by extending the north and south ends of Bridge 3.1, a design change to the north end and an extension to the south end of Bridge 3.9, and a design change to the Algoma Switch area at the south end of the Project.

2.1.5 Minimization Measures

Project specific conservation measures and best management practices (BMP) to reduce impact to bull trout and designated bull trout critical habitat are as follows:

- MM1 - Removal of vegetation will be limited to what is necessary for Project construction and for safe operation of equipment.
- MM2 - Temporary and permanent nearshore fills will be placed, and temporary fills will be removed, during LPO drawdown or winter pool when no is water present in the fill impact areas.
- MM3 - In-water steel piles for the temporary and permanent work bridges will be driven to refusal with a vibratory driver. One pile per pier of the temporary work bridge (10 of 48 piles for Bridge 3.1; 76 of 700 piles for Bridge 3.9) and all piles for the permanent bridges will be proofed with an impact hammer. Primary use of a vibratory driver will reduce the amount and duration of in-water sound.
- MM4 – Where possible, piles for the Bridge 3.1 temporary work bridge and the new, permanent bridge will be driven during LPO lake drawdown/winter pool/low-water conditions since sound does not propagate well in shallow water.
- MM5 – During impact driving for the new, temporary (USCG 2018, *in litt)* and permanent Bridges 3.1 and 3.9, air bubble curtains will be used to attenuate sound.
- MM6 - Open-ended piles will reduce the number of strikes required to install the piles and thereby reduce the duration of in-water sound (Singh 2014, p. 1; Karlowskis 2014, i; FHWA/IN/JTRP-2002 to 2004, p. 4).
- MM7 - Dispersal strikes will be utilized when an impact hammer is used to proof and/or install temporary and permanent in-water piles to minimize the potential for fish to be in the vicinity when production pile driving occurs.
- MM8 - During impact driving in water that is greater than 2 feet deep turbidity curtains (silt curtains) will be utilized to minimize in-water sediment suspension (WSDOT 2018).
- MM9 - Silt curtains must be reliable, in good condition, and maintained. Use of silt curtains should be in accordance with manufacturer’s guidance (Idaho Department of Environmental Quality [IDEQ] 2018, entire).
- MM10 - Turbidity monitoring per ID WQ standards and the Project’s 401 Water Quality Certification must be conducted to ensure silt curtains are functioning correctly.

- MM11 - Work will be performed during daylight hours; bull trout migrations are mostly nocturnal.
- MM12 - Bridge 3.9 temporary work bridge and the new, permanent bridge were designed at a height of 14 to 15 feet at the deepest part of LPO, which will allow penetration of ambient light during most of the day.
- MM13 - To contain sediments when removing piles for the Bridge 3.1 temporary work bridge, piles will be slowly vibrated out of the creek bed, will be removed during winter pool low water conditions, and turbidity curtains will be used where possible.
- MM14 - To contain and settle sediments when removing piles for the Bridge 3.9 temporary work bridge, piles will be slowly vibrated out of the lakebed at a rate of approximately one-quarter inch per second and turbidity curtains will be used around each pile or bent being removed; curtains will be anchored to the lakebed for total water column seal and tied off to withstand maximum current conditions.
- MM15 - Existing staging areas and access roads on the BNSF ROW will be utilized to avoid additional impacts to environmentally sensitive areas.
- MM16 - A Temporary Erosion and Sediment Control Plan and BMPs will be installed to reduce erosion from exposed soils and maintained throughout Project construction.
- MM17 - The contractor will install and maintain BMPs to keep construction debris from entering waters of the United States.
- MM18 - A Storm Water Pollution Prevention Plan (SWPPP) will be implemented as part of the NPDES Permit (USEPA 2017, pp 26-33).
- MM19 - A Water Quality Monitoring and Protection Plan (WQMPP) will be implemented as part of the 401 Water Quality Certification (IDEQ, 2018, entire).
- MM20 - A Spill Prevention, Control, and Countermeasure plan will be implemented to control and contain pollutants and product.
- MM21 - Prior to transport to the Project work site, equipment will be cleaned of accumulated grease, oil, or mud.
- MM22 - Equipment and machinery on the Project work site will be inspected daily to check for leaks or problems.
- MM23 - Equipment and machinery used in or over water will be pressure washed or steam cleaned of oils, grease, or other aquatic pollutants such as invasive species, in an upland location or staging area with appropriate wastewater controls and treatment prior to entering on or over waters of the United States (LPO or Sand Creek). Any wastewater or wash water will not be allowed to enter waters of the United States (IDEQ 2018).
- MM24 - Fully stocked petroleum containment spill kits will be kept and maintained onsite at power equipment work sites, portable fuel container sites, and construction staging areas during construction. Spill containment systems will be adequate to contain one and a half times the volume of fuel or fluids associated with each piece of equipment or machinery staged on the work bridge (USEPA n.d.; IDEQ 2018).
- MM25 - Full, secondary containment will be under equipment that use fuels or other hazardous materials on the temporary work bridge or within 100 feet of Sand Creek or LPO (USEPA n.d.; IDEQ 2018).
- MM26 - Equipment and machinery working on the temporary bridges will utilize biodegradable products when possible.

- MM27 - Fuel containers will not be stored on the temporary work bridge. Fueling and maintenance work will occur with secondary containment when on the temporary work bridge. Fuel and hazardous material storage and staging will occur 50 feet away from waters of the United States within staging areas on the BNSF ROW.
- MM28 - Fuel containers or other hazardous materials will not be stored unsecured at the Project site during nonwork hours.
- MM29 - A concrete handling BMP will be developed and approved by the IDEQ prior to concrete pumping or pours associated with the new bridge sections (IDEQ 2018).
- MM30 - BNSF will assign an inspector to document that minimization measures proposed and/or conditioned by regulatory agencies are implemented, maintained, and adaptively managed as needed (USEPA n.d.).

2.1.6 Mitigation Components

The Project will result in a total of 0.28 acre of permanent wetland fill. The impacted wetland is not utilized by Endangered Species Act (ESA)-listed species, therefore, mitigation is related to Clean Water Act regulations. Per mitigation regulations outlined in Section 332.3 of Title 33 of the Code of Federal Regulations (33 CFR 332.3), compensatory wetland mitigation options should be considered in the following order: mitigation banks, purchasing in-lieu fee program credits, or creating permittee-responsible mitigation sites. A mitigation bank is available within the impacted watershed and will therefore be utilized to compensate for unavoidable impacts to the wetland.

BNSF plans to purchase 0.95 credits (Jacobs 2018a, entire; PaDelford 2018, *in litt*) at the bank for compensatory wetland mitigation. The bank currently has approximately 1,000 credits available for purchase (Valencia Wetlands Trust 2017).

Proposed mitigation for 0.88 acre of nearshore fills will be satisfied via LPO and Sand Creek stakeholders through a consensus-based process, including but not limited to the Service, Idaho Department of Fish and Game (IDFG), and other participating non-government organizations. Ongoing stakeholder meetings and communications are focused on identifying current watershed projects that are underway and/or planned in the near future that are suitable and appropriate to mitigate impacts to affected nearshore areas and to threatened bull trout, and will provide the most benefit to the affected aquatic resources. The nearshore fill mitigation project will be identified in the future and will be performed under a separate permitting process.

2.1.7 Action Area

ESA regulations define the term “action area” as all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area for the Project is based on all potential impacts from construction activities, both temporary and permanent, to terrestrial and aquatic species. The action area was delineated by evaluating the farthest reaching physical, chemical, and biotic effects of the action on the environment (Figure 2).

Project implementation will cause temporary increases in noise and turbidity from pile driving and nearshore fills (when the first flush occurs). However, because increases in turbidity will be localized to several feet around piles during pile-driving activities, whereas the zone of increased noise levels will be significantly larger, the extent of the action area in both terrestrial and aquatic environments is defined by the extent of increased noise levels.

2.1.7.1 Terrestrial Impact Zone

Ambient terrestrial noise levels in the Project area are influenced by the local population level, traffic volumes on US 95, rail traffic, and commercial enterprises. The local population center is the City of Sandpoint. US 95 is located adjacent to the north end of the Project and diverges from the rail line near the north end of BNSF Bridge 3.9 to ab out 2,500 feet west of the south end of Bridge 3.9. Ambient noise level projected at 55 A-weighted decibels (dBA) is expected based on the local population (Washington State Department of Transportation [WSDOT] 2018, p. 7.17).

Typical noise levels for construction and equipment were obtained from Chapter 7.0, Construction Noise Impact Assessment, of WSDOT's Biological Assessment Preparation Manual (2018). The impact hammer produces noise levels at 110 dBA at 50 feet from the source. In the event that two simultaneous pile drivers are utilized, 3 dBA was added to the 110 dBA value resulting in 113 dBA as the highest noise level proposed during Project construction. Ambient noise within the study area includes vehicle traffic from US 95 and train traffic with peak noise levels of 140 decibels (dB), which represents a locomotive horn/whistle. Using an ambient noise level of 55, construction noise will attenuate between 25,600 and 51,200 linear feet (4.8 and 9.7 miles) from the site or, more precisely, 39,716 feet (7.52 miles). This assessment does not consider topography or vegetated landforms. When considering topography, construction noise is anticipated to travel a maximum of approximately six miles, which is the furthest open-water distance between the bridge and an elevated landform.

The Project also includes acquiring fill material and rock. However, because the fill and rock will be sourced from existing local commercial sites, the acquisition of the fill and rock will have no effect on listed species. Therefore the source(s) of the rock and fill are not within the action area.

2.1.7.2 Aquatic Impact Zone

The aquatic impact zone was delineated by evaluating the farthest-reaching physical, chemical, and biotic effects of the action on the environment, which was determined to be underwater sound pressure levels (SPLs) from the loudest construction activity.

There will be four distinct pile installation activities for the Project, including temporary and permanent pile installation at Bridges 3.1 and 3.9. The temporary Bridge 3.1 will require 48, 24-inch-diameter steel piles, with up to 40 extending below the OHWM. These will be installed with a vibratory pile driver and 10 piles (1 per pier) will be proofed with an impact hammer. The permanent Bridge 3.1 will require 64, 24-inch diameter piles with 22 located below the OHWM. These piles will receive up to 1,200 strikes per pile.

The permanent Bridge 3.9 will include 288, 36-inch-diameter steel piles, all below the OHWM, which will be vibrated to resistance then proofed with an impact hammer. During installation of the piles, bubble and turbidity curtains will be used in water 2 feet deep or more. These piles will receive up to 1,600 strikes per day. The temporary Bridge 3.9 will include 700, 24-inch-diameter steel piles (all installed to resistance via vibratory hammer) but only 76 piles (1 per pier) will be proofed with an impact hammer. Impact pile driving is anticipated to take between 1 to 3 hours per pile that requires proofing.

For the purposes of defining a conservative action area, the highest SPLs associated with impact-driving steel pipe piles for Bridges 3.1 and 3.9 are assumed. Therefore, the aquatic impact zone includes the farthest distance that underwater sound would travel from impact pile driving activities at Bridges 3.1 and 3.9 until reaching land, or attenuating to background noise levels.

It is likely the contractor will impact-drive piles at both ends of permanent Bridge 3.9 simultaneously, which will increase the SPLs within LPO. Underwater sound attenuation is modeled in the equation below. The National Oceanic and Atmospheric Administration (NOAA) Pile Driving Impact Calculator was also used to assess sound impacts to specific species (Appendix A) and that analysis is presented in the Direct Effects section. SPLs from impact pile driving at Bridge 3.9 create a majority of the action area within LPO; however, sound from pile installation at Bridge 3.1 will extend up into Sand Creek.

Impact driving a 36-inch-diameter steel pipe pile will generate the loudest underwater sound level of 193 dB root-mean-square (RMS) measured at 10 meters (WSDOT 2018, p. 7.40). During previous improvements on Bridge 3.9, acoustic monitoring demonstrated that the use of a bubble curtain during impact pile driving, reduced underwater sound levels by 3 dB. The 3 dB reduction is based on average results of underwater sound monitoring conducted in July 2008, when bubble curtains were activated during impact pile driving while replacing piers at the south end of the existing Bridge 3.9 (Miner 2008, entire). Background sound levels in deep freshwater lakes or deep, slow-moving rivers are approximately 120 dB RMS, similar to marine levels near developed shorelines (WSDOT 2018, p. 7.34).

The extent of the action area was modeled in the equation below using an ambient underwater noise level of 120 dB RMS and a 190 dB RMS measured at 10 meters (32.81 feet) associated with the 36-inch-diameter steel pile and the use of a bubble curtain. Applying the normal attenuation rate of 4.5 dBA per underwater doubling distance results in construction noise attenuation of 288 miles from the Project site.

Distance from Construction Noise to Underwater Ambient Noise

$R_1 = R_2 \times 10^{[(\text{construction noise – ambient sound level in dBA})/\alpha]}$

R_1 is the range or distance at which the transmission loss is

estimated R_2 is the range or distance of the known or

measured sound level

$\alpha = 15$, the alpha (α) value assumes a 4.5 dBA reduction per doubling distance underwater; therefore,

$R_1 = 10 \text{ meters} \times 10^{[(190 - 120)/15]}$

This distance does not consider bathymetry or landforms. The furthest distance construction noise is anticipated to travel is approximately 6 miles, which is the furthest open water distance between Bridge 3.9 and an elevated landform. The action area is defined by the farthest distance that underwater sound will travel before encountering land and therefore extends out to the LPO shoreline (Figure 2) The aquatic impact zone is approximately 8 percent (PaDelford 2018, *in litt*) of the total water surface area of LPO.

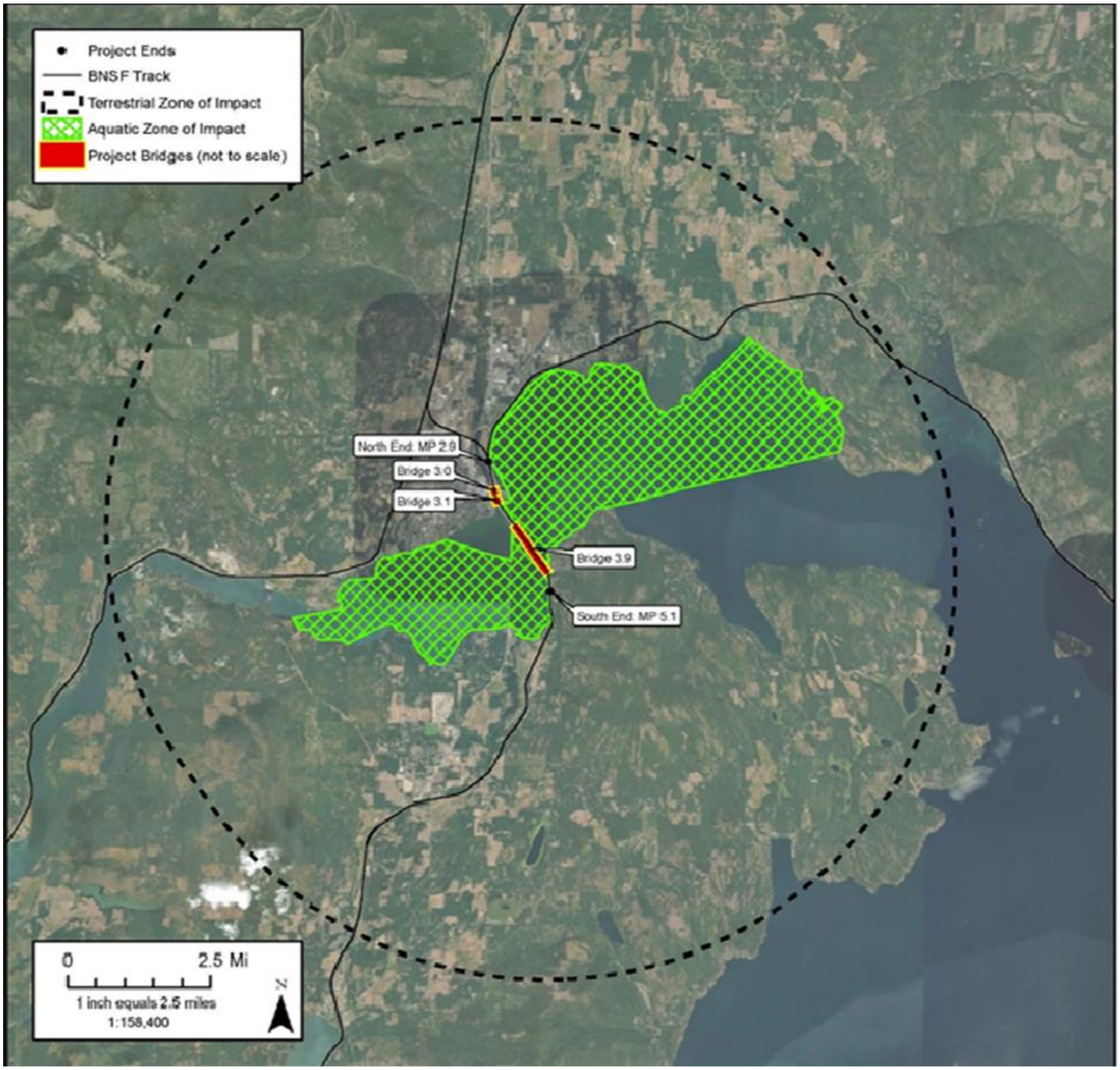

Figure 2. Action Area Map

2.1.8 Proposed Action

The Project construction to build the 2.2-mile-long second main line track west of the existing BNSF main line consists of the following general elements:

- Constructing a new main line track west of the existing BNSF main line track.
- Constructing a new bridge over Bridge Street (Bridge 3.0) adjacent to (west of) the existing rail bridge).
- Constructing a new bridge over Sand Creek (Bridge 3.1) adjacent to (west of) the existing rail bridge.

- Constructing a new bridge over LPO (Bridge. 3.9) adjacent to (west of) the existing rail bridge.
- Upgrading tracks, switches, and signals.
- Building and removing temporary construction bridges over LPO and Sand Creek.
- Improving temporary construction material and equipment work staging areas.
- Filling 0.88 acre of permanent and 0.38 acre of temporary nearshore areas below the jurisdictional OHWM elevation of 2,062.50 feet, associated with bridge abutments and the south switch.
- Filling 0.28 acre of wetland in one location between the rail grade and the multiuse public pathway, south of Bridge 3.1.

Following are the key elements of the construction process, listed in the proposed chronological order:

1. Mobilize and Improve Access Roads/Staging Areas

   a. Access roads and staging areas in the existing BNSF ROW will be improved to accommodate Project-specific construction needs. The Project north end access is via Bridge Street, east of First Avenue in Sandpoint, and north onto Railroad Avenue towards the Amtrak Depot. A BNSF-owned maintenance area is just north of the depot. The south end access to the Project is via Bottle Bay Road, off of US 95, south of the Long Bridge, to Glen Eden Road, a private road with restricted public crossing of the BNSF ROW.

   b. Project access and staging improvements may include reconditioning the existing rock surfaces, improving entry/exit locations for safety (e.g., line of sight clearing), and implementing Project-specific environmental protection measures such as placing rock at construction entrances/exits to avoid off-site sediment tracking and establishing easily accessible emergency containment/cleanup materials for vehicles, equipment, and staged petroleum fluids.

   c. Mobilization of equipment and delivery of Project materials to staging areas will be an ongoing process during construction.

2. Identify Work Limits

   a. Work limits (cut/fill) as per plan and regulatory permits or conditions will be staked and flagged prior to the start of earth-disturbing activities. These areas will be reviewed on-site with the contractor to verify equipment operations and earth-disturbing/fill activities are compliant and within the limits.

   b. Stakes and flagging will be replaced or refreshed by the Project environmental compliance lead as needed throughout construction.

3. Implement Environmental Best Management Practices (BMPs)

   a. When work limits are marked, the contractor will implement temporary environmental protection BMPs, such as installing sediment fencing and filter rolls along the grading/fill work limits adjacent to nearshore and wetland fills.

   b. Clearing and grubbing of existing vegetation will be the minimum required to construct the Project. Grubbed materials will be removed to upland areas within the BNSF ROW or removed to off-site, upland locations in accordance with BNSF environmental requirements for material movement out of the BNSF ROW.

4. Vegetation Removal

a. Riparian vegetation removal in the nearshore and wetland fill areas will be the minimum needed. Vegetation will be cleared and grubbed using backhoes, bull dozers, or machinery appropriate for the specific location. Equipment access will be from adjacent upland areas. Cleared/grubbed materials will be loaded into haul trucks for removal to upland locations within the BNSF ROW or off-site, when those locations have been approved by BNSF and the Project environmental compliance lead.

b. Upland vegetation removal will be the minimum necessary for placement of structural rock fill, as per the Project plan and specifications. Large trees will be cut with chainsaws into manageable pieces for removal, via work trucks, to upland locations within the BNSF ROW prior to removal to approved off-site locations. Smaller-sized shrubs and grasses/weed cover will be grubbed and cleared using bulldozers, backhoes, graders, or other similar earth-moving equipment. Clearing/grading depths will be specified in the design, generally to native rock or rocky soil suitable for railroad grade construction. Grubbed stumps or rootwads will be taken to upland staging areas within the BNSF ROW, via haul trucks, for stockpiling prior to removal to off-site upland locations approved by BNSF and the Project environmental compliance lead.

5. Nearshore and Wetland Fills

a. Only clean, structural rock fill will be used, as required for construction of railroad grades. Fill material will be sourced from existing local commercial quarries approved for use in main line railroad construction.

b. Fill will be placed according to plan and in compliance with regulatory permits. Fill will be brought to the Project via haul/dump trucks with grading/compaction of the fill completed by bulldozers, graders, and roller/compactors. Fill sequencing will be according to plan and in accordance to main line railroad construction standards.

c. Fill work in nearshore and wetland areas will be done during LPO drawdown or low water conditions when no water is present in the fill locations. Fill in adjacent upland locations will be done when the nearshore/wetland fill is completed and compacted in accordance to railroad standards.

d. BMPs to prevent sedimentation from the fill into adjacent regulatory areas will be implemented prior to fill placement. These will be identified in the Project Stormwater SWPPP and WQMPP. BMPs such as sediment filter fencing, sediment filter rolls, rock filter berms, vegetation filter berms, or other perimeter protection measures will contain fill materials within the staked/flagged/marked work limits. These temporary BMPs will be kept in place until high water, summer pool lake levels are reached to contain potential “first flush” sedimentation from the newly placed rock materials. Prior to the regulated lake levels covering the BMPs and after “first flush” sediment settling, these temporary BMPs will be removed so they do not become a navigation hazard.

6. Upland Work Adjacent to Nearshore/Wetland Fills

a. Grading and compacting for the new rail grade development will be done after nearshore/wetland fill actions are complete during lake water-level drawdown. Clean, structural rock fill will be used in accordance to railroad construction standards. Fill material will be sourced from existing local commercial quarries approved for use in main line railroad construction.

b. Fill will be placed in locations/work limits according to plan and in compliance with regulatory permits. Fill will be brought to the work sites via haul/dump trucks and grading/compaction will be done by bulldozers, graders, and roller/compactors in a sequence according to standard practices for main line railroad construction.

c. Best management practices to prevent sedimentation to jurisdictional areas adjacent to upland fill locations will be implemented before fill work starts. The BMPs will be maintained throughout the Project until complete. When possible, as rail grade development is completed, final restoration/stabilization BMPs will be implemented—such as final seeding/mulching and/or rock cover. If upland areas are unworked for more than fourteen days during the summer/fall (i.e., dry season) or seven days during the winter/spring (i.e., wet season) temporary seed/mulch cover will be implemented.

d. Best management practices to avoid impacts via construction-related stormwater runoff will be implemented and maintained during work activities.

7. Construct Temporary Work Bridge 3.1 (Sand Creek)

a. A temporary timber deck work bridge will be constructed immediately adjacent to and west of the new Sand Creek bridge location. The Sand Creek temporary work bridge will measure approximately 510 feet long and 32 feet wide with eleven 48-foot-long spans. The temporary work bridge will be supported by 10 piers partially or fully below the OHWM. Eight piers will consist of 4, 24-inch-diameter, open-ended steel pipe piles, and two piers will consist of 8, 24-inch-diameter, open-ended steel pipe piles. In total, 30 to 40 piles will be below the OHWM to account for minor adjustments in span support needs and site conditions. The temporary work bridge will support large cranes that will be working to construct the new, permanent bridge over Sand Creek.

b. Generally, the work bridge will be used to gain access from the south side of Sand Creek, from an existing maintenance road and work pad west of the existing BNSF tracks. North side access will be developed off of Bridge Street, but will likely be used as a backup. The expected primary access point will presumably be from the south. Construction of the work bridge will likely start from the south side of Sand Creek, progressing north. The ends of the work bridge will consist of a temporary bulkhead at the water’s edge that is filled to the existing grade or higher, as necessary. This will require permanent fill at the south end and temporary fill along the north end. Construction of the work bridge will be done in “leapfrog” fashion. The crane will advance a pile-driving template for every span. Once the template is in place, the support piles will be driven in the proper location. Four support piles are typical and have been assumed for this Project. Project-specific geotechnical data presumes that after a few days in place, the piles will have adequate strength for heavy loading. After the support piles are in place, the bracing will be installed and pier caps will be secured on top of the piles. Next, the beam groups will be placed from the temporary bulkhead to the first bent (cross-ways structural element to create the trestle) and secured to the foundations. Finally, the timber deck will be placed out to the first pier, and a safety handrail will be installed. At this time, the crane will be able to move out to the end of the work bridge and the entire process will be repeated for subsequent spans.

c. The work bridge will be constructed as noted and extended to the north end of the new bridge. The proposed work bridge deck construction system will be fully contained. Plastic sheeting will be installed between the deck timbers and the plywood to seal the deck. The bull rail (sides of the work bridge) will have foam rope under them and be tightened down to provide another level of sealed containment.

d. Once the work bridge reaches the north end, the production pile driving for the new, second bridge will commence and work from north to south. The temporary work bridge piles will be vibrated to resistance, and one pile per pier will be proofed with an impact hammer at an estimated 20 to 50 strikes for a short duration. Impact and vibratory pile driving will occur during daylight working hours. Assuming that two temporary work bridge piles can be driven per day, pile driving is expected to occur for about a month for the Sand Creek temporary work bridge, dependent on weather or other interruptions.

e. With the pile-driving activity, short, temporary retaining walls will be constructed at each pier, along the upland side (east) embankment so that the existing track stability is not adversely affected. Once enough piles are placed and their capacity is confirmed, the precast pile caps will be installed. After caps are placed, the precast concrete or steel beams, steel walkway, and handrail will be erected.

f. The temporary Sand Creek work bridge marked and lighted navigation channel will be limited to the period when no navigational access up Sand Creek is available, from approximately October 15 to April 15, depending on the fall LPO lake level drawdown and spring fill. The Albeni Falls Dam is approximately 25 miles downstream from the Project, on the Pend Oreille River, and regulates the ordinary high water and ordinary low water levels of LPO. The temporary work bridge over the marked and lighted navigation channel for Sand Creek will be removed between April 15 and October 15. As a result, the temporary work bridge will not impact navigation for marine traffic in Sand Creek as it will not be an obstruction when navigational access up Sand Creek is available.

8. Construct Temporary Work Bridge 3.9 (LPO)

a. A temporary timber deck work bridge will be constructed immediately adjacent to and west of the new LPO bridge location. The LPO temporary work bridge will measure approximately 4,800 feet long and 32 feet wide, with 101 approximately 48-foot-long spans and one 24-foot-long span at the north end. Additionally, eight 64-foot-wide staging set-outs will be installed at approximately 500-foot intervals along the bridge for safety and material staging and to provide continuous through-access for the length of the temporary work bridge.

b. The temporary work bridge will support large cranes that will be working to construct the new, permanent bridge over LPO. The temporary work bridge will maintain a 42-foot horizontal and 15-foot vertical clearance at the location of the marked navigation channel under the exiting bridge.

c. Construction of the work bridge will likely start from both the north and south ends of the Project over LPO. The end of the work bridge will consist of a temporary bulkhead at the lake’s edge. This work requires both temporary and permanent fill to the existing grade or higher, as necessary. Construction of the work bridge will be done in "leapfrog" fashion. The crane will advance a pile-driving template for every span. Once the template is in place, the support piles will be driven in the proper location. Four support piles are typical and have been assumed for this Project. Project-specific geotechnical data, presumes that after a few days in place, the piles will have adequate strength for heavy loading. After the support piles are in place, the bracing will be installed and the pier cap secured on top of the piles. Next the beam groups will be placed from the abutment to the first bent and secured to the foundations. Finally, the timber deck will be placed out to the first pier and the handrail will be installed. Once these items are complete, the crane will move out to the end of the work bridge and the entire process will be repeated for subsequent spans. If the process is started from each bank at the same time, it is conceivable that the two bridge segments will be joined near the middle of the Project corridor over LPO.

d. There will be a time lag for when the work bridge has been extended out far enough from the bank and the piles have gained enough strength to support additional equipment and material for construction of the new, second bridge. Once this occurs, the production phase will begin. A work bridge deck system that will potentially be used will be fully contained. Plastic sheeting will be installed between the deck timbers and the plywood to seal the deck. The bull rail (sides of work bridge) will have foam rope under them and tightened down to provide another level of sealed containment. The temporary bridge piles will be vibrated to resistance, and one pile per pier will be proofed with an impact hammer at an estimated 20 to 50 strikes for a short duration. The work bridge will require 700, 24-inch-diameter steel pipe piles, with six hundred of the piles being installed in water. Impact and vibratory pile driving will occur during daylight working hours. Assuming that two temporary bridge piles can be driven per day, pile driving is expected to occur for an estimated one calendar year for the LPO temporary work bridge, dependent on weather or other interruptions. The vertical clearance of the LPO temporary work bridge will gradually rise from the abutments. Spans 1 through 16 at the north end of the bridge will have less than 10 feet of vertical clearance, with the maximum vertical clearance (low chord) gradually rising from 10 to 15 feet for Spans 17 through 67. Spans 68 through 71 will provide 15 feet of vertical clearance, with the low chord gradually lowering back down from 15 feet to 10 feet at the south end for Spans 72 through 101. The LPO temporary work bridge will be constructed first and will remain in place until the new, second bridge is placed into service. The temporary work bridge went through many design iterations to identify the least impacts to navigation while providing a safe working platform for the large, heavy equipment required to construct the new LPO railroad bridge. The majority of the work bridge will retain an equivalent vertical and horizontal clearance as the existing railroad bridge during construction. All marine traffic that now passes below the existing bridge will be able to pass under the temporary work bridge throughout construction. Signage, lighting, and other notices will be in place to direct marine traffic on LPO away from restrictive spans to the safe, non-restrictive boating passage spans.

9. Construct New, Second Bridge 3.1 (Sand Creek)

a. The new, second bridge over Sand Creek will be constructed approximately 35 feet west of the existing rail bridge in existing BNSF ROW and will measure approximately 505 feet long by 21 feet wide. The new bridge will be supported by 11 piers, each consisting of open-ended, 24-inch-diameter steel pipe piles. Two piers within the OHWM of the creek channel will consist of eight piles each; seven piers (one partially or wholly within the OHWM and six fully upland) will consist of six piles each; and two piers upland of the OHWM will consist of three piles each. A total of 64 piles will be placed, with 22 below the OHWM. Piles within the main channel of Sand Creek will be driven during low-water conditions/winter pool elevation. Two of the bridge bents will be fully within the Sand Creek navigational channel. The new bridge navigational horizontal clearance is 74 feet; the existing bridge has an approximately 45-foot-wide horizontal clearance. Vertical clearance of the new bridge will match the vertical clearance of the existing bridge, which is 17 feet above the 2,062.5-foot OHWM elevation. The new Sand Creek bridge piles will be vibrated to resistance into the creek bed and finished with an impact hammer with an average of 1,200 strikes per pile. Pile driving will occur during daylight working hours. Assuming that up to two piles could be driven per day, pile driving will occur for about 1 month, dependent on weather-related, or other, interruptions. Generally, a new rail bridge consists of four primary elements, working from the bottom up: installing piles, installing pier caps, pre-cast beams and deck, and installing the pile bracing. The first element is pile installation, which consists of vibrating to resistance, impact-hammer driving to load specifications, and proofing/testing to verify that loadbearing criteria has been met. A pile template will be installed at each new pier location. The pile template will likely have four temporary piles with a steel frame installed on top to correctly position the new permanent piling. Due to the long lengths of new pile required, the piles will be delivered to the work site by trucks to the Project staging areas and then to the pile placement locations as needed via the temporary work bridge. The sections will be welded as they are driven to form one long pile. The first section is driven before the second section is held in place and welded to the first. The third section is then welded to the pile and driving of that pile is completed. Each pier will have six piles. The pile bracing may be installed any time after the piles are complete, but this will likely occur during LPO drawdown or low water periods.

b. Once the pile capacity has been verified through impact testing, the top of the piles will be cut off at the proper elevation and the precast pile cap can be installed. This is done by lifting the cap from the work bridge and setting it onto the piles before welding the bottom of the cap to the top of the piles.

c. When at least two pier caps have been installed, erection of the precast concrete beams and bridge deck may begin. Depending on length, there are four or five beams per span, which will be connected to each other with steel diaphragms that bolt to the beam. The beams will rest on bearings that are anchored into the pier caps. Ballast and track will be placed directly on the deck structure.

d. These four bridge construction elements will generally follow each other in a linear fashion for the construction of the new, permanent Bridge 3.1 over Sand Creek.

10. Construct New, Second Bridge 3.9 (LPO)

a. The new, second bridge over LPO will be constructed approximately 50 feet west of the existing rail bridge in existing BNSF ROW and measure approximately 4,874 feet long by 18 feet wide. The new bridge will have 49 spans: forty-two 104-foot long, six 75-foot-11-inch long, and one 47-foot-10-inch long.

b. Each pier bent will consist of 6, open-ended, 36-inch-diameter steel pipe piles for a total of 288 piles below the regulated summer pool elevation of 2,062.5 feet that makes up the jurisdictional OHWM of the lake. The new piers will align approximately with every other pier of the existing bridge.

c. The new, permanent LPO bridge will have 10 spans at, and adjacent to, the designated navigation spans on the existing bridge that will closely match those longer-span horizontal clearances. The low chord of the new bridge will be 15 feet above the regulated summer pool elevation of 2,062.5 feet. These 15-foot clearances will consist of six 75-foot-11-inch spans, four of which will align with the existing rail bridge’s 77-foot spans that are equal to or greater than 15-foot vertical clearance. The new bridge will not reduce the horizontal or vertical clearance over the marked navigation channel under the existing bridge.

d. Generally, a new rail bridge consists of five primary elements, working from the bottom up: installing piles, installing pier caps, setting beams, casting the concrete deck, and installing the pile bracing. The first element is pile installation, which consists of vibrating to resistance, impact-hammer driving to load specifications, and proofing/testing to verify that load-bearing criteria has been met. A pile template will be installed at each new pier location. The pile template will likely have four temporary piles with a steel frame installed on top to correctly position the new permanent piling. Due to the long lengths of new pile required, the piles will be delivered to the work site by trucks to the Project staging areas and then to the pile placement locations as needed via the temporary work bridge. The sections will be welded as they are driven to form one long pile. The first section is driven before the second section is held in place and welded to the first. The third section is then welded to the pile and driving of that pile is completed. Each pier will have six piles. The pile bracing can be installed any time after the piles are complete, but this will likely occur during LPO drawdown or low water periods.

e. Once the pile capacity has been verified through impact testing, the top of the piles will be cut off at the proper elevation and the precast pile cap can be installed. This is done by lifting the cap from the work bridge and setting it onto the piles before welding the bottom of the cap to the top of the piles.

f. When at least two pier caps have been installed, erection of the precast concrete beams can begin. Depending on length, there are four or five beams per span that will be connected to each other with steel diaphragms that bolt to the beam. The beams will rest on bearings that are anchored into the pier caps.

g. Next the bridge deck construction will commence. The deck is nominally 13 feet wide by 76 or 104 feet long and 8 inches thick. Concrete formwork will be installed between and outside the beams. Then reinforcing bar will be tied in place on the formwork. Once all elements are checked for conformance with the design plans, the concrete will be placed with the use of a concrete pump, supplied by concrete trucks, from the temporary work bridge. A second concrete placement activity, via a concrete pump system/concrete truck support, will potentially be required for each span to construct the curbs on the outside of each deck. Once these items are complete, the temporary formwork will be removed. Finally, the steel handrail will be installed on the outside face of each curb.

h. The five-bridge construction elements will generally follow each other in a linear fashion. Because Bridge 3.9 is so long, it is likely that pile driving will occur at the same time the concrete deck is being installed, i.e., all five primary bridge elements may occur at the same time.

i. The new, permanent LPO bridge, will require vibrating 288 piles to resistance into the lake bed and finishing with an impact hammer with an average of 1,600 strikes per pile. All piles will be installed in water. Pile driving will occur during daylight working hours. Assuming that up to two piles will be driven per day, pile driving will take place over 6 consecutive months, dependent on weather-related or other interruptions. Air bubble curtains will be used during impact pile driving to attenuate in-water SPLs (when water is more than 2 feet deep; WSDOT 2018), and a turbidity curtain will surround the area where bubble curtains are utilized

11. Remove Temporary Work Bridge 3.1 (Sand Creek)

a. Once all the new bridge construction elements have been completed, and the track has been installed, the contractor will begin removing the work bridge. For one span at a time, the deck is removed, then the beams, then the pile cap, and finally the piles. This process is repeated until complete. A crane will be used as the main piece of equipment during this disassembly process.

b. The temporary work bridge components, deck sections first, will be stockpiled in upland staging areas for eventual removal from the site. The temporary work bridge piles will be removed using a vibratory extraction methodology further described in the Minimization Measures section.

12. Remove Temporary Work Bridge 3.9 (LPO)

a. As with the temporary bridge over Sand Creek, the LPO temporary work bridge will be removed in sections when the new bridge construction is complete.

b. Generally, this process will be the same as described for the Sand Creek Bridge 3.1 work bridge. Once all the new, permanent bridge construction elements have been completed, and the new main line track has been installed, the contractor will begin removing the work bridge.

13. Remove Temporary Nearshore Fills

a. Temporary nearshore fills will be removed once temporary work bridge removal is complete and work space from adjacent upland areas is allowed. Backhoes with “thumb”’ attachments on the hoe portion or excavators will be used to remove the temporary fill material. This work will be done during LPO drawdown or low water conditions.

14. Demobilize and Stabilize/Restore Disturbed Areas

a. Concurrent with the disassembly of the temporary work bridges, final grading and track construction could be occurring in upland areas within the Project limits.

b. Site restoration will include final grading and removal of temporary nearshore fills in areas adjacent to Sand Creek or LPO. These areas will be seeded and mulched with native riparian grass species and, where there is sufficient soil, native riparian trees and shrubs will be planted. Sediment control BMPs will be implemented around these areas until vegetation becomes established.

c. When open soil areas are determined to be stable by the environmental compliance lead, temporary construction materials and BMPs such as fencing, signage, and erosion control products will be removed.

d. Final inspection Project punch-list environmental items will also be addressed at this time prior to the contractor demobilization off of the Project site. Construction supplies and equipment will be removed from the staging areas and the contractor will demobilize off BNSF property. Staging areas will be restored to BNSF standards.

2.2 Analytical Framework for the Jeopardy and Adverse Modification Determinations

2.2.1 Jeopardy Determination

In accordance with policy and regulation, the jeopardy analysis in this Opinion relies on four components:

1. The *Status of the Species*, which evaluates the bull trout's range-wide condition, the factors responsible for that condition, and its survival and recovery needs.
2. The *Environmental Baseline,* which evaluates the condition of the bull trout in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the bull trout.
3. The *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the bull trout.
4. *Cumulative Effects*, which evaluates the effects of future, non-Federal activities reasonably certain to occur in the action area on the bull trout.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the bull trout's current status, taken together with cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of the bull trout in the wild.

Recovery Units (RUs) for the bull trout were defined in the final *Recovery Plan for the Coterminous United States Population of [the] Bull Trout* (USFWS 2015a, entire). Pursuant to Service policy, when a proposed Federal action impairs or precludes the capacity of a RU from providing both the survival and recovery function assigned to it, that action may represent jeopardy to the species. When using this type of analysis, the biological opinion describes how the proposed action affects not only the capability of the RU, but the relationship of the RU to both the survival and recovery of the listed species as a whole.

The jeopardy analysis for the bull trout in this biological opinion considers the relationship of the action area and affected core areas (discussed below under the *Status of the Species* section) to the RU and the relationship of the RU to both the survival and recovery of the bull trout as a whole as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

Within the above context, the Service also considers how the effects of the proposed Federal action and any cumulative effects impact bull trout local and core area populations in determining the aggregate effect to the RU(s). Generally, if the effects of a proposed Federal action, taken together with cumulative effects, are likely to impair the viability of a core area population(s), such an effect is likely to impair the survival and recovery function assigned to a RU(s) and may represent jeopardy to the species (USFWS 2005a, 70 FR 56258).

2.2.2 Adverse Modification Determination

Section 7(a)(2) of the Act requires that Federal agencies ensure that any action they authorize, fund, or carry out is not likely to destroy or to adversely modify designated critical habitat. A final rule revising the regulatory definition of "destruction or adverse modification of critical habitat" was published on February 11, 2016 (USFWS and NMFS 2016, 81 FR 7214). The final rule became effective on March 14, 2016. The revised definition states: "Destruction or adverse modification means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features."

The destruction or adverse modification analysis in this biological opinion relies on four components:

1. The *Status of Critical Habitat*, which describes the range-wide condition of designated critical habitat for the bull trout in terms of the key components of the critical habitat that provide for the conservation of the bull trout, the factors responsible for that condition, and the intended value of the critical habitat overall for the conservation/recovery of the bull trout.
2. The *Environmental Baseline*, which analyzes the condition of the critical habitat in the action area, the factors responsible for that condition, and the value of the critical habitat in the action area for the conservation/recovery of the listed species.
3. The *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated and interdependent activities on the key components of critical habitat that provide for the conservation of the listed species, and how those impacts are likely to influence the value of the affected critical habitat units for the conservation/recovery of the listed species.
4. The *Cumulative Effects*, which evaluate the effects of future non-Federal activities that are reasonably certain to occur in the action area on the key components of critical habitat that provide for the conservation of the listed species and how those impacts are likely to influence the value of the affected critical habitat units for the conservation/recovery of the listed species.

For purposes of making the destruction or adverse modification determination, the effects of the proposed Federal action, together with any cumulative effects, are evaluated to determine if the value of the critical habitat rangewide for the conservation/recovery of the listed species would remain functional or would retain the current ability for the key components of the critical habitat that provide for the conservation of the listed species to be functionally re-established in areas of currently unsuitable but capable habitat.

Note: Past designations of critical habitat have used the terms "primary constituent elements" (PCEs), “physical or biological features” (PBFs) or "essential features" to characterize the key components of critical habitat that provide for the conservation of the listed species. The new critical habitat regulations (USFWS and NMFS 2016, 81 FR 7214) discontinue use of the terms “PCEs” or “essential features” and rely exclusively on use of the term PBFs for that purpose because that term is contained in the statute. To be consistent with that shift in terminology and in recognition that the terms PBFs, PCEs, and essential habit features are synonymous in meaning, we are only referring to PBFs herein. Therefore, if a past critical habitat designation defined essential habitat features or PCEs, they will be referred to as PBFs in this document. This does not change the approach outlined above for conducting the ‘‘destruction or adverse modification’’ analysis, which is the same regardless of whether the original designation identified PCEs, PBFs or essential features.

2.3 Status of the Species and Critical Habitat

This section presents information about the regulatory, biological and ecological status of the bull trout and its critical habitat that provides context for evaluating the significance of probable effects caused by the proposed action.

2.3.1 Bull Trout

2.3.1.1 Listing Status

The coterminous United States population of the bull trout was listed as threatened on November 1, 1999 (USFWS 1999, 64 FR 58910-58933). The threatened bull trout occurs in the Klamath River Basin of south-central Oregon; the Jarbidge River in Nevada; the Willamette River Basin in Oregon; Pacific Coast drainages of Washington, including Puget Sound; major rivers in Idaho, Oregon, Washington, and Montana, within the Columbia River Basin; and the St. Mary-Belly River, east of the Continental Divide in northwestern Montana (Bond 1992, p. 2; Brewin and Brewin 1997, p. 215; Cavender 1978, pp. 165-166; Howell and Buchanan 1992, entire; Leary and Allendorf 1997, pp. 716-719; USFWS 1999, 64 FR 58910).

The final listing rule for the United States coterminous population of the bull trout discusses the consolidation of five Distinct Population Segments (DPSs) into one listed taxon and the application of the jeopardy standard under section 7 of the Endangered Species Act (Act) relative to this species, and established five interim recovery units for each of these DPSs for the purposes of Consultation and Recovery (USFWS 1999, 64 FR 58930).

The 2010 final bull trout critical habitat rule (USFWS 2010a, 75 FR 63898-64070) identified six draft recovery units based on new information that confirmed they were needed to ensure a resilient, redundant, and representative distribution of bull trout populations throughout the range of the listed entity. The final bull trout recovery plan (RP) (USFWS 2015a, pp. 36-43) formalized these six recovery units: Coastal, Klamath, Mid-Columbia, Columbia Headwaters, Saint Mary, and Upper Snake. The final recovery units replace the previous five interim recovery units and will be used in the application of the jeopardy standard for Section 7 consultation procedures.

2.3.1.2 Reasons for Listing and Emerging Threats

Throughout its range, the bull trout is threatened by the combined effects of habitat degradation, fragmentation, and alterations associated with dewatering, road construction and maintenance, mining, grazing, the blockage of migratory corridors by dams or other diversion structures, poor water quality; incidental angler harvest; entrainment (a process by which aquatic organisms are pulled through a diversion or other device) into diversion channels; and introduced non-native species (USFWS 1999, 64 FR 58910). Poaching and incidental mortality of bull trout during other targeted fisheries are additional threats.

Since the time of coterminous listing the species (64 FR 58910) and designation of its critical habitat (USFWS 2004a, 69 FR 59996; USFWS 2005a, 70 FR 56212; USFWS 2010a, 75 FR 63898) a great deal of new information has been collected on the status of bull trout. The Service's Science Team Report (Whitesel et al. 2004, entire), the bull trout core areas templates (USFWS 2005a, entire; 2009, entire), Conservation Status Assessment (USFWS 2005c, entire), and 5-year Reviews (USFWS 2008, entire; 2015h, entire) have provided additional information about threats and status. The final RP lists many other documents and meetings that compiled information about the status of bull trout (USFWS 2015a, p. 3). As did the prior 5-year review (2008), the 2015 5-year status review maintains the listing status as threatened based on the information compiled in the final bull trout RP (USFWS 2015a, entire) and the Recovery Unit Implementation Plans (RUIPs) (USFWS 2015b-g, entire).

When first listed, the status of bull trout and its threats were reported by the Service at subpopulation scales. In 2002 and 2004, the draft recovery plans (USFWS 2002a, entire; 2004a, entire; 2004b, entire) included detailed information on threats at the recovery unit scale (i.e. similar to subbasin or regional watersheds), thus incorporating the metapopulation concept with core areas and local populations. In the 5-year Reviews, the Service established threats categories (i.e. dams, forest management, grazing, agricultural practices, transportation networks, mining, development and urbanization, fisheries management, small populations, limited habitat, and wild fire) (USFWS 2008, pp. 39-42; USFWS 2015h, p. 3). In the final RP, threats and recovery actions are described for 109 core areas, forage/migration and overwintering areas, historical core areas, and research needs areas in each of the six recovery units (USFWS 2015a, p 10). Primary threats are described in three broad categories: Habitat, Demographic, and Nonnative Fish for all recovery areas within the coterminously listed range of the species.

The 2015 5-year status review references the final RP and the RUIPs and incorporates by reference the threats described therein (USFWS 2015h, pp. 2-3). Although significant recovery actions have been implemented since the time of listing, the 5-year review concluded that the listing status should remain as "threatened" (USFWS 2015h, p. 3).

New or Emerging Threats

The 2015 RP (USFWS 2015a, entire) describes new or emerging threats such as climate change and other threats. Climate change was not addressed as a known threat when bull trout was listed. The 2015 bull trout RP and RUIPs summarize the threat of climate change and acknowledge that some bull trout local populations and core areas may not persist into the future due to anthropogenic effects such as climate change. The RP further states that use of best available information will ensure future conservation efforts that offer the greatest long-term benefit to sustain bull trout and their required cold-water habitats (USFWS 2015a, pp. vii, 17-20).

Mote et al. (2014, pp. 487-513) summarized climate change effects in the Pacific Northwest to include rising air temperature, changes in the timing of streamflow related to changing snowmelt, increases in extreme precipitation events, lower summer stream flows, and other changes. A warming trend in the mountains of western North America is expected to decrease snowpack, hasten spring runoff, reduce summer stream flows, and increase summer water temperatures (Poff et al. 2002, p. 34; Koopman et al. 2009, entire; PRBO 2011, p. 13). Lower flows as a result of smaller snowpack could reduce habitat, which might adversely affect bull trout reproduction and survival. Warmer water temperatures could lead to physiological stress and could also benefit nonnative fishes that prey on or compete with bull trout. Increases in the number and size of forest fires could also result from climate change (Westerling et al. 2006, p. 940) and could adversely affect watershed function by resulting in faster runoff, lower base flows during the summer and fall, and increased sedimentation rates. Lower flows also may result in increased groundwater withdrawal for agricultural purposes and resultant reduced water availability in certain stream reaches occupied by bull trout (USFWS 2015c, p. B-10).

Although all salmonids are likely to be affected by climate change, bull trout are especially vulnerable given that spawning and rearing are constrained by their location in upper watersheds and the requirement for cold water temperatures (Rieman et al. 2007, p. 1552). Climate change is expected to reduce the extent of cold water habitat (Isaak et al. 2015, p. 2549, Figure 7), and increase competition with other fish species (lake trout, brown trout, brook trout, and northern pike) for resources in remaining suitable habitat. Several authors project that brook trout, a fish species that competes for resources with and predates on the bull trout, will continue increasing their range in several areas (an upward shift in elevation) due to the effects from climate change (e.g., warmer water temperatures) (Wenger et al. 2011, p. 998, Figure 2a, Isaak et al. 2014, p. 114).

2.3.1.3 Species Description

Bull trout, member of the family Salmonidae, are char native to the Pacific Northwest and western Canada. The bull trout and the closely related Dolly Varden (*Salvelinus malma*) were not officially recognized as separate species until 1980 (Robins et al. 1980, p. 19). Bull trout historically occurred in major river drainages in the Pacific Northwest from the southern limits in the McCloud River in northern California (now extirpated (Rode 1990, p. 1)), Klamath River basin of south central Oregon, and the Jarbidge River in Nevada to the headwaters of the Yukon River in the Northwest Territories, Canada (Cavender 1978, pp. 165-169; Bond 1992, pp. 2-3). To the west, the bull trout's current range includes Puget Sound, coastal rivers of British Columbia, Canada, and southeast Alaska (Bond 1992, p. 2-3). East of the Continental Divide bull trout are found in the headwaters of the Saskatchewan River in Alberta and the MacKenzie River system in Alberta and British Columbia (Cavender 1978, p. 165-169; Brewin and Brewin 1997, pp. 209-216). Bull trout are wide spread throughout the Columbia River basin, including its headwaters in Montana and Canada.

2.3.1.4 Life History

Bull trout exhibit resident and migratory life history strategies throughout much of the current range (Rieman and McIntyre 1993, p. 2). Resident bull trout complete their entire life cycle in the streams where they spawn and rear. Migratory bull trout spawn and rear in streams for 1 to 4 years before migrating to either a lake (adfluvial), river (fluvial), or, in certain coastal areas, to saltwater (anadromous) where they reach maturity (Fraley and Shepard 1989, p. 1; Goetz 1989, pp. 15-16). Resident and migratory forms often occur together and it is suspected that individual bull trout may give rise to offspring exhibiting both resident and migratory behavior (Rieman and McIntyre 1993, p. 2).

Bull trout have more specific habitat requirements than other salmonids (Rieman and McIntyre 1993, p. 4). Watson and Hillman (1997, p. 248) concluded that watersheds must have specific physical characteristics to provide habitat requirements for bull trout to successfully spawn and rear. It was also concluded that these characteristics are not necessarily ubiquitous throughout these watersheds, thus resulting in patchy distributions even in pristine habitats.

Bull trout are found primarily in colder streams, although individual fish are migratory in larger, warmer river systems throughout the range (Fraley and Shepard 1989, pp. 135-137; Rieman and McIntyre 1993, p. 2 and 1995, p. 288; Buchanan and Gregory 1997, pp. 121-122; Rieman et al. 1997, p. 1114). Water temperature above 15°C (59°F) is believed to limit bull trout distribution, which may partially explain the patchy distribution within a watershed (Fraley and Shepard 1989, p. 133; Rieman and McIntyre 1995, pp. 255-296). Spawning areas are often associated with cold water springs, groundwater infiltration, and the coldest streams in a given watershed (Pratt 1992, p. 6; Rieman and McIntyre 1993, p. 7; Rieman et al. 1997, p. 1117). Goetz (1989, pp. 22, 24) suggested optimum water temperatures for rearing of less than 10°C (50°F) and optimum water temperatures for egg incubation of 2 to 4°C (35 to 39°F).

All life history stages of bull trout are associated with complex forms of cover, including large woody debris, undercut banks, boulders, and pools (Goetz 1989, pp. 22-25; Pratt 1992, p. 6; Thomas 1992, pp. 4-5; Rich 1996, pp. 35-38; Sexauer and James 1997, pp. 367-369; Watson and Hillman 1997, pp. 247-249). Jakober (1995, p. 42) observed bull trout overwintering in deep beaver ponds or pools containing large woody debris in the Bitterroot River drainage, Montana, and suggested that suitable winter habitat may be more restrictive than summer habitat. Bull trout prefer relatively stable channel and water flow conditions (Rieman and McIntyre 1993, p. 6). Juvenile and adult bull trout frequently inhabit side channels, stream margins, and pools with suitable cover (Sexauer and James 1997, pp. 368-369).

The size and age of bull trout at maturity depend upon life history strategy. Growth of resident fish is generally slower than migratory fish; resident fish tend to be smaller at maturity and less fecund (Goetz 1989, p. 15). Bull trout normally reach sexual maturity in 4 to 7 years and live as long as 12 years. Bull trout are iteroparous (they spawn more than once in a lifetime), and both repeat- and alternate-year spawning has been reported, although repeat-spawning frequency and post-spawning mortality are not well documented (Leathe and Graham 1982, p. 95; Fraley and Shepard 1989, p. 135; Pratt 1992, p. 8; Rieman and McIntyre 1996, p. 133).

Bull trout typically spawn from August to November during periods of decreasing water temperatures. Migratory bull trout frequently begin spawning migrations as early as April, and have been known to move upstream as far as 250 kilometers (km) (155 miles (mi)) to spawning grounds (Fraley and Shepard 1989, p. 135). Depending on water temperature, incubation is normally 100 to 145 days (Pratt 1992, p.1) and, after hatching, fry remain in the substrate. Time from egg deposition to emergence may exceed 200 days. Fry normally emerge from early April through May depending upon water temperatures and increasing stream flows (Pratt 1992, p. 1).

The iteroparous reproductive system of bull trout has important repercussions for the management of this species. Bull trout require two-way passage up and downstream, not only for repeat spawning, but also for foraging

Bull trout are opportunistic feeders with food habits primarily a function of size and life history strategy. Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macro zooplankton and small fish (Boag 1987, p. 58; Goetz 1989, pp. 33-34; Donald and Alger 1993, pp. 239-243). Adult migratory bull trout are primarily piscivores, known to feed on various fish species (Fraley and Shepard 1989, p. 135; Donald and Alger 1993, p. 242).

2.3.1.5 Population Dynamics

Population Structure

Bull trout are naturally migratory, which allows them to capitalize on temporally abundant food resources and larger downstream habitats. Resident forms may develop where barriers (either natural or manmade) occur or where foraging, migrating, or overwintering habitats for migratory fish are minimized (Brenkman and Corbett 2005, pp. 1075-1076; Goetz et al. 2004, p. 105; Starcevich et al. 2012, p. 10; Barrows et al. 2016, p. 98). For example, multiple life history forms (e.g., resident and fluvial) and multiple migration patterns have been noted in the Grande Ronde River (Baxter 2002, pp. 96, 98-106) and Wenatchee River (Ringel et al. 2014, pp. 61-64). Parts of these river systems have retained habitat conditions that allow free movement between spawning and rearing areas and the mainstem rivers. Such multiple life history strategies help to maintain the stability and persistence of bull trout populations to environmental changes.

Benefits of connected habitat to migratory bull trout include greater growth in the more productive waters of larger streams, lakes, and marine waters; greater fecundity resulting in increased reproductive potential; and dispersing the population across space and time so that spawning streams may be recolonized should local populations suffer a catastrophic loss (Frissell 1999, pp. 861-863; MBTSG 1998, p. 13; Rieman and McIntyre 1993, pp. 2-3). In the absence of the migratory bull trout life form, isolated populations cannot be replenished when disturbances make local habitats temporarily unsuitable. Therefore, the range of the species is diminished, and the potential for a greater reproductive contribution from larger size fish with higher fecundity is lost (Rieman and McIntyre 1993, p. 2).

Population Dynamics

Although bull trout are widely distributed over a large geographic area, they exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1993, p. 4). Increased habitat fragmentation reduces the amount of available habitat and increases isolation from other populations of the same species (Saunders et al. 1991, entire). Burkey (1989, entire) concluded that when species are isolated by fragmented habitats, low rates of population growth are typical in local populations and their probability of extinction is directly related to the degree of isolation and fragmentation. Without sufficient immigration, growth for local populations may be low and probability of extinction high (Burkey 1989, entire).

2.3.1.6 Status and Distribution

While all six of the bull trout recovery units are necessary to maintain the bull trout's distribution, as well as its genetic and phenotypic diversity, all of which are important to ensure the species' resilience to changing environmental conditions, this Opinion will only discuss the Upper Columbia Headwaters Recovery Unit as pertinent to this consultation. A comprehensive discussion is found in the Service's 2015 RP for the bull trout (USFWS 2015a, entire) and the 2015 RUIPs (USFWS 2015b-g, entire).

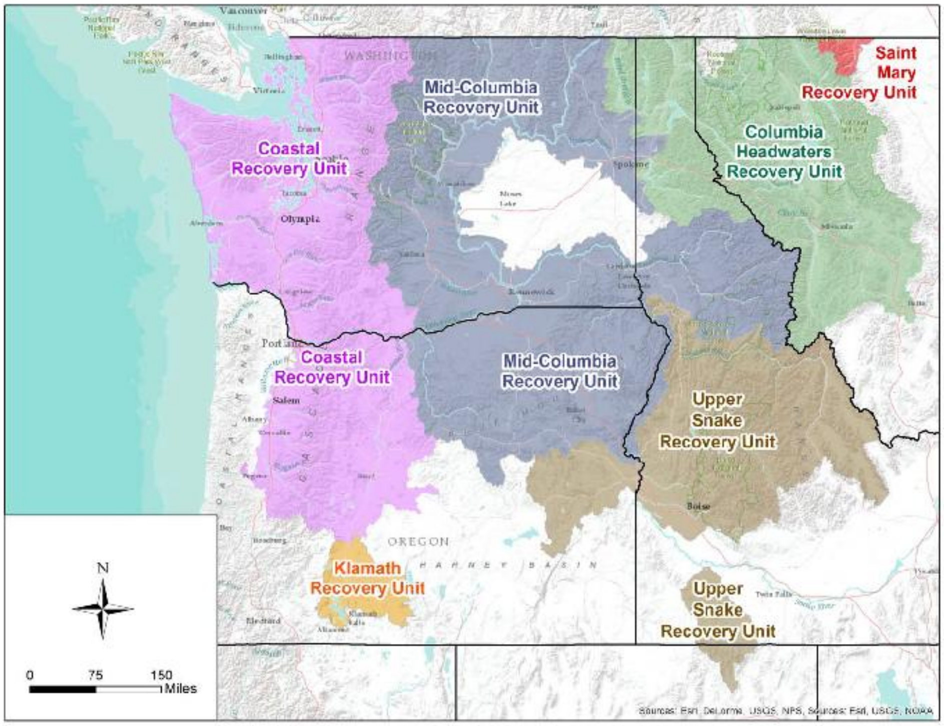

Figure 3. Map showing the location of the six bull trout Recovery Units.

Columbia Headwaters Recovery Unit

The Columbia Headwaters RUIP describes the threats to bull trout and the site-specific management actions necessary for recovery of the species within the unit (USFWS 2015e, entire). The Columbia Headwaters RU is located in western Montana, northern Idaho, and the northeastern corner of Washington. The RU is divided into five geographic regions: Upper Clark Fork, Lower Clark Fork, Flathead, Kootenai, and Coeur d'Alene Geographic Regions (USFWS 2015e, pp. D-2 – D-4). This RU contains 35 bull trout core areas; 15 of which are complex core areas as they represent larger interconnected habitats and 20 simple core areas as they are isolated headwater lakes with single local populations. The 20 simple core areas are each represented by a single local population, many of which may have persisted for thousands of years despite small populations and isolated existence (USFWS 2015e, p. D-1). Fish passage improvements within the RU have reconnected some previously fragmented habitats (USFWS 2015e, p. D-1), while others remain fragmented. Unlike the other RUs in Washington, Idaho and Oregon, the Columbia Headwaters RU does not have any anadromous fish overlap. Therefore, bull trout within the Columbia Headwaters RU do not benefit from the recovery actions for salmon (USFWS 2015e, p. D-41).

Conclusions from the 2008 5-year review (USFWS 2008, Table 1) were that 13 of the Columbia Headwaters RU core areas were at High Risk (37.1 percent), 12 were considered At Risk (34.3 percent), 9 were considered at Potential Risk (25.7 percent), and only 1 core area (Lake Koocanusa; 2.9 percent) was considered at Low Risk. Simple core areas, due to limited demographic capacity and single local populations were generally more inherently at risk than complex core areas under the model. While this assessment was conducted nearly a decade ago, little has changed in regard to individual core area status in the interim (USFWS 2015e, p. D-7).

The current condition of the bull trout in this RU is attributed to the adverse effects of climate change, mostly historical mining and contamination by heavy metals, expanding populations of nonnative fish predators and competitors, modified instream flows, migratory barriers (e.g., dams), habitat fragmentation, forest practices (e.g., logging, roads), agriculture practices (e.g. irrigation, livestock grazing), and residential development. Of the 34 occupied core areas, nine (26 percent) have no identified primary threats (USFWS 2015e, Table D-2).

Conservation measures or recovery actions implemented include habitat improvement, fish passage, and removal of nonnative species. For more information on conservation actions see section 2.3.1.7 below.

For more information on conservation actions see section 2.3.1.7 below.

2.3.1.7 Conservation Needs

The 2015 RP for bull trout established the primary strategy for recovery of bull trout in the coterminous United States: (1) conserve bull trout so that they are geographically widespread across representative habitats and demographically stable in six RUs; (2) effectively manage and ameliorate the primary threats in each of six RUs at the core area scale such that bull trout are not likely to become endangered in the foreseeable future; (3) build upon the numerous and ongoing conservation actions implemented on behalf of bull trout since their listing in 1999, and improve our understanding of how various threat factors potentially affect the species; (4) use that information to work cooperatively with our partners to design, fund, prioritize, and implement effective conservation actions in those areas that offer the greatest long-term benefit to sustain bull trout and where recovery can be achieved; and (5) apply adaptive management principles to implementing the bull trout recovery program to account for new information (USFWS 2015a, p. 24.).

The 2015 RP (USFWS 2015a, entire) integrates information collected since the 1999 listing regarding bull trout life history, distribution, demographics, conservation successes, etc., and integrates and updates previous bull trout recovery planning efforts across the coterminous range of the bull trout.

The Service has developed a recovery approach that: (1) focuses on the identification of and effective management of known and remaining threat factors to bull trout in each core area; (2)

acknowledges that some extant bull trout core area habitats will likely change (and may be lost) over time; and (3) identifies and focuses recovery actions in those areas where success is likely to meet our goal of ensuring the certainty of conservation of genetic diversity, life history features, and broad geographical representation of remaining bull trout populations so that the protections of the Act are no longer necessary (USFWS 2015a, p. 45-46).

To implement the recovery strategy, the 2015 RP establishes three categories of recovery actions for each of the six RUs (USFWS 2015a, pp. 50-51):

1. Protect, restore, and maintain suitable habitat conditions for bull trout.
2. Minimize demographic threats to bull trout by restoring connectivity or populations where appropriate to promote diverse life history strategies and conserve genetic diversity.
3. Prevent and reduce negative effects of nonnative fishes and other nonnative taxa on bull trout.
4. Work with partners to conduct research and monitoring to implement and evaluate bull trout recovery activities, consistent with an adaptive management approach using feedback from implemented, site-specific recovery tasks, and considering the effects of climate change.

Bull trout recovery is based on a geographical hierarchical approach. Bull trout are listed as a single DPS within the five-state area of the coterminous United States. The single DPS is subdivided into six biological-based recovery units: (1) Coastal Recovery Unit; (2) Klamath Recovery Unit; (3) Mid-Columbia Recovery Unit; (4) Columbia Headwaters Recovery Unit (5) Upper Snake Recovery Unit; and (6) Saint Mary Recovery Unit (USFWS 2015a, p. 23). A viable recovery unit should demonstrate that the three primary principles of biodiversity have been met: representation (conserving the genetic makeup of the species); resiliency (ensuring that each population is sufficiently large to withstand stochastic events); and redundancy (ensuring a sufficient number of populations to withstand catastrophic events) (USFWS 2015a, p. 33).

2.3.1.8 Federal, State, and Tribal Conservation Actions Since Listing

Since our listing of bull trout in 1999, numerous conservation measures that contribute to the conservation and recovery of bull trout have been and continue to be implemented across its range in the coterminous United States. These measures are being undertaken by a wide variety of local and regional partnerships, including State fish and game agencies, State and Federal land management and water resource agencies, Tribal governments, power companies, watershed working groups, water users, ranchers, and landowners.

In many cases, these bull trout conservation measures incorporate or are closely interrelated with work being done for recovery of salmon and steelhead, which are limited by many of the same threats. These include removal of migration barriers (culvert removal or redesign at stream crossings, fish ladder construction, dam removal, etc.) to allow access to spawning or FMO habitat; screening of water diversions to prevent entrainment into unsuitable habitat in irrigation systems; habitat improvement (riparian revegetation or fencing, placement of coarse woody debris in streams) to improve spawning suitability, habitat complexity, and water temperature; instream flow enhancement to allow effective passage at appropriate seasonal times and prevent channel dewatering; and water quality improvement (decommissioning roads, implementing best management practices for grazing or logging, setting pesticide use guidelines) to minimize impacts from sedimentation, agricultural chemicals, or warm temperatures.

At sites that are vulnerable to development, protection of land through fee title acquisition or conservation easements is important to prevent adverse impacts or allow conservation actions to be implemented. In several bull trout core areas, fisheries management to manage or suppress non-native species (particularly brown trout, brook trout, lake trout, and northern pike) is ongoing and has been identified as important in addressing effects of non-native fish competition, predation, or hybridization.

A more comprehensive overview of conservation successes since 1999, described for each recovery unit, is found in the Service's Summary of Bull Trout Conservation Successes and Actions since 1999 (Available at: http://www.fws.gov/pacific/ecoservices/endangered/recovery/documents/Service_2013_summary_of_conservation_successes.pdf).

2.3.1.9 Contemporaneous Federal Actions

Projects subject to Section 7 consultation under the Act have occurred throughout the range of bull trout. Singly or in aggregate, these projects could affect the species' status. The Service reviewed 137 opinions produced by the Service from the time of listing in June 1998 until August 2003 (Nuss 2003, entire). The Service analyzed 24 different activity types (e.g., grazing, road maintenance, habitat restoration, timber sales, hydropower, etc.). Twenty opinions involved multiple projects, including restorative actions for bull trout.

The geographic scale of projects analyzed in these opinions varied from individual actions (e.g., construction of a bridge or pipeline) within one basin, to multiple-project actions, occurring across several basins. Some large-scale projects affected more than one recovery unit.

The Service's assessment of opinions from the time of listing until August 2003 (137 opinions), confirmed that no actions that had undergone Section 7 consultation during this period, considered either singly or cumulatively, would appreciably reduce the likelihood of survival and recovery of the bull trout or result in the loss of any (sub) populations (USFWS 2006, pp. B-36 – B-37).

2.3.2 Bull Trout Critical Habitat

2.3.2.1 Legal Status

Ongoing litigation resulted in the U.S. District Court for the District of Oregon granting the Service a voluntary remand of the 2005 critical habitat designation. Subsequently, the Service published a proposed critical habitat rule on January 14, 2010 (USFWS 2010b, 75 FR 2260) and a final rule on October 18, 2010 (USFWS 2010a, 75 FR 63898). The rule became effective on November 17, 2010. A justification document was also developed to support the rule and is available on our website (http://www.fws.gov/pacific/bulltrout). The scope of the designation involved the species' coterminous range within the Coastal, Klamath, Mid-Columbia, Columbia Headwaters, Upper Snake, and St. Mary recovery units[1].

Rangewide, the Service designated reservoirs/lakes and stream/shoreline miles in 32 critical habitat units (CHU) as bull trout critical habitat (see Table 1). Designated bull trout critical habitat is of two primary use types: (1) spawning and rearing; and (2) foraging, migrating, and overwintering (FMO).

Table 2. Stream/shoreline distance and reservoir/lake area designated as bull trout critical habitat by state.

State	Stream/Shoreline Miles	Stream/Shoreline Kilometers	Reservoir/ Lake Acres	Reservoir/ Lake Hectares
Idaho	8,771.6	14,116.5	170,217.5	68,884.9
Montana	3,056.5	4,918.9	221,470.7	89,626.4
Nevada	71.8	115.6	-	-
Oregon	2,835.9	4,563.9	30,255.5	12,244.0
Oregon/Idaho	107.7	173.3	-	-
Washington	3,793.3	6,104.8	66,308.1	26,834.0
Washington (marine)	753.8	1,213.2	-	-
Washington/Idaho	37.2	59.9	-	-
Washington/Oregon	301.3	484.8	-	-
Total	**19,729.0**	**31,750.8**	**488,251.7**	**197,589.2**

Compared to the 2005 designation, the final rule increases the amount of designated bull trout critical habitat by approximately 76 percent for miles of stream/shoreline and by approximately 71 percent for acres of lakes and reservoirs.

This rule also identifies and designates as critical habitat approximately 1,323.7 km (822.5 miles) of streams/shorelines and 6,758.8 ha (16,701.3 acres) of lakes/reservoirs of unoccupied habitat to address bull trout conservation needs in specific geographic areas in several areas not occupied at the time of listing. No unoccupied habitat was included in the 2005 designation. These unoccupied areas were determined by the Service to be essential for restoring functioning

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[1] Note: the adverse modification analysis does not rely on recovery units.

migratory bull trout populations based on currently available scientific information. These unoccupied areas often include lower mainstem river environments that can provide seasonally important migration habitat for bull trout. This type of habitat is essential in areas where bull trout habitat and population loss over time necessitates reestablishing bull trout in currently unoccupied habitat areas to achieve recovery.

The final rule continues to exclude some critical habitat segments based on a careful balancing of the benefits of inclusion versus the benefits of exclusion. Critical habitat does not include: (1) waters adjacent to non-Federal lands covered by legally operative incidental take permits for habitat conservation plans (HCPs) issued under section 10(a)(1)(B) of the Endangered Species Act of 1973, as , in which bull trout is a covered species on or before the publication of this final rule; (2) waters within or adjacent to Tribal lands subject to certain commitments to conserve bull trout or a conservation program that provides aquatic resource protection and restoration through collaborative efforts, and where the Tribes indicated that inclusion would impair their relationship with the Service; or (3) waters where impacts to national security have been identified (USFWS 2010a, 75 FR 63898). Excluded areas are approximately 10 percent of the stream/shoreline miles and 4 percent of the lakes and reservoir acreage of designated critical habitat. Each excluded area is identified in the relevant CHU text, as identified in paragraphs (e)(8) through (e)(41) of the final rule. It is important to note that the exclusion of waterbodies from designated critical habitat does not negate or diminish their importance for bull trout conservation. Because exclusions reflect the often complex pattern of land ownership, designated critical habitat is often fragmented and interspersed with excluded stream segments.

2.3.2.2 Conservation Role and Description of Critical Habitat

The conservation role of bull trout critical habitat is to support viable core area populations (USFWS 2010a, 75 FR 63943). The core areas reflect the metapopulation structure of bull trout and are the closest approximation of a biologically functioning unit for the purposes of recovery planning and risk analyses. CHUs generally encompass one or more core areas and may include FMO areas, outside of core areas, that are important to the survival and recovery of bull trout.

As previously noted, 32 CHUs within the geographical area occupied by the species at the time of listing are designated under the final rule. Twenty-nine of the CHUs contain all of the physical or biological features identified in this final rule and support multiple life-history requirements. Three of the mainstem river units in the Columbia and Snake River basins contain most of the physical or biological features necessary to support the bull trout’s particular use of that habitat, other than those physical and biological features associated with Physical or Biological Features (PBFs) 5 and 6, which relate to breeding habitat (see list below).

The primary function of individual CHUs is to maintain and support core areas, which (1) contain bull trout populations with the demographic characteristics needed to ensure their persistence and contain the habitat needed to sustain those characteristics (Rieman and McIntyre 1993, p. 19); (2) provide for persistence of strong local populations, in part, by providing habitat conditions that encourage movement of migratory fish (MBTSG 1998, pp. 48-49; Rieman and McIntyre 1993, pp. 22-23); (3) are large enough to incorporate genetic and phenotypic diversity, but small enough to ensure connectivity between populations (MBTSG 1998, pp. 48-49; Rieman and McIntyre 1993, pp. 22-23); and (4) are distributed throughout the historic range of the species to preserve both genetic and phenotypic adaptations (MBTSG 1998, pp. 13-16; Rieman and Allendorf 2001, p. 763; Rieman and McIntyre 1993, p. 23).

In determining which areas to propose as critical habitat, the Service considered the physical and biological features that are essential to the conservation of bull trout and that may require special management considerations or protection. These features are the PBFs laid out in the appropriate quantity and spatial arrangement for conservation of the species. The PBFs of designated critical habitat are:

1. Springs, seeps, groundwater sources, and subsurface water connectivity (hyporheic flows) to contribute to water quality and quantity and provide thermal refugia.
2. Migration habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and freshwater and marine foraging habitats, including, but not limited to, permanent, partial, intermittent, or seasonal barriers.
3. An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.
4. Complex river, stream, lake, reservoir, and marine shoreline aquatic environments and processes that establish and maintain these aquatic environments, with features such as large wood, side channels, pools, undercut banks and unembedded substrates, to provide a variety of depths, gradients, velocities, and structure.
5. Water temperatures ranging from 2 to 15 °C (36 to 59 °F), with adequate thermal refugia available for temperatures that exceed the upper end of this range. Specific temperatures within this range will depend on bull trout life-history stage and form; geography; elevation; diurnal and seasonal variation; shading, such as that provided by riparian habitat; streamflow; and local groundwater influence.
6. In spawning and rearing areas, substrate of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount of fine sediment, generally ranging in size from silt to coarse sand, embedded in larger substrates, is characteristic of these conditions. The size and amounts of fine sediment suitable to bull trout will likely vary from system to system.
7. A natural hydrograph, including peak, high, low, and base flows within historic and seasonal ranges or, if flows are controlled, minimal flow departures from a natural hydrograph.
8. Sufficient water quality and quantity such that normal reproduction, growth, and survival are not inhibited.
9. Sufficiently low levels of occurrence of nonnative predatory (e.g., lake trout, walleye, northern pike, smallmouth bass); interbreeding (e.g., brook trout); or competing (e.g., brown trout) species that, if present, are adequately temporally and spatially isolated from bull trout.

2.3.2.3 Current Rangewide Condition of Bull Trout Critical Habitat

The condition of bull trout critical habitat varies across its range from poor to good. Although still relatively widely distributed across its historic range, the bull trout occurs in low numbers in many areas, and populations are considered depressed or declining across much of its range (USFWS 2002b, 67 FR 71240). This condition reflects the condition of bull trout habitat.

The primary land and water management activities impacting the physical and biological features essential to the conservation of bull trout include timber harvest and road building, agriculture and agricultural diversions, livestock grazing, dams, mining, urbanization and residential development, and nonnative species presence or introduction (USFWS 2010b, 75 FR 2282).

There is widespread agreement in the scientific literature that many factors related to human activities have impacted bull trout and their habitat, and continue to do so. Among the many factors that contribute to degraded PBFs, those which appear to be particularly significant and have resulted in a legacy of degraded habitat conditions are as follows:

1. Fragmentation and isolation of local populations due to the proliferation of dams and water diversions that have eliminated habitat, altered water flow and temperature regimes, and impeded migratory movements (Dunham and Rieman 1999, p. 652; Rieman and McIntyre 1993, p. 7).
2. Degradation of spawning and rearing habitat and upper watershed areas, particularly alterations in sedimentation rates and water temperature, resulting from forest and rangeland practices and intensive development of roads (Fraley and Shepard 1989, p. 141; MBTSG 1998, pp. ii - v, 20-45).
3. The introduction and spread of nonnative fish species, particularly brook trout and lake trout, as a result of fish stocking and degraded habitat conditions, which compete with bull trout for limited resources and, in the case of brook trout, hybridize with bull trout (Leary et al. 1993, p. 857; Rieman et al. 2006, pp. 73-76).
4. Degradation of FMO habitat resulting from reduced prey base, roads, agriculture, development, and dams.

The bull trout critical habitat final rule also aimed to identify and protect those habitats that provide resiliency for bull trout use in the face of climate change. Over a period of decades, climate change may directly threaten the integrity of the essential physical or biological features described in PBFs 1, 2, 3, 5, 7, 8, and 9. Protecting bull trout strongholds and cold water refugia from disturbance and ensuring connectivity among populations were important considerations in addressing this potential impact. Additionally, climate change may exacerbate habitat degradation impacts both physically (e.g., decreased base flows, increased water temperatures) and biologically (e.g., increased competition with nonnative fishes).

2.4 Environmental Baseline of the Action Area

2.4.1 Terrestrial Setting

While Project actions are limited to the BNSF ROW in upland areas, the terrestrial setting includes the action area which extends to a modeled 7.5 miles. Uplands in the action area are a patchwork of urban, urban fringe, and rural development, managed forest lands and minor amounts of undisturbed areas. The immediate Project area is primarily developed and consists of railroad tracks, gravel and paved parking areas, highway/roadways, and LPO. The cities of Sandpoint, Kootenai, Dover, and Sagle all occur within 7.5 miles of the Project. Aside from potential elevated noise levels, little disturbance would occur in terrestrial areas; therefore, they are not described in detail in the section.

2.4.2 Lake Pend Oreille

LPO is a natural, temperate, oligotrophic lake. It is the largest natural lake in Idaho and the fifth deepest lake in the United States, with a mean depth of 538 feet, a maximum depth of 1,152 feet at its southern end, and a surface area of 94,720 acres. It is fed by over 20 streams originating in the Selkirk Mountains to the northwest, the Cabinet Mountains to the northeast, and the Coeur d'Alene Mountains to the east, which comprise most of the largely undeveloped, steep, rocky terrain LPO's shoreline and littoral zone. The remaining littoral zone at the lake's northern end and bays consists of gradual or moderately sloping bottom, surrounded by flat to gently sloping upland and floodplain with residential and commercial development within the cities of Sandpoint, Ponderay, and Kootenai; the cities of Hope and Clark Fork (farther east); and within the unincorporated areas of Sagle (south of Sandpoint; McCubbins et al. 2016, p. 1270).

The Clark Fork River, originating in western Montana, is the largest tributary into the lake providing 92 percent of LPO's inflow at the river's mouth near the city of Clark Fork, northeast of Sandpoint. Three hydroelectric dams were constructed from 1913 to 1959 (Cabinet Gorge, Noxon, and Thompson Falls Dams), creating a series of impoundments on the lower Clark Fork River.

The Pend Oreille River is LPO's only surface water outlet west of Sandpoint near the city of Dover. The river flows approximately 27 miles from LPO in Idaho into eastern Washington, then north into Canada where it joins the Upper Columbia River. The Pend Oreille River is impounded by the Albeni Falls hydroelectric dam, constructed in 1955 near the Idaho-Washington border, which regulates the lake's surface elevation/pool at 2,062.5 feet from approximately mid-June through September, and at 2,051 to 2,056 feet from October through May. The Project area is in the shallowest portion of LPO where waters are likely the warmest.

A wide diversity of fish species are present in LPO. The native fish present are westslope cutthroat trout (*Oncorhynchus clarki lewisi*), bull trout (*Salvelinus confluentus*), mountain whitefish (*Prosopium williamsoni*), pygmy whitefish (*Prosopium coulterii*), slimy sculpin (*Cottus cognates*), peamouth (*Mylocheilus caurinus*), northern pikeminnow (*Pschocheilus oregonensis*), redside shiner (*Richardsonius balteatus*), longnose sucker (*Catostomus catostomus*) and largescale sucker (*Catostomus macrocheilus*).

Non-native sport fish that have been stocked or found their way into the lake over the years include kokanee (*Oncorhynchus nerka* – a land-locked form of sockeye salmon), rainbow trout (*Oncorhynchus mykiss*), Gerrard-strain rainbow trout (Kamloops), lake whitefish (*Coregonus clupeaformis*), lake trout (*Salvelinus namaycush*), smallmouth bass (*Micropterus dolomieu*), and several other species present in low quantity including northern pike (*Esox lucius*), brown trout (*Salmo trutta*), largemouth bass (*Micropterus salmoides*), yellow perch (*Perca flavescens*), and walleye (*Sander vitreus*) (McCubbins et al. 2016, pp 1270-1271).

2.4.3 Sand Creek

The Sand Creek watershed, a tributary to LPO, covers 38 square miles or 24,209 acres, and includes Jack Creek, Little Sand Creek, Swede Creek, and Schweitzer Creek northeast of Sandpoint. Sand Creek generally flows from north to south for approximately 16 miles and discharges into LPO within the City of Sandpoint, where it is subject to the regulated levels of LPO. Although it is known locally known as Sand Creek and is considered to be Sand Creek by the IDL (Fuson 2017, *in litt*), federal agencies and the IDEQ consider the lower portion of Sand Creek, from LPO upstream to State Highway 200, as an inlet of LPO (Williams 2018, *in litt*; IDEQ 2018).

The average gradient of Sand Creek is one percent and the primary channel substrate is sand. Land use consists of forestry, agriculture, and permanent grasslands with small areas of shrub land and barren land. The primary land use is agriculture/rural. Land ownership is mostly private, with the remainder of the watershed held by the City of Sandpoint, Bureau of Land Management, Idaho State, and the United States Forest Service (IDEQ 2017b).

The upper portion of the creek is surrounded by sparse residential development within the unincorporated areas of Bonner County, except for the Schweitzer Mountain Ski Resort, a large residential and commercial development located in the upper reaches of Schweitzer Creek. The lower, approximate four-mile portion of Sand Creek is surrounded by residential and commercial development within the cities of Sandpoint and Ponderay.

2.4.4 Bull Trout

2.4.4.1 Status of the Bull Trout in the Action Area

The Lake Pend Oreille Core Area is one of the largest, most complex, and best-documented bull trout core areas in the upper Columbia River watershed. The Core Area includes the Pend Oreille River in northeastern Washington, a nearly 95,000-acres lake in Idaho (Lake Pend Oreille), and the Lower Clark Fork River in western Montana. Bull trout face a variety of threats across their range; however the biggest threats to bull trout status and distribution within the Lake Pend Oreille core area are believed to be from the following (USFWS 2015a, p. 15-18):

1. Introduced species/fisheries management;
2. Forest management practices and forest roads;
3. Fish passage issues (artificial barriers to migration), connectivity, and entrainment; and,
4. Residential development and urbanization.

In 1925, the U.S. Fish Commission stocked 100,000 lake trout (*S. namaycush*) into Lake Pend Oreille and its tributaries (Pratt and Huston 1993, p. 75). Additionally, lake trout may also have migrated downstream of Flathead Lake, where they were introduced 20 years earlier (USFWS 2002c, p. 91). Lake trout compete with native bull trout for food resources and are listed as one of the biggest threats to bull trout populations in the Lake Pend Oreille core area and in Lake Pend Oreille (Lake Pend Oreille Bull Trout Watershed Advisory Group [LPOBTWAG] 1999, p. B-4; USFWS 2008, p. 16). Findings from Donald and Alger (1993, p. 245) and Fredenberg (2002, p. 151) suggest that bull trout will not persist in the presence of lake trout. For example, Priest Lake experienced dramatic declines in bull trout numbers as corresponding lake trout numbers increased (Mauser 1986, p. 26).

Efforts to reduce competition for food resources, which benefit lake conditions for bull trout in Lake Pend Oreille, are ongoing through predator removal programs. Considerable effort has been put into controlling the lake trout population in Lake Pend Oreille through angler incentive programs, and trap and gill netting projects. This program continues and is believed to be highly effective at reducing lake trout numbers. A more detailed description of the lake trout removal program can be found in Section 2.6.1.2 of this Opinion.

To monitor bull trout population trends, an extensive redd count monitoring program in Lake Pend Oreille core area has been devised by the Idaho Department of Fish and Game and has been in place since 1983 (USFWS 2008, p. 2). Table 3 documents the results of annual redd surveys in the Lake Pend Oreille core area (Ryan and Jakubowski 2011, p. 16, Bouwens pers. comm. 2017). Based on 2010 surveys of the Lake Pend Oreille drainage, the adult bull trout spawning population consisted of at least an estimated 2,093 fish (compared to 2,771 in 2009) (Hardy pers. comm. 2011). Survey results from 2009 also identified more than six local populations with greater than 100 individuals in each, estimated adult escapement (number of adults returning to spawn based on the number of redds observed during annual surveys) of 2,500 or more individuals, and increasing relative abundance measured as the trend in adult escapement. Recovery objectives (USFWS 2002d) were met for five years between 2002 and 2006, but estimated adult escapement was less than 2,500 in 2007, 2008 and 2010 and represented below average counts in several highly influential tributary spawning populations including Trestle Creek, Granite Creek, and Gold Creek (Hardy et al. 2010, p. 17; Hardy pers. comm. 2011). Despite this, regression analysis depicting trends in bull trout redds from 1983 to 2017, demonstrates that redd abundance varies annually throughout the core area (Hardy et al. 2010, p. 14, 41; Hardy pers. comm. 2011). Although the fundamental trend for bull trout redd counts from 1983 to 2017 appears positive, bull trout like other fish species demonstrate population fluctuations (as assessed by redd counts) due to a variety of factors.

Bull trout in the interconnected Lake Pend Oreille watershed appear to be entirely adfluvial (Panhandle Bull Trout Advisory Team [PBTTAT] 1998, p.8). Adult bull trout make spawning migrations into the larger tributaries beginning in April (PBTTAT 1998, p. 9), with juvenile outmigration occurring as early as March and lasting until June. Fall migrations (September-October) follow a similar pattern of movement with adults moving further upstream to spawn (then returning to Lake Pend Oreille to overwinter) and juveniles moving downstream into Lake Pend Oreille (Downs et al. 2006, p. 193-194). Adult and subadult bull trout are likely to transit through the action area year-round, including moving through the area for foraging, or in the course of migrating to spawning and rearing (SR) tributaries (Dupont et al. 2007, p. 1269).

Some bull trout migrations in LPO have been shown to be very extensive (USFWS 2002d, p. 15). For example, research conducted by Dupont and Horner (2002, p. 125) suggested that migratory bull trout spawning in the Middle Fork East River and Uleda Creeks, tributaries to the East River downstream of Priest Lake, may exhibit an unusual life history strategy. These fish have been documented to migrate downstream out of Lake Pend Oreille into the Pend Oreille River, before ascending the East River drainage for spawning. It was previously believed that bull trout in this drainage were part of the Priest Lake core area (USFWS 2008, p. 3). This life history was believed to also occur in tributaries downstream of Albeni Falls prior to construction of the dam.

There is no documented presence of bull trout in Sand Creek, and there is minimal data on bull trout use of LPO within the Project action area (Sitarii 2017, *in litt*); USFWS 2017b). Subadult bull trout emigrate into LPO from tributaries in two pulses, one in spring associated with snowmelt runoff and increasing water temperatures and a second in fall as stream temperatures drop and fall rains begin (Downs et al. 2006). A fall-only subadult bull trout emigration occurs from the downstream East River to the Pend Oreille River to LPO, presumably to allow bull trout to avoid swimming upstream into the lake against the current during spring high flows (USFWS 2015b).

Fish passage barriers also influence bull trout distribution throughout the core area. Log crossings, beaver dams, large alluvial deposits and culverts are recognized as fish passage barriers across the area. To improve fish passage, many of these barriers (i.e., culverts, log crossings, etc.) have been removed or replaced. While the aforementioned barriers influence fish passage on a local scale, large hydroelectric dams have had the greatest influence on bull trout distribution throughout the core area. Beginning in 1913, with the construction of Thompson Falls Dam on a set of natural falls in the Clark Fork River, dams in the basin (Cabinet Gorge in 1952, Albeni Falls in 1955, Box Canyon in 1956, and Noxon Rapids in 1959) have permanently interrupted established bull trout migration routes, eliminating access from portions of the tributary system to the productive waters of Lake Pend Oreille and Flathead Lake (USFWS 2015a, p. 15). Three dams on the lower Clark Fork River have significantly reduced the amount of spawning and rearing habitat available to Lake Pend Oreille bull trout. Other effects of these dams to bull trout habitat include changes in water quality (temperature, sediment, and nutrients) and quantity, lake drawdowns, a reduction in shoreline food sources, and direct losses of fish into water conveyance systems (turbines, spillways, or water delivery systems) (USFWS 2015a, p. 34).

Within the action area, the Pend Oreille River has been significantly altered by residential development along the shoreline. Bank armoring and recreational docks have limited complexity and large wood recruitment, modified natural hydraulic processes, and removed vegetation that provide shade and forage. These actions have furthered limited the potential for bull trout use of the river, and the persistence of the species in the action area.

Table 3. Bull trout redd counts from tributaries of Lake Pend Oreille, Clark Fork River, and Pend Oreille River, Idaho.

STREAM (*Index)	Avg 1983-2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Clark Fork R.	7	0	3	2	0	1	0	0	--	--	--			
Lightning Cr.	10	22	9	3	10	11[b]	0	20	1	1	4	11	--	3
East Fork Cr. *	51	50	51	34	38	85	26	64	11[b]	26	22	17	19	80
Savage Cr.	8	7	25	0[b]	8	5	6	1	--[b]	5	6	5	1	19
Char Cr.	11	15	20	1	5[e]	1[e]	4[e]	9[e]	0[b,e]	4[e]	2	0	0	0
Porcupine Cr.	9	14	8	8	8	15	11	13	2[b]	4	15	0	14	10
Wellington Cr.	9	6	29	9	10	4[b]	7	6	5	5	11	8	3	5
Rattle Cr.	22	34	21	2	24	62[b]	43	65	59	8	63	5	5	20
Johnson Cr. *	19	45	28	32	40	47	57	54	54	50	21	5	5	10
Twin Cr.	9	7	11	0	4	0	0	1	--	--	--	--	--	--
Morris Cr.	2	3	16	0	6	6	9	0	0[b]	3	14	0	3	32
Strong Cr.	1	--	--	--	7	6	2	11	3	47	17	0	10	4
Trestle Cr. [a] *	251	174	395	145	183	279	188	178	187	133	159	117	91	75
Pack R.	23	53	44	16	11	4	0	1	7	6	1	35	5	57
Grouse Cr. *	37	77	55	38	31	51	27	116	69	12	54	48	--	32
Granite Cr.	43	132	166	104	52	106[c]	75[c]	129[c]	68	217	115	66	48	96
Sullivan Springs Cr.	15	15	28	17	7[c]	2[c]	9[c]	11[c]	4	11	4	0	4	14
North Gold Cr. *	30	34	30	28	17	28[c]	28[c]	6[c]	3[b]	28	25	41	22	54
Gold Cr. *	120	200	235	179	73	107[c]	130[c]	56[c]	110[c]	106[c]	88	69	71	169
W. Gold Cr.	NA	--	4	0	7	5	4	0	8	29	10	3	0	3
M.F. East R.	13	48	71	34	36	25	22	28	28	25	51	51	50	23
Uleda Cr.	4	4	7	2	7[b]	16	6	9	24	14	26	11	2	1
N.F. East R.	1	0	0	--	0	--	0	--	--	--	--	--	--	--
Caribou Creek	NA	--	--	--	--	--	--	37	6	47	9	57	4	51
Hellroaring	NA	--	--	--	--	--	--	--	3	--	--	2	2	24
Total 6 index streams	507	580	794	456	382	597	456	474	434	355	369	297	208	420
Total of all streams	694	940	1256	654	584	866	654	815	652	781	717	551	359	782

[a] Additional approx. 0.5 km reach immediately upstream of index reach on Trestle Creek added in 2001
[b] Impaired observation conditions (ice, high water, etc.)
[c] Abundant early spawning kokanee made identification of bull trout redds in lower reaches difficult
[d] Partial Count
[e] Barrier excluded bull trout from accessing typical spawning habitat

2.4.4.2 Factors Affecting the Bull Trout in the Action Area

Specific threats identified in the LPO-B core area and its tributaries, extending from Cabinet Gorge Dam on the Clark Fork River downstream to LPO to Albeni Falls Dam on the Pend Oreille River include (USFWS 2010a):

- Historic fragmentation of the lower Clark Fork River due to three privately-owned mainstem hydroelectric dams (Cabinet Gorge, Noxon Rapids, and Thompson Falls) that seriously compromised access and productivity of this bull trout habitat for nearly a century;
- Overfishing of bull trout and the presence of voracious non-native species, specifically lake trout (mackinaw) that prey on juvenile bull trout and consume kokanee, a primary food source for bull trout, as identified by the IDFG; and
- Legacy impacts from upland/riparian land management practices threaten habitat through increases in sedimentation, riparian and instream degradation, loss of large woody debris, and pool reduction in FMO habitat and in some SR tributaries.

Ongoing and planned near-term fish passage efforts at Cabinet Gorge and Albeni Falls dams (fishways and trap and transport programs) will improve the longer-term prognosis for bull trout connectivity, and are expected to provide a critical linkage to recovering bull trout in the entire Lower Clark Fork Geographic Region in the future. Continuing efforts to suppress non-native fish (specifically lake trout), which is funded under the Avista Corporation Clark Fork Settlement Agreement (CFSA), would remain an important component of the recovery effort (USFWS 2010a).

In addition, Lake Pend Oreille and Sand Creek within the Project action area are listed for water quality impairments by IDEQ (2007) and have established loading targets, or total maximum daily loads (TMDLs). These include Sand Creek TMDLs for temperature and sediment approved by USEPA in 2007, and a LPO nearshore TMDL for total phosphorus approved by USEPA in 2002. Lake Pend Oreille and Sand Creek within the Project action area are also currently listed as impaired by mercury and development of a TMDL is currently underway. Pend Oreille River (including the outlet arm of LPO within the Project action area) is currently in need of TMDLs for temperature and dissolved gas supersaturation impairments (IDEQ 2017a, Appendix K, p. 12).

2.4.5 Bull Trout Critical Habitat

2.4.5.1 Status of Bull Trout Critical Habitat in the Action Area

In accordance with section 3(5)(A)(i) of the ESA and regulations at 50 CFR 424.12(b), in determining which areas occupied at the time of listing to propose critical habitat, the Service considered the physical or biological features essential to the conservation of the species and that may require special management considerations or protection, and were discussed earlier in this document. The PBFs listed earlier in the document, and apply to the action area are as follows:

1. The Project action area (Sand Creek and LPO) has ample water sources year-round. Water levels are controlled by the Albeni Falls Dam on the Pend Oreille River at the Idaho/Washington border, approximately 25 miles downstream from the Project. Levels fluctuate from an elevation of 2,051 feet at winter pool to 2,062 feet at summer pool.

2. Shoreline armoring, marinas, and bridges are present within Sand Creek and LPO. Migration between spawning, and rearing habitat in tributaries, and overwintering and foraging habitat in LPO, has been impeded by upstream dams on the lower Clark Fork River (Cabinet Gorge, Noxon Rapids) and by the downstream Albeni Falls Dam on the Pend Oreille River.

3. An abundant food base is present in LPO with IDFG estimating kokanee abundance at 21 million in 2015, a primary bull trout food source. However, predation of kokanee by lake trout is an issue in LPO, and significantly impacted the kokanee population before IDFG initiated an ongoing lake trout suppression effort in 2006. IDFG is also currently researching feasibility of a walleye suppression effort in LPO.

4. The Project area includes Sand Creek and LPO. Large wood, pools and undercut banks are not present within the Project area. Though LPO levels are artificially managed, there are a variety of depths and gradients present in the action area.

5. A 2005 temperature monitoring study (Annear et al. 2006) reported temperatures ranging from 2 to 22°C at depths ranging from 0.16 to 15.24 meters between February and November in LPO near Contest Point (approximately 1.5 miles upstream/east of the existing Bridge 3.9), and reported temperatures ranging from 7 to 25°C at depths ranging from 0.61 to 7.62 meters between April and November at the US 95 bridge over LPO (approximately 0.5-mile downstream/west of the existing Bridge 3.9). The study also noted that thermal stratification occurs in LPO in the middle of summer (August).

6. Not applicable; the Project is not within bull trout SR habitat.

7. Sand Creek and LPO have seasonal changes in water levels that can depart from a natural hydrograph. Water levels are controlled by the Albeni Falls Dam on the Pend Oreille River at the Idaho/Washington border, approximately 25 miles downstream of the Project. Levels fluctuate from an elevation of 2,051 feet at winter pool to 2,062 feet at summer full pool.

8. Water quality impairments exist in the action area for sediment, temperature, and nearshore phosphorus. These issues have established TMDLs: Sand Creek temperature and sediment in 2007, and a LPO nearshore TMDL for total phosphorus in 2002. LPO and Sand Creek within the Project action area are also currently listed as impaired by mercury. Additionally, the Pend Oreille River (including the outlet arm of LPO within the Project action area) have impairments for temperature and dissolved gas supersaturation that are a medium TMDL in 2019 (IDEQ 2017a, Appendix K, p. 12).

9. Per IDFG (2017a, *in litt*) data, predatory species are present within the LPO including walleye, smallmouth bass, northern pike, and lake trout. These invasive species present a threat to bull trout through predation or competition. IDFG is conducting an ongoing lake trout suppression effort that has been underway since 2006 and is also currently researching feasibility of a walleye suppression effort.

2.4.5.2 Factors Affecting Bull Trout Critical Habitat in the Action Area

Changes in hydrology and temperature caused by changing climate have the potential to negatively impact aquatic ecosystems in Idaho, with salmonid fishes being especially sensitive. Average annual temperature increases due to increased carbon dioxide are affecting snowpack, peak runoff, and base flows of streams and rivers (Mote et al. 2003, p. 45). Increases in water temperature may cause a shift in the thermal suitability of aquatic habitats (Poff et al. 2002, p. iii). For species that require colder water temperatures to survive and reproduce, warmer temperatures could lead to significant decreases in available suitable habitat. Increased frequency and severity of flood flows during winter can affect incubating eggs and alevins in the streambed and over-wintering juvenile fish. Eggs of fall spawning fish, such as bull trout, may suffer high levels of mortality when exposed to increased flood flows (Independent Scientific Advisory Board (ISAB) 2007, p. iv).

2.5 Effects of the Proposed Action

Effects of the action consider the direct and indirect effects of an action on the listed species and/or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action. These effects are considered along with the environmental baseline and the predicted cumulative effects to determine the overall effects to the species. Direct effects are defined as those that result from the proposed action and directly or immediately impact the species or its habitat. Indirect effects are those that are caused by, or will result from, the proposed action and are later in time, but still reasonably certain to occur. An interrelated activity is an activity that is part of the proposed action and depends on the proposed action for its justification. An interdependent activity is an activity that has no independent utility apart from the action under consultation.

2.5.1 Direct Effects of the Proposed Action on Bull Trout

Direct effects are those that result from the proposed action and directly or immediately impact the species or its habitat. Indirect effects are those that are caused by, or would result from, the proposed action and occur later in time (USFWS 2015i). Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area. The proposed action may result in direct effects to bull trout from temporary pile driving associated with the construction permanent and temporary bridges.

2.5.1.1 Elevated Underwater Sound Levels

The Project would construct both a temporary and permanent bridges over Sand Creek and LPO, which would require vibratory and impact pile driving of both 36-inch-diameter steel piles and 24-inch-diameter steel piles. The project includes both vibratory and impact pile driving.

High levels of underwater sound can injure or kill fish and cause alterations in behavior (Turnpenny et al. 1994, entire; Turnpenny and Nedwell 1994, pp 11-13; Popper 2003, p. 29; Hastings and Popper 2005, entire; NMFS 2007, entire). Death from barotrauma can be instantaneous or delayed up to several days after exposure. Even in the absence of mortality, elevated noise levels can cause sublethal injuries. Fish suffering damage to hearing organs may suffer equilibrium problems, and may have a reduced ability to detect predators and prey (Hastings et al. 1996, pp. 1762-1763). Hastings (2007, p. 5) determined that a sound exposure level (SEL) as low as 183 dB (re: 1 µPa2-sec) was sufficient to injure the non-auditory tissues of juvenile spot (*Leiostomus xanthurus*) and pinfish (*Lagodon rhomboides*) with an estimated mass of 0.5 grams.

Adverse effects on survival and fitness can occur even in the absence of overt injury. Exposure to elevated noise levels can cause a temporary shift in hearing sensitivity (referred to as a temporary threshold shift), decreasing sensory capability for periods lasting from hours to days (Turnpenny et al. 1994, entire; Hastings et al. 1996, p. 1759). Popper et al. (2005, p. 3959) found temporary threshold shifts in hearing sensitivity after exposure to cumulative SELs as low as 184 dB. Temporary threshold shifts reduce the survival, growth, and reproduction of the affected fish by increasing the risk of predation and reducing foraging or spawning success.

Cumulative SEL is a measure of the risk of injury from exposure to multiple pile strikes. The Equal Energy Hypothesis, described by NMFS (2007, entire), is used as a basis for calculating cumulative SEL. The number of pile strikes is estimated per continuous work period. This approach assumes that there would be a break of at least 12 hours between work periods. NMFS uses the practical spreading model to calculate transmission loss. The NMFS uses an agreed-upon interim criteria to minimize potential impacts to fishes (Fisheries Hydroacoustic Working Group 2008, entire).

The interim criteria include peak SPL and SEL injury threshold limits of:

- Peak SPL: levels at or above 206 dB from a single hammer strike likely results in the onset of physical injury; and
- SEL: cumulative levels at or above 187 dB for fish sizes of 2 grams or greater, or 183 dB for fish smaller than 2 grams.

Bull trout smaller than 2 grams are not present within the LPO since spawning and rearing do not occur within the vicinity of the Project. Pile driving SPLs in excess of 150 dB RMS are expected to cause temporary changes in bull trout behavior such as a startle response, disruption of feeding, or impairment of predator detection.

The action area is not optimal habitat for use by bull trout throughout the year, or specific times of day. A limited study was conducted where 2 of 6 radio tagged adult bull trout were found to overwinter near the BNSF railroad bridge beginning in November, but remained in the area only until May upon which returned to their spawning and rearing tributary (Dupont, et al, 2007, p. 2269, 1272). During the winter, daylight hours are shorter, and there will be less construction activity. Project planning anticipates “minimal or no production over a 2-3 month period each winter” which allows for greater habitat availability during this timeframe.

The habitat in the action area is also sub-optimal since it is relatively shallow (10-25 feet deep) compared to other areas of the lake. Studies have shown that bull trout display little activity during the day, and tend to occupy deeper water at the time pile driving would occur, with peak bull trout activity typically occurring at night (McPhail and Baxter 1996, p. 14; Muhlfeld, et al 2003, p. 163). This being the case, few, if any, bull trout are expected to occupy these shallow water areas during periods of daylight. Since pile driving will only occur during daylight hours, and there is a break of 12 hours or more, bull trout migration and foraging through the action area is available nightly. Spawning tributaries are outside of the action area, and will not affect bull trout staging at the mouth of tributaries, or upstream migration for spawning.

The shallow depths in the action area also allow for warmer water that tends to limit bull trout distribution when greater than 15 degrees Celsius. A temperature study in the area noted that water temperatures at depths found in the action area are above 15 degrees Celsius from late June through September, which would discourage bull trout use of this habitat during this period (Annear, 2006, p. 14) when more optimal temperatures are found in deeper adjacent habitat.

2.5.1.1.1 Vibratory Pile Driving

All piles will require vibratory pile driving for installation and all temporary piles will be removed slowly with a vibratory pile driver at a rate of 4 piles per day. Vibratory pile driving will occur year round during temporary and permanent bridge installation and temporary bridge removal. Vibratory pile drivers produce SPLs 10 to 20 dB below that of impact pile drivers. However, vibratory pile driving will occur for much longer durations than impact pile driving. Vibratory pile driving is not likely to result in fish injury but is likely to impact behavior by resulting in an avoidance of the project area. Distance at which 150 dB RMS is expected to be exceeded (behavioral effects) is 464 meters (2.98 miles). Vibratory pile driving will occur off and on year round between May of 2019 and November 2022.

2.5.1.1.2 Impact Pile Driving

Piles 36 inches in diameter are the widest pile proposed, and will be installed with vibratory pile-driving equipment and an impact hammer will be used for finishing. Approximately four 36-inch-diameter piles will be driven per day with up to 1,600 strikes per pile. The impact hammer can produce spikes of sound reaching levels than can harm or kill fish or cause behavioral effects. Impact hammers produce more intense pressure waves, and while the initial strikes may elicit a startle response in fish, the response wanes and fish may remain within the range of potentially harmful sound. Additionally, impact hammers produce short spikes of sound lasting less than a few seconds with energy outside of the infrasound range, which may not elicit an avoidance response in fishes. Therefore, fish may be exposed to harmful pressures for longer periods of time (USFWS 2015b).

Impact pile driving associated with 24-inch-diameter piles at both temporary work bridges is anticipated to require a total of 144 hours of impact pile driving with an injury area (cumulative SEL dB to fish ≥ 2 grams) of 61 meters and a disturbance area of 3.4 miles (Appendix A). Temporary bridge construction will occur over a year-long period and affect both migration and non-migration periods.

Impact pile driving a 36-inch-diameter piles associated with permanent Bridge 3.9 is anticipated to require 432 hours of pile driving, with two pile drivers going at once, at each end of the bridge. This action will result in an injury area (cumulative SEL dB to fish ≥ 2 grams) of 0.62 miles and a disturbance area of 2.88 miles (Appendix A). Permanent bridge construction will occur over a 2-year-long period and affect both migration and non-migration periods.

Impact pile driving of 24-inch-diameter pile associated with Bridge 3.1 is anticipated to require 44 hours of pile driving over a 1- to 5-month period. This action will result in an injury area (cumulative SEL dB to fish ≥ 2 grams) of 0.28 miles and a disturbance area of 2.88 miles (Appendix A). Permanent bridge construction may affect both migration and non-migration periods.

Impact pile driving will occur for approximately 620 hours over a two-year period considering two impact pile drivers may be working at either ends of Bridge 3.9. Considering there are 24 hours in a day, and 365 days in a year, this results in impact pile driving 3.5 percent of the time over a two-year span. All pile driving will occur during daylight hours.

For aquatic species, risk of injury or mortality resulting from noise is related to the effects of rapid pressure changes, especially on gas-filled spaces in the fish's body (such as swim bladder, lungs, sinus cavities, etc.). Generally, in-water or near-water pile driving is the issue of concern. Noise generated by impact pile driving is impulsive—consisting of a broad range of frequencies over a short duration. Different aquatic species exhibit different hearing ranges, and threshold distances and noise levels have been established to be used as a basis for effect determinations.

Peak dB describes the instantaneous peak SPL and is used to evaluate potential injury to fish, and RMS dB describes the pressure level during the impulse and is used to describe disturbance-related effects (i.e., harassment) to fish. SEL is used as an indication of the energy dose (WSDOT 2018).

There are several factors that can reduce the extent of underwater noise transmission, including water depth, sediment type, bottom topography, current, underwater structures, sinuosity (in rivers or streams), type and diameter of piles, and use of attenuation devices such as air bubble curtains (WSDOT 2018). Calculated results for Bridge 3.9 show a cumulative SEL of 218 dB and the following distances at which various thresholds of accumulated SEL are expected to be exceeded for bull trout:

- Distance at which 206 dB PEAK is expected to be exceeded (onset of physical injury) = 12 meters (37 feet)
- Distance at which 187 dB accumulated SEL is expected to be exceeded (onset of physical injury to fish 2g or greater) = 1000 meters (0.62 mile)
- Distance at which 150 dB RMS is expected to be exceeded (behavioral effects) = 4,642 meters (2.88 miles)

Potential behavioral effects to bull trout could therefore extend northeast to LPO's Kootenai Bay, and southwest nearly to the start of the Pend Oreille River near the City of Dover at the lake's outlet arm (Figure 4). Calculated results for Bridge 3.1 show a cumulative SEL of 212 dB and the following distances within which various thresholds of accumulated SEL are projected to be exceeded for bull trout:

- Distance in which 206 dB PEAK is expected to be exceeded (onset of physical injury) = 7 meters (23 feet)
- Distance within which 187 dB accumulated SEL is expected to be exceeded (onset of physical injury to fish 2g or greater) = 451 meters (0.28 mile)
- Distance within which 150 dB RMS is expected to be exceeded (behavioral effects) = 5,412 meters (3.36 miles)

For Bridge 3.9, the NOAA Pile Driving Calculator (Appendix A) shows that injury to subadult and adult bull trout could occur within approximately 0.62 miles of the pile driving, and behavioral effects could occur within approximately 2.88 miles. For Bridge 3.1, the calculator shows that injury to subadult and adult bull trout could extend approximately 0.28 miles from the bridge into LPO, and behavioral effects could extend over a mile southeast across LPO to the lake shoreline near Contest Point and overlap the behavioral effects range of Bridge 3.9. These noise-related effects to bull trout within the action area are expected to be adverse.

Bull trout typically remain in colder and deeper waters during daylight hours. The action area contains the shallowest portion of LPO, with depths of only 10 to 25 feet in the vicinity of the bridges. Much deeper water is located adjacent the action area and in other parts of LPO. Due to increased activity occurring in the immediate area of Project construction and the use of dispersion strikes, bull trout could be expected to move away from the area at, or prior to, initiation of impact pile driving. The operational pause of up to 12 hours or more (overnight) between work periods, is believed to be sufficient time for recovery from exposure to high noise levels (USFWS 2015i, entire). Additionally, Project actions are proposed in the shallowest, and likely the warmest portion, of the lake; therefore, species presence is anticipated to be fewer relative to other areas of the Lake. Further, bull trout are known to be most active at night and thus less likely to be in the action area when pile driving occurs. Lastly, air bubble curtains would be used to attenuate sound impacts when installing temporary and permanent bridge piles to reduce SPLs by 3 dB thereby somewhat reducing the lateral extent of effects.

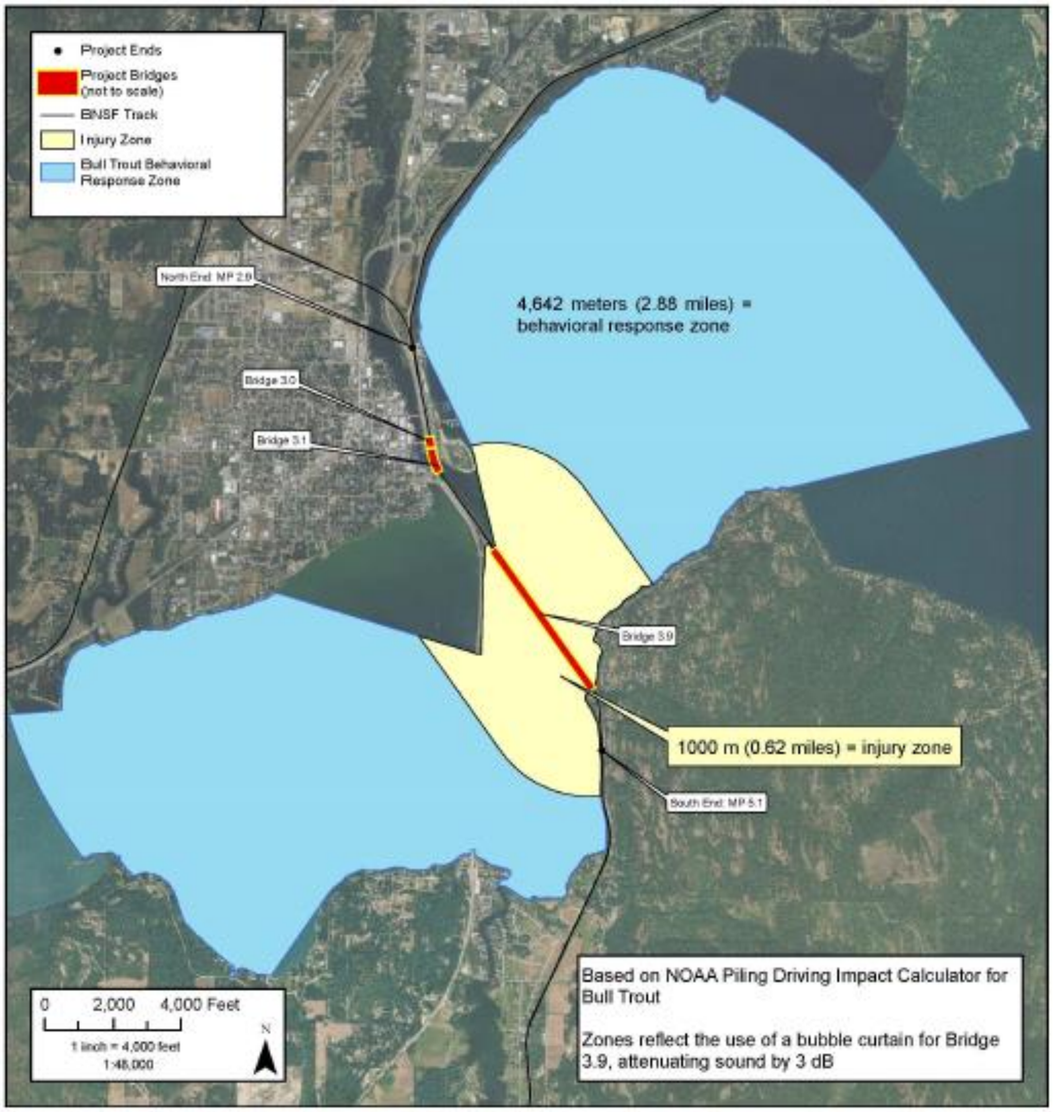

Figure 4. Bull Trout Threshold Distances

2.5.1.2 Sedimentation/Turbidity

Activities included in the proposed action may result in suspended sediment above background levels as a result of excavation or fill placement below or adjacent to the OHWM/MHHW, runoff from areas with disturbed riparian vegetation, placement of rip-rap, and pile driving and removal. BNSF would employ BMPs and minimization measures to minimize the production of suspended sediment.

Increases in turbidity from the proposed action would largely be temporary and localized in nature. Sediment input from disturbed riparian areas would occur until the sites are stabilized or new vegetation grows. Placement of nearshore fill is proposed during low/no water conditions to reduce sedimentation and turbidity impacts. However, when water levels increase during the high water season, loose sediments from newly placed nearshore fills can temporarily increase turbidity in a localized area. Sediments resuspended from pile driving would continue for a short period after driving is completed, and would occur only in a small area surrounding the pile being driven or removed. When possible turbidity curtains would be utilized.

Salmonids typically avoid areas with higher suspended sediment, which can mean that they displace themselves from their preferred habitats in order to seek areas with less suspended sediment. Fish unable to avoid suspended sediment can experience adverse effects. The severity of effect of suspended sediment increases as a function of the sediment concentration and exposure time (Newcombe and Jensen 1996; Bash et al. 2001, pp 7-8). Suspended sediments can cause sublethal effects such as elevated blood sugars and cough rates (Servizi and Martens 1991, p. 495), physiological stress, and reduced growth rates. Sigler et al. (1984, p. 150) found that a reduction in growth occurred in steelhead and coho salmon when turbidity was as little as 25 NTUs.

Elevated turbidity levels can reduce the ability of salmonids to detect prey, cause gill damage (Sigler et al. 1984, p 50; Lloyd et al. 1987, p. 23; Bash et al. 2001, p. 7), and cause juvenile steelhead to leave rearing areas (Sigler et al. 1984, p. 149). Decreases in reactive distance reactive distance were also reported and a reduced percentage of prey captured (Sweka and Hartman 2001, p. 141; Bash et al. 2001, pp. 21-23; Klein 2003, pp. 1, 21). At 0 NTUs, 100 percent of the prey items were consumed; at 10 NTUs, fish frequently were unable to capture prey species; at 60 NTUs, only 35 percent of the prey items were captured. At 20 to 60 NTUs, significant delay in the response of fish to prey was observed (Bash et al. 2001, p. 22). Loss of visual capability and capture of prey leads to depressed growth and reproductive capability. Additionally, short-term pulses of suspended sediment influence territorial, gill-flaring, and feeding behavior of salmon under laboratory conditions (Berg and Northcote 1985, p. 1410). Adult and larger juvenile salmonids appear to be little affected by high concentrations of suspended sediments that occur during storm and snowmelt runoff episodes (Bjornn and Reiser 1991, p. 119). However, research indicates that chronic exposure can cause physiological stress responses that can increase maintenance energy and reduce feeding and growth (Lloyd et al. 1987, p. 23; Servizi and Martens 1991, p. 497).

While pile driving itself typically generates localized sediment displacement, the use of air bubble curtains can mobilize a higher level of sediment and increase localized areas of turbidity within the action area temporarily. Removal of piles for the temporary work bridges also could result in localized turbidity increases. The level of turbidity within several meters of construction is likely to exceed natural background levels. Turbidity can cause stress responses in bull trout, such as gill flaring, coughing, avoidance, and an increase in blood sugar levels. However, moderate levels of turbidity can also reduce vulnerability to predators due to a camouflaging effect (USFWS 2015i, entire).

Turbidity impacts will be reduced by utilizing turbidity curtains during impact driving of the piles for temporary and permanent bridges while bubble curtains are in use in water greater than 2 ft. in depth, and where appropriate when bubble curtains are not being used (Sugarman 2019, *in litt*). They will also be used when removing piles for the temporary work bridge over LPO, and where possible for the temporary work bridge over Sand Creek. Turbidity curtains are expected to limit the extent and magnitude of sediment transport. Additionally, the potential of bull trout remaining in the construction area will be low due to the activity and noise avoidance. Therefore, the effects to bull trout from temporary increases in turbidity are expected to be insignificant.

2.5.1.3 Contaminant Mobilization

Potential contaminants in lakebed sediments could include mercury (LPO and Sand Creek are listed as mercury-impaired), and arsenic, cadmium, copper, lead, and zinc primarily from legacy discharges from mining and smelting in the headwaters of Montana's Clark Fork River. The Clark Fork River contributes approximately 92 percent of the annual inflow to the lake and most of the annual suspended sediment load.

Concentrations of Clark Fork River bed-sediment metals decrease exponentially with distance downstream away from mining (Axtmann and Luoma 1991, p. 79). No sediment studies were conducted in the Project vicinity; however, a study done for the Clark Fork Delta restoration project (approximately 16 miles upstream of the Project) detected metal concentrations (cadmium, copper, mercury and zinc) exceeding the USEPA's Sediment Evaluation Framework (SEF) Interim Freshwater SL1 Concentrations (concentrations below this level are not expected to adversely affect benthic communities) in 13 of 103 samples collected at 10 of 33 sampling locations; 8 of the 13 contaminated samples were at depths between 1.5 and 2.5 feet (GeoEngineers 2014, entire).

Construction of permanent and temporary work bridges creates the potential risk of construction materials or construction equipment fluids (fuel, oil, hydraulic fluid, antifreeze, etc.) entering open waters. Exposure to high levels of petroleum-based products can cause toxicity to bull trout and chronic lethal and sublethal effects to a wide range of aquatic organisms. Spills of wet concrete into water can potentially result in temporary localized increases in pH levels. The risk to aquatic life depends on the type of contaminant, the time of year, the amount of material spilled or leaked, and the effectiveness of containment materials (USFWS 2015i, entire).

Implementation of BMPs/minimization measures such as containment systems installed under the construction and permanent bridges to capture potential falling construction materials or debris, spill prevention planning and staging, proper storage and handling of fluids, and equipment monitoring and maintenance, are all proposed to be implemented to reduce potential impacts to water quality and bull trout.

As discussed under Sedimentation/Turbidity above, pile removal has the ability to increase turbidity. If contaminated sediments are present within the pile driving area, there is a potential for resuspension of these particles. The use of turbidity curtains is proposed and will help contain suspended sediments to a localized area. If a fish is within the vicinity of pile removal activities during sediment resuspension, there is a potential for exposure.

Depending on the type of metal and its concentration when remobilized in the water column, potential effects to bull trout can range from coughing and neurotoxicity to adverse growth and behavior impacts. Potential effects to bull trout critical habitat include effects to water quality and an adequate prey base, since metals bioaccumulate in adult piscivorous fish such as bull trout. However, these effects are primarily associated with chronic exposure and/or very high levels of acute exposure (USFWS 2015j, entire).

BMPs that will be utilized to contain and control potential remobilization of contaminated sediments during pile removal include slowly vibrating the piles out of the lakebed and using turbidity curtains around each pile or bent being removed; curtains will be anchored to the lakebed for total water column seal and tied off to withstand maximum current conditions. Should turbidity occur, it will be of short duration and contained within the turbidity curtain until sediments have settled. Therefore, effects to bull trout from temporary remobilization of contaminated sediments are expected to be insignificant.

2.5.1.4 Nearshore Fill Placement

The Project action will consist of a filling 0.88 acre of permanent nearshore area and 0.38 acre of temporary nearshore area below the jurisdictional ordinary high water mark elevation of 2,062.5 feet, associated with bridge abutments and the south switch. Fills result in both temporary and permanent habitat loss.

The LPO water level is slowly brought up about 5 feet in the month of April through a release from the upstream dam, 4 feet in the month of May and, 2 to 2.5 feet by mid-June. Sometimes USACE engages their “flexible winter operations” which could fluctuate the lake level 1-5 feet multiple times during the winter (Jacobs 2018b, entire). When water levels increase during the high water season, loose sediments from newly placed nearshore fills can temporarily increase turbidity in a localized area. However, due to the small size of the fill area relative to LPO, effects to bull trout from nearshore fill placement are expected to be insignificant.

2.5.1.5 Riparian Vegetation Removal

Shoreline development at both ends of Bridge 3.9 has reduced shoreline vegetation and LWD recruitment, displaced willow habitat, and altered wave and scour patterns adjacent to new shoreline structures. Removal of riparian vegetation can increase water temperature and reduce the supply of terrestrial insects. Removal of riparian trees also reduces the potential for LWD recruitment that contributes to production of invertebrate prey for bull trout (USFWS 2015i, entire).

Removal of existing shoreline vegetation will be limited to the minimum necessary for construction of the Project.

During construction and prior to post-construction revegetation, there will temporarily be a loss of vegetation within the project construction and staging areas. However, due to the small area where riparian vegetation will be removed relative to the total amount of shoreline and riparian vegetation currently remaining in LPO, effects to bull trout from this activity are expected to be insignificant.

2.5.2 Indirect Effects on Bull Trout

Indirect effects are those impacts that are caused by the action and occur later in time (after the action is completed) but are still reasonably certain to occur. There may be permanent indirect effects to bull trout due to the potential for increased predation associated with the increased shading and additional pier hiding habitat from Bridge 3.9 after construction. Non-pollution generating stormwater would flow through the bridge as it does on the existing bridge. Water captured in the deck tubs would run off through scuppers or along the bents. The water would remain within the same subbasin and therefore would not result in a hydrologic affect.

2.5.2.1 Long-Term Habitat Loss or Alteration

LPO provides FMO habitat for bull trout. The Project will construct a new railroad bridge over LPO that will require driving 288 permanent 36-inch-diameter steel piles and up to 700 temporary 24-inch-diameter piles into the lakebed. This will result in a permanent loss of 2,036 square feet of benthic habitat, and a temporary loss of 2,200 square feet of benthic habitat (the area where the piles are installed). The Project action will also consist of a filling 0.88 acre of permanent nearshore area and 0.38 acre of temporary nearshore area below the jurisdictional ordinary high water mark elevation of 2,062.5 feet, associated with bridge abutments and the south switch. Given the footprint of the Project where permanent benthic habitat will be lost relative to the total benthic habitat available in LPO, the effects to benthic habitat are expected to be discountable.

2.5.2.2 Predator/Prey Relationships

Bridge 3.9 over LPO will result in additional shading (low level) and additional pier hiding habitat (moderate). Both have the potential to create rearing and ambush habitat for native and non-native fish species that prey on subadult bull trout. Smallmouth bass and largemouth bass are two predator fish in the action area that have a strong affinity to habitat structures including bridges and pilings (USFWS 2015i, entire).

Based on the presence of bull trout and predators in the action area, and the additional shading and structure created by the new Bridge 3.9, there is a potential for increased predation of subadult bull trout. Bull trout in the action area are migratory and use the area for foraging and overwintering. However, due to the small size of Bridge 3.9 relative to LPO, effects to bull trout from increased predator habitat are expected to be insignificant.

2.5.3 Effects of Interrelated or Interdependent Actions

Per 50 CFR 402.33(a)(2)(iii), interrelated or interdependent actions should be assessed and considered when providing a determination. Interrelated or interdependent actions associated with the Project include staging areas which require temporary nearshore fills and temporary clearing and grading which require removal of riparian vegetation. These actions and impacts are fully reviewed in the direct and indirect analysis of effect sections.

2.5.4 Direct and Indirect Effects of the Proposed Action on Bull Trout Critical Habitat

This section provides an analysis of the Project’s effects on each PBF detailed earlier in this document.

The Project will not impact water levels or subsurface water connectivity as no actions are proposed that will substantially reduce water levels or interrupt water connectivity. Placement of temporary and permanent nearshore fills will result in insignificant impacts to PBF 1.

While the new, permanent Bridge 3.9 over LPO will have new in-water piers, these will not be partial or complete fish barriers to bull trout migration in the Project action area. There will be fewer piers supporting the new Bridge 3.9 compared to the existing bridge, and the new bridge piers will align approximately with every other pier of the existing bridge. Spacing between piers for the new bridge ranges from approximately 65 feet to 93 feet. However, pile driving during bull trout migratory periods in the spring and fall may affect bull trout migration in LPO. While most bull trout migrations are nocturnal and occur within the first few hours of darkness, there may be isolated instances of bull trout attempting to migrate during daylight transition times (early morning/early evening hours) when construction work could be starting or ending. Sound pressure impacts above behavior disturbance are unavoidable. Since the project will impact behavior within a migratory zone for an extended duration of 620 hours over a 2-year period; the project will significantly affect the ability of the action area to serve as a migratory corridor for bull trout.

The Project may impact predator/prey relationships at the Bridge 3.9 permanent bridge and temporary work bridge due to the presence of more underwater structures that provide ambush habitat for native and non-native fish species that prey on sub-adult bull trout. Temporary turbidity during construction, and/or placement of nearshore fills, could impact access to macroinvertebrates in a localized area. Limited vegetation removal will not substantially change the availability of riparian organisms due to the existing low-quality nearshore habitat in the Project area; therefore, the project will have insignificant impacts on PBF 3.

Kokanee, a preferred prey species, are high in number in LPO (IDFG estimated kokanee abundance to be 21 million in 2015) and any declines in the population due to Project implementation will be temporary.

The Project will not change substrates or the presence of side channels. The Project will not change the depths, velocities or channels of the Sand Creek inlet or LPO. Sand Creek gradient will not be modified. The Project will not change water temperatures or the amount of thermal refugia currently available in LPO. Therefore, the placement of piles and fill within the Sand Creek inlet within LPO will result in insignificant impacts to PBF 4.

The new Bridge 3.9 and the temporary work bridge were designed to match the elevation of the existing bridge and are at sufficient elevations to allow penetration of sunlight during most of the day and are not expected to affect existing surface water temperatures. LPO stratifies in the summer and bull trout will be expected to occupy the deeper, colder waters below the thermocline during the daytime. Therefore, there will be no expected change in the amount of available thermal refugia in the action area. Additionally, a relatively small amount of riparian vegetation will need to be removed in areas needed for construction of bridge abutments and at the south switch. The limited amount of riparian vegetation removal will not substantially impact water temperatures and, therefore, will have an insignificant impact to PBF 5. There will be no effect on PBF 6 since spawning and rearing habitat do not occur within the project vicinity or action area.

Due to the small size of the fill areas relative to LPO, the effects to the hydrology of the action area from implementation of the Project are expected to be insignificant.

The Project does not include any elements that would impact the quantity of water in LPO. The Project may impact water quality associated with PBF 8, due to sedimentation during nearshore fill placements and temporary fill removals, and during bridge pile installations and temporary work bridge pile removals. Pile removal in LPO could also potentially remobilize contaminated sediments. The areas of temporary increases in suspended sediments are insignificant when compared to the size of LPO and the available critical habitat.

The Project will not contribute to water quality impairments for temperature or dissolved gases in the action area. Existing temperature and dissolved gas impairments are in the Pend Oreille River, approximately 2.7 miles west/downstream of Bridge 3.9. Removal of temporary piles for Bridges 3.1 and 3.9 work bridges may result in short-term, spatially-limited sedimentation/turbidity in Sand Creek and LPO, and could also remobilize contaminated sediments if present. Sand Creek and LPO are both listed as impaired by mercury, which may be present in bottom sediments. The use of turbidity curtains during in-water pile removal, and during the use of bubble curtains, will limit the extent and duration of sedimentation and potential remobilization of contaminants. Therefore, effects to water quality from Project implementation are expected to be insignificant.

The Project will not introduce new predatory, inbreeding or competitive species. However, Bridge 3.9 new permanent and temporary work bridges may provide additional ambush habitat for native and non-native fish species that prey on subadult bull trout. New underwater pier structures for the new bridge in LPO may alter predator/prey relationships due to the presence of more structures that provide ambush habitat for native and non-native fish species that prey on sub-adult bull trout. These altered relationships will occur year-round since sub-adult bull trout are present in the lake year-round and do not migrate to/from SR tributaries until they are sexually mature. However, due to the small size of predator habitat resulting from Project implementation relative to LPO, effects to PBF 9 in the action area are expected to be insignificant.

2.5.5 Effects of Interrelated or Interdependent Actions

Per 50 CFR 402.33(a)(2)(iii), interrelated or interdependent actions should be assessed and considered when providing a determination. Interrelated or interdependent actions associated with the project include staging areas which require temporary nearshore fills and temporary clearing and grading which require removal of riparian vegetation. These actions and impacts are fully reviewed in the direct and indirect analysis of effect sections.

2.6 Cumulative Effects

The implementing regulations for section 7 define cumulative effects to include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this Opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Though the information and activities presented below do not directly occur within the Project action area, they are provided to assist Service with preparation of the Biological Opinion and to help in tracking the environmental conditions throughout a general area. These actions are assumed to continue at this level of effort for the foreseeable future.

2.6.1 Non-Native Fish Suppression

Avista CFSA has provided funding to IDFG for suppression of lake trout via the LPO Trap and Gill Net Program and the LPO Angler Incentive Program since 2006. The goals of these programs are to reduce predator abundance and increase kokanee numbers. These programs have removed more than 216,000 lake trout from 2006 through 2017 (Avista 2017, p. 5).

Annual CFSA Implementation Reports to the Federal Energy Regulatory Commission (FERC) document the number of lake trout removed from LPO and has resulted in a positive response in bull trout and kokanee abundance for both programs, but also there is an amount of bull trout take and mortalities associated with the Trap and Gill Net Program (Avista 2016, pp. 69-70; Avista 2017, pp. 76-77). As a result of the lake trout suppression efforts, 1,612 bull trout were taken with 549 of them moralities in 2016 with similar numbers reported in 2017.

Avista is also providing research CFSA funding to IDFG for a walleye suppression feasibility study. In 2017, walleye were tagged and released, and the first year of a three-year removal plan started in 2018. As a result of this investigation, 15 bull trout were taken with 11 mortalities reported in 2018.

2.6.2 Fish Passage Projects

The project noted below is anticipated to benefit bull trout. At this time, there are no other known state, tribal or private actions that are certain to occur in the action area, other than additional private docks may be constructed along the LPO and Pend Oreille River shorelines within the action area. These docks are not anticipated to alter any measurable amount of shoreline within the Project action area. Overall, non-associated projects are not anticipated to result in overall negative impacts to bull trout.

- Avista Cabinet Gorge Dam Fish Passage Facility (Clark Fork River):
  - Would construct a new facility to transport native migratory salmonids, with a focus on upstream transport of bull trout to tributaries in Montana to restore connectivity in the LPO bull trout core recovery area.
  - Construction to begin in fall 2018.
  - Current trap and haul passage of bull trout at Cabinet Gorge Dam passed 903 bull trout (4 mortalities) in 2016–2017.
- Albeni Falls Dam Fish Passage Facility (Pend Oreille River):
  - Would construct a new facility to allow upstream passage of bull trout over Albeni Falls Dam to restore connectivity in the LPO bull trout core recovery area
  - U.S. Army Corps of Engineers is currently seeking appropriations and funding for construction of the facility.

2.7 Conclusion on Bull Trout

The Service has reviewed the current status of the bull trout, the environmental baseline in the action area, effects of the proposed action, and cumulative effects, and it is our conclusion that the proposed action is not likely to jeopardize the species' continued existence. This determination is based on the following:

- The action area is designated as FMO habitat, but is not high quality due to its shallow depth, and elevated water temperatures during warmer times of the year. Bull trout rearing and spawning habitats are not present in the action area, and therefore the proposed action will have no effect on bull trout rearing or spawning habitat, or these essential behaviors.
- The proposed action incorporates both permanent design elements and conservation measures which will reduce effects to habitat and avoid and minimize impacts during construction. The action's temporary adverse effects are limited in both physical extent and duration allowing access to FMO habitat in the action area at times they are most likely to use it.
- Due to the relatively small area that will experience effects to water quality, as well as implementation of conservation measures, we expect that few subadult and adult bull trout or their prey base will be exposed to these impacts or experience measurable adverse effects from reduced water quality. In the long term, we do not expect that the proposed action will worsen surface water or sediment quality trajectories at the scale of the action area or Lake Pend Oreille watershed.
- With full implementation of the proposed conservation measures (e.g., not pile driving at night, when bull trout are most active), we expect that low numbers of subadult and adult bull trout will be adversely affected by construction activities. Exposure to construction activities may kill or injure a limited number of bull trout, may result in sub lethal physiological stress with potential consequences for individual growth and/or long term survival, and will disrupt normal bull trout behaviors (feeding, moving, and sheltering). However, we expect that the vast majority of temporary, construction-related bull trout exposures will be sub-lethal, and many are likely to elicit only mild behavioral responses (e.g., avoidance of the immediate work area). Because these subadult and adult bull trout may originate from any of the more than 20 local populations in the core area, we expect that any resulting temporary or long term effects to bull trout numbers (abundance) or reproduction (productivity) will not be measurable at the scale of the local populations or core area.
- The proposed action may result in temporary adverse effects to the bull trout prey base. Construction activities will create conditions which benefit nonnative fish predators and could, at least hypothetically, lead to increased predator numbers or density in the short term. Kokanee, a preferred prey species, are high in number in LPO (IDFG estimated kokanee abundance to be 21 million in 2015) and declines will be temporary, not measureable, and the project will likely have insignificant or discountable adverse effects to the bull trout prey base in the long term.
- The proposed action will have limited short-term, and no measurable long term effects on bull trout distribution at the scale of the local populations or the core area.
- The anticipated direct and indirect effects of the action, combined with the effects of interrelated and interdependent actions, and the cumulative effects associated with future State, tribal, local, and private actions will not appreciably reduce the likelihood of survival and recovery of the species. The anticipated direct and indirect

effects of the action (permanent and temporary) will not measurably reduce bull trout numbers, reproduction, or distribution at the scale of the core area or Columbia Headwaters recovery unit. The anticipated direct and indirect effects of the action will not alter the status of bull trout at the scale of the Columbia Headwaters recovery unit recovery unit or coterminous range.

2.8 Conclusion on Bull Trout Critical Habitat

The Service has reviewed the current status of bull trout critical habitat, the environmental baseline in the action area, effects of the proposed action, and cumulative effects, and it is our conclusion that the proposed action is not likely to destroy or adversely modify designated critical habitat for bull trout. The action area provides seven out of the nine PBFs for designated bull trout critical habitat.

- The action area is designated as FMO habitat, but is not high quality due to its shallow depth, and elevated water temperatures during warmer times of the year. Bull trout rearing and spawning habitats are not present in the action area, and therefore the proposed action will have no effect on bull trout rearing or spawning habitat, or these essential behaviors.
- The proposed action incorporates both permanent design elements and conservation measures which will reduce effects to critical habitat and avoid and minimize impacts during construction. The action's temporary, construction-related adverse effects are limited in both physical extent and duration.
- The action will result in temporary, intermittent, adverse effects to function of the foraging, migratory corridor (PBF 2) during daylight hours in the vicinity of the action area, for approximately three years (2019 through 2022).
- The proposed action will result in temporary adverse effects to the bull trout prey base (PBF 3). Construction activities will create conditions which benefit nonnative fish predators and could, at least hypothetically, lead to increased predator numbers or density in the short term. Kokanee, a preferred prey species, are high in number in LPO (IDFG estimated kokanee abundance to be 21 million in 2015) and any declines will be temporary, and the project will likely have insignificant or discountable adverse effects to the bull trout prey base in the long term.
- We expect that relatively few subadult and adult bull trout or their prey base will be exposed to water quality impacts or experience measurable adverse effects with the full implementation of the proposed conservation measures. In the long term, we do not expect that the proposed action will worsen surface water or sediment quality trajectories at the scale of the action area or the Lake Pend Oreille watershed.
- The action will result in temporary adverse effects that impair free movement and/or temporarily displace bull trout from refugia or preferred habitats due to hydroacoustic effects during daylight hours. However, in the long term, we do not expect that the proposed action will worsen surface water or sediment quality trajectories at the scale of the action area or Lake Pend Oreille watershed. Furthermore, we do not expect that the project’s long term effects will cause or contribute to a measurable, incremental decline in the bull trout prey base.
- The action will result in limited, temporary adverse effects to lake and shoreline

aquatic habitats and processes (PBF 4). Construction activities will increase the amount of artificial, over-water and in-water structure for a term of approximately three years (2019 through 2022). However, the action also includes design measures and mitigation components which we expect will reduce permanent or long term impacts to aquatic habitats, and maintain or restore important habitat functions over time. The action's adverse effects to lake and shoreline habitats (e.g., surface water quality resulting from sediment, in-water and over-water structures) are limited in physical extent, will not further degrade current function, prevent future establishment of full, proper function, or preclude bull trout from foraging, migrating, and overwintering in the action area.

- The action will result in temporary adverse effects to PBF 9. Construction activities will create conditions which benefit nonnative fish predators and could, at least hypothetically, lead to increased predator numbers or density in the short term. Kokanee, a preferred prey species, are high in number in LPO (IDFG estimated kokanee abundance to be 21 million in 2015) and declines will be temporary, not measureable, and the project will likely have insignificant or discountable adverse effects to the bull trout prey base in the long term.
- Within the action area, bull trout critical habitat will retain its current ability to establish functioning PBFs. The anticipated direct and indirect effects of the action, combined with the effects of interrelated and interdependent actions, and the cumulative effects associated with future State, tribal, local, and private actions will not prevent the PBFs of critical habitat from being maintained, and will not degrade the current ability to establish functioning PBFs at the scale of the action area. Critical habitat within the action area will continue to serve the intended conservation role for the species at the scale of the core area, and the Columbia Headwaters recovery unit, and coterminous range.

The Service has reviewed the current status of bull trout critical habitat, the environmental baseline in the action area, effects of the proposed action, and cumulative effects, and it is our conclusion that the proposed action is not likely to destroy or adversely modify designated critical habitat for bull trout.

2.9 Incidental Take Statement

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered and threatened fish and wildlife species, respectively, without specific exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm in the definition of take in the Act means an act which actually kills or injures wildlife. Such act may include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to listed species by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering.

Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

2.9.1 Form and Amount or Extent of Take Anticipated

We anticipate that take in the form of harm (injury or mortality) and harassment (disruption of normal behaviors) of subadult and adult bull trout from the Lake Pend Oreille core areas will result from the proposed action.

Regulation 50 CFR 402.14 (i)(1)(i) authorizes the use of surrogates when amount or extent of anticipated incidental take will be difficult to detect or quantify. Therefore the Service is using distance elevated sound pressure levels travel, and the calculated area of impact as a surrogate in place of a numerical value for the following reasons: 1) the low likelihood of finding dead or injured adults, or subadults; 2) delayed mortality; and, 3) the relationship between habitat conditions and the distribution and abundance of individuals is imprecise such that a specific number of affected individuals cannot be practically obtained. Due to the sub-optimal habitat conditions in the action area, e.g. shallow water, water temperatures in excess of 15 degrees Celsius in June through September, water disturbance from construction activities, in concert with conservation and mitigation measures, and adjacent preferential habitat, the number of bull trout affected is likely to be very low. However, we anticipate that all bull trout that experience these elevated noise levels will be harmed (injury or mortality) or harassed (disruption of normal behaviors) as described below:

1. Incidental take of bull trout in the form of harassment resulting from degraded surface water quality and exposure to elevated turbidity and sedimentation during construction. Water quality will be degraded intermittently while construction activities are being completed in the action area below the OHWM of Lake Pend Oreille, to include the LPO inlet identified as Sand Creek. Take will result when levels of turbidity reach or exceed 25 NTU above background at any time.

2. Incidental take of bull trout as described in table 4, resulting from the direct effects of elevated sound pressure levels in the action area.

Table 4. Incidental take of bull trout from elevated sound pressure levels on Lake Pend Oreille, Idaho

Action	Form of Incidental Take	Stressor	Duration and period	Distance	Area (acres)	Percent of available bull trout FMO habitat on LPO
Construction of Temporary Work Bridge 3.1	Harm	Direct effect of exposure to elevated underwater SPLs resulting from impact pile driving and proofing of approximately 10, 24-inch steel piles below the OHWM of LPO inlet identified as Sand Creek in 2019 and possibly another 10, 24-inch steel piles in 2020. If the temporary bridge is removed for navigation and reinstalled in 2020, the additional take for the same area and duration will apply.	Approximately 30 hours between 2019 and 2020	0.04 mi (64 m)	2.9	0.003

Action	Form of Incidental Take	Stressor	Duration and period	Distance	Area (acres)	Percent of available bull trout FMO habitat on LPO
Construction of Permanent Bridge 3.1	Harm	Direct effect of exposure to elevated underwater SPLs resulting from impact pile driving and proofing of approximately 22, 24-inch steel piles below the OHWM of LPO inlet identified as Sand Creek	Approximately 44 hours between 2019 and 2020	0.28 mi. (451 m)	19	0.02
Construction of Temporary Work Bridge 3.9	Harm	Direct effect of exposure to elevated underwater SPLs resulting from impact pile driving and proofing of approximately 76, 24-inch steel piles below the OHWM of LPO	Approximately 288 hours between 2019 and 2020	0.04 mi. (64 m)	2.9	0.003
Construction of Permanent Bridge 3.9	Harm	Direct effect of exposure to elevated underwater SPLs resulting from impact pile driving and proofing of approximately 288, 36-inch steel piles below the OHWM of LPO	Approximately 864 hours between 2020 and 2022	0.62 mi. (998 m)	830	0.88
Construction of Temporary Work Bridge 3.1	Harassment	Direct effect of exposure to elevated underwater SPLs resulting from impact pile driving and proofing of approximately 10, 24-inch steel piles below the OHWM of LPO inlet identified as Sand Creek in 2019 and possibly another 10, 24-inch steel piles in 2020. If the temporary bridge is removed for navigation and reinstalled in 2020, the additional take for the same area and duration will apply.	Approximately 30 hours between 2019 and 2020	3.4 mi (5,472 m)	310	0.33
Construction of Permanent Bridge 3.1	Harassment	Direct effect of exposure to elevated underwater SPLs resulting from impact pile driving and proofing of approximately 22, 24-inch steel piles below the OHWM of LPO inlet identified as Sand Creek between 2019 and 2020	Approximately 44 hours between 2019 and 2020	3.36 mi. (5,407 m)	310	0.3
Construction of Temporary Work Bridge 3.9	Harassment	Direct effect of exposure to elevated underwater SPLs resulting from impact pile driving and proofing of approximately 76, 24-inch steel piles below the OHWM of Lake Pend Oreille	Approximately 288 hours between 2019 and 2020	3.4 mi. (5,412 m)	7,230	7.6
Construction of Permanent Bridge 3.9	Harassment	Direct effect of exposure to elevated underwater SPLs resulting from impact pile driving and proofing of approximately 288, 36-inch steel piles below the OHWM of LPO	Approximately 864 hours between 2020 and 2022	2.88 mi. (4,635 m)	6,650	7.02
Construction of All Bridges	Harassment	Direct exposure of elevated underwater SPLs resulting from installation and removal of piles using a vibratory hammer	Approximately 2 years during the project	0.29 mi (464 m)	351	0.37

2.9.2 Effect of the Take

In the accompanying Opinion, the Service determined that this level of anticipated take is not likely to jeopardize the continued existence of the bull trout across its range.

2.9.3 Reasonable and Prudent Measures

The Service concludes that the following reasonable and prudent measures are necessary and appropriate to minimize the take of bull trout caused by the proposed action.

1. Minimize and monitor incidental take caused by elevated turbidity and sedimentation during construction.

2. Minimize and monitor incidental take caused by elevated underwater SPLs from impact driving and proofing of steel piles, and proper function and attenuation provided by bubble curtains with limited hydroacoustic monitoring.

3. Minimize migration and foraging affects caused by elevated underwater SPLs from pile driving and impact proofing of steel piles by limiting these activities to daylight hours only, not to exceed a 12-hour period.

2.9.4 Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the USCG must ensure compliance with the following terms and conditions, which implement the RPMs described above. These terms and conditions are non-discretionary.

The following terms and conditions are required for the implementation of RPM 1:

- Measure turbidity to ensure levels do not exceed 25 NTUs above background level at 325 ft. (100 m) from the sediment generating activity.
    - Monitoring shall be conducted to establish background turbidity levels away from the influence of sediment-generating activities, and compared to turbidity levels at least twice daily during sediment-generating activities. In the event of a visually appreciable change in background turbidity (plume), an additional sample shall be taken.
    - If, in cooperation with other permit authorities, the USCG develops a functionally equivalent monitoring strategy (e.g., intensive monitoring, by project area or activity, followed by validation and routine monitoring), they may submit this plan to the Service for review and approval in lieu of the above monitoring requirements. The strategy must be submitted to the Service a minimum of 60 days prior to construction. In order to be approved for use in lieu of the above requirements, the plan must meet each of the same objectives
- The USCG shall ensure a monitoring report is submitted to the Idaho Fish and Wildlife Office in Spokane, Washington, by September 30 following each year of the project. The report shall include, at a minimum, the following: (a) dates, times, and locations of construction activities, (b) monitoring results, sample times, locations, and measured turbidities (in NTUs), (c) summary of construction activities and measured turbidities associated with those activities, and (d) summary of corrective actions taken to reduce turbidity.
- The USCG shall also ensure the Service is copied on any water or sediment quality monitoring data or reports submitted to the Idaho Department of Environmental Quality in satisfaction of related permits.

The following terms and conditions are required for the implementation of RPM 2:

- The USCG shall ensure a vibratory pile hammer is used to the fullest extent practicable when installing steel piles below the OHWM.
- The USCG shall ensure in-water sound generation and attenuation is monitored while installing steel piles with an impact pile hammer.
- The USCG will ensure that hydroacoustic equipment used for monitoring is tested and calibrated prior to data collection.
- The USCG shall ensure a performance test of the sound attenuation device is conducted prior to any impact pile driving or proofing. The performance test shall confirm calculated pressures and flow rates at each manifold ring.
- The USCG shall ensure that a qualified individual is present during all impact pile driving and proofing operations to observe and report any indications of dead, injured, or distressed fish. The USCG shall ensure that the Service is contacted within 24 hours if any dead, injured, or distressed fish are observed.
- The USCG shall ensure routine monitoring is conducted and document the effectiveness of the noise attenuation device with hydroacoustic monitoring for permanent bridges in the action area for peak, SEL, and RMS at a distance of 10 m:
    - A minimum of five steel pilings installed during the initial pile driving activity for each bridge in the critical habitat area
    - A minimum of five additional steel piling installed at the mid-point of the piling installation; and,
    - A minimum of five additional steel piling installed near completion of the piling installation schedule.
    - If, in cooperation with other permit authorities, the USCG develops a functionally equivalent monitoring strategy (e.g., intensive monitoring, by project area or activity, followed by validation and routine monitoring), they may submit this plan to the Service for review and approval in lieu of the above monitoring requirements. The strategy must be submitted to the Service a minimum of 60 days prior to construction. In order to be approved for use in lieu of the above requirements, the plan must meet each of the same objectives
- If the pile strike count for four consecutive piles exceeds by 50 percent or more the maximum single pile strike count observed when performing routine monitoring in that area, this shall be indicative of changed pile driving characteristics. The USCG shall ensure pile driving ceases and is not restarted except with implementation of contingency hydroacoustic monitoring.
- In each instance of changed pile driving characteristics, contingency hydroacoustic monitoring will document effectiveness of the noise attenuation device and resulting peak sound levels for the next three steel piles.
- Factors to consider in identifying the piles to be monitored include, but are not limited to bathymetry of the project site, total number of piles to be impact driven and proofed, depth of water, and distance from shore. This monitoring shall document recorded SPLs, and single strike and cumulative SELs, and the distance from the pile at mid-water depth.
- The USCG shall ensure the Service is contacted within 24 hours if the hydroacoustic monitoring indicates that the sound levels will exceed the levels estimated in the Biological Opinion.

- The USCG shall also ensure the Service is contacted within 24 hours if they determine that unattenuated pile strikes are necessary to determine baseline sound levels or evaluate effectiveness of the noise attenuation device. The USCG shall consult with the Service regarding modifications to the proposed action in an effort to reduce the sound levels below the limits of take and continue hydroacoustic monitoring.
- USCG shall ensure peak, SEL, and RMS sound pressure levels are measured in water that is at least 8 meters deep near the mouth of Trestle Creek when construction of permanent Bridge 3.9 commences to determine if RMS level exceeds the behavioral threshold of 150 dB. If the RMS exceeds this threshold, the USCG will coordinate with the Service to determine if it will impede immigration and emigration from critical spawning and rearing habitat. If the RMS level does not exceed this threshold, no further monitoring of this site is necessary for the duration of the Project.
- The USCG shall ensure a monitoring report is submitted to the Idaho Fish and Wildlife Office in Spokane, Washington (Attn: Field Office Supervisor), by September 30th each year of the project, and at the completion of the project. The report shall include the following information:
    - Size and type of piles driven and proofed;
    - The type of sound attenuation devise used;
    - The impact hammer force used to drive and proof piles;
    - A description of the monitoring equipment;
    - The distance between hydrophone and pile;
    - The depth of the hydrophone;
    - The distance from the pile to the wetted perimeter;
    - The depth of water;
    - The depth into the substrate the pile was driven and proofed;
    - The physical characteristics of the bottom substrate into which the piles were driven and proofed; and
    - The results of the hydroacoustic monitoring, including the frequency spectrum, SPLs, and single-strike and cumulative SEL. The report must also include the ranges and means for peak, RMS, and SELs.

The following term and condition is required for the implementation of RPM 3:

- The USCG will restrict pile driving and impact proofing activities from sunrise to sunset in the action area.

2.9.5 Reporting and Monitoring Requirement

In order to monitor the impacts of incidental take, the Federal agency or any applicant must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR 402.14 (i)(3)]. In addition, any accidental spills of equipment, creation of a sediment plume that extends beyond 100 meters, or chemicals that could have an adverse effect to bull trout will be reported to the Service within 24 hours of the incident.

2.10 Conservation Recommendations

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery programs, or to develop new information on listed species.

2.10.1 Invasive Species Prevention

Zebra mussels (*Dreissena polymorpha*), cheatgrass (*Bromus tectorum*), and other invasive species (IS) hold the potential to harm listed species and critical habitat given their ability to quickly colonize and drastically modify entire ecosystems. Human activity is the primary means of IS movement into new landscapes and watersheds, and therefore effective prevention measures can reduce the risk of biological invasions substantially. Executive Order 13112, reaffirmed by Executive Order 13751 directs all federal departments and agencies to take steps to prevent the introduction and spread of invasive species, which are defined as a non-native species "whose introduction does or is likely to cause economic or environmental harm or harm to human health."

Note: the following best management practices supplement any applicable laws and regulations for invasive species control, including state watercraft inspection requirements.

2.10.2 Use local, low-risk sources of materials

- Locally-sourced materials typically do not present invasive species risks that are not already found within the project area. Plants, seeds, and bulbs necessary for habitat restoration or other purposes should be from sources certified as weed-free or otherwise evaluated to ensure that they are not harboring invasive species. Nurseries providing materials should be using best management practices to validate that plants are labeled correctly and are not infested by disease or pests.
- Soil, rocks, gravel, mulch, and other fill material for habitat restoration, road construction, or other purposes should be from sources that have been inspected (and treated, as warranted) for the presence of invasive species prior to transport.
- Water transported for fire management, vegetation irrigation, or other purposes should come from potable sources and/or water bodies not known to harbor invasive species.
- Logs, branches, dimensional lumber, and other woody material for habitat restoration or other purposes should be locally sourced to the extent practical, inspected, and treated (as appropriate to intended use) to minimize infestation by invasive species, including wood-boring insects.

2.10.3 Reduce Exposure

- Field work within sites with existing invasive species should be planned to avoid routes of transit through areas of heavy invasive species density, and to work in invaded portions and/or downstream areas last to avoid introduction into uninvaded portions.

- Activity should be timed when feasible to avoid exposure to reproductive stages of invasive species (e.g., seasons when seed production is prevalent).
- Vehicles should be parked on pavement, gravel, or other sites that are away from vegetation; or in designated parking areas that help contain the spread of invasive species.

2.10.4 Inspect and Decontaminate Vehicles, Gear, Materials and Equipment

- Prior to arrival at a new field site, all vehicles, equipment, gear, and materials imported from outside of the watershed should be thoroughly cleaned to remove all visible plants and animals (even if they appear dead), mud, and other material. Where possible, particularly for water-based equipment, a hot water pressure washer should be used to apply constant exposure at a minimum of 140°F (60°C) and minimal pressure of 90 pounds/square inch (PSI) for a minimum of 15 seconds on hard/nonporous surfaces. Alternatively, or as extra protection, a brush with a combination of soft and stiff bristles should be used to remove unwanted material, paying special attention to crevices and other surface features (e.g., carpeting, Velcro, felt soles) more likely to accumulate debris or harbor invasive species.
- Upon arrival at a new field site, all vehicles, equipment, gear, and materials should be staged initially in a dedicated containment area, and thoroughly inspected for hitchhiking organisms such as seeds, plant fragments, snails, etc. Concealed recesses and other inconspicuous locations where water or organisms can escape initial observation require heightened scrutiny; a mirror and flashlight can help inspection in these hard-to-reach areas. Where inspection at the field site reveals that prior off-site cleaning procedures have failed to remove unwanted material, the associated item should be cleaned on land and within containment prior to deployment.
- Prior to entering a new water body, equipment should be thoroughly dry (ideally for a minimum of 5 days), and any standing water (including inside internal compartments, tubing, bilges and bladders) should be drained completely on land.

2.10.5 Monitor site and respond quickly to invasive species introductions

- The site should be monitored regularly (with particular attention to vehicle and equipment staging and storage areas) for incipient populations of non-native plant and animals likely to establish if prevention measures are not fully effective. Eradication measures should be implemented quickly for any detected invasions by executing standard control treatments for the species and/or soliciting assistance from local invasive species managers.

2.10.6 Additional References:

1. Technical Memorandum No. 86-68220-07-05: Inspection and Cleaning Manual for Equipment and Vehicles to Prevent the Spread of Invasive Species (2012 Edition)

2. Preventing Invasive Species: Cleaning Watercraft and Equipment, NOAA.

3. Uniform Minimum Protocols and Standards for Watercraft Inspection and Decontamination Programs for Dreissenid Mussels in the Western United States (UMPS III). Pacific States Marine Fisheries Commission, Portland, OR. (2016 Edition)

4. Invasive Species of Idaho, Idaho State Department of Agriculture.

2.11 Reinitiation Notice

This concludes formal consultation on the proposed Burlington Northern Santa Fe Sandpoint Junction Connector Project. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if:

1. The amount or extent of incidental take is exceeded.
2. New information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this Opinion.
3. The agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this Opinion.

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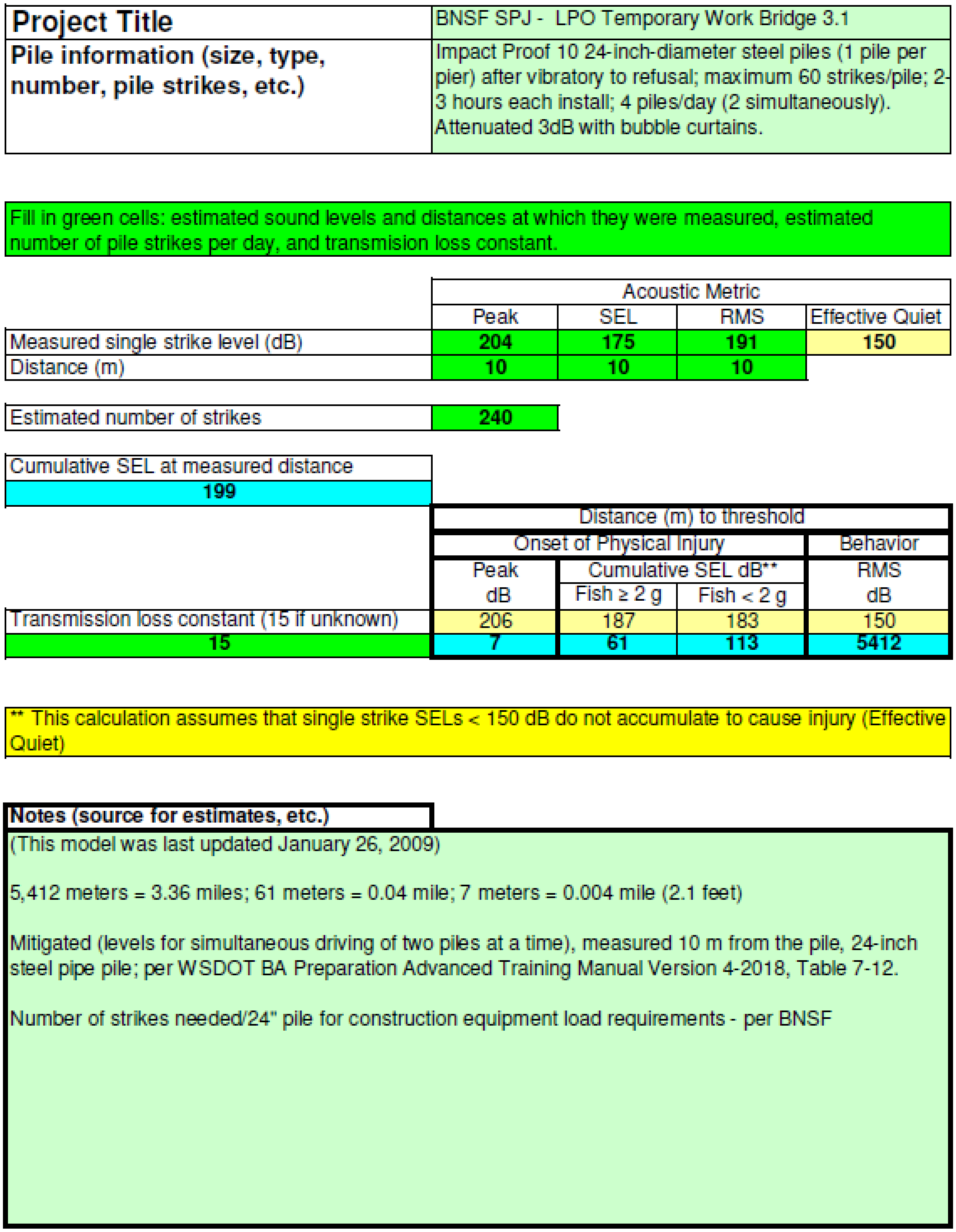
4. APPENDICES

4.1 Appendix A



Project Title	BNSF SPJ - LPO Temporary Work Bridge 3.1
Pile information (size, type, number, pile strikes, etc.)	Impact Proof 10 24-inch-diameter steel piles (1 pile per pier) after vibratory to refusal; maximum 60 strikes/pile; 2-3 hours each install; 4 piles/day (2 simultaneously). Attenuated 3dB with bubble curtains.

Fill in green cells: estimated sound levels and distances at which they were measured, estimated number of pile strikes per day, and transmission loss constant.

	Acoustic Metric			
	Peak	SEL	RMS	Effective Quiet
Measured single strike level (dB)	**204**	**175**	**191**	**150**
Distance (m)	**10**	**10**	**10**	

Estimated number of strikes	**240**

Cumulative SEL at measured distance
199

	Distance (m) to threshold			
	Onset of Physical Injury			Behavior
	Peak dB	Cumulative SEL dB**		RMS dB
		Fish ≥ 2 g	Fish < 2 g	
Transmission loss constant (15 if unknown)	206	187	183	150
15	**7**	**61**	**113**	**5412**

** This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

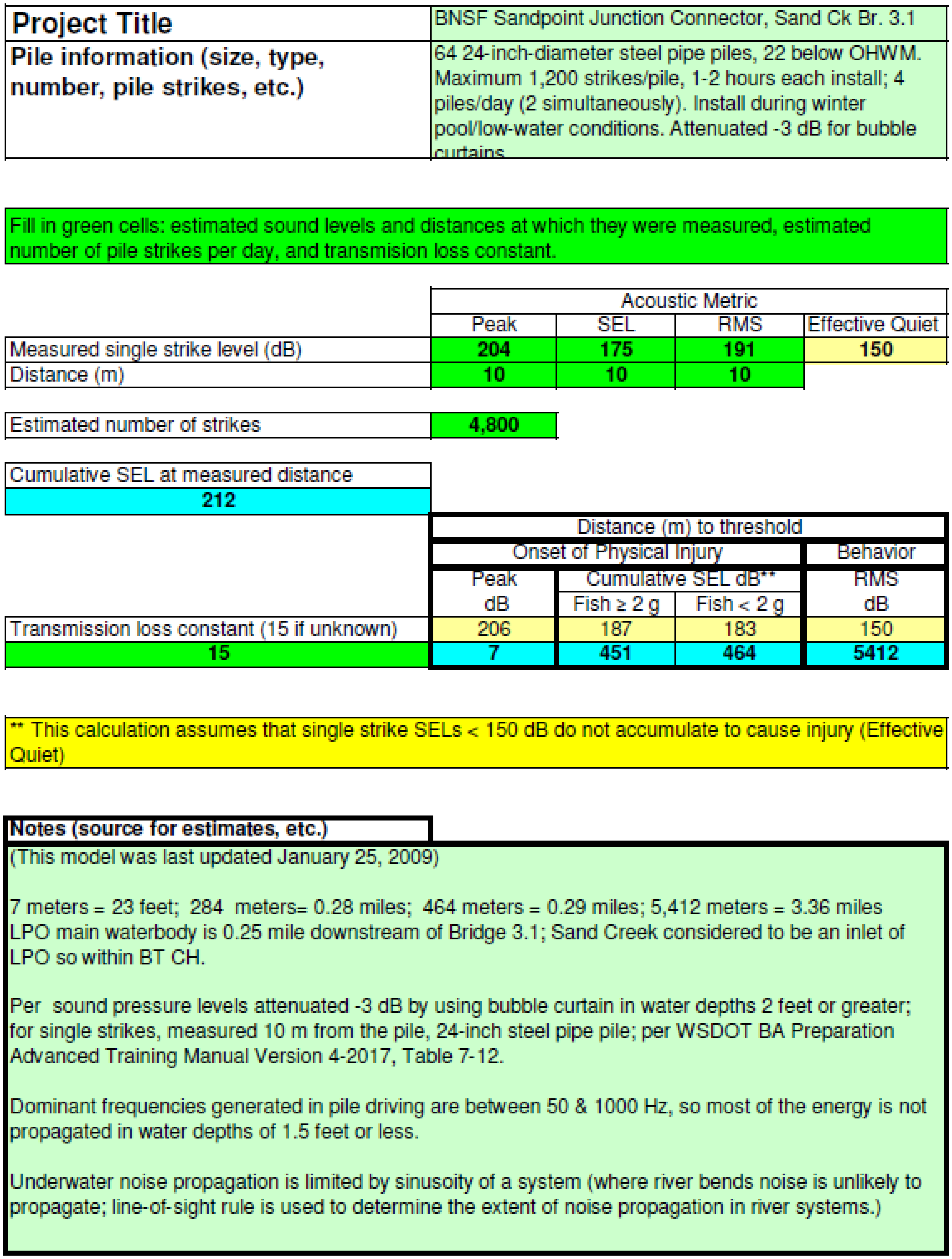
Notes (source for estimates, etc.)

(This model was last updated January 26, 2009)

5,412 meters = 3.36 miles; 61 meters = 0.04 mile; 7 meters = 0.004 mile (2.1 feet)

Mitigated (levels for simultaneous driving of two piles at a time), measured 10 m from the pile, 24-inch steel pipe pile; per WSDOT BA Preparation Advanced Training Manual Version 4-2018, Table 7-12.

Number of strikes needed/24" pile for construction equipment load requirements - per BNSF



Project Title	BNSF Sandpoint Junction Connector, Sand Ck Br. 3.1
Pile information (size, type, number, pile strikes, etc.)	64 24-inch-diameter steel pipe piles, 22 below OHWM. Maximum 1,200 strikes/pile, 1-2 hours each install; 4 piles/day (2 simultaneously). Install during winter pool/low-water conditions. Attenuated -3 dB for bubble curtains

Fill in green cells: estimated sound levels and distances at which they were measured, estimated number of pile strikes per day, and transmision loss constant.

	Acoustic Metric			
	Peak	SEL	RMS	Effective Quiet
Measured single strike level (dB)	**204**	**175**	**191**	**150**
Distance (m)	**10**	**10**	**10**	

Estimated number of strikes	**4,800**

Cumulative SEL at measured distance
212

	Distance (m) to threshold			
	Onset of Physical Injury			Behavior
	Peak	Cumulative SEL dB**		RMS
	dB	Fish ≥ 2 g	Fish < 2 g	dB
Transmission loss constant (15 if unknown)	206	187	183	150
15	**7**	**451**	**464**	**5412**

** This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

Notes (source for estimates, etc.)

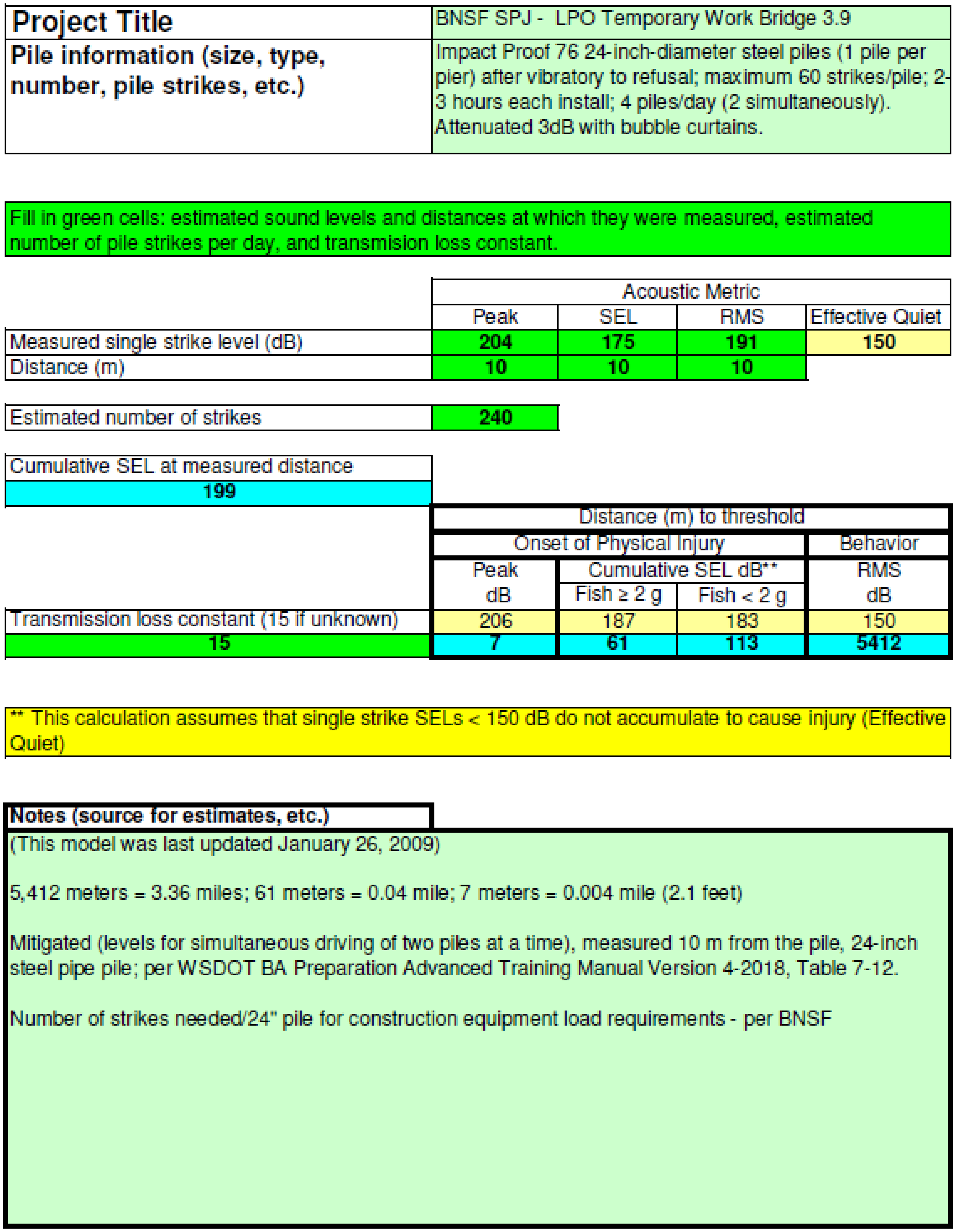
(This model was last updated January 25, 2009)

7 meters = 23 feet; 284 meters= 0.28 miles; 464 meters = 0.29 miles; 5,412 meters = 3.36 miles
LPO main waterbody is 0.25 mile downstream of Bridge 3.1; Sand Creek considered to be an inlet of LPO so within BT CH.

Per sound pressure levels attenuated -3 dB by using bubble curtain in water depths 2 feet or greater; for single strikes, measured 10 m from the pile, 24-inch steel pipe pile; per WSDOT BA Preparation Advanced Training Manual Version 4-2017, Table 7-12.

Dominant frequencies generated in pile driving are between 50 & 1000 Hz, so most of the energy is not propagated in water depths of 1.5 feet or less.

Underwater noise propagation is limited by sinusoity of a system (where river bends noise is unlikely to propagate; line-of-sight rule is used to determine the extent of noise propagation in river systems.)



Project Title	BNSF SPJ - LPO Temporary Work Bridge 3.9
Pile information (size, type, number, pile strikes, etc.)	Impact Proof 76 24-inch-diameter steel piles (1 pile per pier) after vibratory to refusal; maximum 60 strikes/pile; 2-3 hours each install; 4 piles/day (2 simultaneously). Attenuated 3dB with bubble curtains.

Fill in green cells: estimated sound levels and distances at which they were measured, estimated number of pile strikes per day, and transmision loss constant.

	Acoustic Metric			
	Peak	SEL	RMS	Effective Quiet
Measured single strike level (dB)	**204**	**175**	**191**	**150**
Distance (m)	**10**	**10**	**10**	

Estimated number of strikes	**240**

Cumulative SEL at measured distance
199

	Distance (m) to threshold			
	Onset of Physical Injury			Behavior
	Peak dB	Cumulative SEL dB**		RMS dB
		Fish ≥ 2 g	Fish < 2 g	
Transmission loss constant (15 if unknown)	206	187	183	150
15	**7**	**61**	**113**	**5412**

** This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

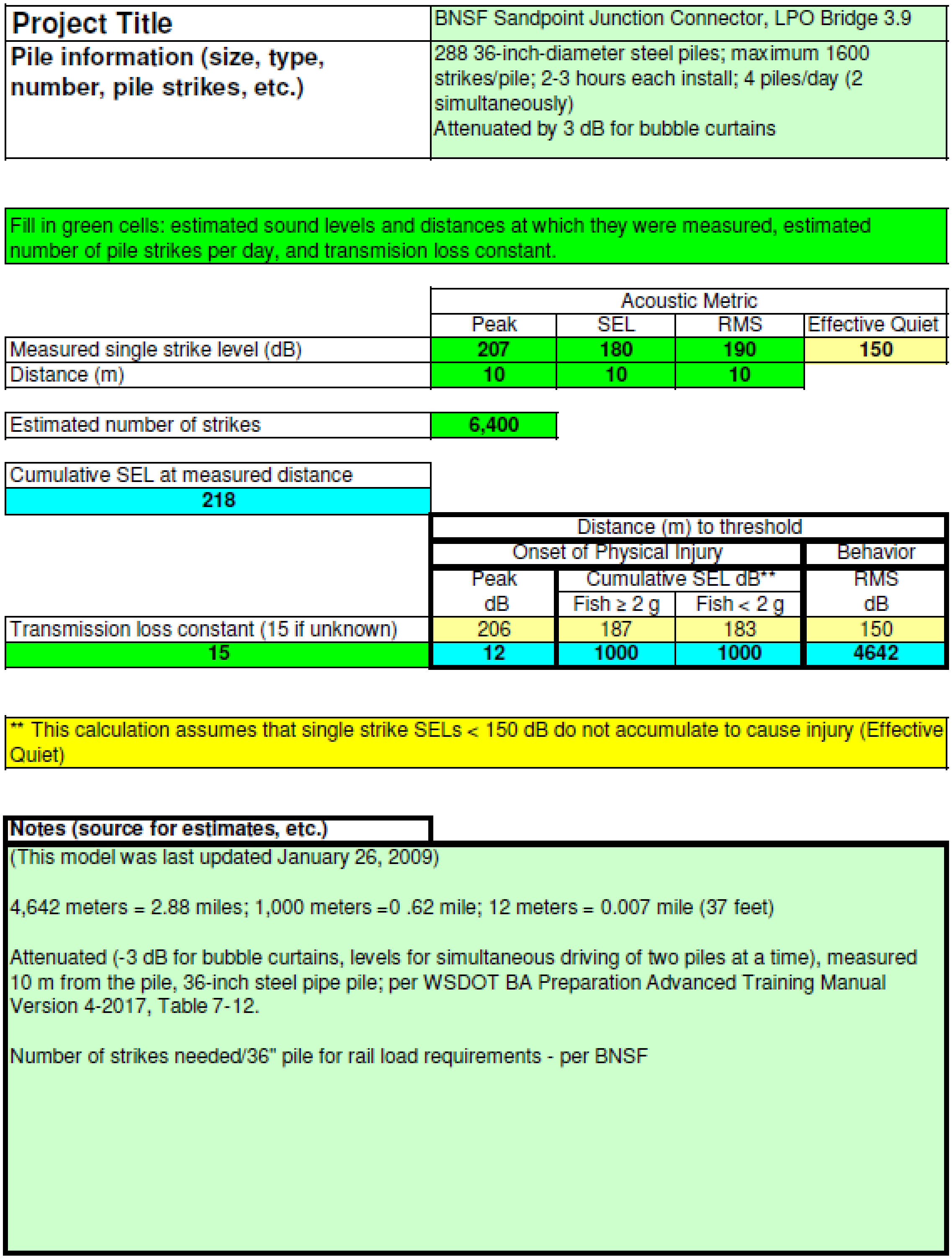
Notes (source for estimates, etc.)

(This model was last updated January 26, 2009)

5,412 meters = 3.36 miles; 61 meters = 0.04 mile; 7 meters = 0.004 mile (2.1 feet)

Mitigated (levels for simultaneous driving of two piles at a time), measured 10 m from the pile, 24-inch steel pipe pile; per WSDOT BA Preparation Advanced Training Manual Version 4-2018, Table 7-12.

Number of strikes needed/24" pile for construction equipment load requirements - per BNSF



Project Title	BNSF Sandpoint Junction Connector, LPO Bridge 3.9
Pile information (size, type, number, pile strikes, etc.)	288 36-inch-diameter steel piles; maximum 1600 strikes/pile; 2-3 hours each install; 4 piles/day (2 simultaneously) Attenuated by 3 dB for bubble curtains

Fill in green cells: estimated sound levels and distances at which they were measured, estimated number of pile strikes per day, and transmision loss constant.

	Acoustic Metric			
	Peak	SEL	RMS	Effective Quiet
Measured single strike level (dB)	**207**	**180**	**190**	**150**
Distance (m)	**10**	**10**	**10**	

Estimated number of strikes	**6,400**

Cumulative SEL at measured distance
218

	Distance (m) to threshold			
	Onset of Physical Injury			Behavior
	Peak dB	Cumulative SEL dB**		RMS dB
		Fish ≥ 2 g	Fish < 2 g	
Transmission loss constant (15 if unknown)	206	187	183	150
15	**12**	**1000**	**1000**	**4642**

** This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

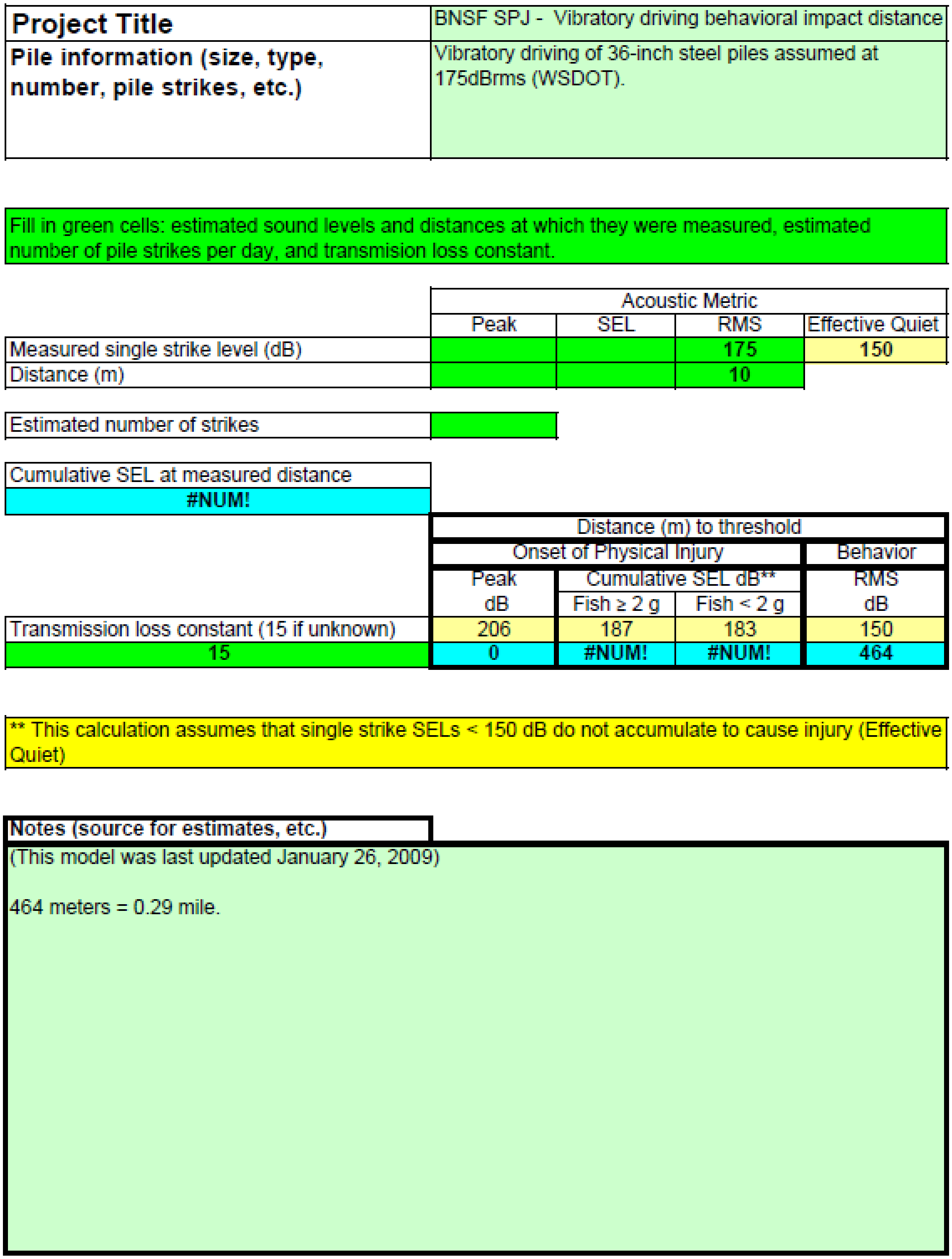
Notes (source for estimates, etc.)

(This model was last updated January 26, 2009)

4,642 meters = 2.88 miles; 1,000 meters =0 .62 mile; 12 meters = 0.007 mile (37 feet)

Attenuated (-3 dB for bubble curtains, levels for simultaneous driving of two piles at a time), measured 10 m from the pile, 36-inch steel pipe pile; per WSDOT BA Preparation Advanced Training Manual Version 4-2017, Table 7-12.

Number of strikes needed/36" pile for rail load requirements - per BNSF



Project Title	BNSF SPJ - Vibratory driving behavioral impact distance
Pile information (size, type, number, pile strikes, etc.)	Vibratory driving of 36-inch steel piles assumed at 175dBrms (WSDOT).

Fill in green cells: estimated sound levels and distances at which they were measured, estimated number of pile strikes per day, and transmision loss constant.

	Acoustic Metric			
	Peak	SEL	RMS	Effective Quiet
Measured single strike level (dB)			**175**	**150**
Distance (m)			**10**	

Estimated number of strikes	

Cumulative SEL at measured distance
#NUM!

	Distance (m) to threshold			
	Onset of Physical Injury			Behavior
	Peak dB	Cumulative SEL dB**		RMS dB
		Fish ≥ 2 g	Fish < 2 g	
Transmission loss constant (15 if unknown)	206	187	183	150
15	**0**	**#NUM!**	**#NUM!**	**464**

** This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

Notes (source for estimates, etc.)

(This model was last updated January 26, 2009)

464 meters = 0.29 mile.

BIOLOGICAL ASSESSMENT

BNSF Sandpoint Junction Connector Project

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Revised August 22, 2018

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Abbreviation and Acronyms

°C	degree Celsius
BMP	best management practice
BNSF	BNSF Railway Company
CFR	Code of Federal Regulations
CFSA	Clark Fork Settlement Agreement
CHU	Critical Habitat Unit
CHRU	Columbia Headwaters Recovery Unit
dB	decibel
dBA	A-weighted decibel
ESA	Endangered Species Act
FMO	foraging, migration, and overwintering
FR	Federal Register
IDEQ	Idaho Department of Environmental Quality
IDFG	Idaho Department of Fish and Game
IDL	Idaho Department of Lands
Jacobs	Jacobs Engineering Group Inc.
LPO	Lake Pend Oreille
LPO-B	Lake Pend Oreille Basin
MP	milepost
MRL	Montana Rail Link
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OHWM	ordinary high water mark
PCE	primary constituent element
Project	BNSF Sandpoint Junction Connector Project
RMS	root-mean-square
ROW	right-of-way
SEL	sound exposure level
SPL	sound pressure level
SR	spawning and rearing
SWPPP	Stormwater Pollution Prevention Plan
TMDL	total maximum daily load

US 95	U.S. Highway 95
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
WQMPP	Water Quality Monitoring and Protection Plan
WSDOT	Washington State Department of Transportation

Executive Summary

BNSF Railway Company (BNSF) proposes to construct the Sandpoint Junction Connector Project (Project). The Project would consist of a 2.2-mile-long second main line track adjacent to (west of) the existing BNSF main line track. The Project action would consist of a constructing a second main line track; upgrading existing access roads, staging areas, tracks, switches and signals; constructing new bridges over Bridge Street (Bridge 3.0), Sand Creek (Bridge 3.1), and Lake Pend Oreille (LPO; Bridge. 3.9) adjacent to (west of) the existing rail bridges; building temporary construction bridges adjacent to (west of) the new bridges; filling 0.88 acre of permanent nearshore area and 0.38 acre of temporary nearshore area below the jurisdictional ordinary high water mark elevation of 2,062.5 feet, associated with bridge abutments and the south switch; and filling 0.28 acre of wetland south of Bridge 3.1.

The impacts to jurisdictional wetlands, nearshore areas, and navigable waters of LPO and Sand Creek require permits from the U.S. Coast Guard and the U.S. Army Corps of Engineers. These federal actions trigger evaluation under the Endangered Species Act for Project impacts to threatened or endangered species and their designated critical habitat.

This Biological Assessment determines that Project activities are likely to adversely affect individual adult and sub-adult threatened bull trout primarily due to pile driving during construction for the new Bridge 3.1 in Sand Creek and the new Bridge 3.9 in LPO. This Biological Assessment determines that Project activities are likely to adversely affect bull trout-designated critical habitat in LPO and Sand Creek because of elevated sound pressure levels during construction.

ESA-Listed Species and Critical Habitats Effect Determination

Common Name	Scientific Name	Status (Species and Critical Habitat)	Species/Habitat in Action Area	Determination
Bull Trout	*Salvelinus confluentus*	Threatened; Critical Habitat	No	Likely to Adversely Affect; Likely to Adversely Affect Critical Habitat
Grizzly Bear	*Ursus arctos horribilis*	Threatened	No	No Effect
Canada Lynx	*Lynx canadensis*	Threatened	No	No Effect
North American Wolverine	*Gulo gulo luscus*	Proposed Threatened	No	Will Not Jeopardize the Continued Existence; No Effect if listed prior to completion.
Woodland Caribou	*Rangifer tarandus caribou*	Endangered	No	No Effect

Introduction

The BNSF Sandpoint Junction Connector Project (Project) would consist of a 2.2-mile-long second main line track adjacent to (west of) the existing BNSF main line track to connect the Algoma main line track (milepost [MP] 5.1) south of Sandpoint, to the Sandpoint Junction switch (MP 2.9), where the BNSF and the Montana Rail Link (MRL) main lines converge in Sandpoint (**Figure 1**). Project Plans are provided in **Appendix A**.

The Project would entail constructing a second main line track; upgrading existing access roads, staging areas, tracks, switches and signals; constructing new bridges over Bridge Street (Bridge 3.0), Sand Creek (Bridge 3.1), and Lake Pend Oreille (LPO; Bridge. 3.9) adjacent to (west of) the existing rail bridges; building temporary construction bridges adjacent to (west of) the new bridges; filling 0.88 acre of permanent nearshore area and 0.38 acre of temporary nearshore area below the jurisdictional ordinary high water mark elevation of 2,062.5 feet, associated with bridge abutments and the south switch; and filling 0.28 acre of wetland south of Bridge 3.1.

The purpose of the Project is to reduce the delay of freight and passenger rail traffic by increasing the operational efficiency of the BNSF freight rail system between its Algoma main line track south of Sandpoint (BNSF MP 5.1) and the Sandpoint Junction (MP 2.9), where BNSF and the MRL main line tracks join just north of the Sandpoint Amtrak Station.

The Project need is based on the existing infrastructures' ability to handle the previous growth of freight rail service demands in the BNSF northern tier, a high-volume traffic corridor between the Midwest (Chicago Terminus) and the West Coast. Rail traffic in this corridor has increased as a result of population growth and the corresponding increase in the demand for freight and will likely continue this trend. The existing bridges over Sand Creek and LPO have the physical capacity to move more trains, but additional train volumes would increase congestion and delays, negatively impacting North Idaho communities and communities throughout the BNSF network. If the constriction at this location is not addressed, the delay is expected to increase, resulting in a lower level of service for both rail and vehicle traffic and further constraining the movement of goods and services at a local, regional, national, and international level.

Deteriorating rail service may also cause shippers with alternative options, such as consumer product containers, to convert to highway transportation by truck. One double-stack intermodal train carries the same cargo as 280 trucks that would be diverted to publicly funded highways, producing negative highway congestion, economic, and safety impacts.

Figure 1: Project Overview

Consultation History

The U.S. Coast Guard (USCG) is the lead federal agency associated with this action and would complete formal consultation with the U.S. Fish and Wildlife Service (USFWS) regarding potential Project-related effects to federally listed species and critical habitat. Jacobs Engineering Group Inc. (Jacobs) has had informal, technical assistance discussions with the USFWS to review impacts, methodology, and mitigation opportunities, including phone calls and email communications in August, September, October, and November 2017.

A Biological Assessment was submitted to the USCG on December 21, 2017, as part of the bridge permit application packet for the new Sand Creek and LPO BNSF bridges. The Biological Assessment was updated on April 10, 2018, and was included in the formal Joint Application Public Notice for the U.S. Army Corps of Engineers (USACE) 404 and Section 10 permitting review and the Idaho Department of Lands (IDL) Encroachment Permit process.

Informal meetings and communications with the USFWS between March and June 2018 culminated with a pre-Biological Assessment technical assistance meeting on July 20, 2018, at the USFWS North Idaho field office located in Spokane, Washington.

Participants in that meeting (in person) included Marshall Williams and Katy Fitzgerald with the USFWS and Craig Broadhead, Sue PaDelford, and Diane Williams with Jacobs. Attendees via a teleconference line included Kris Swanson, Austin Hurst, and Matt Keim with BNSF and Shelly Sugarman, Steve Fischer, Danny O’Keefe, John Greene, and Kate O’Dell with the USCG.

The official USFWS Species List is provided in **Appendix B**.

Project Location

The Project is located in the Panhandle Basin, LPO Subbasin, Hydrologic Unit Code 17010214 Pend Oreille Lake, on the BNSF Montana Division, Kootenai River Subdivision, Line Segment 45, within the existing BNSF rights-of-way (ROWs) from MP 2.9+/– to MP 5.1+/– in Bonner County, Idaho (**Figure 2**).

Specifically, the Project is located within portions of Sections 15, 22, 23, 25, 26, 27 and 36; Township 57 North; Range 2 West, Boise Meridian and is within the incorporated limits of the City of Sandpoint and unincorporated Bonner County, Idaho. Latitudinal and longitudinal coordinates for the Project north end is 48°16'54.10" N,116°32'49.35" W and the Project south end is 48°14'56.24" N,116°31'24.02" W.

Figure 2: Project Vicinity

Project Description

General Project Description

Existing Conditions and Structures

The current track configuration involves an MRL siding and two main line tracks, BNSF and MRL, meeting at the Sandpoint Junction (BNSF MP 2.9) just north of the Sandpoint Amtrak Station, becoming a single main line track through Sandpoint and over Sand Creek and LPO to the BNSF Algoma (East) main line track (BNSF MP 5.1) where the single main line transitions to two main lines. Key features of the Project corridor are described below:

- The north end of the Project (BNSF MP 2.9) is within the City of Sandpoint and is designated as an Urban Transportation Corridor.
- From BNSF MP 2.9 to 3.9, the existing BNSF main line track is surrounded by a BNSF maintenance road, the Sandpoint Amtrak Depot, U.S. Highway 95 (US 95), and the Sandpoint Marina to the west and Sandpoint Avenue, the Seasons of Sandpoint Condominiums, the Best Western Edgewater Resort, the Sandpoint Edgewater RV Park, and a portion of the Sandpoint City Beach Marina to the east.
- BNSF Bridge 3.0 spans Bridge Street in Sandpoint.
- BNSF Bridge 3.1 spans Sand Creek[1] in Sandpoint.
- BNSF Bridge 3.9 spans the open water of LPO from MP 3.9–4.9.
- The south end of the Project (BNSF MP 5.1) is designated as a Rural-Residential Transportation Corridor.

The existing BNSF Bridge 3.1 over Sand Creek is a fixed, single-track bridge measuring 155 feet long and 19 feet wide with four concrete piers, two of which are abutments. It was originally constructed in 1902 but was modified in 1990 with replacement of the superstructure, concrete pier caps, deck, and walk. The existing Bridge 3.9 is a fixed bridge that has both open-deck and ballast-deck spans and measures 4,769 feet long with 88 piers. Thirty-two of the original over 100-year-old, single-column concrete piers on wood pilings (16 on the north end and 16 on the south end of the bridge) were replaced in 2007 to 2008 with steel bents, each composed of six closed-end steel pipe piles. The existing bridge also has a non-operable swing span over the two existing, published 76.6-foot-wide navigation channels.

---

[1] Sand Creek Tributary to Lake Pend Oreille; not to be confused with the Sand Creek tributary to Pack River.

Proposed Action

The Project construction to build the 2.2-mile-long second main line track west of the existing BNSF main line consists of the following general elements:

- Constructing a new main line track west of the existing BNSF main line track.
- Constructing a new bridge over Bridge Street (Bridge 3.0) adjacent to (west of) the existing rail bridge).
- Constructing a new bridge over Sand Creek (Bridge 3.1) adjacent to (west of) the existing rail bridge (**Figure 3**).
- Constructing a new bridge over LPO (Bridge. 3.9) adjacent to (west of) the existing rail bridge (**Figure 4**).
- Upgrading tracks, switches, and signals.
- Building temporary construction bridges over LPO and Sand Creek.
- Improving temporary construction material and equipment work staging areas.
- Filling 0.88 acre of permanent and 0.38 acre of temporary nearshore areas below the jurisdictional ordinary high water mark (OHWM) elevation of 2,062.50 feet, associated with bridge abutments and the south switch.
- Filling 0.28 acre of wetland in one location between the rail grade and the multiuse public pathway, south of Bridge 3.1.

Table 1 summarizes the general work sequencing and a 3-year construction timeline. The current proposed start date is Spring 2019. A construction timing table is provided in **Appendix C**.

Table 1: General Work Sequencing and Timeline

2019	Improve existing access and staging areas Wetland and nearshore structural fills Begin temporary work bridges
2020	Finish structural fills Finish temporary work bridge(s) construction Begin permanent bridge(s) pile driving
2020–2021	Finish permanent bridge(s) pile driving Install permanent bridge spans Track and infrastructure construction Remove temporary work bridge (3.1) before summer pool 2021
2022	Finish track and infrastructure construction Remove temporary work bridge (3.9) Remove temporary fill, stabilize, and restore Demobilize construction equipment and materials

The Project schedule would primarily be determined by the contractor awarded the Project. However, there are some general expectations of the overall timeline. The critical path item is construction of Bridge 3.9 over LPO. Other Project work items can, for the most part, be completed concurrently.

Figure 3: Simulation of new Bridge 3.1 over Sand Creek between US 95 and existing Bridge 3.1

Figure 4: Simulation of new Bridge 3.9 from the north shoreline of the Pend Oreille River

Construction for the work bridges would take approximately 12 months, dependent on weather or other interruptions to complete. After a 4-month head start on the work bridges, the new bridges' overall construction would take approximately 36 months or 3 years. This schedule allows for minimal or no production over a 2- to 3-month period each winter. Work vehicles and equipment for upland activities such as grading and rail grade embankment developing would be typical of heavy construction. Nearshore, in-water, and over-water equipment would be typical of specialized bridge construction.

The Project would require the use of a wide array of construction equipment. **Table 2** includes a list of Project equipment expected to be used on the site, as well as the expected use and the typical maximum in-air noise levels for each piece of equipment as measured from 50 feet away (Washington State Department of Transportation [WSDOT] 2018). If other types of equipment are needed during the Project, specifications, size, and noise levels would fall within the parameters of the equipment in **Table 2**.

Table 2: Construction Equipment List, Use, and Maximum In-Air Noise Levels

Equipment	Expected Use	L_{max} (dBA)
Backhoe	Access road and abutment construction	78
Chainsaw	Clear work area and construction pad	84
Compactor	Compact fill material for ramps, access roads, and staging areas	83
Compressor	Bubble curtain and hand tools	78
Concrete Mixer Truck	New abutments, piles, and decking	79
Concrete Pump Truck	New abutments, piles, and decking	81
Crane	Bridge construction, work trestles, piles, etc.	81
Drill Rig Truck	Geotechnical or subsurface investigation	79
Drum Mixer	Mix concrete or fill material	80
Dump Truck	Deliver supplies and remove rock and soil	76
Excavator	Access road and abutment work	81
Flat Bed Truck	Move supplies and bridge components	74
Front End Loader	Move supplies and bridge components	79
Generator	Power for hand tools and small equipment	81
Generator (<2kVA)	Power roadway signage	73
Vibratory Pile Driver	Installation and removal of in-water piles	101
Impact Pile Driver	Installation of upland and in-water piles	110
Lift	Access	75
Pickup Trucks	Construction worker site access	75
Pneumatic Tools	Power hand tools	85
Rock Drill	Rock removal	81
Roller	Compact fill for access roads	80
Welder/Torch	Welding of steel bridge components	74

Notes:
dBA = A-weighted decibel
L_{max} = highest time-weighted sound level measured

Construction Elements

Table 3 summarizes the timing and duration of Project construction and work activities, assuming a 3-year construction period. However, construction could take up to 3 years and is subject to change based upon the work plan developed by the construction contractor.

Table 3: Project Elements (Estimated Timing and Duration)

No.	Project Element	Timing	Work Description
1	Mobilize and Improve Access Roads and Staging Areas	2019: March, April, May	• Minor expansion/improvement of existing BNSF roads/staging areas • Land clearing for safety and staging
2	Identify Work Limits	2019: March, April, May	• Stake/flag work limits in jurisdictional areas • Stake/flag best management practice (BMP) protection locations
3	Install Environmental BMPs	2019: March, April, May	• Install upland perimeter protection BMPs throughout the Project, and, in particular, adjacent to jurisdictional areas not being impacted by the Project
4	Vegetation Removal	2019: March, April, May	• Riparian vegetation removal in nearshore and wetland fill areas. • Upland vegetation removal for placement of structural rock fill.
5	Nearshore and Wetland Fills	2019: March, April, May	• Place fill during lake drawdown when no water is present in the impacted area: - 0.38-acre temporary nearshore fill - 0.88-acre permanent nearshore fill - 0.28-acre permanent wetland fill • Install perimeter water quality BMP at the edges of fill
6	Upland Work Adjacent to Nearshore and Wetland Fills	2019: May and June	• Upland work associated with bridge abutments • Grading for new rail grade
7	Construct Temporary Work Bridge 3.1 (Sand Creek)	2019–2020: start in October; start in 2020 for pile removal and reinstallation in the navigation channel	• 48, 24-inch-diameter steel piles, up to 40 extend below the ordinary high water mark (OHWM) • Vibratory pile driver; 10 piles (1 per pier) to be proofed with an impact hammer • Estimate 1-month duration for pile driving, dependent on weather or other interruptions. • Work to occur during daylight hours • Drive piles below the OHWM during winter pool/low water conditions, where possible • Remove piles/spans directly over and immediately adjacent to the navigation channel by May 2020 (if still in place at the start of the boating season) and reinstall in October 2020 if needed. • Piles to be slowly vibrated out of creek bed during winter pool/low water conditions and stockpiled in upland staging areas

Table 3: Project Elements (Estimated Timing and Duration (continued)

No.	Project Element	Timing	Description of Work
8	Construct Temporary Work Bridge 3.9 (LPO)	2019–2020: Year round, weather permitting	• 700, 24-inch-diameter steel piles; 600 extend below the OHWM • Vibratory pile driver; 76 piles (1 per pier) to be proofed with an impact hammer • Estimate 1-year duration for pile driving, dependent on weather or other interruptions. • Work to occur during daylight hours • To remain in place up to 3 years (i.e., 2022)
9	Construct New Bridge 3.1 (Sand Creek)	2019–2020: Assumes two low water, lake drawdown construction seasons	• 64, 24-inch-diameter steel piles; 22 below the OHWM • Piles vibrated to resistance then driven with an impact hammer • Work to occur during daylight hours • Estimate 1-month duration for pile driving, dependent on weather or other interruptions. • Drive piles below the OHWM during winter pool/low water conditions, where possible • Construction primarily during low water season(s) • Bubble curtains/turbidity curtains used when pile driving in water 2 feet deep or more • Pile driving may occur at either end, but likely at the south end towards the north
10	Construct New Bridge 3.9 (LPO)	2020–2022: Year round, weather permitting	• 288, 36-inch-diameter steel piles; all below the OHWM • Piles vibrated to resistance then driven with an impact hammer • Work to occur during daylight hours • Bubble curtains/turbidity curtains used when pile driving in water 2 feet deep or more Estimate 6-month duration for pile driving, dependent on weather or other interruptions. • Work to start prior to completion of temporary work bridge • Piles may be driven simultaneously at either bridge end • Cast-in-place concrete deck
11	Remove Temporary Work Bridge 3.1 (Sand Creek)	2021: February, March, April	• Dismantle temporary bridge spans • Piles to be slowly vibrated out of creek bed during winter pool/low water conditions • Turbidity curtains to be used during pile removal in water 2 feet deep or more • Materials removed to staging areas until Project demobilization
12	Remove Temporary Work Bridge 3.9 (LPO)	2021–2022: Year round, weather permitting; start July/August	• Dismantle temporary bridge spans • Piles to be slowly vibrated out of lakebed • Full containment turbidity curtains to be used during pile removal • Materials removed to staging areas until Project demobilization

Table 3: Project Elements (Estimated Timing and Duration (continued)

No.	Project Element	Timing	Description of Work
13	Remove Temporary Nearshore Fills	2022: October	• Remove in the dry during winter drawdown when no water present in impacted areas: • Install BMPs to prevent sedimentation to LPO or Sand Creek
14	Demobilize and Stabilize/Restore Disturbed Areas	2022: October to November	• Final grading • Removal of access road fills and temporary at-grade crossings • Seeding/mulching and native riparian plantings • Removal of temporary fencing, signage, etc. • Performed during low/no water conditions as necessary • Materials removed from staging areas • Staging areas restored to BNSF standards

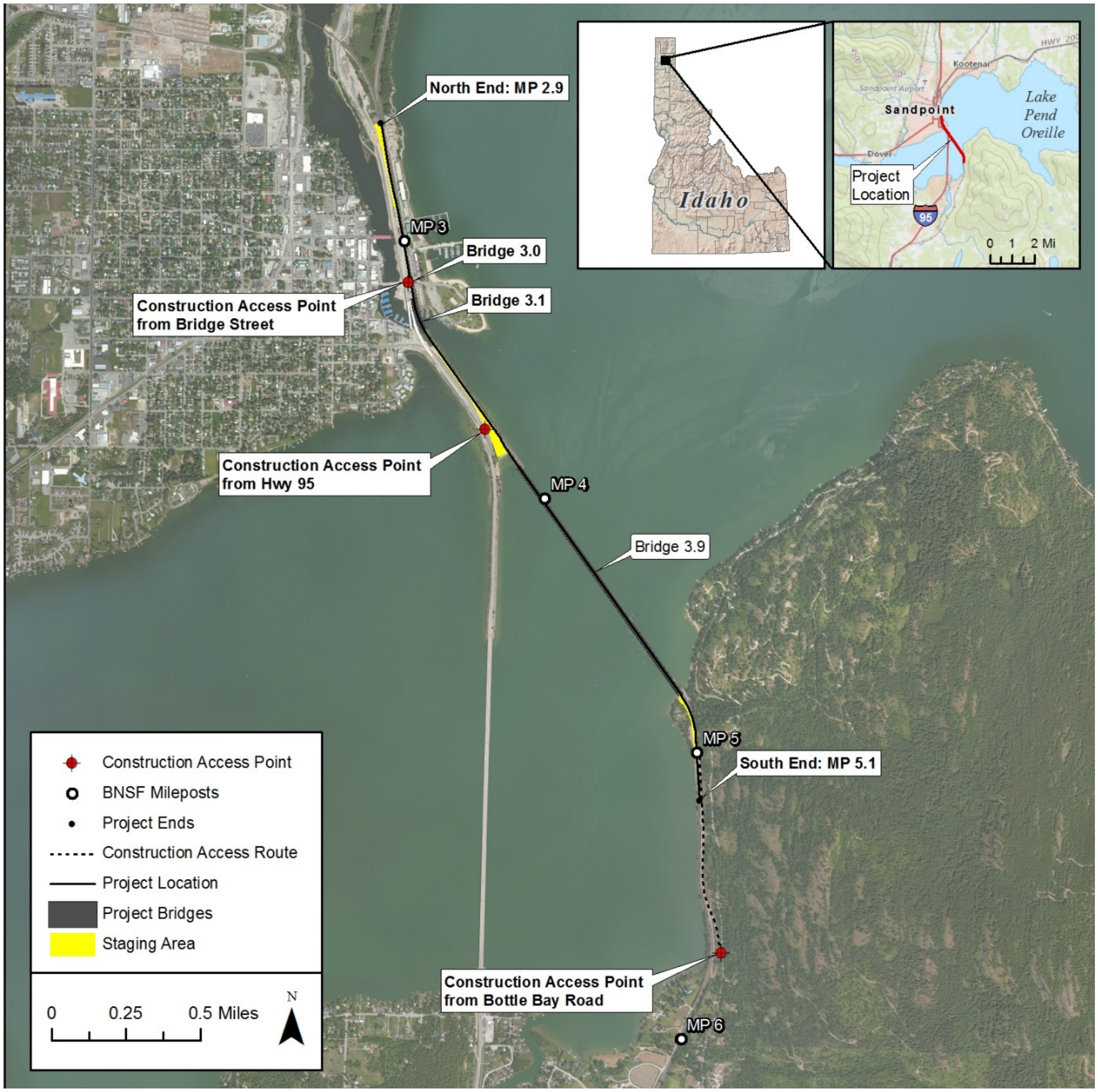
Detailed Project Description – Construction Key Elements

The construction process includes the proposed Project actions: mobilizing equipment and materials needed for construction, reestablishing and improving existing access roads at the north and south ends of the Project corridor; improving staging areas within the existing BNSF ROW; constructing temporary work bridges; constructing new, permanent bridges; removing temporary work bridges; restoring the site; and demobilizing.

A contractor has not been identified for this Project. However, elements 7 through 13 describe the bridge construction operations based on current planning and design by BNSF and their design team. Following are the key elements of the construction process, listed in the proposed chronological order:

1. Mobilize and Improve Access Roads/Staging Areas
    a. Access roads and staging areas in the existing BNSF ROW would be improved to accommodate Project-specific construction needs. The Project north end access is via Bridge Street, east of First Avenue in Sandpoint, and north onto Railroad Avenue towards the Amtrak Depot. A BNSF-owned maintenance area is just north of the depot. The south end access to the Project is via Bottle Bay Road, off of US 95, south of the Long Bridge, to Glen Eden Road, a private road with restricted public crossing of the BNSF ROW (**Figure 5**).
    b. Project access and staging improvements may include reconditioning the existing rock surfaces, improving entry/exit locations for safety (e.g., line of sight clearing), and implementing Project-specific environmental protection measures such as placing rock at construction entrances/exits to avoid off-site sediment tracking and establishing easily accessible emergency containment/cleanup materials for vehicles, equipment, and staged petroleum fluids.
    c. Mobilization of equipment and delivery of Project materials to staging areas would be an ongoing process during construction.
2. Identify Work Limits
    a. Work limits (cut/fill) as per plan and regulatory permits or conditions would be staked and flagged prior to the start of earth-disturbing activities. These areas would be reviewed on-site with the contractor to verify equipment operations and earth-disturbing/fill activities are compliant and within the limits.
    b. Stakes and flagging would be replaced or refreshed by the Project environmental compliance lead as needed throughout construction.
3. Install Environmental Best Management Practices (BMPs)
    a. When work limits are marked, the contractor would install temporary environmental protection BMPs, such as sediment fencing and filter rolls, along the grading/fill work limits adjacent to nearshore and wetland fills.
    b. Clearing and grubbing of existing vegetation would be the minimum required to construct the Project. Grubbed materials would be removed to upland areas within the BNSF ROW or removed to off-site, upland locations in accordance with BNSF environmental requirements for material movement out of the BNSF ROW.

Figure 5: Construction Staging Areas and Access Points



4. Vegetation Removal
   a. Riparian vegetation removal in the nearshore and wetland fill areas would be the minimum needed. Vegetation would be cleared and grubbed using backhoes, bull dozers, or machinery appropriate for the specific location. Equipment access would be from adjacent upland areas. Cleared/grubbed materials would be loaded into haul trucks for removal to upland locations within the BNSF ROW or off-site, when those locations have been approved by BNSF and the Project environmental compliance lead.
   b. Upland vegetation removal would be the minimum necessary for placement of structural rock fill, as per the Project plan and specifications. Large trees would be cut with chainsaws into manageable pieces for removal, via work trucks, to upland locations within the BNSF ROW prior to removal to approved off-site locations. Smaller-sized shrubs and grasses/weed cover would be grubbed and cleared using bulldozers, backhoes, graders, or other similar earth-moving equipment. Clearing/grading depths would be specified in the design, generally to native rock or rocky soil suitable for railroad grade construction. Grubbed stumps or rootwads would be taken to upland staging areas within the BNSF ROW, via haul trucks, for stockpiling prior to removal to off-site upland locations approved by BNSF and the Project environmental compliance lead.
5. Nearshore and Wetland Fills
   a. Only clean, structural rock fill would be used, as required for construction of railroad grades. Fill material would be sourced from local commercial quarries approved for use in main line railroad construction.
   b. Fill would be placed according to plan and in compliance with regulatory permits. Fill would be brought to the Project via haul/dump trucks with grading/compaction completed by bulldozers, graders, and roller/compactors. Fill sequencing would be according to plan and in accordance to main line railroad construction standards.
   c. Fill work in nearshore and wetland areas would be done during LPO drawdown or low-water conditions when no water is present in the fill locations. Fill in adjacent upland locations would be done when the nearshore/wetland fill is completed and compacted in accordance to railroad standards.
   d. BMPs to prevent sedimentation from the fill into adjacent regulatory areas would be implemented prior to fill placement. These would be identified in the Project Stormwater Pollution Prevention Plan (SWPPP) and Water Quality Monitoring and Protection Plan (WQMPP). BMPs such as sediment filter fencing, sediment filter rolls, rock filter berms, vegetation filter berms, or other perimeter protection measures would contain fill materials within the staked/flagged/marked work limits. These temporary BMPs would be kept in place until high water, summer pool lake levels are reached to contain potential “first flush” sedimentation from the newly placed rock materials. Prior to the regulated lake levels covering the BMPs and after “first flush” sediment settling, these temporary BMPs would be removed so they do not become a navigation hazard.

6. Upland Work Adjacent to Nearshore/Wetland Fills
    a. Grading and compacting for the new rail grade development would be done after nearshore/wetland fill actions are complete during lake drawdown. Clean, structural rock fill would be used in accordance to railroad construction standards. Fill material would be sourced from local commercial quarries approved for use in main line railroad construction.
    b. Fill would be placed in locations/work limits according to plan and in compliance with regulatory permits. Fill would be brought to the work sites via haul/dump trucks and equipment for grading/compaction would be done by bulldozers, graders, and roller/compactors in a sequence according to standard practices for main line railroad construction.
    c. BMPs to prevent sedimentation to jurisdictional areas adjacent to upland fill locations would be installed before fill work starts. The BMPs would be maintained throughout the Project until complete. When possible, as rail grade development is completed, final restoration/stabilization BMPs would be implemented—such as final seeding/mulching and/or rock cover. If upland areas are unworked for more than fourteen days during the summer/fall (i.e., dry season) or seven days during the winter/spring (i.e., wet season) temporary seed/mulch cover would be implemented.
    d. BMPs to avoid impacts via construction-related stormwater runoff would be implemented and maintained during work activities.
7. Construct Temporary Work Bridge 3.1 (Sand Creek)
    a. A temporary timber deck work bridge would be constructed immediately adjacent to and west of the new Sand Creek bridge location. The Sand Creek temporary work bridge would measure approximately 510 feet long and 32 feet wide with eleven 48-foot-long spans. The temporary work bridge would be supported by 10 piers partially or fully below the OHWM. Eight piers would consist of 4, 24-inch-diameter, open-ended steel pipe piles, and two piers would consist of 8, 24-inch-diameter, open-ended steel pipe piles. In total, 30 to 40 piles would be below the OHWM to account for minor adjustments in span support needs and site conditions. The temporary work bridge would support large cranes that would be working to construct the new, permanent bridge over Sand Creek.
    b. Generally, the work bridge would be used to gain access from the south side of Sand Creek, from an existing maintenance road and work pad west of the existing BNSF tracks. North side access would be developed off of Bridge Street, but would likely be used as a backup. The expected primary access point would presumably be from the south.

        Construction of the work bridge would likely start from the south side of Sand Creek, progressing north. The ends of the work bridge would consist of a temporary bulkhead at the water's edge that is filled to the existing grade or higher, as necessary. This would require permanent fill at the south end and temporary fill along the north end.

        Construction of the work bridge would be done in "leapfrog" fashion. The crane would advance a pile-driving template for every span. Once the template is in place, the support piles would be driven in the proper location. Four support piles are typical and have been assumed for this Project. Project-specific geotechnical data presumes that after a few days in place, the piles would have adequate strength for heavy loading.

After the support piles are in place, the bracing would be installed and pier caps would be secured on top of the piles. Next, the beam groups would be placed from the temporary bulkhead to the first bent and secured to the foundations. Finally, the timber deck would be placed out to the first pier, and a safety handrail would be installed. At this time, the crane would be able to move out to the end of the work bridge and the entire process would be repeated for subsequent spans.

   c. The work bridge would be constructed as noted and extended to the north end of the new bridge. The proposed work bridge deck construction system would be fully contained. Plastic sheeting would be installed between the deck timbers and the plywood to seal the deck. The bull rail (sides of the work bridge) would have foam rope under them and be tightened down to provide another level of sealed containment.
   d. Once the work bridge reaches the north end, the production pile driving for the new, second bridge would commence and work from north to south. The temporary work bridge piles would be vibrated to resistance, and one pile per pier would be proofed with an impact hammer at an estimated 20 to 50 strikes for a short duration. Impact and vibratory pile driving would occur during daylight working hours. Assuming that two temporary work bridge piles can be driven per day, pile driving is expected to occur for about a month for the Sand Creek temporary work bridge, dependent on weather or other interruptions.
   e. With the pile-driving activity, short, temporary retaining walls would be constructed at each pier, along the upland side (east) embankment so that the existing track stability is not adversely affected. Once enough piles are placed and their capacity is confirmed, the precast pile caps could be installed. After caps are placed, the precast concrete or steel beams, steel walkway, and handrail could be erected.
   f. The Sand Creek temporary work bridge marked and lighted navigation channel would be limited to the period when no navigational access up Sand Creek is available, from approximately October 15 to April 15, depending on the Albeni Falls Dam fall LPO drawdown and spring fill. The Albeni Falls Dam is approximately 25 miles downstream from the Project, on the Pend Oreille River, and regulates the ordinary high water and ordinary low water levels of LPO. The temporary work bridge over the marked and lighted navigation channel for Sand Creek would be removed between April 15 and October 15. As a result, the temporary work bridge would not impact navigation for marine traffic in Sand Creek as it would not be an obstruction when navigational access up Sand Creek is available.

8. Construct Temporary Work Bridge 3.9 (LPO)
   a. A temporary timber deck work bridge would be constructed immediately adjacent to and west of the new LPO bridge location. The LPO temporary work bridge would measure approximately 4,800 feet long and 32 feet wide, with 101 approximately 48-foot-long spans and one 24-foot-long span at the north end. Additionally, eight 64-foot-wide staging set-outs would be installed at approximately 500-foot intervals along the bridge for safety and material staging and to provide continuous through-access for the length of the temporary work bridge.
   b. The temporary work bridge would support large cranes that would be working to construct the new, permanent bridge over LPO. The temporary work bridge would maintain a 42-foot horizontal and 15-foot vertical clearance at the location of the marked navigation channel under the exiting bridge.

c. Construction of the work bridge would likely start from both the north and south ends of the Project over LPO. The end of the work bridge would consist of a temporary bulkhead at the lake's edge. This work requires both temporary and permanent fill to the existing grade or higher, as necessary.

   Construction of the work bridge would be done in "leapfrog" fashion. The crane would advance a pile-driving template for every span. Once the template is in place, the support piles would be driven in the proper location. Four support piles are typical and have been assumed for this Project. Project-specific geotechnical data, presumes that after a few days in place, the piles would have adequate strength for heavy loading. After the support piles are in place, the bracing would be installed and the pier cap secured on top of the piles. Next the beam groups would be placed from the abutment to the first bent and secured to the foundations. Finally, the timber deck would be placed out to the first pier and the handrail would be installed. Once these items are complete, the crane would move out to the end of the work bridge and the entire process would be repeated for subsequent spans. If the process is started from each bank at the same time, it is conceivable that the two bridge segments would be joined near the middle of the Project corridor over LPO.

d. There would be a time lag for when the work bridge has been extended out far enough from the bank and the piles have gained enough strength to support additional equipment and material for construction of the new, second bridge. Once this occurs, the production phase would begin.

   A work bridge deck system that would potentially be used would be fully contained. Plastic sheeting would be installed between the deck timbers and the plywood to seal the deck. The bull rail (sides of work bridge) would have foam rope under them and tightened down to provide another level of sealed containment.

   The temporary bridge piles would be vibrated to resistance, and one pile per pier would be proofed with an impact hammer at an estimated 20 to 50 strikes for a short duration. The work bridge would require 700, 24-inch-diameter steel pipe piles, with six hundred of the piles being installed in water.

   Impact and vibratory pile driving would occur during daylight working hours. Assuming that two temporary bridge piles can be driven per day, pile driving is expected to occur for an estimated one calendar year for the LPO temporary work bridge, dependent on weather or other interruptions.

   The vertical clearance of the LPO temporary work bridge would gradually rise from the abutments. Spans 1 through 16 at the north end of the bridge would have less than 10 feet of vertical clearance, with the maximum vertical clearance (low chord) gradually rising from 10 to 15 feet for Spans 17 through 67. Spans 68 through 71 would provide 15 feet of vertical clearance, with the low chord gradually lowering back down from 15 feet to 10 feet at the south end for Spans 72 through 101.

   The LPO temporary work bridge would be constructed first and would remain in place until the new, second bridge is placed into service. The temporary work bridge went through many design iterations to identify the least impacts to navigation while providing a safe working platform for the large, heavy equipment required to construct the new LPO railroad bridge. The majority of the work bridge would retain an equivalent vertical and horizontal clearance as the existing railroad bridge during construction.

All marine traffic that now passes below the existing bridge would be able to pass under the temporary work bridge throughout construction. Signage, lighting, and other notices would be in place to direct marine traffic on LPO away from restrictive spans to the safe, non-restrictive boating passage spans.

9. Construct New, Second Bridge 3.1 (Sand Creek)
    a. The new, second bridge over Sand Creek would be constructed approximately 35 feet west of the existing rail bridge in existing BNSF ROW and measures approximately 505 feet long by 21 feet wide. The new bridge would be supported by 11 piers, each consisting of open-ended, 24-inch-diameter steel pipe piles. Two piers within the OHWM of the creek channel would consist of eight piles each; seven piers (one partially or wholly within the OHWM and six fully upland) would consist of six piles each; and two piers upland of the OHWM would consist of three piles each. A total of 64 piles would be placed, with 22 below the OHWM. Piles within the main channel of Sand Creek would be driven during low-water conditions/winter pool elevation.

       Two of the bridge bents would be fully within the Sand Creek navigational channel. The new bridge navigational horizontal clearance is 74 feet; the existing bridge has an approximately 45-foot-wide horizontal clearance. Vertical clearance of the new bridge would match the vertical clearance of the existing bridge, which is 17 feet above the 2,062.5-foot OHWM elevation. The new Sand Creek bridge piles would be vibrated to resistance into the creek bed and finished with an impact hammer with an average of 1,200 strikes per pile. Pile driving would occur during daylight working hours. Assuming that up to two piles could be driven per day, pile driving would occur for about 1 month, dependent on weather-related, or other, interruptions.

       Generally, a new rail bridge consists of four primary elements, working from the bottom up: installing piles, installing pier caps, pre-cast beams and deck, and installing the pile bracing. The first element is pile installation, which consists of vibrating to resistance, impact-hammer driving to load specifications, and proofing/testing to verify that load-bearing criteria has been met. A pile template would be installed at each new pier location. The pile template would likely have four temporary piles with a steel frame installed on top to correctly position the new permanent piling. Due to the long lengths of new pile required, the piles would be delivered to the work site by trucks to the Project staging areas and then to the pile placement locations as needed via the temporary work bridge. The sections would be welded as they are driven to form one long pile. The first section is driven before the second section is held in place and welded to the first. The third section is then welded to the pile and driving of that pile is completed. Each pier would have six piles. The pile bracing may be installed any time after the piles are complete, but this would likely occur during LPO drawdown or low water periods.
    b. Once the pile capacity has been verified through impact testing, the top of the piles would be cut off at the proper elevation and the precast pile cap can be installed. This is done by lifting the cap from the work bridge and setting it onto the piles before welding the bottom of the cap to the top of the piles.
    c. When at least two pier caps have been installed, erection of the precast concrete beams and bridge deck may begin. Depending on length, there are four or five beams per span and would be connected to each other with steel diaphragms that bolt to the beam. The beams would rest on bearings that are anchored into the pier caps. Ballast and track would be placed directly on the deck structure.

d. These four bridge construction elements would generally follow each other in a linear fashion for the construction of the new, permanent Bridge 3.1 over Sand Creek.

10. Construct New, Second Bridge 3.9 (LPO)

a. The new, second bridge over LPO would be constructed approximately 50 feet west of the existing rail bridge in existing BNSF ROW and measure approximately 4,874 feet long by 18 feet wide. The new bridge would have 49 spans: forty-two 104-foot long, six 75-foot-11-inch long, and one 47-foot-10-inch long.

b. Each pier bent would consist of 6, open-ended, 36-inch-diameter steel pipe piles for a total of 288 piles below the regulated summer pool elevation of 2,062.5 feet that makes up the jurisdictional OHWM of the lake. The new piers would align approximately with every other pier of the existing bridge.

c. The new, permanent LPO bridge would have 10 spans at, and adjacent to, the designated navigation spans on the existing bridge that would closely match those longer-span horizontal clearances. The low chord of the new bridge would be 15 feet above the regulated summer pool elevation of 2,062.5 feet. These 15-foot clearances would consist of six 75-foot-11-inch spans, four of which would align with the existing rail bridge’s 77-foot spans that are equal to or greater than 15-foot vertical clearance. The new bridge would not reduce the horizontal or vertical clearance over the marked navigation channel under the existing bridge.

d. Generally, a new rail bridge consists of five primary elements, working from the bottom up: installing piles, installing pier caps, setting beams, casting the concrete deck, and installing the pile bracing. The first element is pile installation, which consists of vibrating to resistance, impact-hammer driving to load specifications, and proofing/testing to verify that load-bearing criteria has been met. A pile template would be installed at each new pier location. The pile template would likely have four temporary piles with a steel frame installed on top to correctly position the new permanent piling. Due to the long lengths of new pile required, the piles would be delivered to the work site by trucks to the Project staging areas and then to the pile placement locations as needed via the temporary work bridge. The sections would be welded as they are driven to form one long pile. The first section is driven before the second section is held in place and welded to the first. The third section is then welded to the pile and driving of that pile is completed. Each pier would have six piles. The pile bracing may be installed any time after the piles are complete, but this would likely occur during LPO drawdown or low water periods.

e. Once the pile capacity has been verified through impact testing, the top of the piles would be cut off at the proper elevation and the precast pile cap can be installed. This is done by lifting the cap from the work bridge and setting it onto the piles before welding the bottom of the cap to the top of the piles.

f. When at least two pier caps have been installed, erection of the precast concrete beams may begin. Depending on length, there are four or five beams per span and would be connected to each other with steel diaphragms that bolt to the beam. The beams would rest on bearings that are anchored into the pier caps.

g. Next the bridge deck construction would commence. The deck is nominally 13 feet wide by 76 or 104 feet long and 8 inches thick. Concrete formwork would be installed between and outside the beams. Then reinforcing bar would be tied in place on the formwork. Once all elements are checked for conformance with the design plans, the concrete would be placed with the use of a concrete pump, supplied by concrete trucks, from the temporary work bridge. A second concrete placement activity, via a concrete pump system/concrete truck support, would potentially be required for each span to construct the curbs on the outside of each deck. Once these items are complete, the temporary formwork would be removed. Finally, the steel handrail would be installed on the outside face of each curb.

h. The five-bridge construction elements would generally follow each other in a linear fashion. Because Bridge 3.9 is so long, it is likely that pile driving would be occurring at the same time the concrete deck is being installed, i.e., all five primary bridge elements may be occurring at the same time.

i. The new, permanent LPO bridge would require vibrating 288 piles to resistance into the lake bed and finishing with an impact hammer with an average of 1,600 strikes per pile. All piles would be installed in water. Pile driving would occur during daylight working hours. Assuming that up to two piles could be driven per day, pile driving would occur for at an estimated 6 months, dependent on weather-related or other interruptions. Air bubble curtains would be used during impact pile driving to attenuate in-water SPLs (when water is more than 2 feet deep; WSDOT 2018), and a turbidity curtain would surround the area where bubble curtains would be utilized.

Table 4 summarizes the pile driving and installation details for both temporary and the new, second Bridge 3.1 (Sand Creek) and Bridge 3.9 (LPO).

Table 4: Number of Piles and Installation Detail

Action	Support Type (diameter)	Installation/Removal Method	Total Quantity	In-Water Quantity	Bubble Curtains (in water depth of 2 feet or more)
Temporary Work Bridges					
Bridge 3.1 Install and remove temporary work bridge piles.	24-inch Steel Pipe Pile (open-ended)	Install: Vibratory to refusal and impact hammer for proofing 10 piles (1 per pier); estimated 20–50 strikes per pile. Remove: Vibratory extraction.	48	Up to 40	No
Bridge 3.9 Install and remove temporary work bridge piles.	24-inch Steel Pipe Pile (open-ended)	Install: Vibratory to refusal and impact hammer for proofing 76 piles (1 per pier); estimated 20–50 strikes per pile. Remove: Vibratory extraction; turbidity curtains	700	600	No
Install and remove temporary platforms on west side of bridges (staging setouts).	24-inch Steel Pipe Pile (open-ended)	Install: Vibratory to refusal and impact hammer for proofing, estimated 20–50 strikes per pile. Remove: Vibratory extraction; turbidity curtains.	Included in overall temporary bridge pile quantities	Included in overall temporary bridge pile quantities	No

Table 4: Number of Piles and Installation Detail (continued)

Action	Support Type (diameter)	Installation/Removal Method	Total Quantity	In-Water Quantity	Bubble Curtains (in water depth of 2 feet or more)
Permanent Bridges					
Bridge 3.1 Install bridge piles.	24-inch Steel Pipe Pile (open-ended)	Install: Vibratory to resistance and finished with an impact hammer, estimated 1,200 strikes per pile.	64	22	Yes
Bridge 3.9 Install bridge piles.	36-inch Steel Pipe Pile (open-ended)	Install: Vibratory to resistance and finished with an impact hammer, estimated 1,600 strikes per pile.	288	288	Yes
TOTAL			**1,100**	**950**	

11. Remove Temporary Work Bridge 3.1 (Sand Creek)
    a. Once all the new bridge construction elements have been completed, and the track has been installed, the contractor would begin removing the work bridge. For one span at a time, the deck is removed, then the beams, then the pile cap, and finally the piles. This process is repeated until complete. A crane would be used as the main piece of equipment during this disassembly process.
    b. The temporary work bridge components, deck sections first, would be stockpiled in upland staging areas for eventual removal from the site. The temporary work bridge piles would be removed using a vibratory extraction methodology further described in the Minimization Measures section.
12. Remove Temporary Work Bridge 3.9 (LPO)
    a. As with the temporary bridge over Sand Creek, the LPO temporary work bridge would be removed in sections when the new bridge construction is complete.
    b. Generally, this process would be the same as described for the Sand Creek Bridge 3.1 work bridge. Once all the new, permanent bridge construction elements have been completed, and the new main line track has been installed, the contractor would begin removing the work bridge.
13. Remove Temporary Nearshore Fills
    a. Temporary nearshore fills would be removed once temporary work bridge removal is complete and work space from adjacent upland areas is allowed. Backhoes with “thumb”' attachments on the hoe portion or excavators would be used to remove the temporary fill material. This work would be done during LPO drawdown or low water conditions.

14. Demobilize and Stabilize/Restore Disturbed Areas
    a. Concurrent with the disassembly of the temporary work bridges, final grading and track construction could be occurring in upland areas within the Project limits.
    b. Site restoration would include final grading and removal of temporary nearshore fills in areas adjacent to Sand Creek or LPO. These areas would be seeded and mulched with native riparian grass species and, where there is sufficient soil, riparian plantings of native trees and shrubs would be implemented. Sediment control BMPs would be installed around these areas until vegetation becomes established.
    c. When open soil areas are determined to be stable by the environmental compliance lead, temporary construction materials and BMPs such as fencing, signage, and erosion control products would be removed.
    d. Final inspection Project punch-list environmental items would also be addressed at this time prior to the contractor demobilization off of the Project site. Construction supplies and equipment would be removed from the staging areas and the contractor would demobilize off BNSF property. Staging areas would be restored to BNSF standards.

Impact Avoidance and Minimization Measures

Avoidance Measures

The purpose of the Project is to reduce delay and improve operational efficiency between the two tracks at the north end of the BNSF Algoma main line (MP 5.1) and the BNSF Sandpoint Junction (MP 2.9) where the BNSF and MRL main lines converge. The proposed Project fulfills this purpose by improving the existing railroad corridor between MP 5.1 and MP 2.9.

The improved corridor must be of sufficient width to accommodate a second track that enables safe, adjacent operations for freight and passenger trains within the BNSF ROW. A minimum 15-foot-wide track center is required for adjacent simultaneous train operations on upland rail grade areas, and 30- to 50-foot-wide track centers are needed at bridge locations to ensure that the pile driving for the new bridges does not impact the integrity of the piles for the existing bridges. Since the Project crosses Sand Creek and LPO, in-water impacts cannot be entirely avoided.

Constructing the Project to the west of the existing track and bridges, rather than to the east, would avoid the placement of an estimated 3.82 to 5.82 additional acres of in-water fill as follows (taking into account a reduction of wetland fill of 0.28 acre south of Bridge 3.1):

- Additional nearshore fill of approximately 2.9 acres from Bridge 3.1 (Sand Creek) to Bridge 3.9 (LPO); approximately 0.5-mile of rail grade was already constructed on the west side of the tracks at the time of the US 95 Sandpoint bypass Project.
- Additional nearshore fill of approximately 1.2 acres for equipment and materials staging that would need to be brought in by barge over LPO (otherwise all Project equipment/materials would be brought in on Bridge Street in Sandpoint).
- Lake bottom excavation and fill of undetermined quantity (estimated up to 2 acres) for a large work barge landing area.

Constructing the Project within the existing BNSF ROW and within the proposed Project area would avoid the following:

- Development of a new transportation corridor outside of the existing BNSF ROW that would still have to cross Sand Creek and LPO.
- Additional environmental impacts at newly acquired properties for a new 100-foot-wide ROW that may have resulted in 13 to 18 acres of aquatic impacts.

Changes to initial Project designs avoided the following:

- Temporary nearshore fill of 0.17 acre by extending the southern-most span of the LPO temporary work bridge.
- Permanent nearshore fill of 1.97 acres by extending the north and south ends of Bridge 3.1, a design change to the north end and an extension to the south end of Bridge 3.9, and a design change to the Algoma Switch area at the south end of the Project.

Minimization Measures

The Project-specific WQMPP and SWPPP would be implemented for the Project and would contain BMPs to reduce impacts to bull trout and designated bull trout critical habitat. These and other measures to be implemented include, but are not limited to, the following:

- MM1 - Removal of vegetation would be limited to what is necessary for Project construction and for safe operation of equipment.
- MM2 - Temporary and permanent nearshore fills would be placed, and temporary fills would be removed, during LPO drawdown or winter pool when no is water present in the fill impact areas.
- MM3 - In-water steel piles for the temporary and permanent work bridges would be driven to refusal with a vibratory driver. One pile per pier of the temporary work bridge (10 of 48 piles for Bridge 3.1; 76 of 700 piles for Bridge 3.9) and all piles for the permanent bridges would be proofed with an impact hammer. Primary use of a vibratory driver would reduce the amount and duration of in-water sound.
- MM4 – Where possible, piles for the Bridge 3.1 temporary work bridge and the new, permanent bridge would be driven during LPO lake drawdown/winter pool/low-water conditions since sound does not propagate well in shallow water. MM5 – During impact driving for the new, permanent Bridges 3.1 and 3.9, air bubble curtains would be used to attenuate sound.
- MM5 - Open-ended piles would reduce the number of strikes required to install the piles and thereby reduce the duration of in-water sound (Singh 2014; Karlowskis 2014; FHWA/IN/JTRP-2002 to 2004).
- MM6 - Dispersal strikes would be utilized when an impact hammer is used to proof and/or install temporary and permanent in-water piles to minimize the potential for fish to be in the vicinity when production pile driving occurs.
- MM7 - During impact driving in water that is greater than 2 feet deep turbidity curtains (silt curtains) would be utilized to minimize in-water sediment suspension (WSDOT 2018).
- MM8 - Silt curtains must be reliable, in good condition, and maintained. Use of silt curtains should be in accordance with manufacturer's guidance (Idaho Department of Environmental Quality [IDEQ] 2018).
- MM9 - Turbidity monitoring per ID WQ standards and the Project's 401 Water Quality Certification must be conducted to ensure silt curtains are functioning correctly.
- MM10 - Work would be performed during daylight hours; bull trout migrations are mostly nocturnal.
- MM11 - Bridge 3.9 temporary work bridge and the new, permanent bridge were designed at a height of 14 to 15 feet at the deepest part of LPO, which would allow penetration of ambient light during most of the day.

- MM12 - To contain sediments when removing piles for the Bridge 3.1 temporary work bridge, piles would be slowly vibrated out of the creek bed, would be removed during winter pool low water conditions, and turbidity curtains would be used where possible.
- MM13 - To contain and settle sediments when removing piles for the Bridge 3.9 temporary work bridge, piles would be slowly vibrated out of the lakebed at a rate of approximately one-quarter inch per second and turbidity curtains would be used around each pile or bent being removed; curtains would be anchored to the lakebed for total water column seal and tied off to withstand maximum current conditions.
- MM14 - Existing staging areas and access roads on the BNSF ROW would be utilized to avoid additional impacts to environmentally sensitive areas.
- MM15 - A Temporary Erosion and Sediment Control Plan and BMPs would be installed to reduce erosion from exposed soils and maintained throughout Project construction.
- MM16 - The contractor would install and maintain BMPs to keep construction debris from entering waters of the United States.
- MM17 - A SWPPP would be implemented as part of the NPDES Permit (USEPA n.d.).
- MM18 - A WQMPP would be implemented as part of the 401 Water Quality Certification (IDEQ 2018).
- MM19 - A Spill Prevention, Control, and Countermeasure plan would be implemented to control and contain pollutants and product.
- MM20 - Prior to transport to the Project work site, equipment would be cleaned of accumulated grease, oil, or mud.
- MM21 - Equipment and machinery on the Project work site would be inspected daily to check for leaks or problems.
- MM22 - Equipment and machinery used in or over water would be pressure washed or steam cleaned of oils, grease, or other aquatic pollutants such as invasive species, in an upland location or staging area with appropriate wastewater controls and treatment prior to entering on or over waters of the United States (LPO or Sand Creek). Any wastewater or wash water would not be allowed to enter waters of the United States (IDEQ 2018).
- MM23 - Fully stocked petroleum containment spill kits would be kept and maintained on-site at power equipment work sites, portable fuel container sites, and construction staging areas during construction. Spill containment systems would be adequate to contain one and a half times the volume of fuel or fluids associated with each piece of equipment or machinery staged on the work bridge (USEPA n.d.; IDEQ 2018).
- MM24 - Full, secondary containment would be under equipment that use fuels or other hazardous materials on the temporary work bridge or within 100 feet of Sand Creek or LPO (USEPA n.d.; IDEQ 2018).
- MM25 - Equipment and machinery working on the temporary bridges would utilize biodegradable products when possible.

- MM26 - Fuel containers would not be stored on the temporary work bridge. Fueling and maintenance work would occur with secondary containment when on the temporary work bridge. Fuel and hazardous material storage and staging would occur 50 feet away from waters of the United States within staging areas on the BNSF ROW.
- MM27 - Fuel containers or other hazardous materials would not be stored unsecured at the Project site during nonwork hours.
- MM28 - A concrete handling BMP would be developed and approved by the IDEQ prior to concrete pumping or pours associated with the new bridge sections (IDEQ 2018).
- MM29 - BNSF would assign an inspector to document that minimization measures proposed and/or conditioned by regulatory agencies are implemented, maintained, and adaptively managed as needed (USEPA n.d.).

Mitigation Measures

As previously mentioned, the Project would result in a total of 0.28 acre of permanent wetland fill. The impacted wetland is not utilized by Endangered Species Act (ESA)-listed species, therefore, mitigation is related to Clean Water Act regulations. Per mitigation regulations outlined in Section 332.3 of Title 33 of the Code of Federal Regulations (33 CFR 332.3), compensatory wetland mitigation options should be considered in the following order: mitigation banks, purchasing in-lieu fee program credits, or creating permittee-responsible mitigation sites. A mitigation bank is available within the impacted watershed and would therefore be utilized to compensate for unavoidable impacts to the wetland.

BNSF plans to purchase 3.64 credits (Jacobs 2018) at the bank for compensatory wetland mitigation. The bank currently has approximately 1,000 credits available for purchase (Valencia Wetlands Trust 2017).

Proposed mitigation for 0.88 acre of nearshore fills would be satisfied via LPO and Sand Creek stakeholders through a consensus-based process, including but not limited to the USFWS, Idaho Department of Fish and Game (IDFG), and other participating non-government organizations. Ongoing stakeholder meetings and communications are focused on identifying current watershed projects that are underway and/or planned in the near future that are suitable and appropriate to mitigate impacts to affected nearshore areas and to threatened bull trout, and would provide the most benefit to the affected aquatic resources. The nearshore fill mitigation project would be identified in the future and would be performed under a separate permitting process.

Action Area

ESA regulations define the term “action area” as all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area for the Project is based on all potential impacts from construction activities, both temporary and permanent, to terrestrial and aquatic species. The action area was delineated by evaluating the farthest reaching physical, chemical, and biotic effects of the action on the environment (**Figure 6**).

Temporary increases in noise and turbidity from pile driving and nearshore fills (when the first flush occurs) were identified as potential impact mechanisms. Turbidity would be localized to several feet around piles during pile-driving activities; therefore, noise would generate the outer extent of the actions in both terrestrial and aquatic environments. The loudest construction activity would be impact hammer pile driving to install steel pipe piles for Bridges 3.1 and 3.9.

Terrestrial Impact Zone

Ambient terrestrial noise levels in the Project area are influenced by the local population level, traffic volumes on US 95, rail traffic, and commercial enterprises. The local population center is the City of Sandpoint. US 95 is located adjacent to the north end of the Project and diverges from the rail line near the north end of BNSF Bridge 3.9 to about 2,500 feet west of the south end of Bridge 3.9. Ambient noise level projected at 55 A-weighted decibels (dBA) is expected based on the local population (Washington State Department of Transportation [WSDOT] 2018).

Typical noise levels for construction and equipment were obtained from Chapter 7.0, Construction Noise Impact Assessment, of WSDOT’s Biological Assessment Preparation Manual (2018). The impact hammer produces noise levels at 110 dBA at 50 feet from the source. In the event that two simultaneous pile drivers are utilized, 3 dBA was added to the 110 dBA value resulting in 113 dBA as the highest noise level proposed during Project construction. Ambient noise within the study area includes vehicle traffic from US 95 and train traffic with peak noise levels of 140 decibels (dB), which represents a locomotive horn/whistle. Therefore, terrestrial construction noise would not surpass noise levels which are regularly experienced in the area. Since construction noise (use of the impact hammer) would result in a more frequent noise elevation than train whistles, a terrestrial noise assessment has been conducted.

The following formula was used to determine the extent of terrestrial noise (WSDOT 2018):

$$D = D_o \times 10^{[(\text{construction noise} - \text{ambient sound level in dBA})/\alpha]}$$

Where D = distance from the noise source

D_o = the reference measurement distance (50 feet in this case)

$\alpha = 25$ for soft ground and 20 for hard ground. For point source noise, a spherical spreading loss model is used. The alpha (α) values assume a 7.5 dBA reduction per doubling distance over soft ground and a 6.0 dBA reduction per doubling distance over hard ground.

$$\text{Distance (D)} = 50 \times 10^{[(\text{construction} - \text{ambient})/\alpha]}$$

Since the site is primarily surrounded by water which is considered a “hard site” in regards to noise analysis, a doubling distance of -6.0 dBA is used. For a hard site with a doubling distance of 6 dBA, 20 is used for α (WSDOT 2018). Ambient noise is 55 dBA and construction noise is 113dBA. **Table 5** summarizes these calculations.

Distance from Construction Noise to Ambient Noise

$$\text{Distance (D)} = 50 \times 10^{[(\text{construction} - \text{ambient})/\alpha]}$$
$$D = 50 \times 10^{[(113 - 55)/20]}$$
$$D = 50 \times 10^{[2.90]}$$
D = 39,716 feet (7.52 miles)

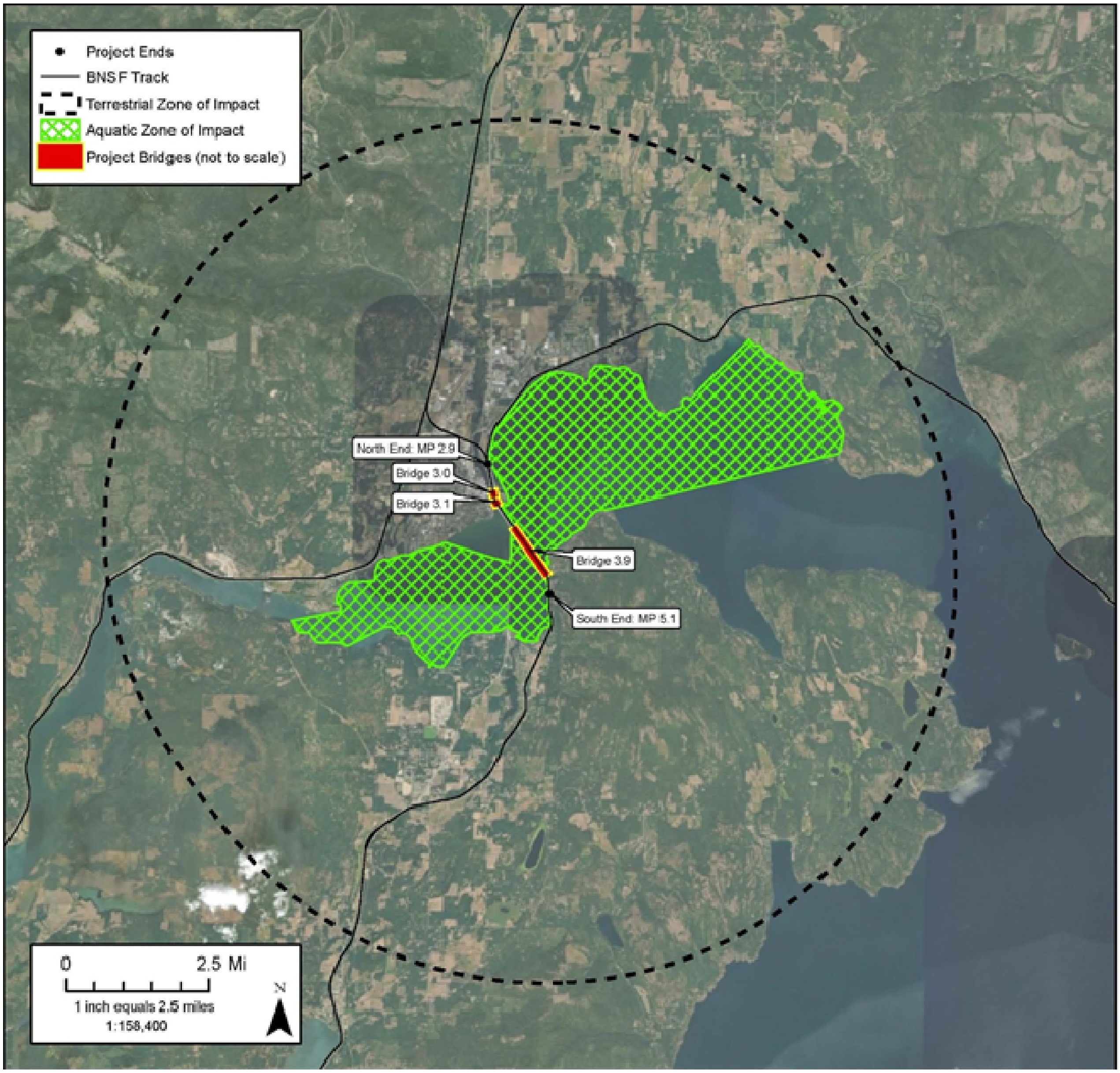
Table 5: Airborne Construction Noise Attenuation

Distance from Bridge (feet)	Construction Noise (attenuation = -6 dBA)	US 95 Noise (attenuation = -3 dBA)	Ambient Noise (dBA)
50	113 dBA	72.8 dBA	55
100	107 dBA	69.8 dBA	55
200	101 dBA	66.8 dBA	55
400	95 dBA	63.8 dBA	55
800	89 dBA	60.8 dBA	55
1,600	83 dBA	57.8 dBA	55
3,200	77 dBA	54.8 dBA	55
6,400	71 dBA	Below Ambient	55
12,800	65 dBA	--	55
25,600	59 dBM	--	55
51,200	53 dBM	--	55

Notes:
-- = not applicable
dBA = A-weighted decibel
dBM = decibels relative to one milliwatt

Using an ambient noise level of 55, construction noise would attenuate between 25,600 and 51,200 linear feet (4.8 and 9.7 miles) from the site or, more precisely, 39,716 feet (7.52 miles). This assessment does not consider topography or vegetated landforms. When considering topography, construction noise is anticipated to travel a maximum of approximately six miles, which is the furthest open-water distance between the bridge and an elevated landform.

Figure 6: Action Area Map



Aquatic Impact Zone

The aquatic impact zone was delineated by evaluating the farthest-reaching physical, chemical, and biotic effects of the action on the environment, which was determined to be underwater SPLs from the loudest construction activity.

There would be four distinct pile installation activities for the Project, including temporary and permanent pile installation at Bridges 3.1 and 3.9. The temporary Bridge 3.1 would require 48, 24-inch-diameter steel piles, up to 40 extend below the OHWM. These would be installed with a vibratory pile driver and 10 piles (1 per pier) to be proofed with an impact hammer. The permanent Bridge 3.1 would require 64, 24-inch diameter piles with 22 located below the OHWM. These piles would receive up to 1,200 strikes per pile.

The permanent Bridge 3.9 would include 288, 36-inch-diameter steel piles, all below the OHWM, which would be vibrated to resistance then driven with an impact hammer and would utilize a bubble and turbidity curtain in water 2 feet deep or more. These piles would receive up to 1,600 strikes per mile. The temporary Bridge 3.9 would include 700, 24-inch-diameter steel piles but only 76 piles (1 per pier) would be proofed with an impact hammer. Impact pile driving is anticipated to take between 1 to 3 hours per pile that requires proofing.

For the purposes of defining a conservative action area, the highest SPLs associated with impact-driving steel pipe piles for Bridges 3.1 and 3.9 are assumed. Therefore, the aquatic impact zone includes the farthest distance that underwater sound would travel from impact pile driving activities at Bridges 3.1 and 3.9 until reaching land, or attenuating to background noise levels.

It is likely the contractor would impact drive piles at both ends of permanent Bridge 3.9 simultaneously, which would increase the SPLs within LPO. Underwater sound attenuation is modeled in the equation below. The National Oceanic and Atmospheric Administration (NOAA) Pile Driving Impact Calculator was also used to assess sound impacts to specific species (**Appendix D**) and that analysis is presented in the Direct Effects section. SPLs from impact pile driving at Bridge 3.9 create a majority of the action area within LPO; however, sound from pile installation at Bridge 3.1 would extend up into Sand Creek.

Impact driving a 36-inch-diameter steel pipe pile would generate the loudest underwater sound level of 193 dB RMS measured at 10 meters (WSDOT 2018). During previous improvements on Bridge 3.9, acoustic monitoring using a bubble curtain recorded a 3 dB reduction in sound levels. The 3 dB reduction is based on average results of underwater sound monitoring (**Appendix E**) conducted in July 2008, when bubble curtains were activated during impact pile driving while replacing piers at the south end of the existing Bridge 3.9 (Robert Miner Dynamic Testing, Inc. 2008). Background sound levels in deep freshwater lakes or deep, slow-moving rivers are approximately 120 dB root-mean-square (RMS), similar to marine levels near developed shorelines (WSDOT 2018).

The extent of the action area was modeled in the equation below using an ambient underwater noise level of 120 dB RMS and a 190 dB RMS measured at 10 meters (32.81 feet) associated with the 36-inch-diameter steel pile and the use of a bubble curtain. Applying the normal attenuation rate of 4.5 dBA per underwater doubling distance results in construction noise attenuation of 288 miles from the Project site.

Distance from Construction Noise to Underwater Ambient Noise

$R_1 = R_2 \times 10^{[(\text{construction noise – ambient sound level in dBA})/\alpha]}$

R_1 is the range or distance at which the transmission loss is estimated

R_2 is the range or distance of the known or measured sound level

$\alpha = 15$, the alpha (α) value assumes a 4.5 dBA reduction per doubling distance underwater; therefore,

$R_1 = 10 \text{ meters} \times 10^{[(190 - 120)/15]}$

This distance does not consider bathymetry or landforms. The furthest distance construction noise is anticipated to travel is approximately 6 miles, which is the furthest open water distance between Bridge 3.9 and an elevated landform. The action area is defined by the farthest distance that underwater sound would travel before encountering land and would therefore extend out to the LPO shoreline (**Figure 6**). The aquatic impact zone is approximately 1 percent of the total water surface area of LPO.

Environmental Baseline

Terrestrial Setting

While Project actions are limited to the BNSF ROW in upland areas, the terrestrial setting includes the action area which extends to a modeled 7.5 miles. Uplands in the action area are a patchwork of urban, urban fringe, and rural development, managed forest lands and minor amounts of undisturbed areas. The immediate Project area is primarily developed and consists of railroad tracks, gravel and paved parking areas, highway/roadways, and LPO. The cities of Sandpoint, Kootenai, Dover, and Sagle all occur within 7.5 miles of the Project. Aside from potential elevated noise levels, little disturbance would occur in terrestrial areas; therefore, they are not described in detail in the section.

Lake Pend Oreille

LPO is a natural, temperate, oligotrophic lake. It is the largest natural lake in Idaho and the fifth deepest lake in the United States, with a mean depth of 538 feet, a maximum depth of 1,152 feet at its southern end, and a surface area of 94,720 acres. It is fed by over 20 streams originating in the Selkirk Mountains to the northwest, the Cabinet Mountains to the northeast, and the Coeur d'Alene Mountains to the east, which comprise most of the largely undeveloped, steep, rocky terrain LPO's shoreline and littoral zone. The remaining littoral zone at the lake's northern end and bays consists of gradual or moderately sloping bottom, surrounded by flat to gently sloping upland and floodplain with residential and commercial development within the cities of Sandpoint, Ponderay, and Kootenai; the cities of Hope and Clark Fork (farther east); and within the unincorporated areas of Sagle (south of Sandpoint; McCubbins et al. 2016).

The Clark Fork River, originating in western Montana, is the largest tributary into the lake providing 92 percent of LPO's inflow at the river's mouth near the city of Clark Fork, northeast of Sandpoint. Three hydroelectric dams were constructed from 1913 to 1959 (Cabinet Gorge, Noxon, and Thompson Falls Dams), creating a series of impoundments on the lower Clark Fork River.

The Pend Oreille River is LPO's only surface water outlet west of Sandpoint near the city of Dover. The river flows approximately 27 miles from LPO in Idaho into eastern Washington, then north into Canada where it joins the Upper Columbia River. The Pend Oreille River is impounded by the Albeni Falls hydroelectric dam, constructed in 1955 near the Idaho-Washington border, which regulates the lake's surface elevation/pool at 2,062.5 feet from approximately mid-June through September, and at 2,051 to 2,056 feet from October through May. The Project area is in the shallowest portion of LPO where waters are likely the warmest.

A wide diversity of fish species is present in LPO. The native fish present are westslope cutthroat trout (*Oncorhynchus clarki lewisi*), bull trout (*Salvelinus confluentus*), mountain whitefish (*Prosopium williamsoni*), pygmy whitefish (*Prosopium coulterii*), slimy sculpin (*Cottus cognates*), peamouth (*Mylocheilus caurinus*), northern pikeminnow (*Pschocheilus oregonensis*), redside shiner (*Richardsonius balteatus*), longnose sucker (*Catostomus catostomus*) and largescale sucker (*Catostomus macrocheilus*).

Non-native sport fish that have been stocked or found their way into the lake over the years include kokanee (*Oncorhynchus nerka* – a land-locked form of sockeye salmon), rainbow trout (*Oncorhynchus mykiss*), Gerrard-strain rainbow trout (Kamloops), lake whitefish (*Coregonus clupeaformis*), lake trout (*Salvelinus namaycush*), smallmouth bass (*Micropterus dolomieu*), and several other species present in low quantity including northern pike (*Esox lucius*), brown trout (*Salmo trutta*), largemouth bass (*Micropterus salmoides*), yellow perch (*Perca flavescens*), and walleye (*Sander vitreus*) (McCubbins et al. 2016).

Sand Creek

The Sand Creek watershed[2] covers 38 square miles or 24,209 acres, and includes Jack Creek, Little Sand Creek, Swede Creek, and Schweitzer Creek northeast of Sandpoint. Sand Creek generally flows from north to south for approximately 16 miles and discharges into LPO within the City of Sandpoint, where it is subject to the regulated levels of LPO.

Although it is known locally known as Sand Creek and is considered to be Sand Creek by the IDL (2017), federal agencies and the IDEQ consider the lower portion of Sand Creek, from LPO upstream to State Highway 200, as an inlet of LPO (USFWS 2018; IDEQ 2018).

The average gradient of Sand Creek is 1 percent and the primary channel substrate is sand. Land use consists of forestry, agriculture, and permanent grasslands with small areas of shrub land and barren land. The primary land use is agriculture/rural. Land ownership is mostly private, with the remainder of the watershed held by the City of Sandpoint, BLM, Idaho State, and USFS (IDEQ 2017).

The upper portion of the creek is surrounded by sparse residential development within the unincorporated areas of Bonner County, except for the Schweitzer Mountain Ski Resort, a large residential and commercial development located in the upper reaches of Schweitzer Creek. The lower, approximate four-mile portion of Sand Creek is surrounded by residential and commercial development within the cities of Sandpoint and Ponderay.

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[2] Sand Creek Tributary to Lake Pend Oreille; not to be confused with the Sand Creek tributary to Pack River.

Federally Proposed and Listed Species and Designated Critical Habitat

The Project is located across and along the northwestern section of LPO and immediately east and south of US 95 and the city of Sandpoint. Uplands in the action area are a patchwork of urban development and managed forest lands. Developed areas consist of railroad tracks, gravel and paved parking areas, urban and urban fringe development, and highways/roadways.

Species Excluded from Further Assessment

Table 6 identifies USFWS ESA-listed terrestrial species and designated critical habitat provided by USFWS species list in Bonner County, Idaho. The specific habitat conditions required for the federally listed ESA species noted in **Table 6** do not occur in the action area.

Table 6: ESA-Listed and Proposed Terrestrial Species and Designated/Proposed Critical Habitat

Common Name	Scientific Name	ESA Listing	Potential to Occur in Action Area	Determination
Canada lynx	*Lynx canadensis*	Threatened	No	NE
Grizzly bear	*Ursus arctos horribilis*	Threatened	No	NE
North American wolverine	*Gulo luteus*	Proposed Threatened	No	Will Not Jeopardize the Continued Existence
Woodland caribou	*Rangifer tarandus caribou*	Endangered	No	NE
Common Name	**Scientific Name**	**Critical Habitat**	**Critical habitat in Action area**	**Determination**
Canada lynx	*Lynx canadensis*	Contiguous United States DPS	No	NE
Woodland caribou	*Rangifer tarandus caribou*	Selkirk Mountain	No	NE

Notes:
DPS = Distinct Population Segment
ESA = Endangered Species Act
NE = No Effect

Canada Lynx

The Canada lynx is a forest carnivore highly adapted to hunting its primary prey, the snowshoe hare, in deep, powdery snow. Lynx and snowshoe hares are associated with moist, cool, boreal spruce-fir forests. In the northern United States, boreal forests transition to more temperate forest types where lynx populations cannot be sustained. Lynx need persistent deep, powdery snow, which limits competition from other hare predators, as well as denning habitat that consists of log piles, windfalls or dense vegetation to provide security for kittens. Most lynx habitat in the Lower 48 States occur on national forest, national park and BLM lands (USFWS 2013).

According to USFWS ESA distribution mapping, the closest critical habitat for Canada lynx is in Subunit 1 of the Northern Rocky Mountains, located approximately 50 miles northwest of the action area on the border of Boundary (Idaho) and Lincoln (Montana) Counties. The action area is below 4,000 feet and does not contain the preferred boreal spruce-fir forest habitat for Canada lynx. Due to a lack of presence and a lack of habitat disturbance, the Canada lynx would not be affected by the Project.

Grizzly Bear

Grizzly bear prefer habitat in remote areas above 3,500 feet with ample food supplies and forest cover. They are successful omnivores, and in some areas, may be almost entirely herbivorous. Grizzly bears feed on animal matter or vegetable matter that is highly digestible and high in starch, sugars, protein and stored fat.

Upon emerging from hibernation in spring, grizzly bears move to lower elevations to feed on emergent vegetation such grasses, sedges, and forbs. Open south-facing slopes, wet meadows, avalanche chutes, and riparian systems are the most frequently used habitat components. Throughout late spring and early summer, they seek plants at higher elevations, and in late summer and fall they transition to fruits, nuts and herbaceous materials. They are also opportunistic feeders and will prey or scavenge on any available food including ground squirrels, ungulates, carrion, and garbage (USFWS 1982).

The Grizzly Bear Recovery Plan (USFWS 1982) identified key regions and populations in the lower 48 states called “recovery zones.” The closest recovery zones to the Project are the Selkirk Ecosystem, located in northern Bonner County and Boundary County, Idaho; and the Cabinet-Yaak Ecosystem, located in eastern Bonner County and Boundary County, Idaho and northwestern Montana. Both of these recovery zones are over 30 miles away from the Project, and the action area is not located in a grizzly bear recovery zone and does not contain suitable habitat. The Project would not disturb remote forested areas, therefore, grizzly bears would not be affected by the Project.

North American Wolverine

In North America, wolverines occur within a wide variety of habitats, primarily boreal forests, tundra and western mountains throughout Alaska and Canada; however, the southern portion of their range extends into the contiguous United States. Wolverines are opportunistic feeders and primarily scavenge carrion, but also prey on small animals and birds, and eat fruits, berries, and insects. Persistent, stable snow greater than 5 feet deep is required for natal denning (USFWS 2014).

Within Idaho, they occur throughout the state in mountainous areas and are year-round residents. In 2010 through 2014, IDFG conducted a winter bait station survey throughout the state, one being near the northwest range of the Project action area. Wolverines were detected, however, at bait stations in Boundary County, over forty miles from the Project. Appropriate habitat in Bonner County is limited to higher elevations of the Selkirk and Cabinet Mountain Ranges and does not occur in the action area. The Project would not impact tundra or alpine forest habitats and wolverine are not expected within the action area, therefore, North American Wolverine would not be affected by the Project.

Selkirk Mountains Woodland Caribou

The southern Selkirk Mountains woodland caribou requires large contiguous areas of high-elevation, coniferous-forest summer and winter habitat, with little or no vehicle access and disturbance. They prefer old-growth forests in all seasons, and their winter diet is composed almost entirely of arboreal hair lichens that are most commonly found in high-elevation old-growth forests. In spring, the caribou move to lower elevations where snow has melted to forage on new green vegetation, and in summer move back to mid-and upper-elevation spruce/alpine fir forests to selectively forage on grasses, flowering plans, horsetails, willows, dwarf birch leaves and tips, sedges, lichen and huckleberry leaves. In the fall their diet consists of dried grasses, sedges, willow and dwarf birch tips and arboreal lichens (USFWS 2012).

The southern Selkirk Mountains subpopulation of woodland caribou occupies high-elevation habitat in northern Idaho, northeastern Washington, and southern British Columbia. Most recently this subpopulation declined from 46 to 12 caribou between 2009 and 2016. The nearest occurrence of woodland caribou is in the Selkirk Mountains, approximately 70 miles northwest of the Project. The Project action area does not contain suitable habitat for woodland caribou (mature or old-growth conifer forests and undeveloped land) and is not within woodland caribou designated critical habitat. Due to a lack of occurrence and a lack of habitat impacts, woodland caribou would not be affected by the Project.

Because these terrestrial species do not have the potential to occur in the action area, have no known occurrence in the action area, and they have no designated critical habitat in the action area the project would have **No Effect on Canada lynx, grizzly bear, Selkirk mountain North American wolverine (should it be listed prior to completion)** and **Selkirk Mountains woodland caribou**; therefore, they are not further addressed in this Biological Assessment.

Columbia River DPS Bull Trout

Status and Presence in the Action Area

The coterminous United States population of bull trout (*Salvelinus confluentus*) was listed by the USFWS as threatened in November 1999 (64 Federal Register [FR] 58910). Bull trout were listed due to declining trends in distribution and abundance caused by the combined effects of habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, angler harvest and poaching, entrainment into diversion channels and dams, and introduced non-native fish species (USFWS 2015b).

Bull trout are members of the family *Salmonidae* and are char native to Washington, Oregon, Idaho, Nevada, Montana and western Canada. Compared to other salmonids, bull trout have the most specific habitat requirements that appear to influence their distribution and abundance. These requirements are referred to as “the four Cs” – cold, clean, complex and connected habitat – including cold water temperatures (less than 12 degrees Celsius [℃]/54 degrees Fahrenheit); stable stream channels and clean spawning and rearing (SR) gravel; complex stream habitat including deep pools, overhanging banks and large woody debris (LWD); and connectivity (i.e., unblocked migratory corridors) between SR areas and downstream foraging, migration, and overwintering (FMO) habitats (USFWS 2015a).

Bull trout exhibit two life-history forms: resident and migratory. Resident bull trout spend their entire lives in the same stream/creek. Most bull trout are migratory, rearing 1 to 4 years in natal tributaries before moving to larger rivers (fluvial) or lakes (adfluvial) and then migrating back to natal tributaries to spawn from August through November. An anadromous form of bull trout also exists in the Coastal-Puget Sound population, which spawns in rivers and streams but rears young in the ocean. Resident and juvenile bull trout prey on invertebrates and small fish. Adult migratory bull trout primarily eat fish. Resident bull trout range up to 10 inches long, and migratory forms may range up to 35 inches long and weigh up to 32 pounds (USFWS n.d.).

Bull trout normally reach sexual maturity in 4 to 7 years and live as long as 12 years. They spawn more than once in a lifetime, with both repeat- and alternate-year spawning reported. Therefore, bull trout require two-way passage upstream and downstream for repeat spawning and also for foraging (USFWS 2015b). In Idaho, bull trout generally spawn in September and October. Fry normally emerge from early April through May depending upon water temperatures and increasing stream flows (Miller et al. 2014). Most downstream migrations for all size classes of bull trout throughout the year are almost exclusively at night, after sunset and before sunrise (USFWS 2015) and within the first hours of darkness (Downs et al. 2006).

Local Population – Threats, Status, and Recovery Activities

Lake trout suppression programs, including the LPO Trap and Gill Net Program, and the LPO Angler Incentive Program are current, ongoing, and have been in place since 2006. These trout suppression programs and bull trout bycatch affect the environmental baseline. Adfluvial bull trout comprise the predominant life history form present in the LPO basin and are the predominant large-bodied native predator in the lake (McCubbins 2016).

Bull trout rear 1 to 4 years in natal tributaries, and do not return to spawn in their natal tributaries until they are sexually mature. Therefore, subadult bull trout are present in LPO and use the action area year-round as FMO habitat (USFWS 2018), while adult bull trout migrate bull trout most likely use the action area in the course of migrating to and from SR tributaries and as FMO habitat (USFWS 2015b). Adult bull trout begin migrating out of LPO to SR tributaries in April

(USFWS 2015b) and May (Downs et al. 2006), where they remain until spawning. Post-spawn adult bull trout migrate back to LPO in September and October to overwinter (Downs et al. 2006).

Both the IDFG and the USFWS have confirmed that there is no documented presence of bull trout in Sand Creek, and there is minimal data on bull trout use of LPO within the Project action area (IDFG 2017b; USFWS 2017b). Subadult bull trout emigrate into LPO from upstream tributaries in two pulses, one in spring associated with snowmelt runoff and increasing water temperatures and a second in fall as stream temperatures drop and fall rains begin (Downs et al. 2006). A fall-only subadult bull trout emigration occurs from the downstream East River to the Pend Oreille River to LPO, presumably to allow bull trout to avoid swimming upstream into the lake against the current during spring high flows (USFWS 2015b).

LPO and Sand Creek within the Project action area are listed for water quality impairments that have been addressed by established loading targets (total maximum daily loads; TMDLs). These include Sand Creek TMDLs for temperature and sediment approved by USEPA in 2007, and a LPO nearshore TMDL for total phosphorus approved by USEPA in 2002. LPO and Sand Creek within the Project action area are also currently listed as impaired by mercury; development of a TMDL is a medium priority for 2018. Additionally, the Pend Oreille River (including the outlet arm of LPO within the Project action area) is currently in need of TMDLs (medium priority for 2019) for temperature and dissolved gas supersaturation impairments (IDEQ 2014, 20174).

Specific threats identified in the LPO basin proper and its tributaries, extending from Cabinet Gorge Dam on the Clark Fork River downstream to LPO to Albeni Falls Dam on the Pend Oreille River, entirely in Idaho core area include (USFWS 2009):

- Historic fragmentation of the lower Clark Fork River due to three privately-owned mainstem hydroelectric dams (Cabinet Gorge, Noxon Rapids, and Thompson Falls) that seriously compromised access and productivity of this bull trout habitat for nearly a century;
- Overfishing of bull trout and the presence of voracious non-native species, specifically lake trout (mackinaw) that prey on juvenile bull trout and consume kokanee, a primary food source for bull trout, as identified by the IDFG; and
- One primary habitat threat is legacy impacts from upland/riparian land management that increase sedimentation and cause riparian and instream degradation, loss of LWD, and pool reduction in FMO habitat and in some SR tributaries.

Additionally, altered seasonal water level fluctuations have caused reduced riparian vegetation, eroding beaches and shorelines, and decreasing productivity of littoral habitats.

While the adfluvial nature of bull trout in LPO can make them susceptible to threats from non-native fish invasion and mainstem river migratory barriers, it does allow for greater resiliency due to the highly suitable cold water habitat that the lake provides, and the robust size, condition and fecundity of adfluvial fish that are able to capitalize on the lake’s high-quality forage base. This may explain why the bull trout population is relatively robust in LPO (approximately 12,000 fish) despite loss of connectivity to large areas of upstream and downstream SR habitat (USFWS 2015a). A 2007–2008 study also noted that an estimated population of 12,513 bull trout in LPO was similar to that estimated one decade earlier in 1997–1998, indicating a stable population (McCubbins et al. 2016).

Also, it is suggested that a minimum of 10 local populations are required for a bull trout core area (metapopulation) to function effectively, and core areas with more than 10 interconnected local populations are at diminished risk of extirpation. It is also estimated that approximately 1,000 spawning adults within any bull trout population are necessary to ensure persistence of the population by maintaining genetic variation. The LPO core area has at least 20 local populations, and the IDFG has determined that approximately 4,000 adult spawning bull trout occupy LPO at any given time (USFWS 2015b).

Further, bull trout redd counts show a stable to increasing trend in the LPO-B core area. Bull trout redd counts are conducted on a 5-year rotational basis on LPO and lower Clark Fork River tributaries under Appendix A of the Idaho Tributary Habitat Acquisition and Fishery Enhancement Program of the Avista Clark Fork Settlement Agreement (CFSA). These tributaries are designated as critical habitat outside of the Project action area. Six index streams[3] have been counted consistently since 1983 prior to the CFSA. (The CFSA outlines protection, mitigation, and enhancement efforts required under the 2005 relicensing of the Cabinet Gorge and Noxon Rapids Dams on the lower Clark Fork River.)

These bull trout SR tributaries in the LPO-B core area have averaged 738 bull trout redds annually from 1995 to 2014, and 792 bull trout redds from 2005 to 2014. The six index streams represented 68 percent and 62 percent of the total redds during these time periods, respectively (Bouwens and Jakubowski 2016). Habitat conditions in the SR tributaries vary widely among streams and years, ranging from fish passage barriers due to low water in dry years, to variable stream morphology, pool frequency and quality, amount of sedimentation and LWD, road densities, and water temperature.

Ongoing and planned near-term fish passage efforts (fishways and trap and transport programs) have improved the longer-term prognosis for bull trout connectivity, and are expected to provide a critical linkage to recovering bull trout in the entire Lower Clark Fork Geographic Region in the future. Continuing efforts to suppress non-native fish (specifically lake trout), which is largely well-funded under the Avista CFSA, would remain an important component of the recovery effort (USFWS 2009).

A recent study also concluded that lake trout eradication efforts under the Avista CFSA, as well as a moratorium on bull trout angling since 1996, have effectively addressed overfishing and non-native fish threats thereby increasing the likelihood of long-term persistence of the LPO bull trout population (McCubbins et al. 2016).

Recommended recovery tasks to address the primary habitat threats in tributary streams include (USFWS 2015):

- Revegetation of deficient riparian areas; priority watersheds include Pack River and Lightning Creek (located 12 to 20 miles upstream of the Project action area, respectively).
- Continued implementation of the Avista CFSA to protect habitat through acquisitions and easements, and to improve and restore degraded instream habitat in key LPO bull trout SR tributaries.

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[3] East Fork Lightning, Gold, Grouse, Johnson, N. Gold, and Trestle Creeks.

Bull Trout Designated Critical Habitat

Status and Presence in the Action Area

In September 2010, the USFWS designated critical habitat for bull trout throughout their range in areas that contain features considered essential for conservation of the species (75 FR 63898). Thirty-two Critical Habitat Units (CHUs) were designated, including Habitat Unit 31- Clark Fork River Basin, which includes the open water and shorelines of LPO and the Pend Oreille River within the Project action area but does not include Sand Creek (**Figure 7**).

The primary function of individual CHUs is to maintain and support core areas. The 32 designated CHUs are clustered into six recovery units. The Columbia Headwaters Recovery Unit (CHRU) includes western Montana, northern Idaho, and the northeastern corner of Washington. The CHRU is further divided into five geographic regions and 35 core areas. Core areas are defined as groups of partially isolated local populations of bull trout with some degree of gene flow occurring between them, and are considered to be “metapopulations” (USFWS 2015b).

Unique to the CHRU is that bull trout life history in most of the core areas is predominantly adfluvial, with adult and subadult fish residing in the lake during much of their life, often with extensive migrations upstream by adults and downstream by juveniles and post-spawn adults (USFWS 2015a). For example, bull trout were tracked migrating at least 82 km (51 miles) to LPO from the East River, a spawning tributary of Priest River (Dupont et al. 2007).

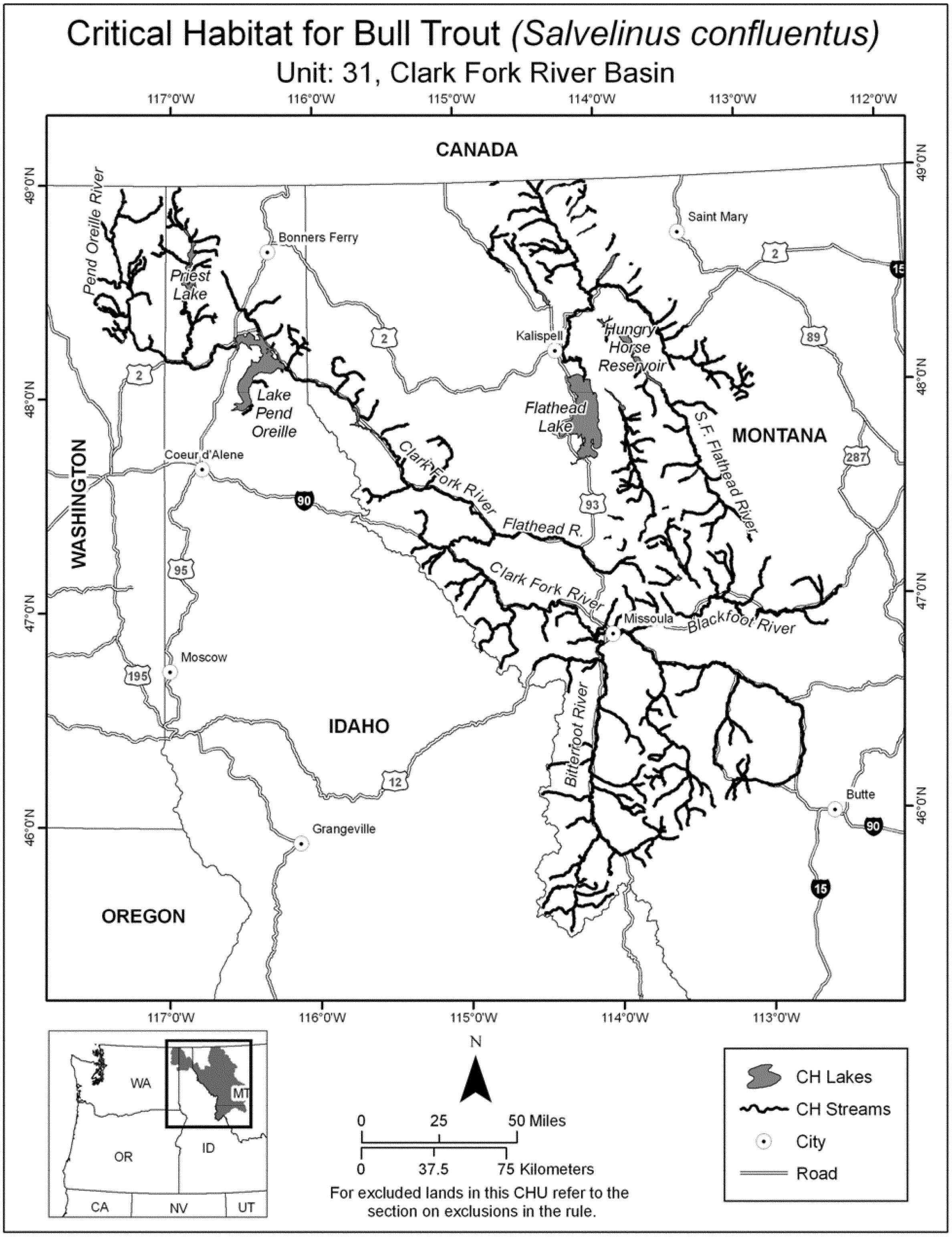
Fifteen of the core areas are referred to as “complex” core areas that represent large, interconnected habitats with multiple spawning streams containing separate and genetically identifiable local populations. These 15 complex core areas contain the majority of individual bull trout and the bulk of the designated critical habitat (USFWS 2015c).

LPO is identified as a complex core area contained within the designated Lower Clark Fork Geographic Region. The Lower Clark Fork Geographic Region, the largest and most diverse bull trout core recovery area in the CHRU, is essential to bull trout conservation because it is among the more secure and stable bull trout refugia across the range of the species and may provide a very important stronghold against potential extinction. It also provides important bull trout FMO habitat for local populations in LPO, Pend Oreille River tributaries, and the Lower Clark Fork River, as well as an essential migratory corridor for bull trout from LPO to access upstream productive watersheds (USFWS 2009).

Because of its systematic and jurisdictional complexity (three states, a tribe, five mainstem dams), the LPO core area is further divided into three parts:

- (LPO-A) Clark Fork River mainstem upstream of Cabinet Gorge Dam on the Idaho/Montana border, almost entirely in Montana;
- (LPO-B) LPO basin proper and its tributaries, extending from Cabinet Gorge Dam on the Clark Fork River downstream to LPO to Albeni Falls Dam on the Pend Oreille River, entirely in Idaho; and
- (LPO-C) the lower basin (lower Pend Oreille River) downstream of Albeni Falls Dam through the Box Canyon Dam to the Boundary Dam one mile upstream of the Canadian border, including portions of Idaho, Washington and the Kalispel Indian Reservation (USFWS 2015c).

Figure 7: Critical Habitat for Bull Trout



The LPO basin proper and its tributaries (LPO-B) represent 15 percent of the LPO complex core area, covering 0.67 million acres with 1,250 miles of mapped streams. The Project lies wholly within LPO-B.

Primary Constituent Elements

In accordance with section 3(5)(A)(i) of the ESA and regulations at 50 CFR 424.12(b), in determining which areas occupied at the time of listing to propose critical habitat, the USFWS considered the physical or biological features essential to the conservation of the species and that may require special management considerations or protection. These features are the PCEs laid out in the appropriate quantity and spatial arrangement for conservation of the species. These include, but are not limited to: (1) Space for individual and population growth for normal behavior; (2) Food, water, air, light, minerals, or other nutritional or physiological requirements; (3) Cover or shelter; (4) Sites for breeding, reproduction, or rearing (or development) of offspring; and (5) Habitats that are protected from disturbance or are representative of the historical, geographical, and ecological distributions of a species.

The primary constituent elements (PCEs) determined essential to the conservation of bull trout) are listed below. A description of existing baseline conditions in the action area as it relates to each PCE is also discussed.

1. Springs, seeps, groundwater sources, and subsurface water connectivity (hyporheic flows) to contribute to water quality and quantity and provide thermal refugia.

   The Project action area (Sand Creek and LPO) has ample water sources year-round. Water levels are controlled by the Albeni Falls Dam on the Pend Oreille River at the Idaho/Washington border, approximately 25 miles downstream from the Project. Levels fluctuate from an elevation of 2,051 feet at winter pool to 2,062 feet at summer pool.

2. Migratory habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and freshwater and marine foraging habitats, including, but not limited to permanent, partial, intermittent or seasonal barriers.

   Shoreline armoring, marinas, and bridges are present within Sand Creek and LPO. Migration between spawning, and rearing habitat in tributaries, and overwintering and foraging habitat in LPO, has been impeded by upstream dams on the lower Clark Fork River (Cabinet Gorge, Noxon Rapids) and by the downstream Albeni Falls Dam on the Pend Oreille River. Water quality in the Project action area is impaired by mercury, and portions of the Project action area are impaired by temperature and total dissolved gas.

3. An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.

   An abundant food base is present in LPO as evidenced by a robust bull trout population. Predation of kokanee, a primary bull trout food source, by non-native fish (lake trout, walleye) is an issue in LPO. An ongoing lake trout suppression effort by IDFG has been underway since 2006. IDFG is also currently researching feasibility of a walleye suppression effort in LPO.

4. Complex river, stream, lake, reservoir, and marine shoreline aquatic environments and processes with features such as large wood, side channels, pools, undercut banks and substrates, to provide a variety of depths, gradients, velocities, and structure.

The Project area includes Sand Creek and LPO. Large wood, pools and undercut banks are not present within the Project area. Though LPO levels are artificially managed, there are a variety of depths and gradients present in the action area.

5. Water temperatures ranging from 2 to 15°C (36 to 59 degrees Fahrenheit), with adequate thermal refugia available for temperatures at the upper end of this range. Specific temperatures within this range would vary depending on bull trout life history stage and form; geography; elevation; diurnal and seasonal variation; shade, such as that provided by riparian habitat; and local groundwater influence.

   A 2005 temperature monitoring study (Annear et al. 2006) reported temperatures ranging from 2 to 22°C at depths ranging from 0.16 to 15.24 meters between February and November in LPO near Contest Point (approximately 1.5 miles upstream/east of the existing Bridge 3.9), and reported temperatures ranging from 7 to 25°C at depths ranging from 0.61 to 7.62 meters between April and November at the US 95 bridge over LPO (approximately 0.5-mile downstream/west of the existing Bridge 3.9). The study also noted that thermal stratification occurs in LPO in the middle of summer (August).

6. Substrates of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount (e.g., less than 12 percent) of fine substrate less than 0.85 millimeter (0.03 inch) in diameter and minimal embeddedness of these fines in larger substrates are characteristic of these conditions.

   Not applicable; the Project is not within bull trout SR habitat.

7. A natural hydrograph, including peak, high, low, and base flows within historic and seasonal ranges or, if flows are controlled, they minimize departures from a natural hydrograph. Existing Conditions: describe conditions in Project area Effects to PCE: describe effects from Project to PCE.

   Sand Creek and LPO have seasonal changes in water levels that can depart from a natural hydrograph. Water levels are controlled by the Albeni Falls Dam on the Pend Oreille River at the Idaho/Washington border, approximately 25 miles downstream of the Project. Levels fluctuate from an elevation of 2,051 feet at winter pool to 2,062 feet at summer pool. Additionally, levels can fluctuate from an elevation of 2,051 feet to 2,056 feet during winter pool.

8. Sufficient water quality and quantity such that normal reproduction, growth, and survival are not inhibited.

   Bull trout rearing and reproduction does not occur within the Project area. Based on the size of the bull trout population LPO, it appears that there is sufficient water quality and quantity for bull trout growth and survival in the Project area. However, LPO and Sand Creek within the Project action area have water quality impairments that have been addressed by established TMDLs, including Sand Creek TMDLs for temperature and sediment (2007), and a LPO nearshore TMDL for total phosphorus (2002).

   LPO and Sand Creek within the Project action area are also currently listed as impaired by mercury; development of a TMDL is a medium priority for 2018. Additionally, the Pend Oreille River (including the outlet arm of LPO within the Project action area) is currently in need of TMDLs (medium priority for 2019) for temperature and dissolved gas supersaturation impairments (IDEQ 2017).

9. Few or no nonnative predatory (e.g., lake trout, walleye, northern pike, smallmouth bass; inbreeding (e.g., brook trout); or competitive (e.g., brown trout) species present.

   Per IDFG 2017 data, predatory species are present within the LPO including walleye, smallmouth bass, northern pike, and lake trout. IDFG is conducting an ongoing lake trout suppression effort that has been underway since 2006 and is also currently researching feasibility of a walleye suppression effort.

Analysis of Effects to Bull Trout

Effects of the Project consider the direct and indirect effects of an action on listed species and critical habitat, together with effects of other activities that are interrelated or interdependent with that action, and then considered along with the environmental baseline and cumulative effects to determine the overall effect to the species. Due to a lack of occurrence, the Project would have no effect on terrestrial ESA-listed species and therefore, they are not addressed in detail in this section.

Direct Effects

Direct effects are those that result from the proposed action and directly or immediately impact the species or its habitat. Indirect effects are those that are caused by, or would result from, the proposed action and occur later in time (USFWS 2015b). Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area. The proposed action may result in direct effects to bull trout from temporary pile driving associated with the construction permanent and temporary bridges.

Elevated Sound Pressure Levels

The Project would construct both a temporary and permanent bridges over Sand Creek and LPO, which would require vibratory and impact pile driving of both 36-inch-diameter steel piles and 24-inch-diameter steel piles. The project includes both vibratory and impact pile driving. High levels of underwater sound can injure or kill fish and cause alterations in behavior (Turnpenny et al. 1994; Turnpenny and Nedwell 1994; Popper 2003; Hastings and Popper 2005; National Marine Fisheries Service [NMFS] 2007). Death from barotrauma can be instantaneous or delayed up to several days after exposure. Even in the absence of mortality, elevated noise levels can cause sublethal injuries. Fish suffering damage to hearing organs may suffer equilibrium problems, and may have a reduced ability to detect predators and prey (Turnpenny et al. 1994; Hastings et al. 1996). Hastings (2007) determined that a sound exposure level (SEL) as low as 183 dB (re: 1 μPa^2-sec) was sufficient to injure the non-auditory tissues of juvenile spot (*Leiostomus xanthurus*) and pinfish (*Lagodon rhomboides*) with an estimated mass of 0.5 grams.

Adverse effects on survival and fitness can occur even in the absence of overt injury. Exposure to elevated noise levels can cause a temporary shift in hearing sensitivity (referred to as a temporary threshold shift), decreasing sensory capability for periods lasting from hours to days (Turnpenny et al. 1994; Hastings et al. 1996). Popper et al. (2005) found temporary threshold shifts in hearing sensitivity after exposure to cumulative SELs as low as 184 dB. Temporary threshold shifts reduce the survival, growth, and reproduction of the affected fish by increasing the risk of predation and reducing foraging or spawning success.

Cumulative SEL is a measure of the risk of injury from exposure to multiple pile strikes. The Equal Energy Hypothesis, described by NMFS (2007), is used as a basis for calculating cumulative SEL. The number of pile strikes is estimated per continuous work period. This approach assumes that there would be a break of at least 12 hours between work periods. NMFS uses the practical spreading model to calculate transmission loss. The NMFS uses an agreed-upon interim criteria to minimize potential impacts to fishes (Fisheries Hydroacoustic Working Group 2008).

The interim criteria include peak SPL and SEL injury threshold limits of:

- Peak SPL: levels at or above 206 dB from a single hammer strike likely results in the onset of physical injury; and
- SEL: cumulative levels at or above 187 dB for fish sizes of 2 grams or greater, or 183 dB for fish smaller than 2 grams.

Bull trout smaller than 2 grams are not present within the LPO since spawning and rearing do not occur within the vicinity of the Project. Pile driving SPLs in excess of 150 dB RMS are expected to cause temporary changes in bull trout behavior such as a startle response, disruption of feeding, or impairment of predator detection. However, since pile driving occurs during daylight hours, there is a break of up to 12 hours overnight. Studies have shown that bull trout display little activity during the day when pile driving would occur, and peak activity is at night (McPhail and Baxter 1996).

Vibratory Pile Driving

All piles would require vibratory pile driving for installation and all temporary piles would be removed slowly with a vibratory pile driver at a rate of 4 piles per day. Vibratory pile driving would occur year round during temporary and permanent bridge installation and temporary bridge removal. Vibratory pile drivers produce SPLs 10 to 20 dB below that of impact pile drivers. However, vibratory pile driving would occur for much longer durations than impact pile driving. Vibratory pile driving is not likely to result in fish injury but is likely to impact behavior by resulting in an avoidance of the project area. Vibratory pile driving would occur off and on year round between May of 2019 and November 2022.

Impact Pile Driving

Piles 36 inches in diameter are the widest pile proposed, and would be installed with vibratory pile-driving equipment and an impact hammer would be used for finishing. Approximately four 36-inch-diameter piles would be driven per day with up to 1,600 strikes per pile. The impact hammer can produce spikes of sound reaching levels than can harm or kill fish or cause behavioral effects. Impact hammers produce more intense pressure waves, and while the initial strikes may elicit a startle response in fish, the response wanes and fish may remain within the range of potentially harmful sound. Additionally, impact hammers produce short spikes of sound lasting less than a few seconds with energy outside of the infrasound range, which may not elicit an avoidance response in fishes. Therefore, fish may be exposed to harmful pressures for longer periods of time (USFWS 2015b).

Impact pile driving associated with 24-inch-diameter piles at both temporary work bridges is anticipated to require a total of 144 hours of impact pile driving with an injury area (cumulative SEL dB to fish ≥ 2 grams) of 97 meters and a disturbance area of 5.3 miles (**Appendix D**). Temporary bridge construction would occur over a year-long period and affect both migration and non-migration periods.

Impact pile driving a 36-inch-diameter piles associated with permanent Bridge 3.9 is anticipated to require 432 hours of pile driving, with two pile drivers going at once, at each end of the bridge. This action would result in an injury area (cumulative SEL dB to fish ≥ 2 grams) of 0.62 miles and a disturbance area of 2.88 miles (**Appendix F**). Permanent bridge construction would occur over a 2-year-long period and affect both migration and non-migration periods.

Impact pile driving of 24-inch-diameter pile associated with Bridge 3.1 is anticipated to require 44 hours of pile driving over a 1- to 5-month period. This action would result in an injury area (cumulative SEL dB to fish ≥ 2 grams) of 0.28 miles and a disturbance area of 2.88 miles (**Appendix F**). Permanent bridge construction may affect both migration and non-migration periods.

Impact pile driving would occur for approximately 620 hours over a two-year period considering two impact pile drivers may be working at either ends of Bridge 3.9. Considering there are 24 hours in a day, and 365 days in a year, this results in impact pile driving 3.5 percent of the time over a two-year span. All pile driving would occur during daylight hours.

For aquatic species, risk of injury or mortality resulting from noise is related to the effects of rapid pressure changes, especially on gas-filled spaces in the fish's body (such as swim bladder, lungs, sinus cavities, etc.). Generally, in-water or near-water pile driving is the issue of concern. Noise generated by impact pile driving is impulsive—consisting of a broad range of frequencies over a short duration. Different aquatic species exhibit different hearing ranges, and threshold distances and noise levels have been established to be used as a basis for effect determinations.

Effects to Bull Trout Life History and Foraging, Migration, and Overwintering

Peak dB describes the instantaneous peak SPL and is used to evaluate potential injury to fish, and RMS dB describes the pressure level during the impulse and is used to describe disturbance-related effects (i.e., harassment) to fish. SEL is used as an indication of the energy dose (WSDOT 2018).

There are several factors that can reduce the extent of underwater noise transmission, including water depth, sediment type, bottom topography, current, underwater structures, sinuosity (in rivers or streams), type and diameter of piles, and use of attenuation devices such as air bubble curtains (WSDOT 2018). Calculated results for Bridge 3.9 show a cumulative SEL of 218 dB and the following distances at which various thresholds of accumulated SEL are expected to be exceeded for bull trout:

- Distance at which 206 dB PEAK is expected to be exceeded (onset of physical injury) = 12 meters (37 feet)
- Distance at which 187 dB accumulated SEL is expected to be exceeded (onset of physical injury to fish 2g or greater) = 1,000 meters (0.62 mile)
- Distance at which 150 dB RMS is expected to be exceeded (behavioral effects) = **4,642 meters (2.88 miles)**

Potential behavioral effects to bull trout could therefore extend northeast to LPO's Kootenai Bay, and southwest nearly to the start of the Pend Oreille River near the City of Dover at the lake's outlet arm (**Figure 8**). Calculated results for Bridge 3.1 show a cumulative SEL of 212 dB and the following distances within which various thresholds of accumulated SEL are projected to be exceeded for bull trout:

- Distance in which 206 dB PEAK is expected to be exceeded (onset of physical injury) = 7 meters (23 feet)
- Distance within which 187 dB accumulated SEL is expected to be exceeded (onset of physical injury to fish 2g or greater) = 451 meters (0.28 mile)
- Distance within which 150 dB RMS is expected to be exceeded (behavioral effects) = **5,412 meters (3.36 miles)**

For Bridge 3.9, the NOAA Pile Driving Calculator (**Appendix D**) shows that injury to subadult and adult bull trout could occur within approximately 0.62 miles of the pile driving, and behavioral effects could occur within approximately 2.88 miles. For Bridge 3.1, the calculator shows that injury to subadult and adult bull trout could extend approximately 0.28 miles from the bridge into LPO, and behavioral effects could extend over a mile southeast across LPO to the lake shoreline near Contest Point and overlap the behavioral effects range of Bridge 3.9.

Bull trout typically remain in colder and deeper waters during daylight hours. The action area contains the shallowest portion of LPO, with depths of only 10 to 25 feet in the vicinity of the bridges. Much deeper water is located outside the action area in other parts of LPO. Due to increased activity occurring in the immediate area of Project construction and the use of dispersion strikes, bull trout could be expected to move away from the area at, or prior to, initiation of impact pile driving. Also, there would be a break of up to 12 hours or more (overnight) between work periods, which is believed to be sufficient time for recovery from exposure to high noise levels (USFWS 2015b). Additionally, Project actions are proposed in the shallowest, and likely the warmest portion, of the lake; therefore, species presence is anticipated to be fewer relative to other areas of the Lake. Further, bull trout are known to be most active at night and thus less likely to be in the action area when pile driving occurs. Lastly, air bubble curtains would be used to attenuate sound impacts when installing permanent bridge piles to reduce SPLs by 3dB thereby somewhat reducing the lateral extent of effects.

Sedimentation/Turbidity

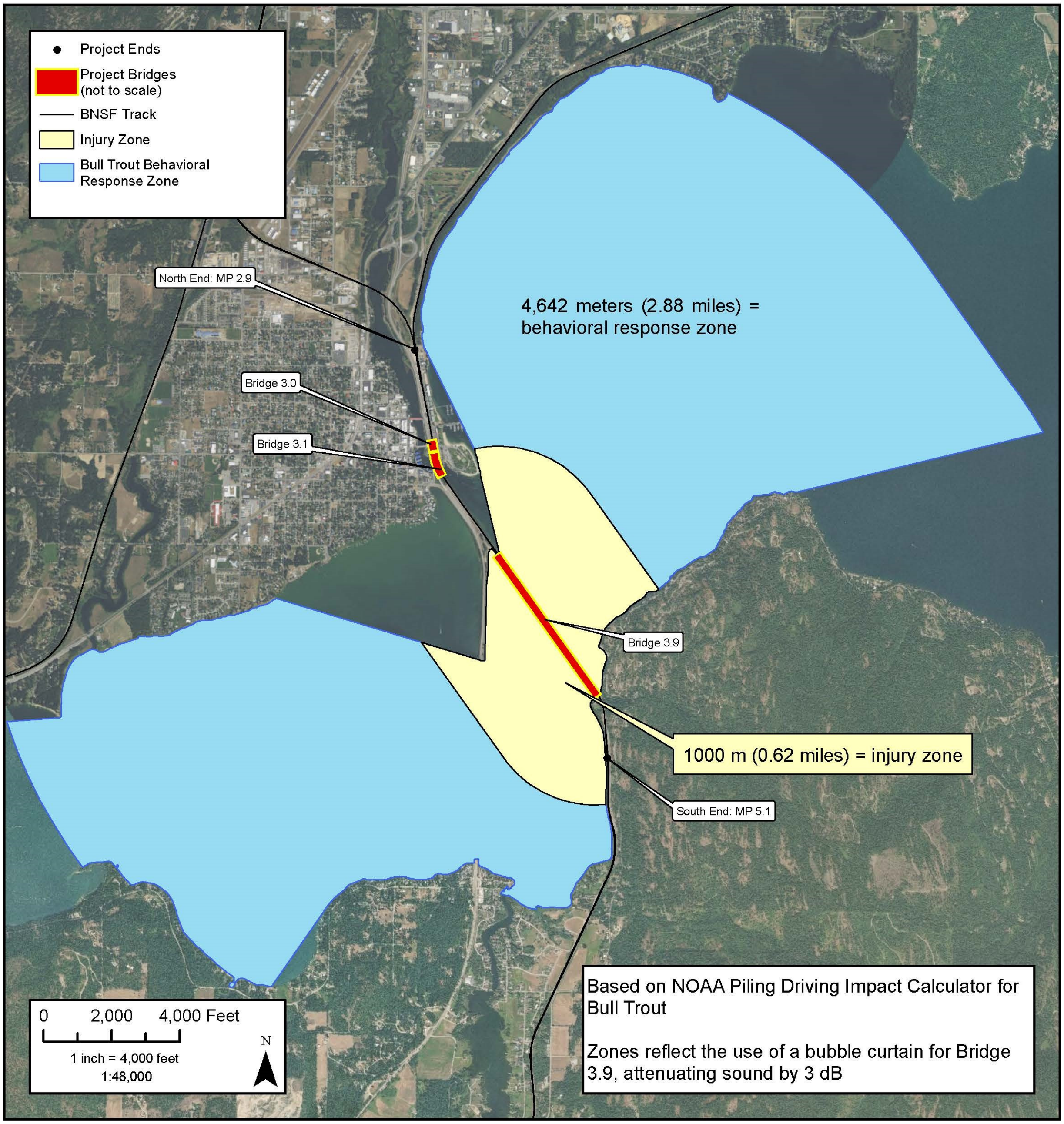
Activities included in the proposed action may result in suspended sediment above background levels as a result of excavation or fill placement below or adjacent to the OHWM/MHHW, runoff from areas with disturbed riparian vegetation, placement of rip-rap, and pile driving and removal. BNSF would employ BMPs and minimization measures to minimize the production of suspended sediment.

Increases in turbidity from the proposed action would largely be temporary and localized in nature. Sediment from disturbed riparian areas would occur only until the sites are stabilized or new vegetation grows. Placement of nearshore fill is proposed during low/no water conditions to reduce sedimentation and turbidity impacts. However, when water levels increase during the high water season, loose sediments from newly placed nearshore fills can temporarily increase turbidity in a localized area. Sediments resuspended from pile driving would continue for only a short period after driving is completed, and would occur only in a small area surrounding the pile being driven or removed. When possible turbidity curtains would be utilized.

Salmonids typically avoid areas with higher suspended sediment, which can mean that they displace themselves from their preferred habitats in order to seek areas with less suspended sediment. Fish unable to avoid suspended sediment can experience adverse effects. The severity of effect of suspended sediment increases as a function of the sediment concentration and exposure time (Newcombe and Jensen 1996; Bash et al. 2001). Suspended sediments can cause sublethal effects such as elevated blood sugars and cough rates (Servizi and Martens 1991), physiological stress, and reduced growth rates.

Elevated turbidity levels can reduce the ability of salmonids to detect prey, cause gill damage (Sigler et al. 1984; Lloyd et al. 1987; Bash et al. 2001), and cause juvenile steelhead to leave rearing areas (Sigler et al. 1984). Additionally, short-term pulses of suspended sediment influence territorial, gill-flaring, and feeding behavior of salmon under laboratory conditions (Berg and Northcote 1985). Adult and larger juvenile salmonids appear to be little affected by

Figure 8: Bull Trout Threshold Distances



the high concentrations of suspended sediments that occur during storm and snowmelt runoff episodes (Bjornn and Reiser 1991). However, research indicates that chronic exposure can cause physiological stress responses that can increase maintenance energy and reduce feeding and growth (Lloyd et al. 1987; Servizi and Martens 1991).

While pile driving itself typically generates localized sediment displacement, the use of air bubble curtains can mobilize a higher level of sediment and increase localized areas of turbidity within the action area temporarily. Removal of piles for the temporary work bridges also could result in localized turbidity increases. The level of turbidity within several meters of construction is likely to exceed natural background levels. Turbidity can cause stress responses in bull trout, such as gill flaring, coughing, avoidance, and an increase in blood sugar levels. However, moderate levels of turbidity can also reduce vulnerability to predators due to a camouflaging effect (USFWS 2015b).

Turbidity impacts would be reduced by utilizing turbidity curtains during impact driving of the piles for the new, permanent Bridges 3.1 and 3.9 while bubble curtains are in use, and where appropriate when bubble curtains are not being used. They would also be used when removing piles for the temporary work bridge over LPO, and where possible for the temporary work bridge over Sand Creek. Turbidity curtains are expected to limit the extent and magnitude of sediment transport. Additionally, the potential of bull trout remaining in the construction area would be low due to the activity and noise avoidance. Therefore, turbidity is not expected to result in significant effects to bull trout.

Contaminant Mobilization

Potential contaminants in lakebed sediments could include mercury (LPO and Sand Creek are listed as mercury-impaired), and arsenic, cadmium, copper, lead, and zinc primarily from legacy discharges from mining and smelting in the headwaters of Montana’s Clark Fork River. The Clark Fork River contributes approximately 92 percent of the annual inflow to the lake and most of the annual suspended sediment load, however these contaminants are not considered to be a limiting factor to bull trout populations.

Concentrations of Clark Fork River bed-sediment metals decrease exponentially with distance downstream away from mining (Axtmann 1990). No sediment studies were conducted in the Project vicinity; however, a study done for the Clark Fork Delta restoration project (approximately 16 miles upstream of the Project) detected metal concentrations (cadmium, copper, mercury and zinc) exceeding the USEPA’s SEF Interim Freshwater SL1 Concentrations in 13 of 103 samples collected at 10 of 33 sampling locations; 8 of the 13 contaminated samples were at depths between 1.5 and 2.5 feet (**Appendix G**; GeoEngineers 2014).

Construction of permanent and temporary work bridges creates the potential risk of construction materials or construction equipment fluids (fuel, oil, hydraulic fluid, antifreeze, etc.) entering open waters. Exposure to high levels of petroleum-based products can cause toxicity to bull trout and chronic lethal and sublethal effects to a wide range of aquatic organisms. Spills of wet concrete into water can potentially result in temporary localized increases in pH levels. The risk to aquatic life depends on the type of contaminant, the time of year, the amount of material spilled or leaked, and the effectiveness of containment materials (USFWS 2015b).

Implementation of BMPs/minimization measures such as containment systems installed under the construction and permanent bridges to capture potential falling construction materials or debris, spill prevention planning and staging, proper storage and handling of fluids, and equipment monitoring and maintenance, are all proposed to be implemented to reduce potential impacts to water quality and bull trout.

As discussed under Sedimentation/Turbidity above, pile removal has the ability to increase turbidity. If contaminated sediments are present within the pile driving area, there is a potential for resuspension of these particles. The use of turbidity curtains is proposed and would help contain suspended sediments to a localized area. If a fish is within the vicinity of pile removal activities during sediment resuspension, there is a potential for exposure.

Depending on the type of metal and its concentration when remobilized in the water column, potential effects to bull trout can range from coughing and neurotoxicity to adverse growth and behavior impacts. Potential effects to bull trout critical habitat include effects to water quality and an adequate prey base, since metals bioaccumulate in adult piscivorous fish such as bull trout. However, these effects are primarily associated with chronic exposure and/or very high levels of acute exposure (USFWS 2015d).

BMPs that would be utilized to contain and control potential remobilization of contaminated sediments during pile removal include slowly vibrating the piles out of the lakebed and using turbidity curtains around each pile or bent being removed; curtains would be anchored to the lakebed for total water column seal and tied off to withstand maximum current conditions. Should turbidity occur, it would be of short duration and contained within the turbidity curtain until sediments have settled.

Nearshore Fill Placement

The Project action would consist of a filling 0.88 acre of permanent nearshore area and 0.38 acre of temporary nearshore area below the jurisdictional ordinary high water mark elevation of 2,062.5 feet, associated with bridge abutments and the south switch. Fills result in both temporary and permanent habitat loss.

The LPO water level is slowly brought up about 5 feet in the month of April through a release from the upstream dam, 4 feet in the month of May and, 2 to 2.5 feet by mid-June. Sometimes USACE engages their “flexible winter operations” which could fluctuate the lake level 1-5 feet multiple times during the winter (Jacobs 2018c). When water levels increase during the high water season, loose sediments from newly placed nearshore fills can temporarily increase turbidity in a localized area.

Riparian Vegetation Removal

Shoreline development at both ends of Bridge 3.9 has reduced shoreline vegetation and LWD recruitment, displaced willow habitat, and altered wave and scour patterns adjacent to new shoreline structures. Removal of riparian vegetation can increase water temperature and reduce the supply of terrestrial insects. Removal of riparian trees also reduces the potential for LWD recruitment that contributes to production of invertebrate prey for bull trout (USFWS 2015b). Removal of existing shoreline vegetation would be limited to the minimum necessary for construction of the Project.

During construction and prior to post-construction revegetation, there would temporarily be a loss of vegetation within the project construction and staging areas. Overall water temperature and LWD recruitment in LPO would not be affected, and removal of localized existing vegetation would be insignificant relative to the total amount of shoreline and riparian vegetation currently remaining in LPO and the Project area.

Indirect Effects

Indirect effects are those impacts that are caused by the action and occur later in time (after the action is completed) but are still reasonably certain to occur. There may be permanent indirect effects to bull trout due to the potential for increased predation associated with the increased shading and additional pier hiding habitat from Bridge 3.9 after construction. Non-pollution generating stormwater would flow through the bridge as it does on the existing bridge. Water captured in the deck tubs would run off through scuppers or along the bents. The water would remain within the same subbasin and therefore would not result in a hydrologic affect.

Long-Term Habitat Loss or Alteration

LPO provides FMO habitat for bull trout. The Project would construct a new railroad bridge over LPO that would require driving 288 permanent 36-inch-diameter steel piles and up to 700 temporary 24-inch-diameter piles into the lakebed. This would result in a permanent loss of 2,036 square feet of benthic habitat, and a temporary loss of 2,200 square feet of benthic habitat (the area where the piles are installed). The Project action would also consist of a filling 0.88 acre of permanent nearshore area and 0.38 acre of temporary nearshore area below the jurisdictional ordinary high water mark elevation of 2,062.5 feet, associated with bridge abutments and the south switch. Given the footprint of the Project where permanent benthic habitat would be lost relative to the total benthic habitat available in LPO, the effects to benthic habitat are expected to be discountable.

Predator/Prey Relationships

Bridge 3.9 over LPO would result in additional shading (low level) and additional pier hiding habitat (moderate). Both have the potential to create rearing and ambush habitat for native and non-native fish species that prey on subadult bull trout. Smallmouth bass and largemouth bass are two predator fish in the action area that have a strong affinity to habitat structures including bridges and pilings (USFWS 2015b).

Based on the presence of bull trout and predators in the action area, and the additional shading and structure created by the new Bridge 3.9, there is a potential for increased predation of subadult bull trout. Bull trout in the action area are migratory and use the area for foraging and overwintering. However, only subadult bull trout are susceptible to increased predation. While the number of subadult bull trout in the action area potentially lost to predation cannot be quantified, the overall robust LPO bull trout population is not expected to be adversely affected.

Bridge Shading

The area shaded by the permanent Bridge 3.9 over LPO is very small compared to the total surface area of the lake (approximately two acres out of a total of 94,720 acres LPO surface area). Similarly, the LPO temporary work bridge is also very small compared to the surface area of the lake (approximately four acres out of a total of 94,720 acres LPO surface area). Additionally, both bridges were designed at elevations that minimize shading impacts. Fish of all species would need to navigate around pile and may have slight behavioral changes due to new structures and a change in shading patterns. However, overall, the bridge shading is not anticipated to substantially affect movement, migration or predation.

Effects to Bull Trout Designated Critical Habitat

The nine bull trout PCEs and a baseline of the existing PCE conditions within the project area are discussed under the Effects to Bull Trout Designated Critical Habitat section. This section provides an analysis of the Project's effects on each individual PCE herein.

The Project would not impact water levels or subsurface water connectivity as no actions are proposed that would substantially reduce water levels or interrupt water connectivity. Placement of temporary and permanent nearshore fills would result in insignificant impacts to PCE 1.

While the new, permanent Bridge 3.9 over LPO would have new in-water piers, these would not be partial or complete fish barriers to bull trout migration in the Project action area. There would be fewer piers supporting the new Bridge 3.9 compared to the existing bridge, and the new bridge piers would align approximately with every other pier of the existing bridge. Spacing between piers for the new bridge ranges from approximately 65 feet to 93 feet. However, pile driving during bull trout migratory periods in the spring and fall may affect bull trout migration in LPO. While most bull trout migrations are nocturnal and occur within the first few hours of darkness, there may be isolated instances of bull trout attempting to migrate during daylight transition times (early morning/early evening hours) when construction work could be starting or ending. Sound pressure impacts above behavior disturbance are unavoidable. Since the project would impact behavior within a migratory zone for an extended duration of 620 hours over a 2-year period; the project would have adverse impacts to PCE 2.

The Project would not contribute to current temperature or dissolved gas water quality impairments in the action area. Existing temperature and dissolved gas impairments are in the Pend Oreille River, approximately 2.7 miles west/downstream of Bridge 3.9. Removal of temporary piles for Bridges 3.1 and 3.9 work bridges may result in short-term, spatially-limited sedimentation/turbidity in Sand Creek and LPO, and could also remobilize contaminated sediments if present. Sand Creek and LPO are both listed as impaired by mercury, which may be present in bottom sediments. Turbidity curtains would be used during in-water pile removal, which would limit the extent and duration of sedimentation and potential remobilization of contaminants; therefore, the project would result in insignificant water quality impacts associated with PCE 2.

The Project may impact predator/prey relationships at the Bridge 3.9 permanent bridge and temporary work bridge due to the presence of more underwater structures that provide ambush habitat for native and non-native fish species that prey on sub-adult bull trout. Temporary turbidity during construction, and/or placement of nearshore fills, could impact access to macroinvertebrates in a localized area. Limited vegetation removal would not substantially change the availability of riparian organisms due to the existing low-quality nearshore habitat in the Project area; therefore, the project would have insignificant impacts on PCE 3.

The Project would not change substrates or the presence of side channels. The Project would not change the depths, velocities or channels of Sand Creek or LPO. Sand Creek gradient would not be modified. The placement of pile within Sand Creek and piles and fill within LPO would result in insignificant impacts to PCE 4. The Project would not change water temperatures or the amount of thermal refugia currently available in LPO.

The new Bridge 3.9 and the temporary work bridge were designed to match the elevation of the existing and are at sufficient elevations to allow penetration of sunlight during most of the day and would not be expected to affect existing surface water temperatures. LPO stratifies in the summer and bull trout would be expected to occupy the deeper, colder waters below the thermocline during the daytime. Therefore, there would be no expected change in the amount of available thermal refugia in the action area. Additionally, a relatively small amount of riparian vegetation would need to be removed in areas needed for construction of bridge abutments and at the south switch. The limited amount of riparian vegetation removal would not substantially impact water temperatures and, therefore, would have an insignificant impact to PCE 5.

There would be no effect on PCE 6 since spawning and rearing habitat do not occur within the project vicinity or action area. The Project would have no or insignificant impacts to PCE 7 as placement of temporary and permanent nearshore fills would result in insignificant impacts to the natural or controlled hydrograph. The Project would not impact water quantity as there is no change in water inputs. The Project may impact water quality associated with PCE 8, due to sedimentation during nearshore fill placements and temporary fill removals, and during bridge pile installations and temporary work bridge pile removals. Pile removal in LPO could also potentially remobilize contaminated sediments. The areas of temporary increases in suspended sediments are insignificant when compared to the size of LPO and the available critical habitat.

The Project would not introduce new predatory, inbreeding or competitive species. However, Bridge 3.9 new permanent and temporary work bridges may provide additional ambush habitat for native and non-native fish species that prey on subadult bull trout. New underwater pier structures for the new bridge in LPO may alter predator/prey relationships due to the presence of more structures that provide ambush habitat for native and non-native fish species that prey on sub-adult bull trout. These altered relationships would occur year-round since sub-adult bull trout are present in the lake year-round and do not migrate to/from SR tributaries until they are sexually mature. The new predator habitat would be relatively small compared to the size of the lake; the Project’s effect on PCE 9 would be insignificant.

The Exposure Table in **Appendix H** displays Project effects on population and habitat indicators.

Interrelated and Interdependent Actions and Activities

Per 50 CFR 402.33(a)(2)(iii), interrelated or interdependent actions should be assessed and considered when providing a determination. Interrelated or interdependent actions associated with the project include staging areas which require temporary nearshore fills and temporary clearing and grading which require removal of riparian vegetation. These actions and impacts are fully reviewed in the Direct and Indirect Analysis of Effect sections.

Cumulative Effects

Cumulative effects are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the ESA.

Though the information and activities presented below do not directly occur within the Project action area, they are provided to assist USFWS with preparation of the Biological Opinion and to help in tracking the environmental conditions throughout a general area. These actions are assumed to continue at this level of effort for the foreseeable future.

Non-Native Fish Suppression

Lake Trout

Appendix F5 of the Avista CFSA has provided funding to IDFG for suppression of lake trout via the LPO Trap and Gill Net Program and the LPO Angler Incentive Program since 2006. The goal of these programs is to reduce predator abundance and increase kokanee numbers, and these programs have removed more than 216,000 lake trout from 2006 through 2017 (Avista 2017).

Annual CFSA Implementation Reports to the Federal Energy Regulatory Commission (FERC) document the number of lake trout removed from LPO and the resulting response in bull trout and kokanee abundance for both programs, well as the amount of bull trout take and mortalities associated with the Trap and Gill Net Program. Information from the two most recent years is noted below (Avista 2016, 2017).

2016

Angler Incentive Program

- Lake trout removed – 2,871

Trap and Gill Net Program

- Lake trout removed - 7,185
- Bull trout take – 1,612
- Bull trout mortalities – 549

Bull Trout/Kokanee Response

- Kokanee abundance estimates remained high for the fourth consecutive year.
- Total kokanee abundance for all age classes was 64 percent higher than in 2012 and over 2.5 times higher than the low point of abundance in 2008.
- Trap net catch rates for bull trout abundance estimates have almost doubled since 2007

2017

Angler Incentive Program

- Lake trout removed – 3,531

Trap and Gill Net Program

- Lake trout removed - 7,216
- Bull trout take – 1,418
- Bull trout mortalities – 442

Bull Trout/Kokanee Response

- Kokanee abundance estimates remained high for the fifth consecutive year.
- Total kokanee abundance remains over 2.5 times higher than the low point of abundance in 2008 and is at the highest levels since the programs began in 2006.
- Trap net catch rates for bull trout abundance estimates have more than doubled since 2007 and were only slightly less than the record high rates of 2016.

Walleye

- Avista is also providing research CFSA funding to IDFG for a walleye suppression feasibility study. In 2017, walleye were tagged and released, and the first year of a three-year removal plan began in 2018. Information from this effort is noted below. Fished Pack River delta, Clark Fork River delta, and LPO north shore between Bridge 3.9 and US 95 long bridge.
- Fished only one day between Bridge 3.9 and the US 95 long bridge due to lake currents on April 23, 2018.
- No bull trout caught at bridges; caught 148 walleye.
- Clark Fork River delta (4/25-4/26) – 15 bull trout caught, 8 mortalities; caught 81 walleye.
- Pack River delta (4/24) – 12 bull trout caught, 3 mortalities; caught 163 walleye.
- Totals (including earlier 4/16-4/20 effort): 31 bull trout caught; 14 mortalities.

Fish Passage Projects

- USACE Albeni Falls Dam Fish Passage Project (Pend Oreille River):
  - Would allow bull trout that currently migrate downstream of Albeni Falls Dam to get back upstream to access LPO FMO habitat.
  - Would increase number of bull trout migrating from the Pend Oreille River to LPO and restore connectivity in the LPO bull trout core recovery area.
  - Earliest construction anticipated in 2022.

- Pend Oreille County Public Utility District Box Canyon Fish Passage Project (Pend Oreille River):
    - Would facilitate upstream passage of fish greater than 4 inches (Albeni Falls is the next upstream dam).
    - Ongoing construction to be complete in July 2018.
- Avista Cabinet Gorge Dam Fish Passage Facility (Clark Fork River):
    - Would construct a new facility to transport native migratory salmonids, with a focus on upstream transport of bull trout to tributaries in Montana to restore connectivity in the LPO bull trout core recovery area.
    - Construction to begin in fall 2018.
    - Current trap and haul passage of bull trout at Cabinet Gorge Dam passed 903 bull trout (4 mortalities) in 2016–2017.

The projects noted above are anticipated to benefit bull trout. At this time, there are no other known state, tribal or private actions that are certain to occur in the action area, other than additional private docks may be constructed along the LPO and Pend Oreille River shorelines within the action area. These docks are not anticipated to alter any measurable amount of shoreline within the Project action area. Overall, non-associated projects are not anticipated to result in overall negative impacts to bull trout.

Conclusions and Effect Determinations

Bull Trout

Bull trout activity and migration primarily occur at night (after sunset and before sunrise). In addition, bull trout typically utilize the deepest and coldest portions of lake environments. Project construction would occur during daylight within the shallowest portion of LPO. Bull trout impact minimization measures include the use of an air bubble curtain during the pile driving at the new permanent bridges; use of open-ended piles to reduce pile driving durations; the use of turbidity curtains during impact pile driving at the new permanent bridges and during removal of the temporary bridge piles; and turbidity curtains and a containment system would be installed under the construction bridges to capture potential falling construction materials or debris.

The Project **May Affect bull trout** because:

- The action area includes LPO and a portion of the mouth of Sand Creek.
- Bull trout have been documented in LPO and the Pend Oreille River.
- Both adult and subadult bull trout may utilize the action area at any given time, especially during spring and fall migration periods when movement through the area is higher.
- Year-round, in-water work is proposed.
- The Project includes installation of piles with a vibratory driver and impact hammer, which increases baseline underwater SPLs.
- The Project would occur over an approximate 3- to 3.5-year time period.

The Project is **Likely to Adversely Affect bull trout** because:

- Underwater noise levels from pile driving would exceed the injury threshold within 0.62 mile of Project actions.
- Underwater SPLs would exceed the behavioral disturbance threshold within 2.88 miles of Project actions.
- Increased SPLs may delay movements and migration of bull trout for 3 years; due to 2 years of impact and vibratory pile driving, and an additional year of vibratory pile driving.
- The Project would increase sedimentation and turbidity in the immediate vicinity of the pile driving actions.
- The Project has the potential to mobilize contaminants in the immediate vicinity of the pile driving actions.
- The Project may result in increased predation of subadult bull trout due to creation of additional predator ambush habitat at the piers.

Bull Trout – Designated Critical Habitat

There are 9 bull trout PCEs used to determine critical habitat. The regulated PCEs and a baseline of the existing PCE conditions within the Project area are discussed under the Bull Trout Designated Critical Habitat section. A full description of Project affects to each PCE is presented in the Effects to Bull Trout Designated Critical Habitat section.

PCE 1, 3, 4, 5, 7, 8 and 9 are present within the action area and may be affected; however, effects to these PCEs are insignificant or discountable per the reasons below. There would be no effect on PCE 6 since spawning and rearing habitat do not occur within the Project vicinity or action area. The Project is likely to adversely affect PCE 2 (migratory habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and freshwater and marine foraging habitats, including, but not limited to permanent, partial, intermittent or seasonal barriers). Therefore, the overall effect determination for bull trout Critical Habitat is Likely to Adversely Affect.

The Project May Affect PCEs 1, 3, 4, 5, 7, 8 and 9 because:

- These PCEs are present in the action area.
- The Project results in minor changes to shading patterns.
- The Project results in temporary increases in turbidity.
- The Project would cause elevated underwater SPLs during migration.
- The Project requires temporary and permanent nearshore fill.

These affects are insignificant or discountable because:

- Bull trout critical habitat in the action area is small compared to the over 94,000 acres of habitat designated in LPO and the Pend Oreille River.
- No bull trout spawning habitat occurs in the action area.
- Bull trout foraging or rearing habitat would not be degraded by the Project.
- Project impacts would not extend to any critical habitat in LPO SR tributaries.
- The contractor would implement BMPs and other minimization and mitigation measures outlined previously, and additional conservation measures or conditions required by the regulatory agencies.

Overall, **the Project is Likely to Adversely Affect bull trout critical habitat** because

- The Project action area is within designated critical habitat for bull trout.
- Elevated SPLs are likely to impact migration behaviors due to avoidance of the project area during 2 years of impact and vibratory pile driving, and an additional year of vibratory pile driving.

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_______. 2015b. *Biological Opinion for the Regional General Permit 27 – Lake Pend Oreille and Pend Oreille River*. Project Number: 01EIFW00-2015-0125. Northern Idaho Field Office, Spokane Valley, WA. February.

_______. 2015c. *Columbia Headwaters Recovery Unit Implementation Plan for Bull Trout (Salvelinus confluentus).* Prepared by Montana Ecological Services Office and Northern Idaho/Eastern Washington Field Office. September.

_______. 2015d. Biological Opinion for the Idaho Water Quality Standards for Numeric Water Quality Criteria for Toxic Pollutants. Idaho Fish and Wildlife Office, Boise, Idaho. June 25.

_______. n.d. Environmental Conservation Online System (ECOS). Species Profile for Bull Trout at https://ecos.fws.gov/ecp0/profile/speciesProfile?sId=8212#status. Accessed September 1, 2017.

_______. n.d. Washington Fish and Wildlife Office. Bull Trout information at https://www.fws.gov/wafwo/articles.cfm?id=149489585. Accessed September 21, 2017.

_______. 2017a. Telephone conversation and emails with attachments regarding preferred documents for use in preparing bull trout biological assessments. From Benjamin Matibag, Fisheries Biologist, Idaho Fish and Wildlife Office, Boise, Idaho. To Diane Williams, Environmental Planner, Jacobs. August 15 and September 25.

———. 2017b. Telephone communications regarding bull trout in Project area and impact assessment and email communication regarding work windows with attachment regarding recent USFWS bull trout biological opinion in Project area between Marshall Williams, Fish and Wildlife Biologist, Eastern Washington/Northern Idaho Field Office, Spokane, Washington, and Diane Williams, Environmental Planner, Jacobs. October 2 through 11 and November 1.

_____. 2018. Email communication noting that Bridge 3.1 is in bull trout critical habitat per federal designation of lower Sand Creek as an inlet of Lake Pend Oreille; between Marshall Williams, Fish and Wildlife Biologist, Eastern Washington/Northern Idaho Field Office, and USCG, USACE, IDEQ, and Jacobs. June 7.

Washington State Department of Transportation (WSDOT). 2018. *Biological Assessment Preparation – Advanced Training Manual Version August-2018*.

_____. n.d. Pile Strike Summary Table at https://www.wsdot.wa.gov/NR/rdonlyres/42F72E68-C26D-4C61-8741-121050313200/0/BA_PileStrikeSummaryTable.pdf; accessed November 24, 2017.

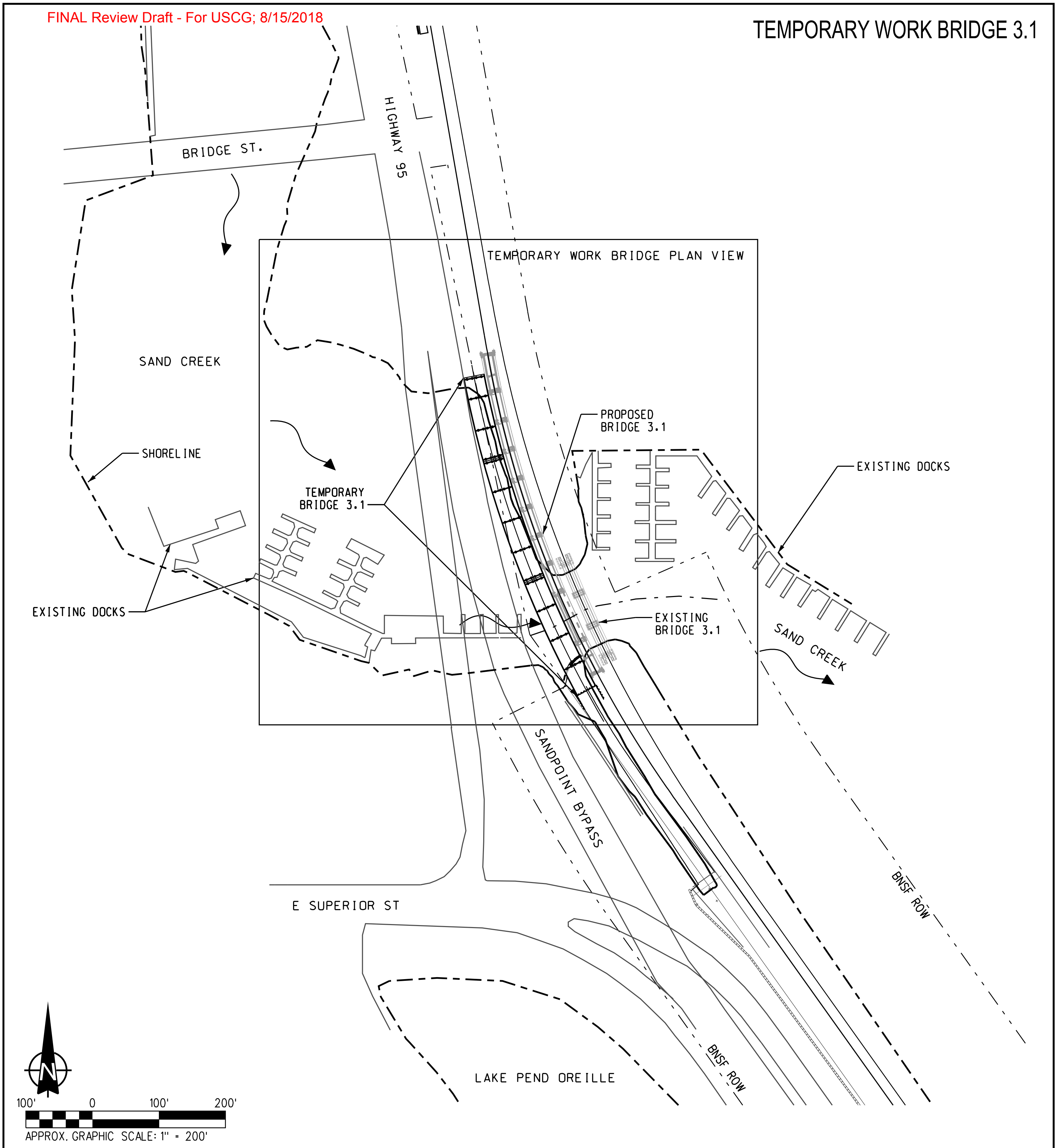
Valencia Wetlands Trust. 2017. Email communication regarding available wetland bank credits. From D. Collier, Managing Partner. To Diane Williams, Environmental Planner, Jacobs. October 19.

Appendix A

Project Plans

FINAL Review Draft - For USCG; 8/15/2018

TEMPORARY WORK BRIDGE 3.1



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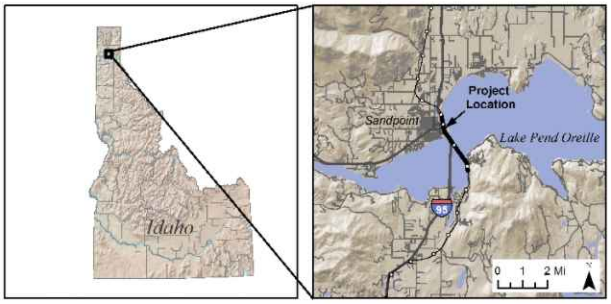

LOCATION / VICINITY MAP

AGENCY REF. NO.:
PROJECT: BNSF / SANDPOINT JUNCTION CONNECTOR BRIDGE 3.1
OWNER: BNSF RAILWAY COMPANY
CONSULTANT: JACOBS ENGINEERING GROUP
LOCATION: BNSF BRIDGE 3.1 MONTANA DIVISION, KOOTENAI RIVER SUB, LINE SEGMENT 45, MP 3.1
MILE POINT OF BRIDGE LOCATION FROM MOUTH: 0.1
WATERWAY: SAND CREEK
CITY: SANDPOINT **COUNTY:** BONNER **STATE:** IDAHO
DATE: 08/07/2018

SHEET 1 OF 4

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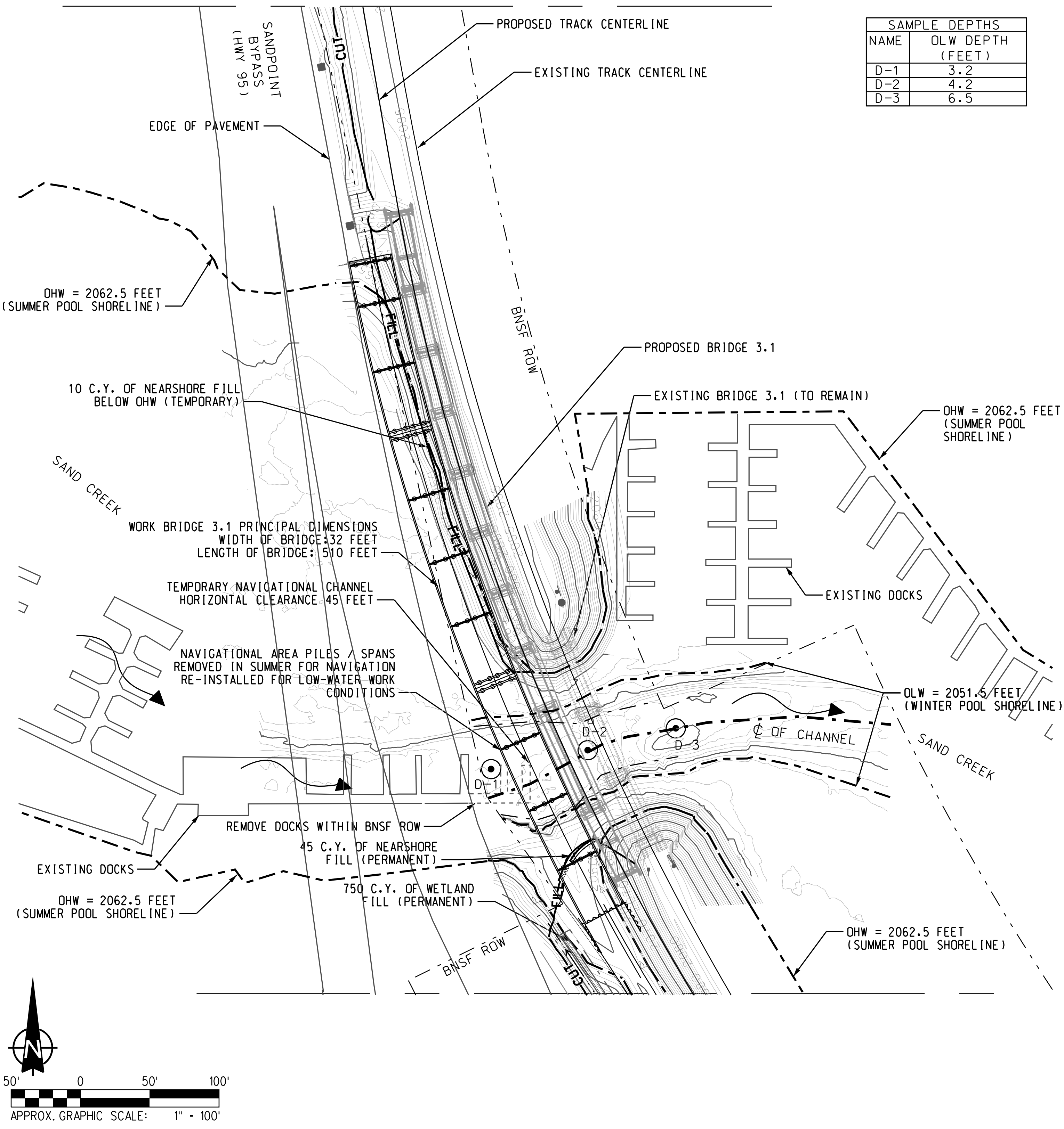
FINAL Review Draft - For USCG; 8/15/2018

PLAN VIEW

TEMPORARY WORK BRIDGE 3.1

SAMPLE DEPTHS	
NAME	OLW DEPTH (FEET)
D-1	3.2
D-2	4.2
D-3	6.5



BASED ON: HANSON PROFESSIONAL SERVICES, INC. PRELIMINARY PLANS. ELEVATIONS ARE RELATIVE TO NAVD88. CONCEPTUAL PLANS UTILIZED TO OBTAIN COAST GUARD BRIDGE PERMIT

LEGEND

— · · —	BNSF RIGHT-OF-WAY (ROW)
— — —	SHORELINE (SUMMER AND WINTER POOL)
— · — ·	CENTERLINE OF NAVIGATIONAL CHANNEL
— — — —	LIMITS OF NAVIGATIONAL CHANNEL
———	STRUCTURE (ROADS, DOCKS)

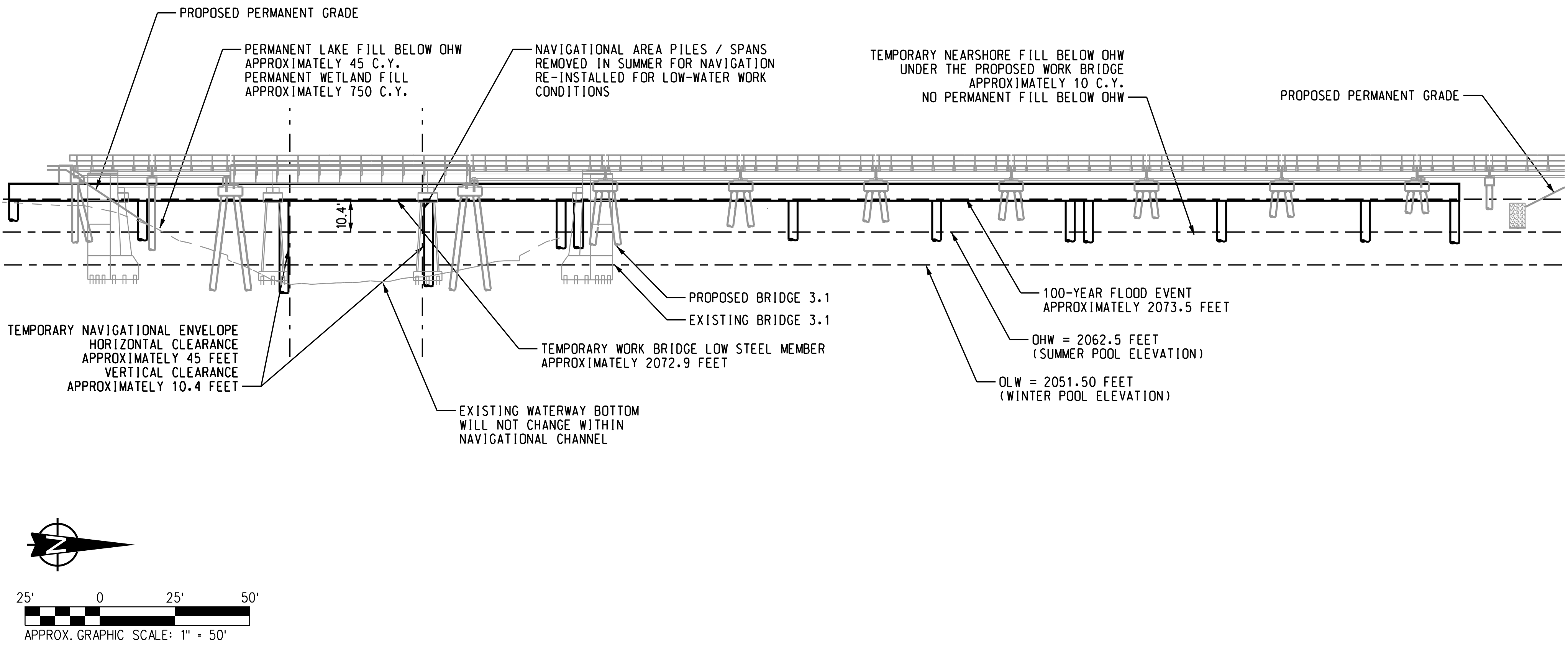
TEMPORARY WORK BRIDGE

AGENCY REF. NO.:
PROJECT: BNSF / SANDPOINT JUNCTION CONNECTOR BRIDGE 3.1
OWNER: BNSF RAILWAY COMPANY
CONSULTANT: JACOBS ENGINEERING GROUP
LOCATION: BNSF BRIDGE 3.1 MONTANA DIVISION, KOOTENAI RIVER SUB, LINE SEGMENT 45, MP 3.1
MILE POINT OF BRIDGE LOCATION FROM MOUTH: 0.1
WATERWAY: SAND CREEK
CITY: SANDPOINT **COUNTY:** BONNER **STATE:** IDAHO
DATE: 08/07/2018

FINAL Review Draft - For USCG; 8/15/2018

ELEVATION VIEW

TEMPORARY WORK BRIDGE 3.1



BASED ON: HANSON PROFESSIONAL SERVICES, INC. PRELIMINARY PLANS. ELEVATIONS ARE RELATIVE TO NAVD88. CONCEPTUAL PLANS UTILIZED TO OBTAIN COAST GUARD BRIDGE PERMIT

LEGEND

— — —— — —	SHORELINE (SUMMER AND WINTER POOL; 100-YEAR FLOOD)
- - —— - ——	LIMITS OF NAVIGATIONAL CHANNEL

TEMPORARY WORK BRIDGE

AGENCY REF. NO.:
PROJECT: BNSF / SANDPOINT JUNCTION CONNECTOR BRIDGE 3.1
OWNER: BNSF RAILWAY COMPANY
CONSULTANT: JACOBS ENGINEERING GROUP
LOCATION: BNSF BRIDGE 3.1 MONTANA DIVISION, KOOTENAI RIVER SUB, LINE SEGMENT 45, MP 3.1
MILE POINT OF BRIDGE LOCATION FROM MOUTH: 0.1
WATERWAY: SAND CREEK
CITY: SANDPOINT **COUNTY:** BONNER **STATE:** IDAHO
DATE: 08/07/2018

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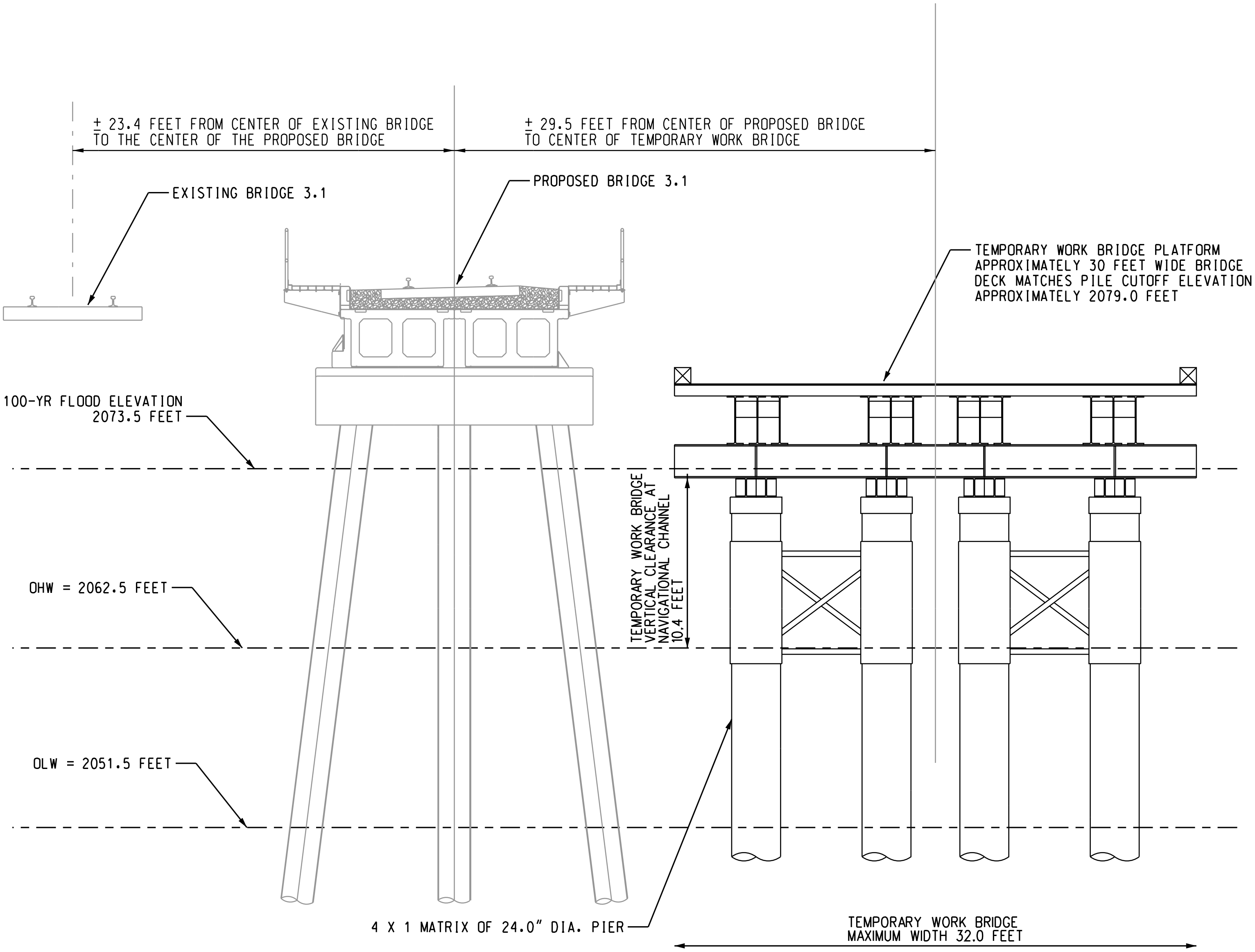
FINAL Review Draft - For USCG; 8/15/2018

TYPICAL SECTION VIEW

TEMPORARY WORK BRIDGE 3.1



APPROX. GRAPHIC SCALE: 1" = 10'

BASED ON: HANSON PROFESSIONAL SERVICES, INC. PRELIMINARY PLANS. ELEVATIONS ARE RELATIVE TO NAVD88. CONCEPTUAL PLANS UTILIZED TO OBTAIN COAST GUARD BRIDGE PERMIT

TEMPORARY WORK BRIDGE

AGENCY REF. NO.:
PROJECT: BNSF / SANDPOINT JUNCTION CONNECTOR BRIDGE 3.1
OWNER: BNSF RAILWAY COMPANY
CONSULTANT: JACOBS ENGINEERING GROUP
LOCATION: BNSF BRIDGE 3.1 MONTANA DIVISION, KOOTENAI RIVER SUB, LINE SEGMENT 45, MP 3.1
MILE POINT OF BRIDGE LOCATION FROM MOUTH: 0.1
WATERWAY: SAND CREEK
CITY: SANDPOINT **COUNTY:** BONNER **STATE:** IDAHO
DATE: 08/07/2018

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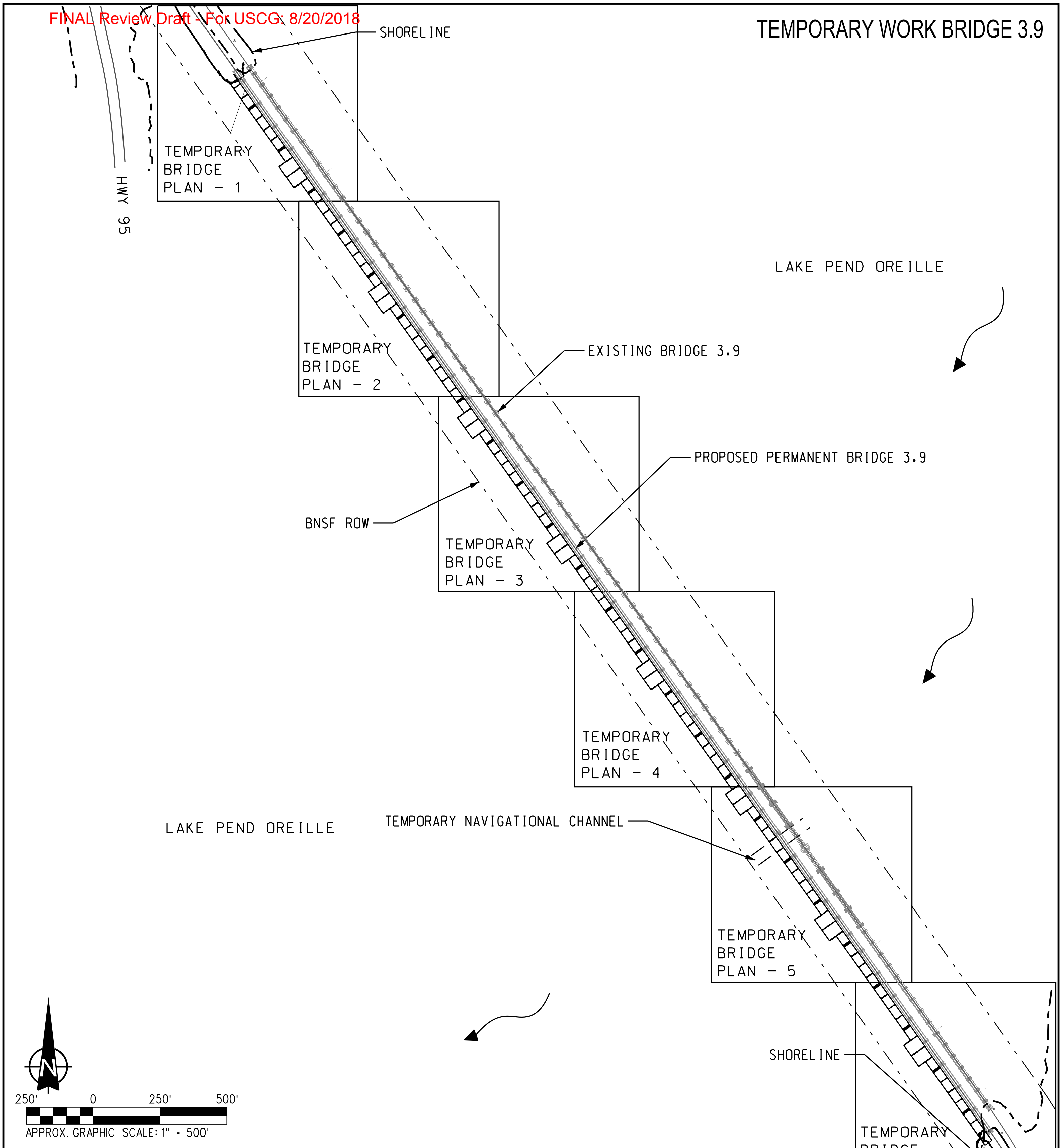
TEMPORARY WORK BRIDGE 3.9



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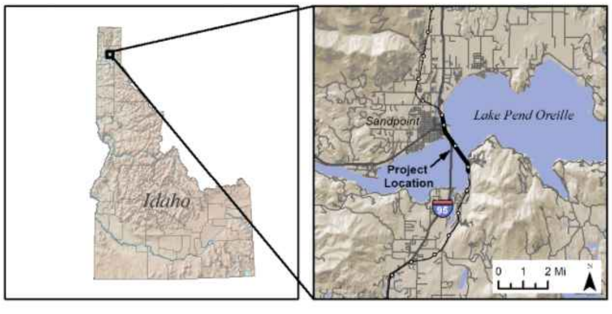
ELEVATIONS ARE RELATIVE TO NAVD88. CONCEPTUAL PLANS UTILIZED TO OBTAIN U.S. COAST GUARD BRIDGE PERMIT



VICINITY / LOCATION MAP

AGENCY REF. NO.:
PROJECT: BNSF / SANDPOINT JUNCTION CONNECTOR BRIDGE 3.9
OWNER: BNSF RAILWAY COMPANY
CONSULTANT: JACOBS ENGINEERING GROUP
LOCATION: BNSF BRIDGE 3.9 MONTANA DIVISION, KOOTENAI RIVER SUB, LINE SEGMENT 45, MP 3.9
MILE POINT OF BRIDGE LOCATION FROM MOUTH: 2.7
WATERWAY: LAKE PEND OREILLE
CITY: SANDPOINT **COUNTY:** BONNER **STATE:** IDAHO
DATE: 08/17/2018

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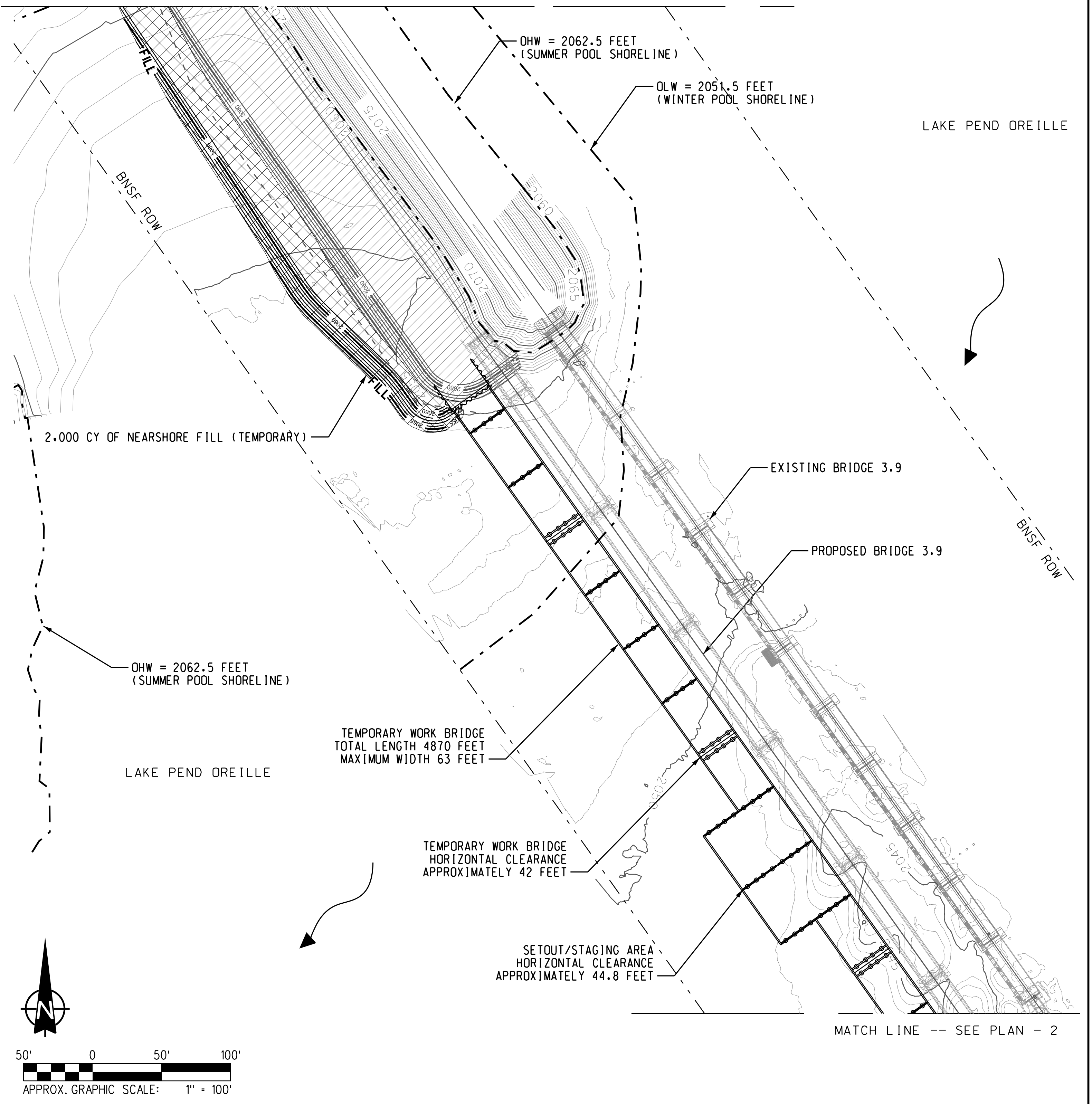
PLAN VIEW - 1

TEMPORARY WORK BRIDGE 3.9



BASED ON: HANSON PROFESSIONAL SERVICES, INC. PRELIMINARY PLANS. ELEVATIONS ARE RELATIVE TO NAVD88. CONCEPTUAL PLANS UTILIZED TO OBTAIN U.S. COAST GUARD BRIDGE PERMIT

LEGEND

— - - — - BNSF RIGHT-OF-WAY (ROW)

– – — – – SHORELINE (SUMMER AND WINTER POOL)

——— STRUCTURE (ROADS, DOCKS)

TEMPORARY WORK BRIDGE

AGENCY REF. NO.:
PROJECT: BNSF / SANDPOINT JUNCTION CONNECTOR BRIDGE 3.9
OWNER: BNSF RAILWAY COMPANY
CONSULTANT: JACOBS ENGINEERING GROUP
LOCATION: BNSF BRIDGE 3.9 MONTANA DIVISION, KOOTENAI RIVER SUB, LINE SEGMENT 45, MP 3.9
MILE POINT OF BRIDGE LOCATION FROM MOUTH: 2.7
WATERWAY: LAKE PEND OREILLE
CITY: SANDPOINT **COUNTY:** BONNER **STATE:** IDAHO
DATE: 08/17/2018

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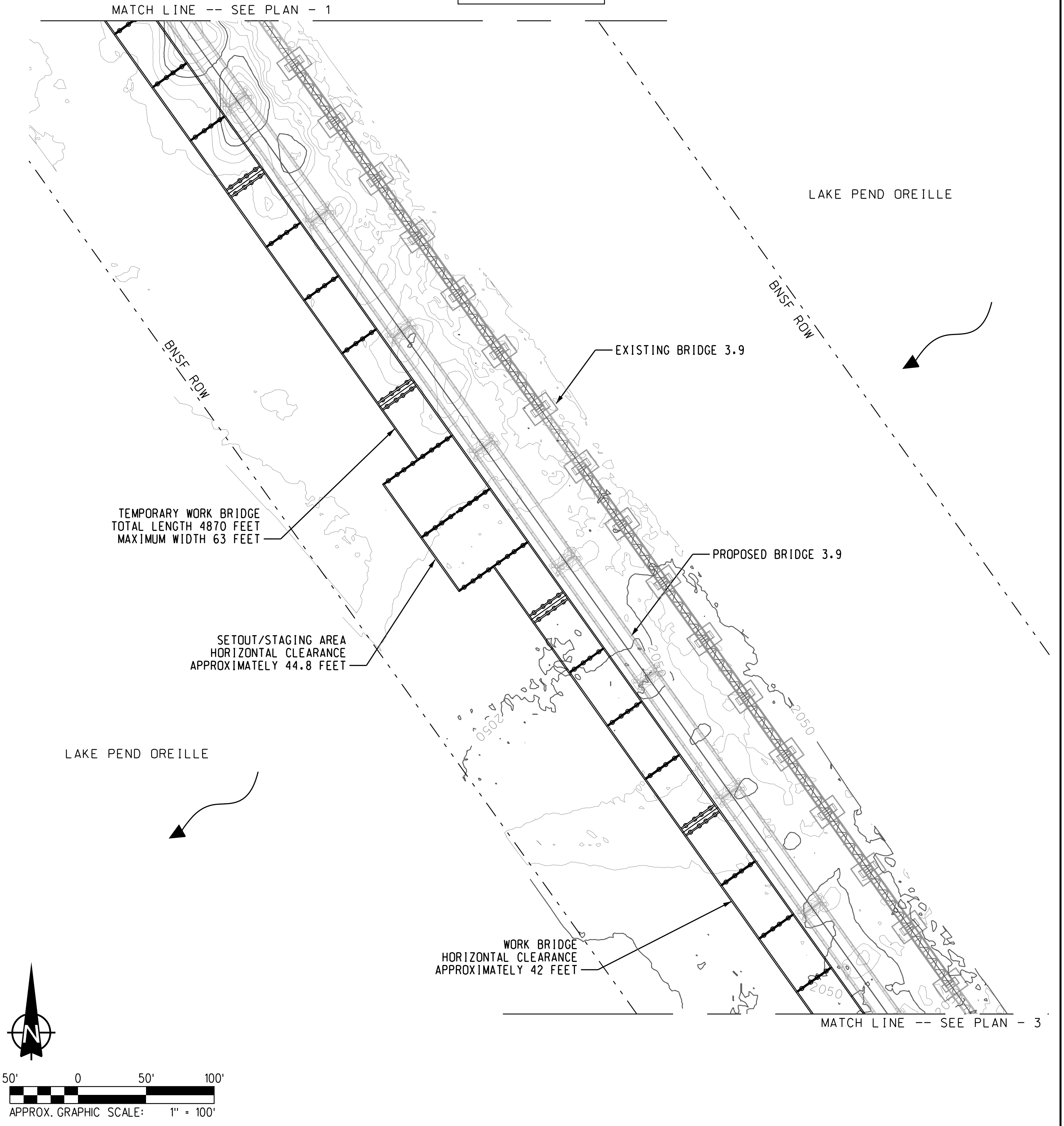
TEMPORARY WORK BRIDGE 3.9

PLAN VIEW - 2



BASED ON: HANSON PROFESSIONAL SERVICES, INC. PRELIMINARY PLANS. ELEVATIONS ARE RELATIVE TO NAVD88. CONCEPTUAL PLANS UTILIZED TO OBTAIN U.S. COAST GUARD BRIDGE PERMIT

LEGEND

— - - — - BNSF RIGHT-OF-WAY (ROW)

TEMPORARY WORK BRIDGE

AGENCY REF. NO.:
PROJECT: BNSF / SANDPOINT JUNCTION CONNECTOR BRIDGE 3.9
OWNER: BNSF RAILWAY COMPANY
CONSULTANT: JACOBS ENGINEERING GROUP
LOCATION: BNSF BRIDGE 3.9 MONTANA DIVISION, KOOTENAI RIVER SUB, LINE SEGMENT 45, MP 3.9
MILE POINT OF BRIDGE LOCATION FROM MOUTH: 2.7
WATERWAY: LAKE PEND OREILLE
CITY: SANDPOINT **COUNTY:** BONNER **STATE:** IDAHO
DATE: 08/17/2018

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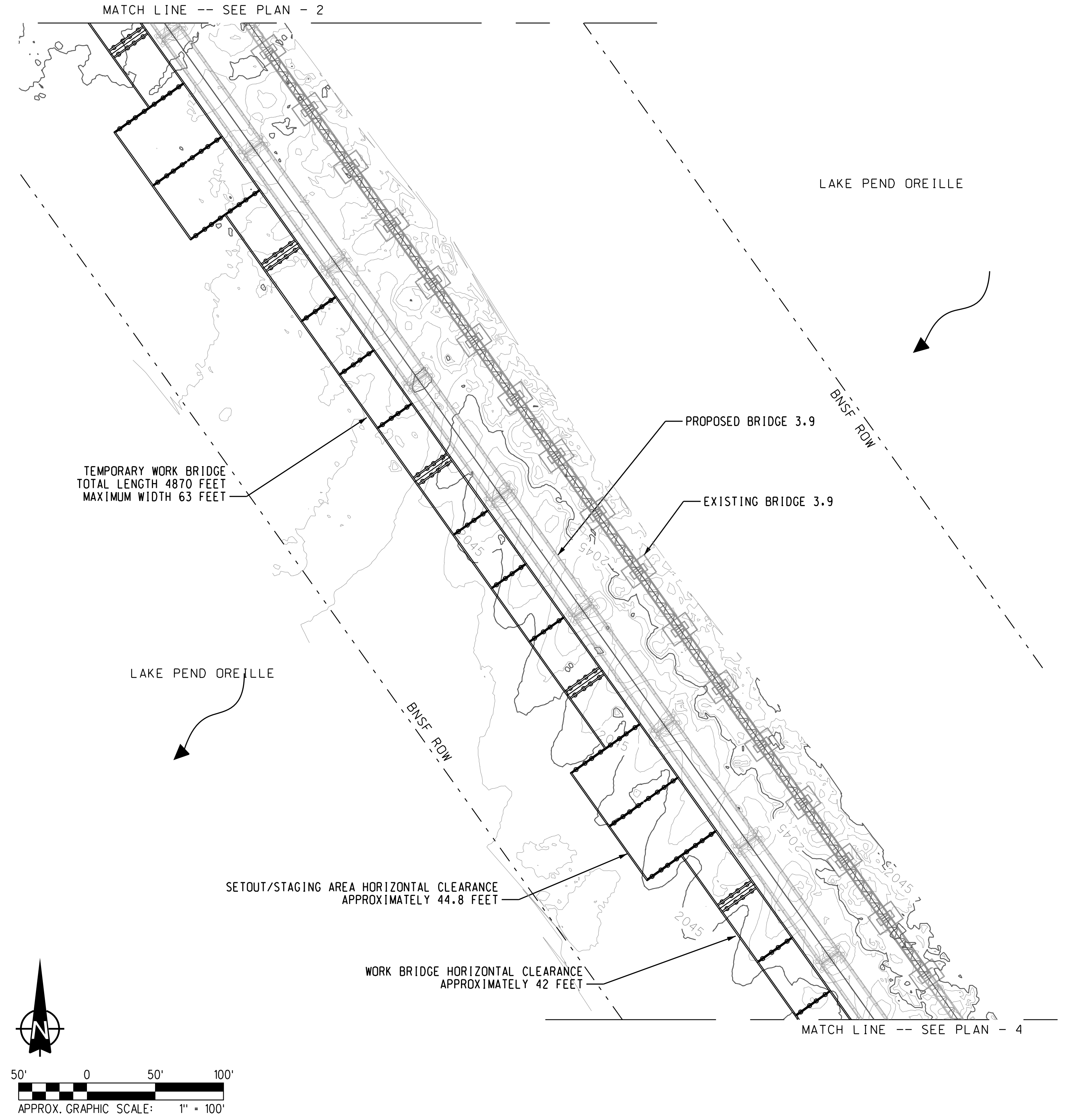
PLAN VIEW - 3

TEMPORARY WORK BRIDGE 3.9



BASED ON: HANSON PROFESSIONAL SERVICES, INC. PRELIMINARY PLANS. ELEVATIONS ARE RELATIVE TO NAVD88. CONCEPTUAL PLANS UTILIZED TO OBTAIN U.S. COAST GUARD BRIDGE PERMIT

LEGEND

— - - — - BNSF RIGHT-OF-WAY (ROW)

TEMPORARY WORK BRIDGE

AGENCY REF. NO.:
PROJECT: BNSF / SANDPOINT JUNCTION CONNECTOR BRIDGE 3.9
OWNER: BNSF RAILWAY COMPANY
CONSULTANT: JACOBS ENGINEERING GROUP
LOCATION: BNSF BRIDGE 3.9 MONTANA DIVISION, KOOTENAI RIVER SUB, LINE SEGMENT 45, MP 3.9
MILE POINT OF BRIDGE LOCATION FROM MOUTH: 2.7
WATERWAY: LAKE PEND OREILLE
CITY: SANDPOINT **COUNTY:** BONNER **STATE:** IDAHO
DATE: 08/17/2018

SHEET 4 OF 11

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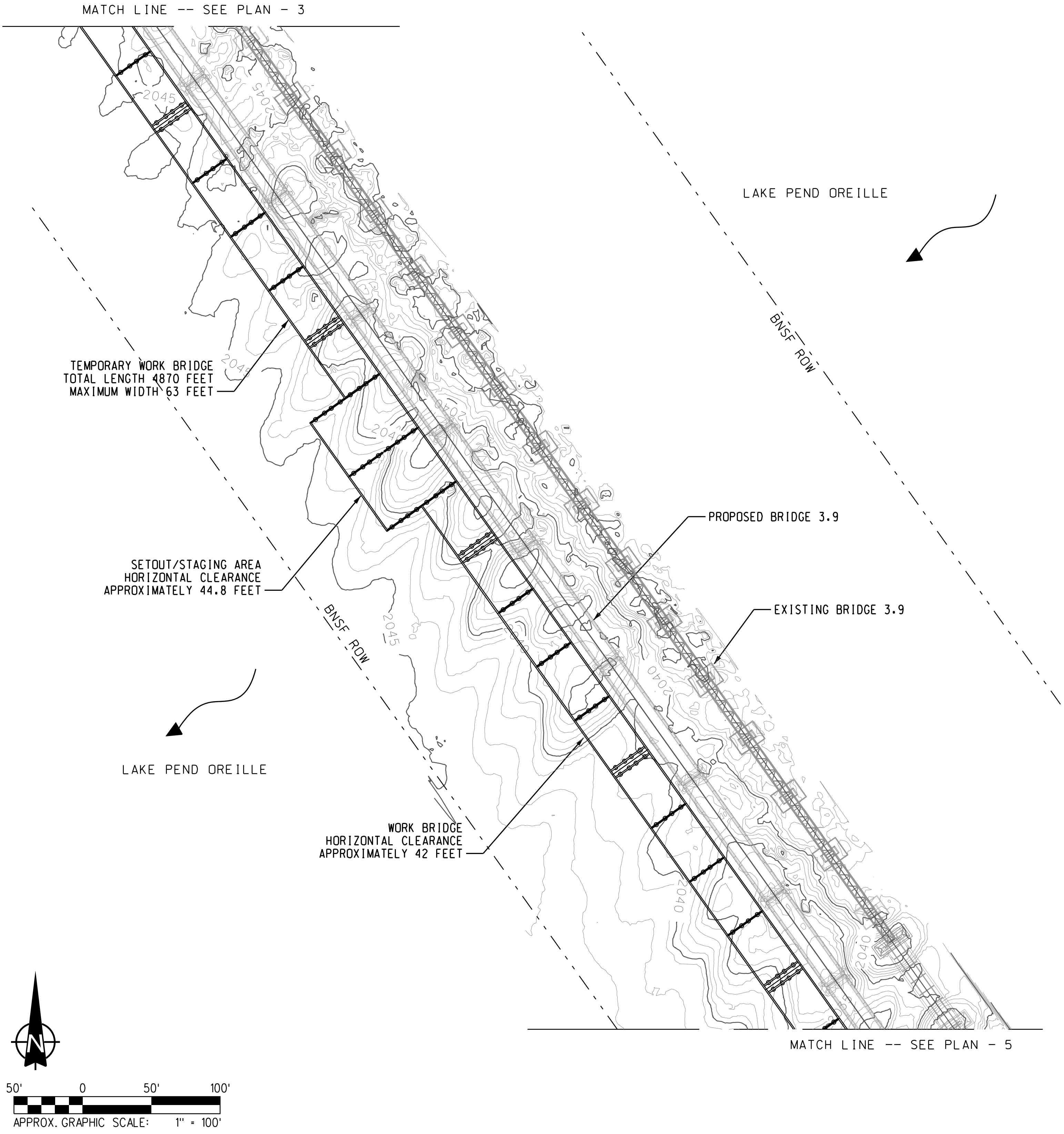
PLAN VIEW - 4

TEMPORARY WORK BRIDGE 3.9



BASED ON: HANSON PROFESSIONAL SERVICES, INC. PRELIMINARY PLANS. ELEVATIONS ARE RELATIVE TO NAVD88. CONCEPTUAL PLANS UTILIZED TO OBTAIN U.S. COAST GUARD BRIDGE PERMIT

LEGEND

— - - — - BNSF RIGHT-OF-WAY (ROW)

TEMPORARY WORK BRIDGE

AGENCY REF. NO.:
PROJECT: BNSF / SANDPOINT JUNCTION CONNECTOR BRIDGE 3.9
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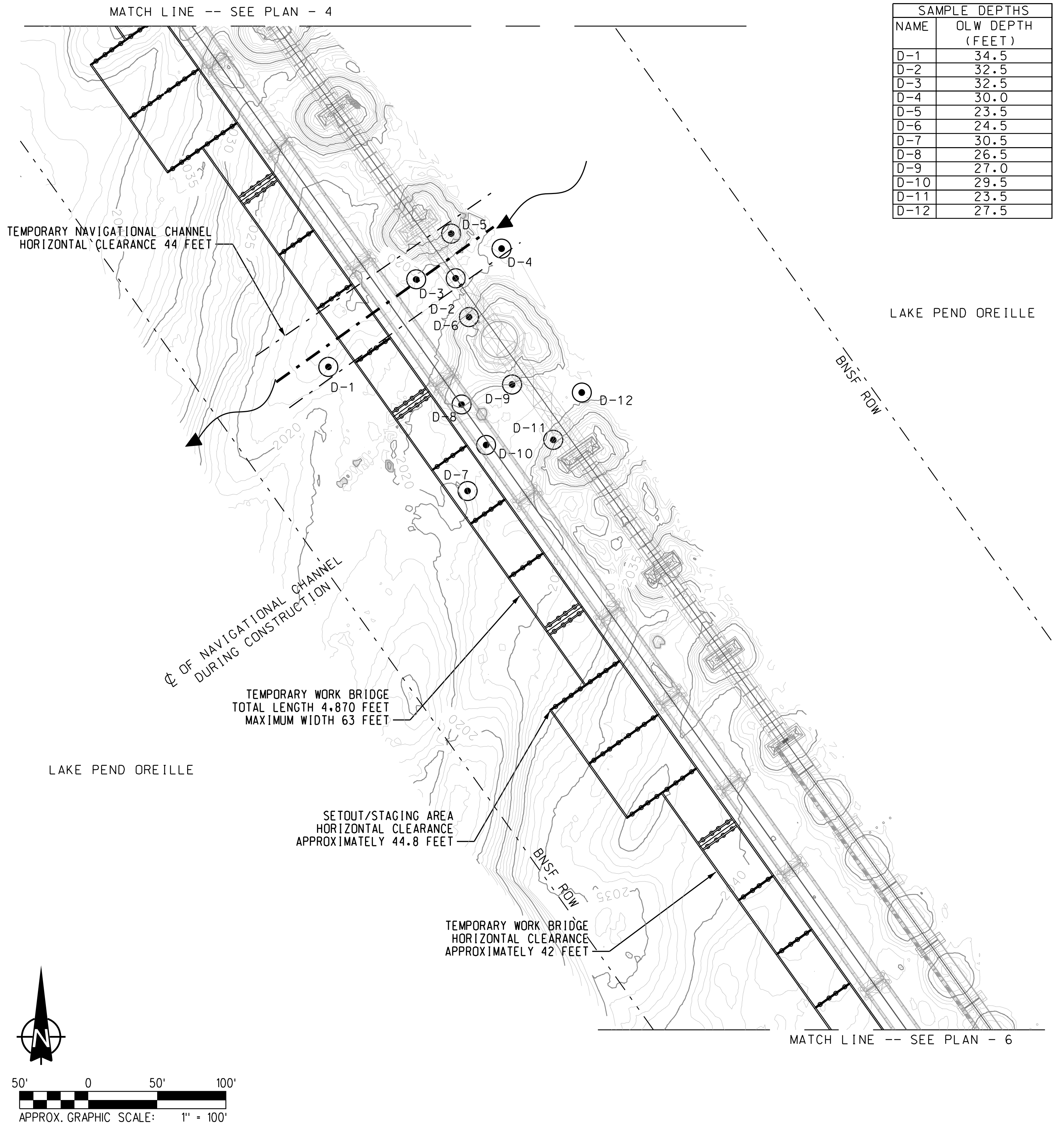
MILE POINT OF BRIDGE LOCATION FROM MOUTH: 2.7
WATERWAY: LAKE PEND OREILLE
CITY: SANDPOINT **COUNTY:** BONNER **STATE:** IDAHO
DATE: 08/17/2018

FINAL Review Draft - For USCG: 8/20/2018

PLAN VIEW - 5

TEMPORARY WORK BRIDGE 3.9

SAMPLE DEPTHS	
NAME	OLW DEPTH (FEET)
D-1	34.5
D-2	32.5
D-3	32.5
D-4	30.0
D-5	23.5
D-6	24.5
D-7	30.5
D-8	26.5
D-9	27.0
D-10	29.5
D-11	23.5
D-12	27.5



BASED ON: HANSON PROFESSIONAL SERVICES, INC. PRELIMINARY PLANS. ELEVATIONS ARE RELATIVE TO NAVD88. CONCEPTUAL PLANS UTILIZED TO OBTAIN U.S. COAST GUARD BRIDGE PERMIT

LEGEND

— - - — -	BNSF RIGHT-OF-WAY (ROW)
— — — — —	SHORELINE (SUMMER AND WINTER POOL)
- - — - —	CENTERLINE OF NAVIGATIONAL CHANNEL
- - — - -	LIMITS OF NAVIGATIONAL CHANNEL

TEMPORARY WORK BRIDGE

AGENCY REF. NO.:
PROJECT: BNSF / SANDPOINT JUNCTION CONNECTOR BRIDGE 3.9
OWNER: BNSF RAILWAY COMPANY
CONSULTANT: JACOBS ENGINEERING GROUP
LOCATION: BNSF BRIDGE 3.9 MONTANA DIVISION, KOOTENAI RIVER SUB, LINE SEGMENT 45, MP 3.9
MILE POINT OF BRIDGE LOCATION FROM MOUTH: 2.7
WATERWAY: LAKE PEND OREILLE
CITY: SANDPOINT **COUNTY:** BONNER **STATE:** IDAHO
DATE: 08/17/2018

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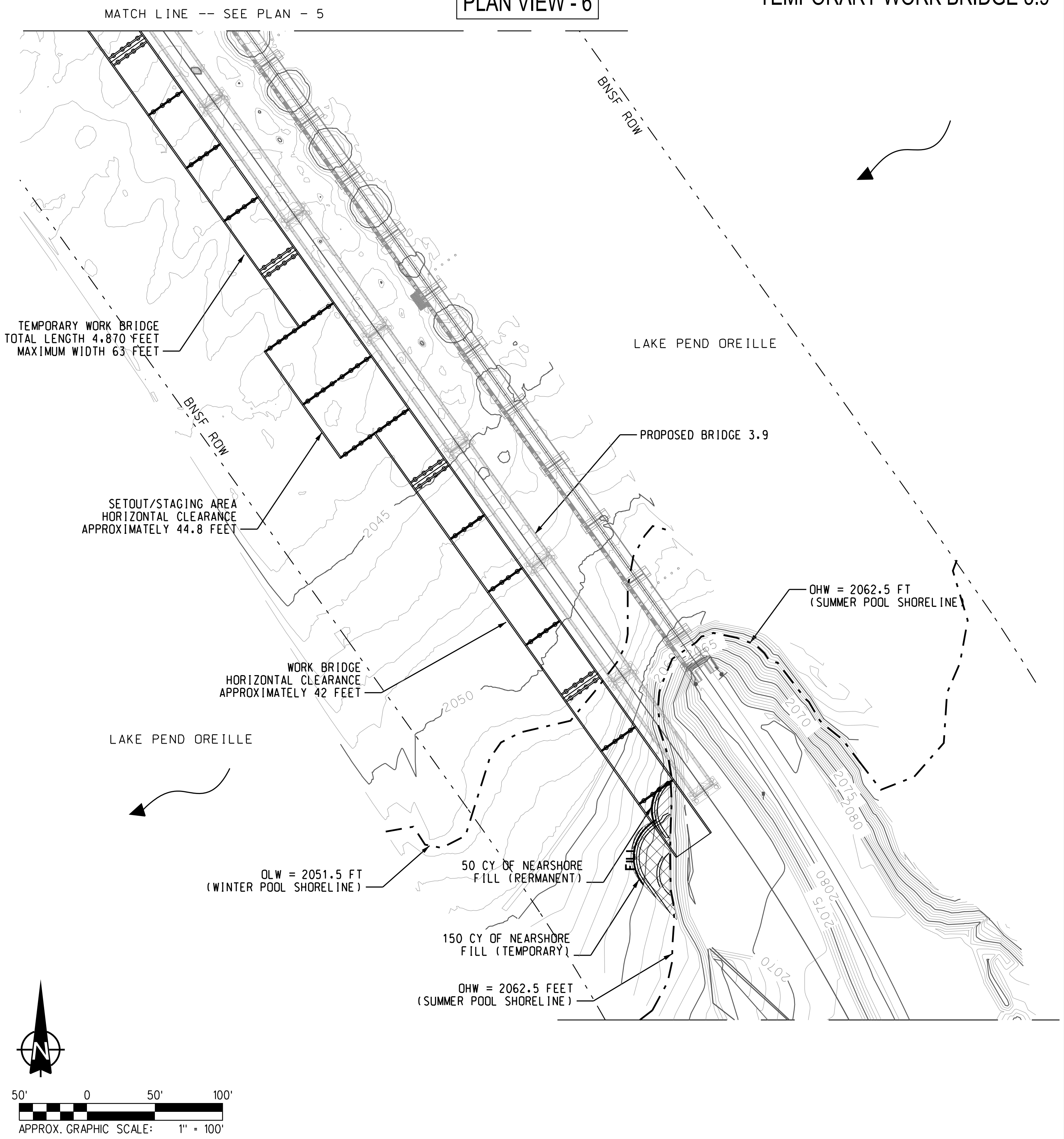
FINAL Review Draft - For USCG: 8/20/2018

PLAN VIEW - 6

TEMPORARY WORK BRIDGE 3.9



BASED ON: HANSON PROFESSIONAL SERVICES, INC. PRELIMINARY PLANS. ELEVATIONS ARE RELATIVE TO NAVD88. CONCEPTUAL PLANS UTILIZED TO OBTAIN U.S. COAST GUARD BRIDGE PERMIT

LEGEND

— - - — -	BNSF RIGHT-OF-WAY (ROW)
— — — —	SHORELINE (SUMMER AND WINTER POOL)
———	STRUCTURE (ROADS, DOCKS)

TEMPORARY WORK BRIDGE

AGENCY REF. NO.:
PROJECT: BNSF / SANDPOINT JUNCTION CONNECTOR BRIDGE 3.9
OWNER: BNSF RAILWAY COMPANY
CONSULTANT: JACOBS ENGINEERING GROUP
LOCATION: BNSF BRIDGE 3.9 MONTANA DIVISION, KOOTENAI RIVER SUB, LINE SEGMENT 45, MP 3.9
MILE POINT OF BRIDGE LOCATION FROM MOUTH: 2.7
WATERWAY: LAKE PEND OREILLE
CITY: SANDPOINT **COUNTY:** BONNER **STATE:** IDAHO
DATE: 08/17/2018

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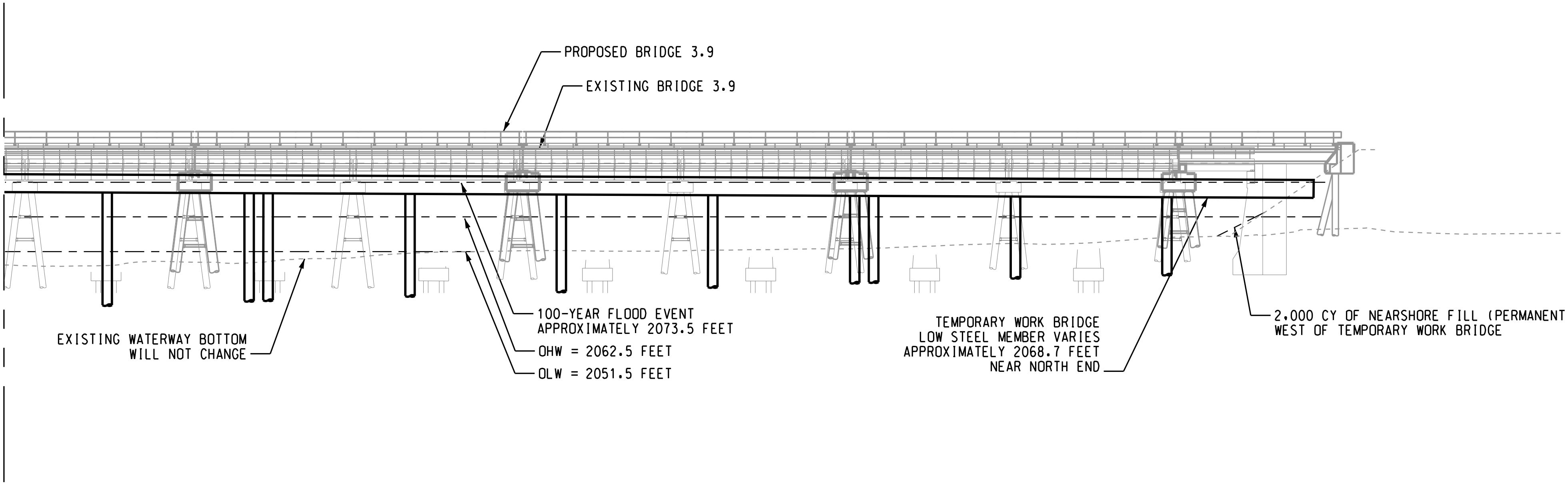
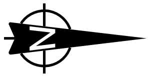
FINAL Review Draft - For USCG: 8/20/2018

ELEVATION VIEW - 1 TEMPORARY NEARSHORE FILL, NORTH END

TEMPORARY WORK BRIDGE 3.9





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BASED ON: HANSON PROFESSIONAL SERVICES, INC. PRELIMINARY PLANS. ELEVATIONS ARE RELATIVE TO NAVD88. CONCEPTUAL PLANS UTILIZED TO OBTAIN U.S. COAST GUARD BRIDGE PERMIT

TEMPORARY WORK BRIDGE

AGENCY REF. NO.:
PROJECT: BNSF / SANDPOINT JUNCTION CONNECTOR BRIDGE 3.9
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CONSULTANT: JACOBS ENGINEERING GROUP
LOCATION: BNSF BRIDGE 3.9 MONTANA DIVISION, KOOTENAI
RIVER SUB, LINE SEGMENT 45, MP 3.9
MILE POINT OF BRIDGE LOCATION FROM MOUTH: 2.7
WATERWAY: LAKE PEND OREILLE
CITY: SANDPOINT **COUNTY:** BONNER **STATE:** IDAHO
DATE: 08/17/2018

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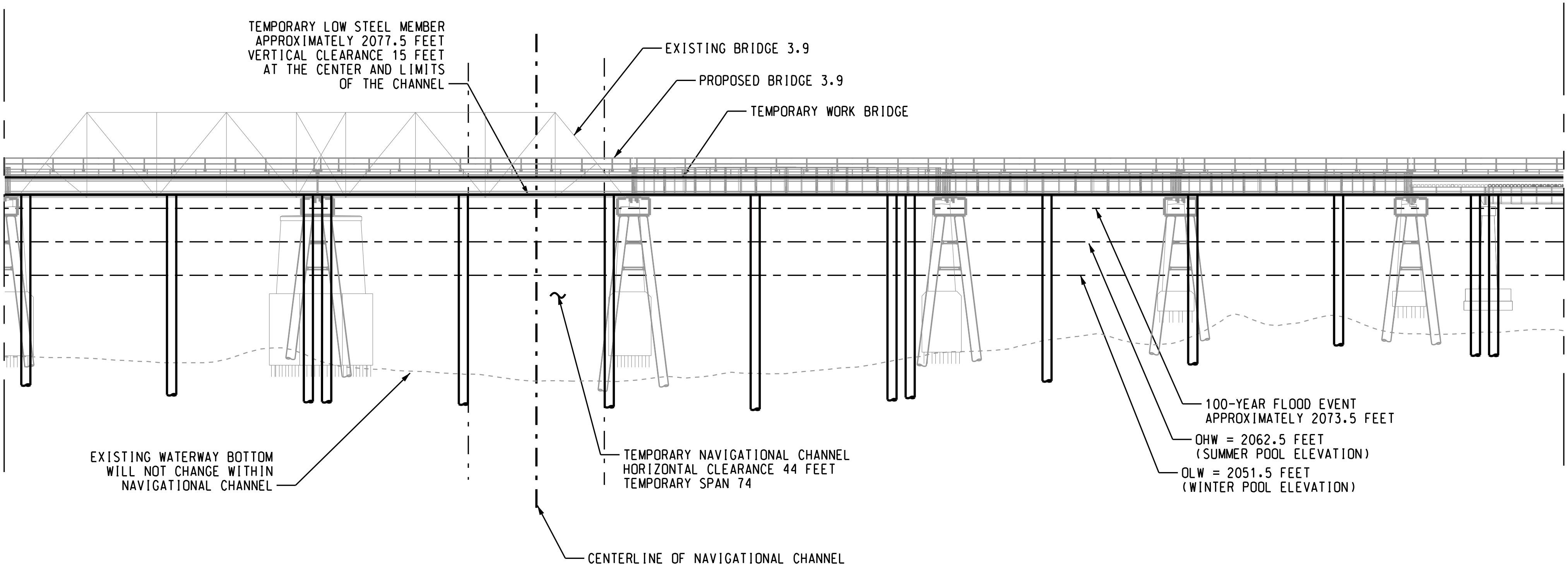
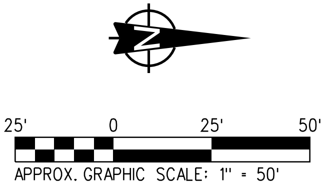
FINAL Review Draft - For USCG: 8/20/2018

ELEVATION VIEW - 2 DEFINED TEMPORARY NAVIGATIONAL CHANNEL PROFILE

TEMPORARY WORK BRIDGE 3.9





BASED ON: HANSON PROFESSIONAL SERVICES, INC. PRELIMINARY PLANS. ELEVATIONS ARE RELATIVE TO NAVD88. CONCEPTUAL PLANS UTILIZED TO OBTAIN U.S. COAST GUARD BRIDGE PERMIT

LEGEND

- - — - — LIMITS OF NAVIGATIONAL CHANNEL

- - — — - — CENTERLINE OF NAVIGATIONAL CHANNEL

TEMPORARY WORK BRIDGE

AGENCY REF. NO.:
PROJECT: BNSF / SANDPOINT JUNCTION CONNECTOR BRIDGE 3.9
OWNER: BNSF RAILWAY COMPANY
CONSULTANT: JACOBS ENGINEERING GROUP
LOCATION: BNSF BRIDGE 3.9 MONTANA DIVISION, KOOTENAI RIVER SUB, LINE SEGMENT 45, MP 3.9
MILE POINT OF BRIDGE LOCATION FROM MOUTH: 2.7
WATERWAY: LAKE PEND OREILLE
CITY: SANDPOINT **COUNTY:** BONNER **STATE:** IDAHO
DATE: 08/17/2018

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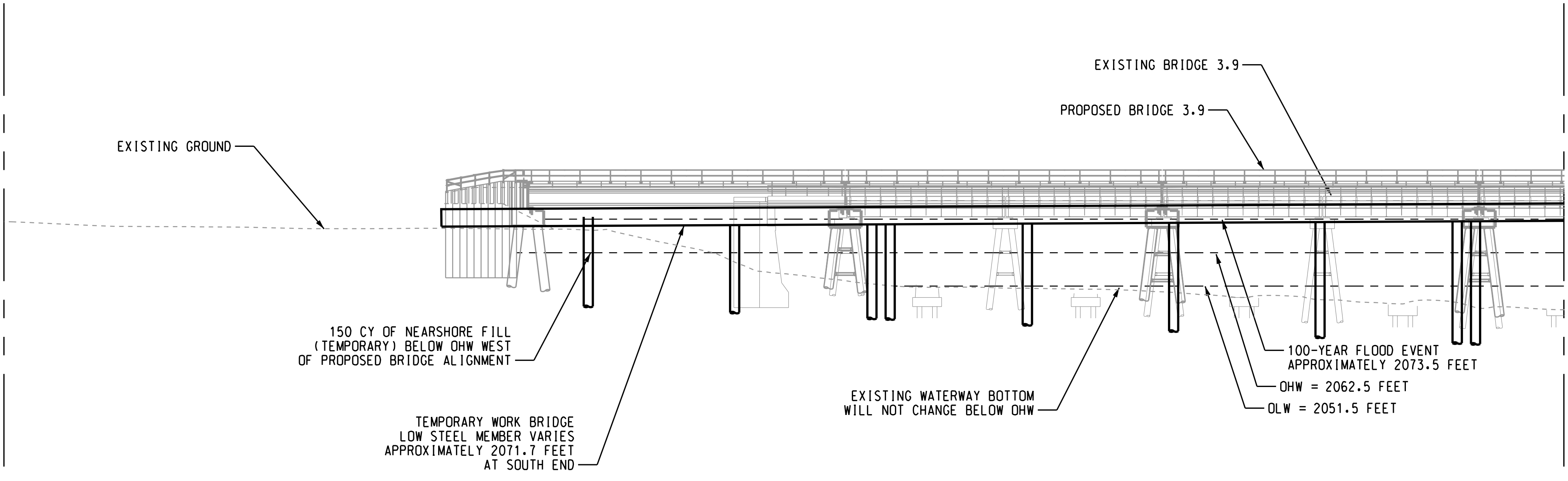
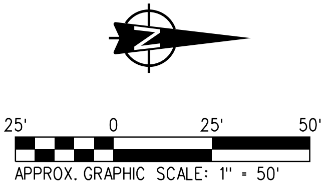
FINAL Review Draft - For USCG: 8/20/2018

ELEVATION VIEW - 3 TEMPORARY NEARSHORE FILL, SOUTH END

TEMPORARY WORK BRIDGE 3.9





APPROX. GRAPHIC SCALE: 1" = 50'

BASED ON: HANSON PROFESSIONAL SERVICES, INC. PRELIMINARY PLANS. ELEVATIONS ARE RELATIVE TO NAVD88. CONCEPTUAL PLANS UTILIZED TO OBTAIN U.S. COAST GUARD BRIDGE PERMIT

TEMPORARY WORK BRIDGE

AGENCY REF. NO.:
PROJECT: BNSF / SANDPOINT JUNCTION CONNECTOR BRIDGE 3.9
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WATERWAY: LAKE PEND OREILLE
CITY: SANDPOINT **COUNTY:** BONNER **STATE:** IDAHO
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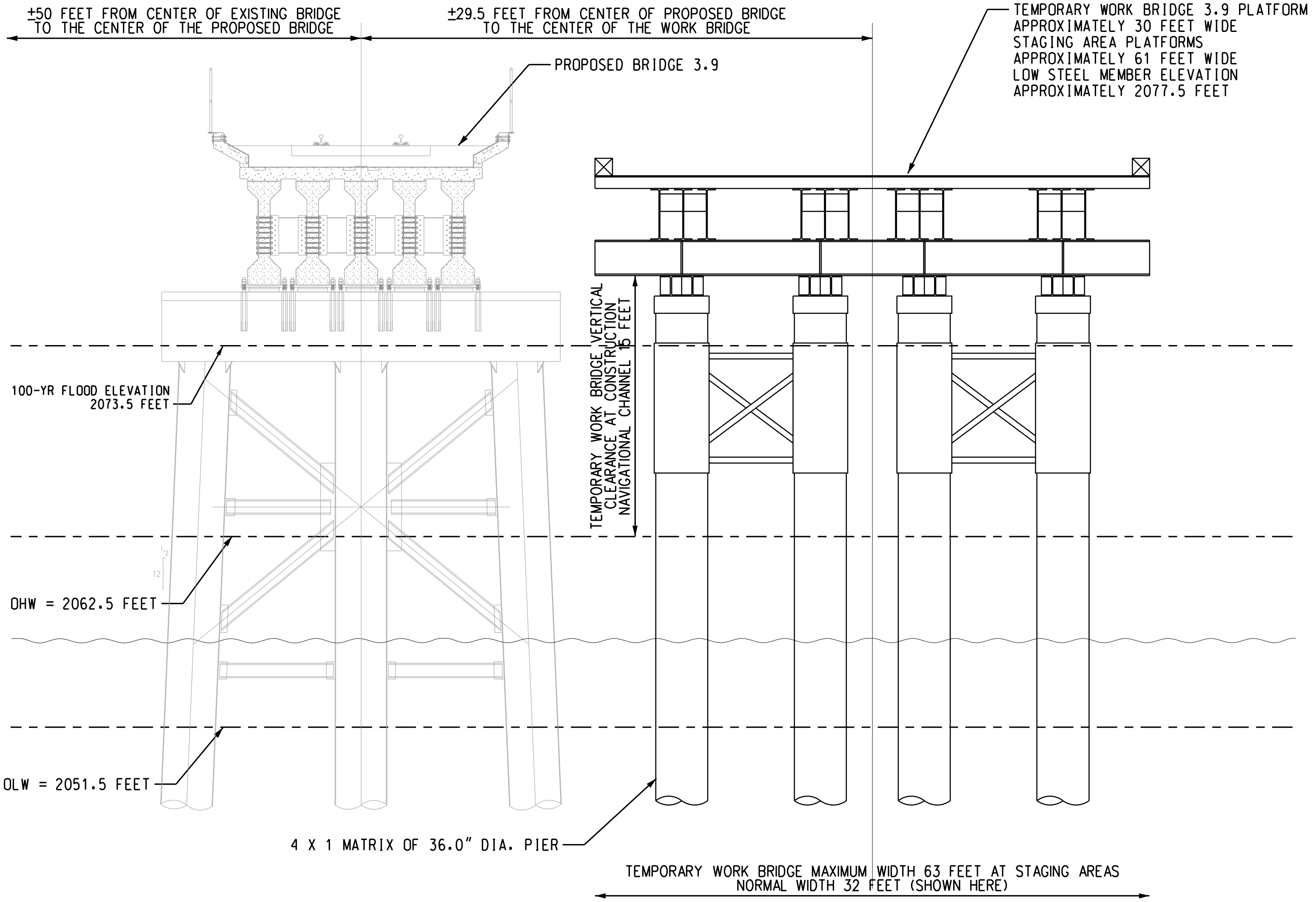
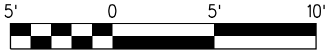
FINAL Review Draft - For USCG: 8/20/2018

TYPICAL SECTION VIEW

TEMPORARY WORK BRIDGE 3.9





APPROX. GRAPHIC SCALE: 1" = 10'

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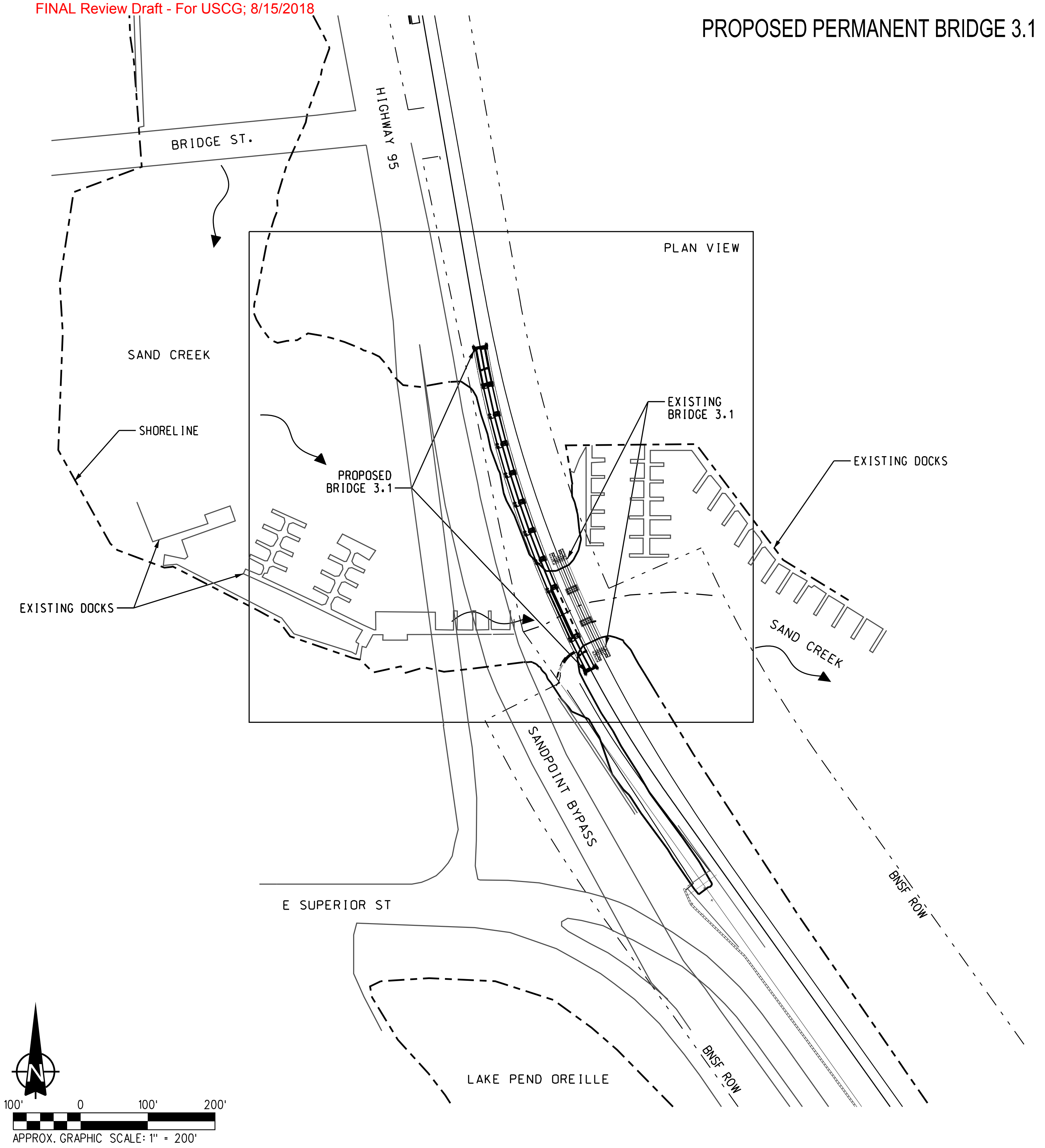
BASED ON: HANSON PROFESSIONAL SERVICES, INC. PRELIMINARY PLANS. ELEVATIONS ARE RELATIVE TO NAVD88. CONCEPTUAL PLANS UTILIZED TO OBTAIN U.S. COAST GUARD BRIDGE PERMIT

TEMPORARY WORK BRIDGE

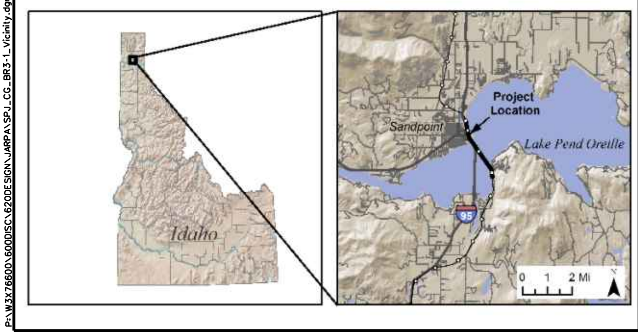
AGENCY REF. NO.:
PROJECT: BNSF / SANDPOINT JUNCTION CONNECTOR BRIDGE 3.9
OWNER: BNSF RAILWAY COMPANY
CONSULTANT: JACOBS ENGINEERING GROUP
LOCATION: BNSF BRIDGE 3.9 MONTANA DIVISION, KOOTENAI RIVER SUB, LINE SEGMENT 45, MP 3.9
MILE POINT OF BRIDGE LOCATION FROM MOUTH: 2.7
WATERWAY: LAKE PEND OREILLE
CITY: SANDPOINT **COUNTY:** BONNER **STATE:** IDAHO
DATE: 08/17/2018

FINAL Review Draft - For USCG; 8/15/2018

PROPOSED PERMANENT BRIDGE 3.1



BASED ON: HANSON PROFESSIONAL SERVICES, INC. PRELIMINARY PLANS. ELEVATIONS ARE RELATIVE TO NAVD88. CONCEPTUAL PLANS UTILIZED TO OBTAIN COAST GUARD BRIDGE PERMIT



LOCATION / VICINITY MAP

AGENCY REF. NO.:
PROJECT: BNSF / SANDPOINT JUNCTION CONNECTOR BRIDGE 3.1
OWNER: BNSF RAILWAY COMPANY
CONSULTANT: JACOBS ENGINEERING GROUP
LOCATION: BNSF BRIDGE 3.1 MONTANA DIVISION, KOOTENAI RIVER SUB, LINE SEGMENT 45, MP 3.1
MILE POINT OF BRIDGE LOCATION FROM MOUTH: 0.1
WATERWAY: SAND CREEK
CITY: SANDPOINT **COUNTY:** BONNER **STATE:** IDAHO
DATE: 08/07/2018

SHEET 1 OF 4

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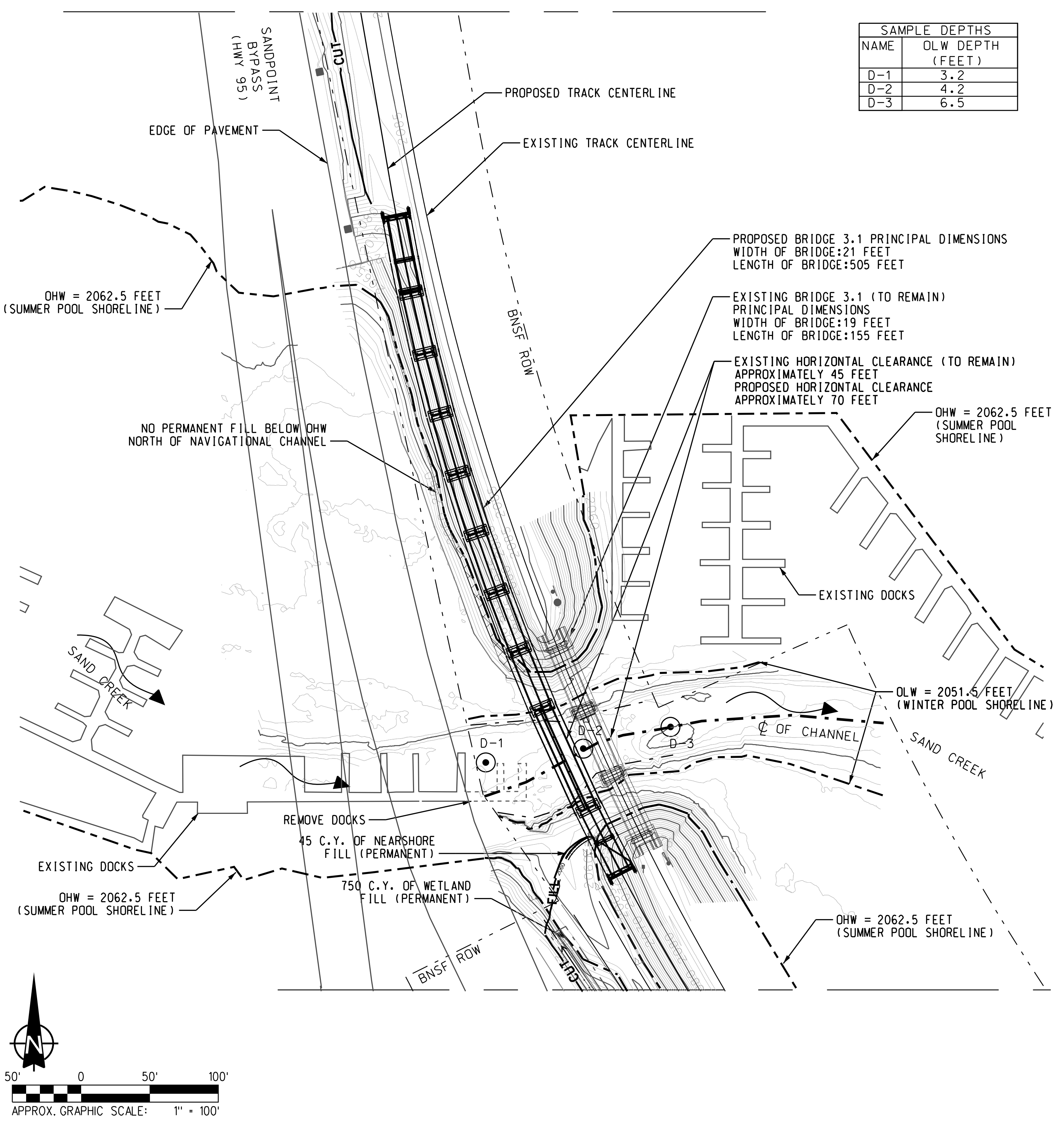
PLAN VIEW

PROPOSED PERMANENT BRIDGE 3.1

SAMPLE DEPTHS	
NAME	OLW DEPTH (FEET)
D-1	3.2
D-2	4.2
D-3	6.5



BASED ON: HANSON PROFESSIONAL SERVICES, INC. PRELIMINARY PLANS. ELEVATIONS ARE RELATIVE TO NAVD88. CONCEPTUAL PLANS UTILIZED TO OBTAIN COAST GUARD BRIDGE PERMIT

LEGEND

— · — · —	BNSF RIGHT-OF-WAY (ROW)
— — —	SHORELINE (SUMMER AND WINTER POOL)
— · — · —	CENTERLINE OF NAVIGATIONAL CHANNEL
- — - — -	LIMITS OF NAVIGATIONAL CHANNEL
———	STRUCTURE (ROADS, DOCKS)

EXISTING CONDITIONS / PROPOSED WORK

AGENCY REF. NO.:
PROJECT: BNSF / SANDPOINT JUNCTION CONNECTOR BRIDGE 3.1
OWNER: BNSF RAILWAY COMPANY
CONSULTANT: JACOBS ENGINEERING GROUP
LOCATION: BNSF BRIDGE 3.1 MONTANA DIVISION, KOOTENAI RIVER SUB, LINE SEGMENT 45, MP 3.1
MILE POINT OF BRIDGE LOCATION FROM MOUTH: 0.1
WATERWAY: SAND CREEK
CITY: SANDPOINT **COUNTY:** BONNER **STATE:** IDAHO
DATE: 08/07/2018

SHEET 2 OF 4

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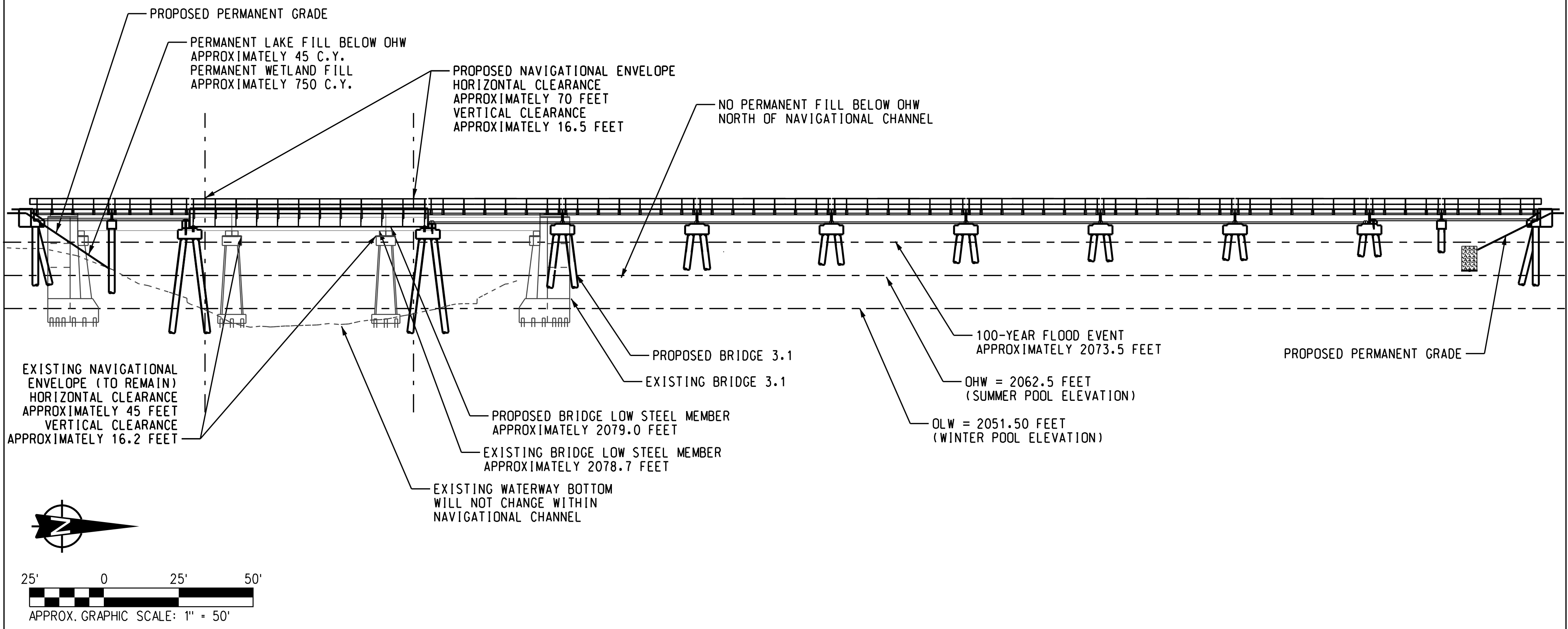
ELEVATION VIEW

PROPOSED PERMANENT BRIDGE 3.1



BASED ON: HANSON PROFESSIONAL SERVICES, INC. PRELIMINARY PLANS. ELEVATIONS ARE RELATIVE TO NAVD88. CONCEPTUAL PLANS UTILIZED TO OBTAIN COAST GUARD BRIDGE PERMIT

LEGEND

– – — – –	SHORELINE (SUMMER AND WINTER POOL; 100-YEAR FLOOD)
- - — - -	LIMITS OF NAVIGATIONAL CHANNEL

EXISTING CONDITIONS / PROPOSED WORK

AGENCY REF. NO.:
PROJECT: BNSF / SANDPOINT JUNCTION CONNECTOR BRIDGE 3.1
OWNER: BNSF RAILWAY COMPANY
CONSULTANT: JACOBS ENGINEERING GROUP
LOCATION: BNSF BRIDGE 3.1 MONTANA DIVISION, KOOTENAI RIVER SUB, LINE SEGMENT 45, MP 3.1
MILE POINT OF BRIDGE LOCATION FROM MOUTH: 0.1
WATERWAY: SAND CREEK
CITY: SANDPOINT **COUNTY:** BONNER **STATE:** IDAHO
DATE: 08/07/2018

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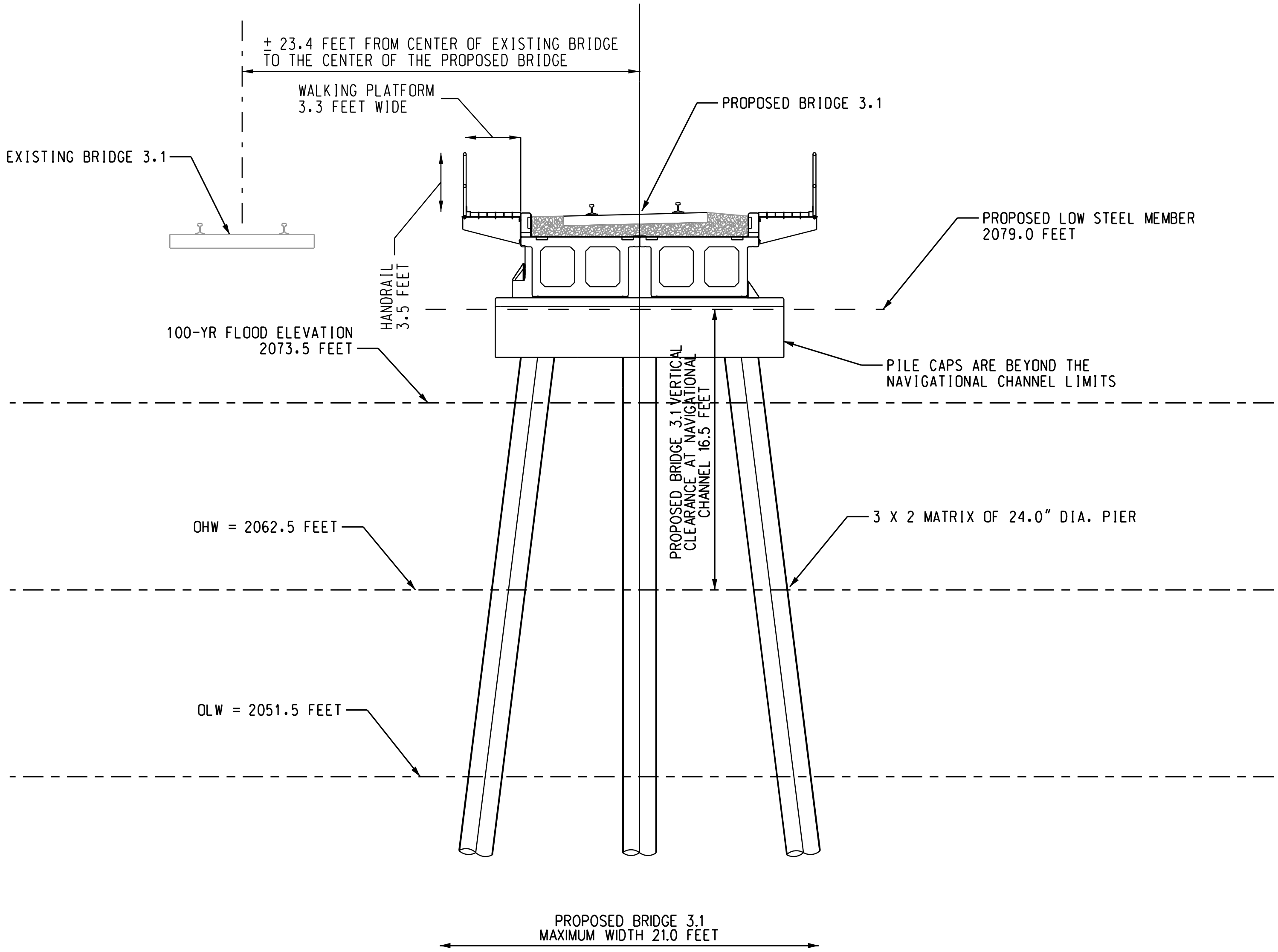
FINAL Review Draft - For USCG; 8/15/2018

TYPICAL SECTION VIEW

PROPOSED PERMANENT BRIDGE 3.1



APPROX. GRAPHIC SCALE: 1" = 10'

BASED ON: HANSON PROFESSIONAL SERVICES, INC. PRELIMINARY PLANS. ELEVATIONS ARE RELATIVE TO NAVD88. CONCEPTUAL PLANS UTILIZED TO OBTAIN COAST GUARD BRIDGE PERMIT

EXISTING CONDITIONS / PROPOSED WORK

AGENCY REF. NO.:
PROJECT: BNSF / SANDPOINT JUNCTION CONNECTOR BRIDGE 3.1
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CONSULTANT: JACOBS ENGINEERING GROUP
LOCATION: BNSF BRIDGE 3.1 MONTANA DIVISION, KOOTENAI RIVER SUB, LINE SEGMENT 45, MP 3.1
MILE POINT OF BRIDGE LOCATION FROM MOUTH: 0.1
WATERWAY: SAND CREEK
CITY: SANDPOINT **COUNTY:** BONNER **STATE:** IDAHO
DATE: 08/07/2018

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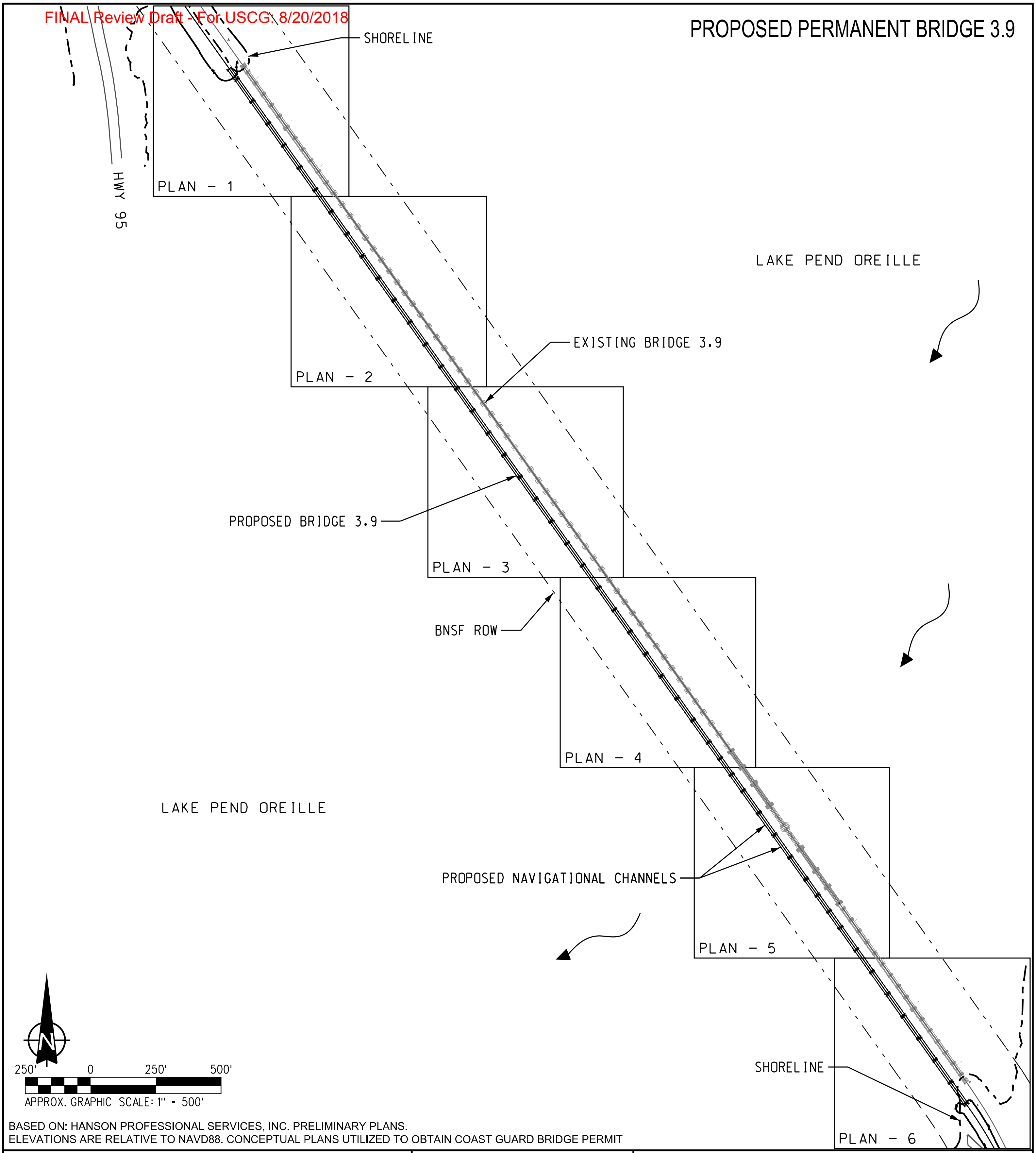
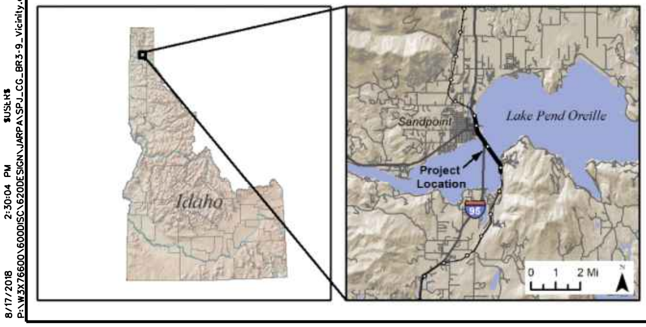
PROPOSED PERMANENT BRIDGE 3.9



BASED ON: HANSON PROFESSIONAL SERVICES, INC. PRELIMINARY PLANS.
ELEVATIONS ARE RELATIVE TO NAVD88. CONCEPTUAL PLANS UTILIZED TO OBTAIN COAST GUARD BRIDGE PERMIT



VICINITY / LOCATION MAP

AGENCY REF. NO.:
PROJECT: BNSF / SANDPOINT JUNCTION CONNECTOR BRIDGE 3.9
OWNER: BNSF RAILWAY COMPANY
CONSULTANT: JACOBS ENGINEERING GROUP
LOCATION: BNSF BRIDGE 3.9 MONTANA DIVISION, KOOTENAI RIVER SUB, LINE SEGMENT 45, MP 3.9
MILE POINT OF BRIDGE LOCATION FROM MOUTH: 2.7
WATERWAY: LAKE PEND OREILLE
CITY: SANDPOINT **COUNTY:** BONNER **STATE:** IDAHO
DATE: 08/17/2018

SHEET 1 OF 11

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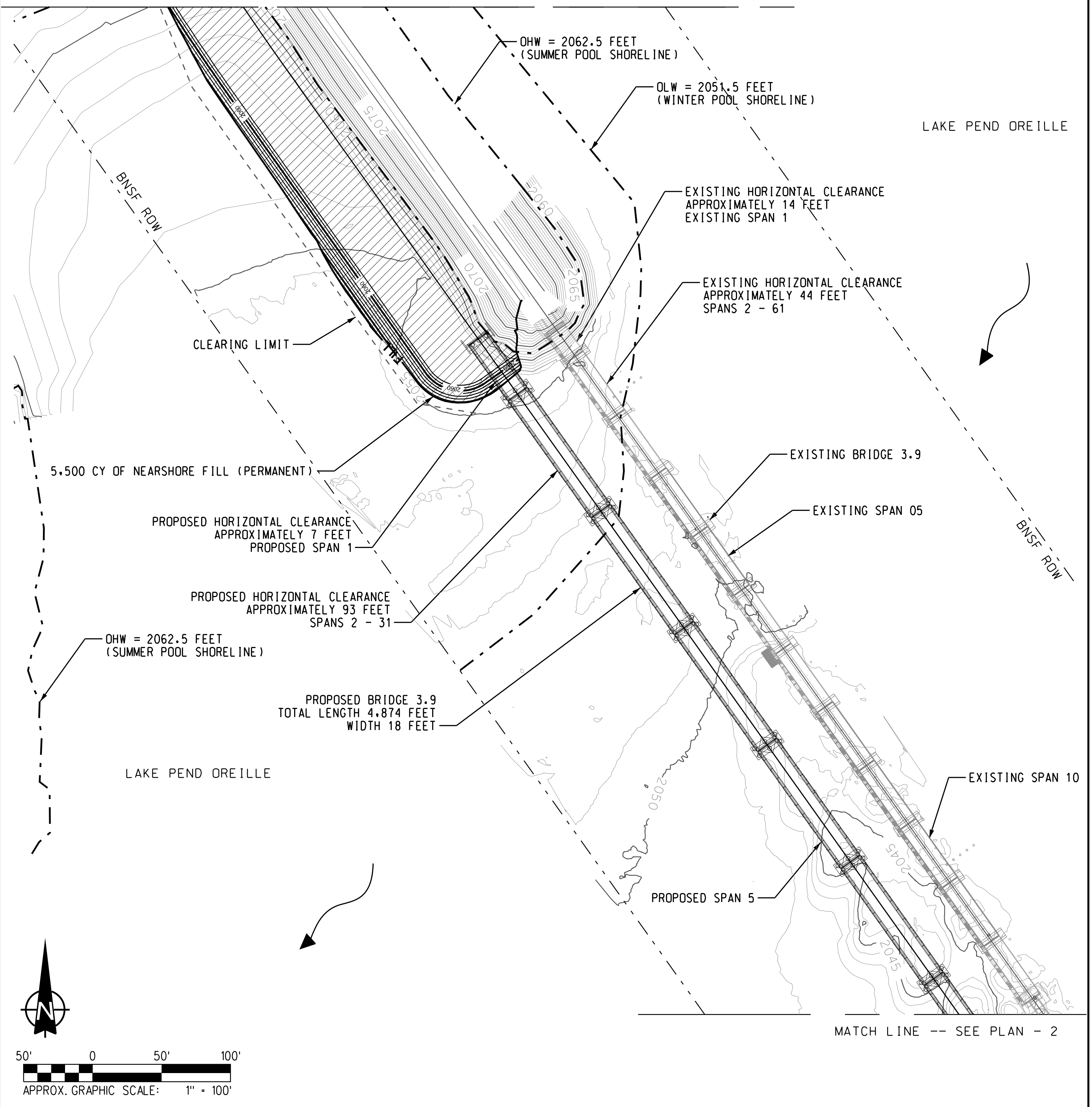
PLAN VIEW - 1

PROPOSED PERMANENT BRIDGE 3.9



BASED ON: HANSON PROFESSIONAL SERVICES, INC. PRELIMINARY PLANS. ELEVATIONS ARE RELATIVE TO NAVD88. CONCEPTUAL PLANS UTILIZED TO OBTAIN U.S. COAST GUARD BRIDGE PERMIT

LEGEND

— - - — -	BNSF RIGHT-OF-WAY (ROW)
— — — —	SHORELINE (SUMMER AND WINTER POOL)
———	STRUCTURE (ROADS, DOCKS)
- - - - - - -	CLEARING LIMITS

EXISTING CONDITIONS / PROPOSED WORK

AGENCY REF. NO.:
PROJECT: BNSF / SANDPOINT JUNCTION CONNECTOR BRIDGE 3.9
OWNER: BNSF RAILWAY COMPANY
CONSULTANT: JACOBS ENGINEERING GROUP
LOCATION: BNSF BRIDGE 3.9 MONTANA DIVISION, KOOTENAI RIVER SUB, LINE SEGMENT 45, MP 3.9
MILE POINT OF BRIDGE LOCATION FROM MOUTH: 2.7
WATERWAY: LAKE PEND OREILLE
CITY: SANDPOINT **COUNTY:** BONNER **STATE:** IDAHO
DATE: 08/17/2018

SHEET 2 OF 11

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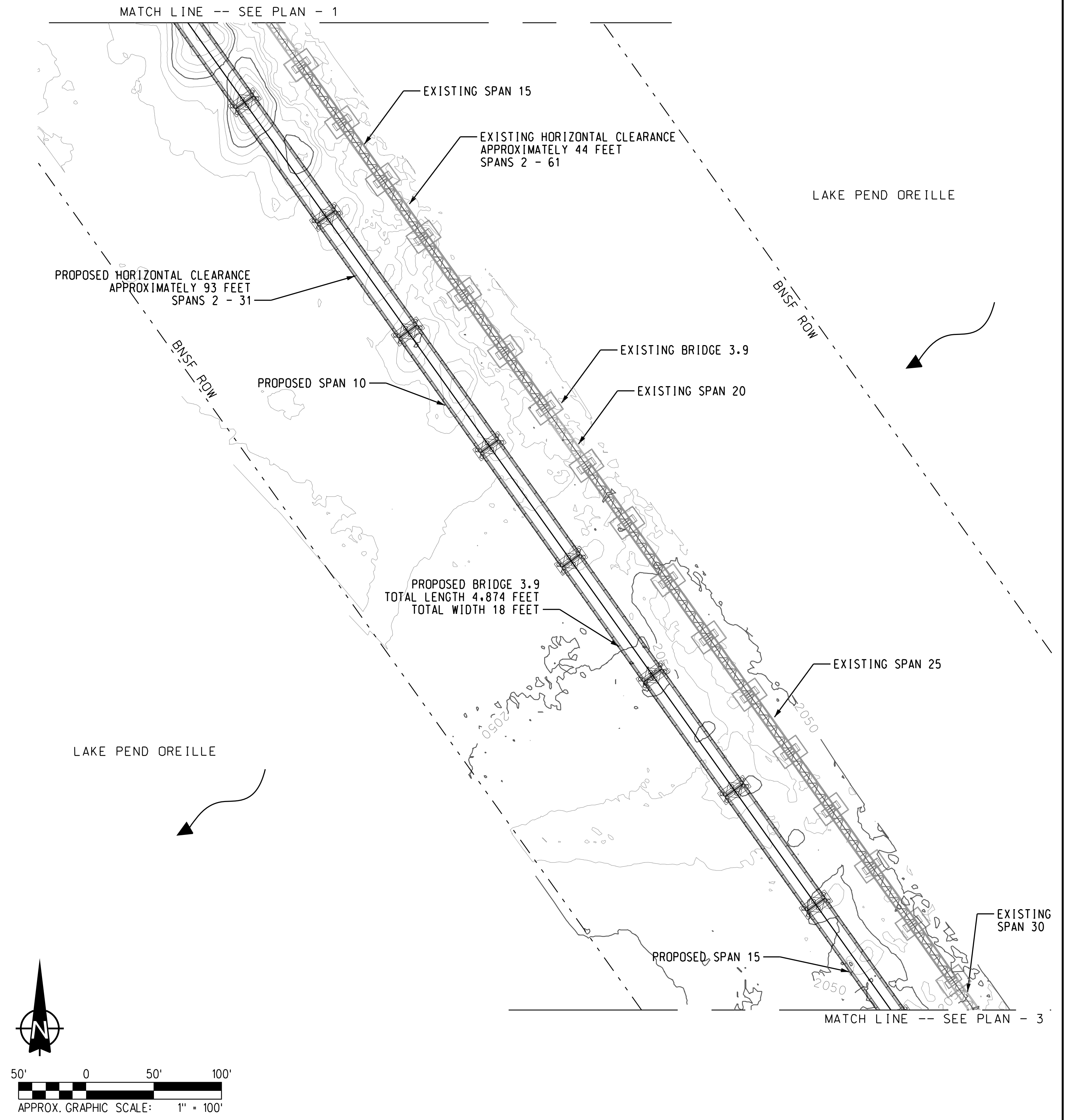
PLAN VIEW - 2

PROPOSED PERMANENT BRIDGE 3.9



BASED ON: HANSON PROFESSIONAL SERVICES, INC. PRELIMINARY PLANS. ELEVATIONS ARE RELATIVE TO NAVD88. CONCEPTUAL PLANS UTILIZED TO OBTAIN U.S. COAST GUARD BRIDGE PERMIT

LEGEND

— - - — - BNSF RIGHT-OF-WAY (ROW)

EXISTING CONDITIONS / PROPOSED WORK

AGENCY REF. NO.:
PROJECT: BNSF / SANDPOINT JUNCTION CONNECTOR BRIDGE 3.9
OWNER: BNSF RAILWAY COMPANY
CONSULTANT: JACOBS ENGINEERING GROUP
LOCATION: BNSF BRIDGE 3.9 MONTANA DIVISION, KOOTENAI RIVER SUB, LINE SEGMENT 45, MP 3.9
MILE POINT OF BRIDGE LOCATION FROM MOUTH: 2.7
WATERWAY: LAKE PEND OREILLE
CITY: SANDPOINT **COUNTY:** BONNER **STATE:** IDAHO
DATE: 08/17/2018

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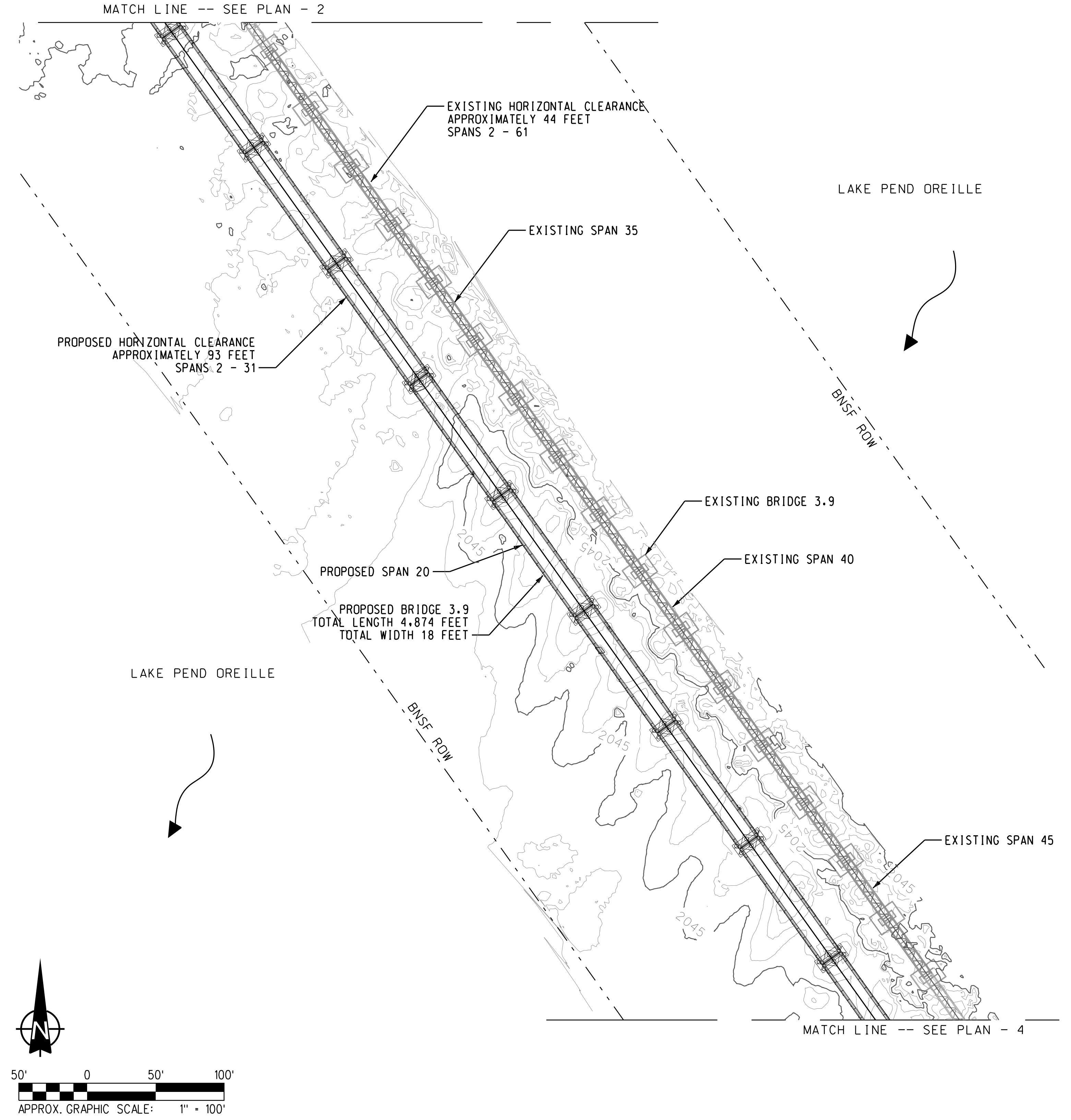
PLAN VIEW - 3

PROPOSED PERMANENT BRIDGE 3.9



BASED ON: HANSON PROFESSIONAL SERVICES, INC. PRELIMINARY PLANS. ELEVATIONS ARE RELATIVE TO NAVD88. CONCEPTUAL PLANS UTILIZED TO OBTAIN U.S. COAST GUARD BRIDGE PERMIT

LEGEND

— - - — -	BNSF RIGHT-OF-WAY (ROW)

EXISTING CONDITIONS / PROPOSED WORK

AGENCY REF. NO.:
PROJECT: BNSF / SANDPOINT JUNCTION CONNECTOR BRIDGE 3.9
OWNER: BNSF RAILWAY COMPANY
CONSULTANT: JACOBS ENGINEERING GROUP
LOCATION: BNSF BRIDGE 3.9 MONTANA DIVISION, KOOTENAI RIVER SUB, LINE SEGMENT 45, MP 3.9
MILE POINT OF BRIDGE LOCATION FROM MOUTH: 2.7
WATERWAY: LAKE PEND OREILLE
CITY: SANDPOINT **COUNTY:** BONNER **STATE:** IDAHO
DATE: 08/17/2018

SHEET 4 OF 11

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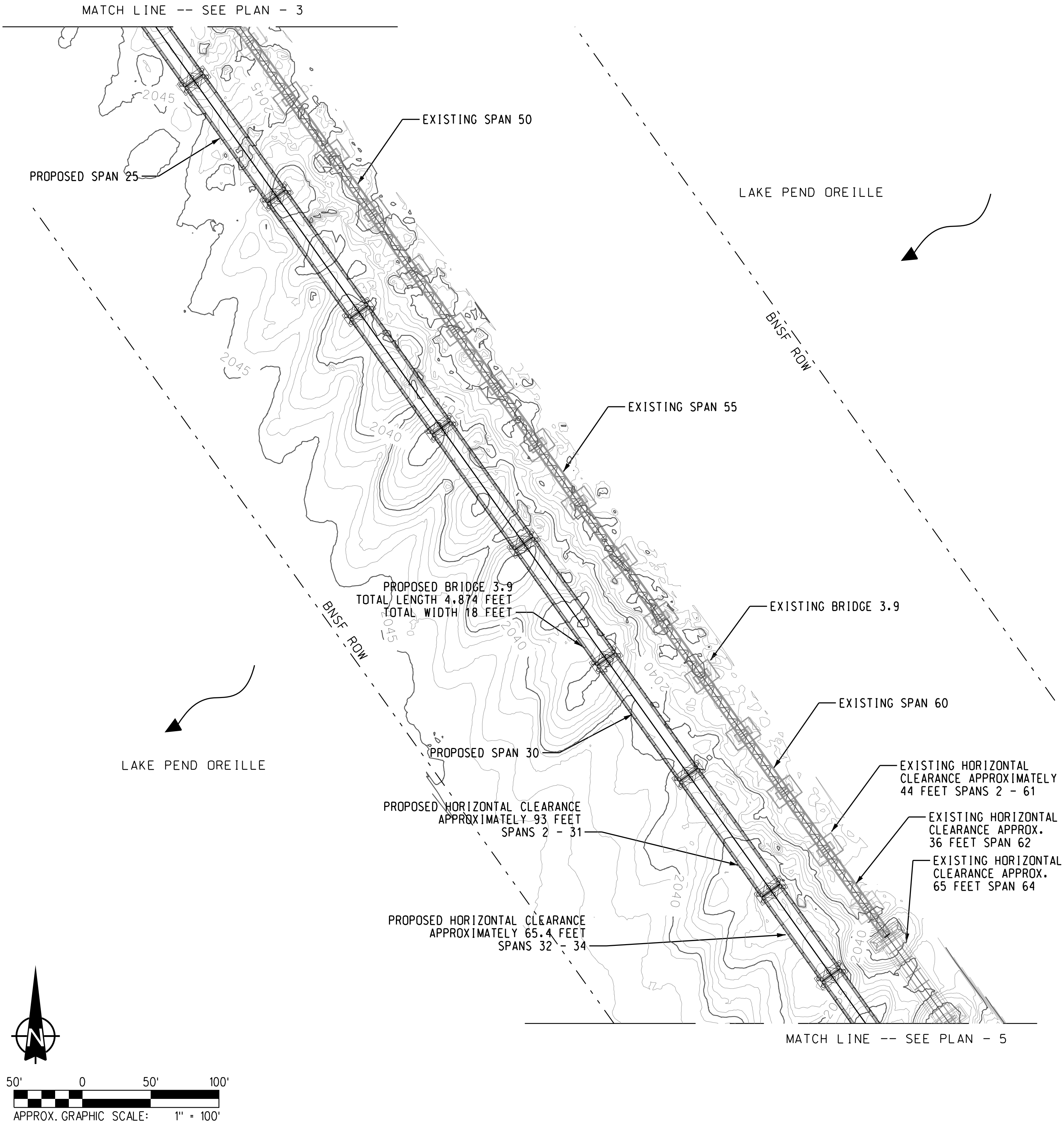
PLAN VIEW - 4

PROPOSED PERMANENT BRIDGE 3.9



BASED ON: HANSON PROFESSIONAL SERVICES, INC. PRELIMINARY PLANS. ELEVATIONS ARE RELATIVE TO NAVD88. CONCEPTUAL PLANS UTILIZED TO OBTAIN U.S. COAST GUARD BRIDGE PERMIT

LEGEND

— - - — - BNSF RIGHT-OF-WAY (ROW)

EXISTING CONDITIONS / PROPOSED WORK

AGENCY REF. NO.:
PROJECT: BNSF / SANDPOINT JUNCTION CONNECTOR BRIDGE 3.9
OWNER: BNSF RAILWAY COMPANY
CONSULTANT: JACOBS ENGINEERING GROUP
LOCATION: BNSF BRIDGE 3.9 MONTANA DIVISION, KOOTENAI RIVER SUB, LINE SEGMENT 45, MP 3.9
MILE POINT OF BRIDGE LOCATION FROM MOUTH: 2.7
WATERWAY: LAKE PEND OREILLE
CITY: SANDPOINT **COUNTY:** BONNER **STATE:** IDAHO
DATE: 08/17/2018

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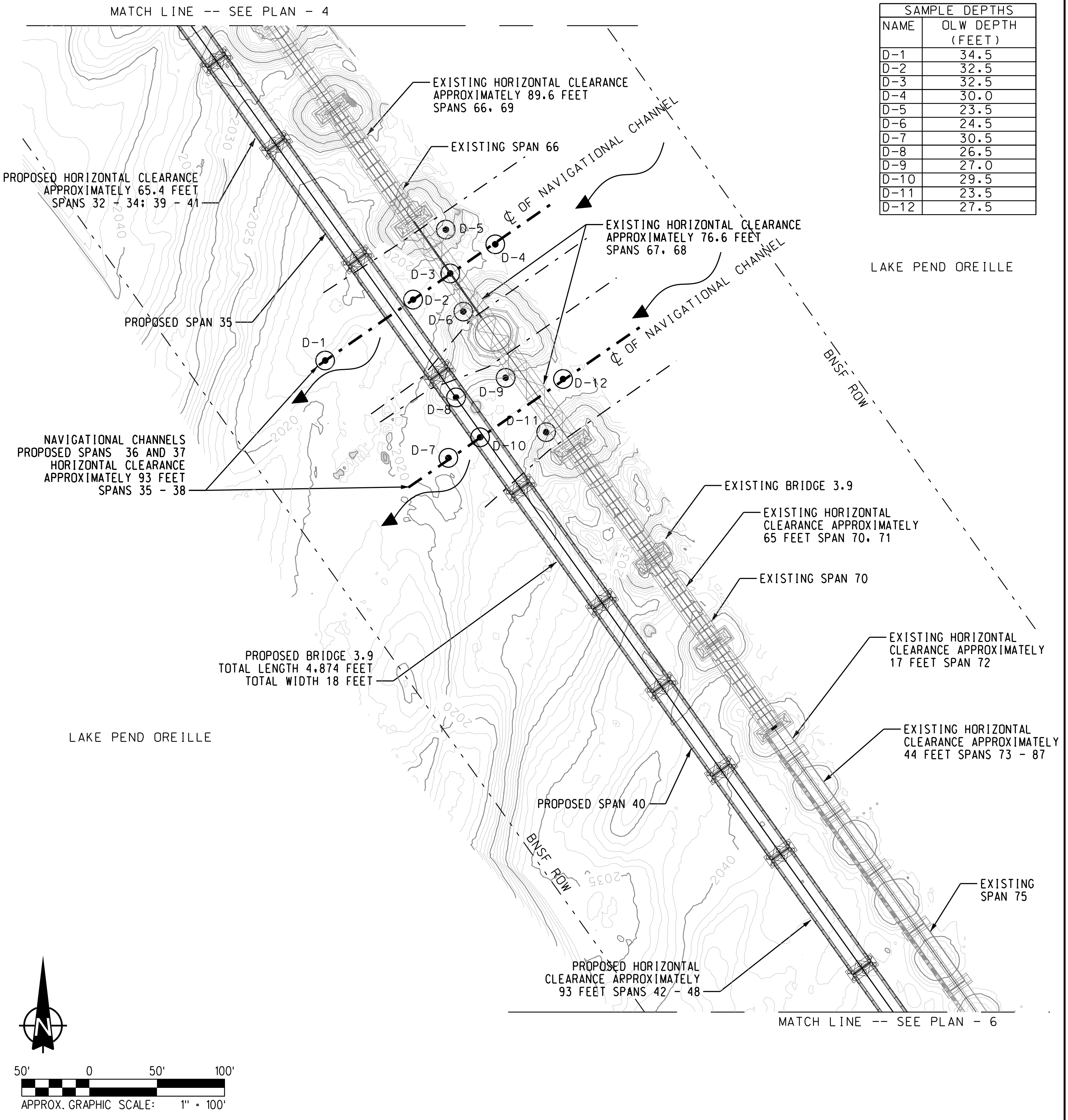
PLAN VIEW - 5

PROPOSED PERMANENT BRIDGE 3.9

SAMPLE DEPTHS	
NAME	OLW DEPTH (FEET)
D-1	34.5
D-2	32.5
D-3	32.5
D-4	30.0
D-5	23.5
D-6	24.5
D-7	30.5
D-8	26.5
D-9	27.0
D-10	29.5
D-11	23.5
D-12	27.5



BASED ON: HANSON PROFESSIONAL SERVICES, INC. PRELIMINARY PLANS. ELEVATIONS ARE RELATIVE TO NAVD88. CONCEPTUAL PLANS UTILIZED TO OBTAIN U.S. COAST GUARD BRIDGE PERMIT

LEGEND

— - - — -	BNSF RIGHT-OF-WAY (ROW)
— — — — —	SHORELINE (SUMMER AND WINTER POOL)
- ▬ - ▬	CENTERLINE OF NAVIGATIONAL CHANNEL
- - — - -	LIMITS OF NAVIGATIONAL CHANNEL

EXISTING CONDITIONS / PROPOSED WORK

AGENCY REF. NO.:
PROJECT: BNSF / SANDPOINT JUNCTION CONNECTOR BRIDGE 3.9
OWNER: BNSF RAILWAY COMPANY
CONSULTANT: JACOBS ENGINEERING GROUP
LOCATION: BNSF BRIDGE 3.9 MONTANA DIVISION, KOOTENAI RIVER SUB, LINE SEGMENT 45, MP 3.9
MILE POINT OF BRIDGE LOCATION FROM MOUTH: 2.7
WATERWAY: LAKE PEND OREILLE
CITY: SANDPOINT **COUNTY:** BONNER **STATE:** IDAHO
DATE: 08/17/2018

SHEET 6 OF 11

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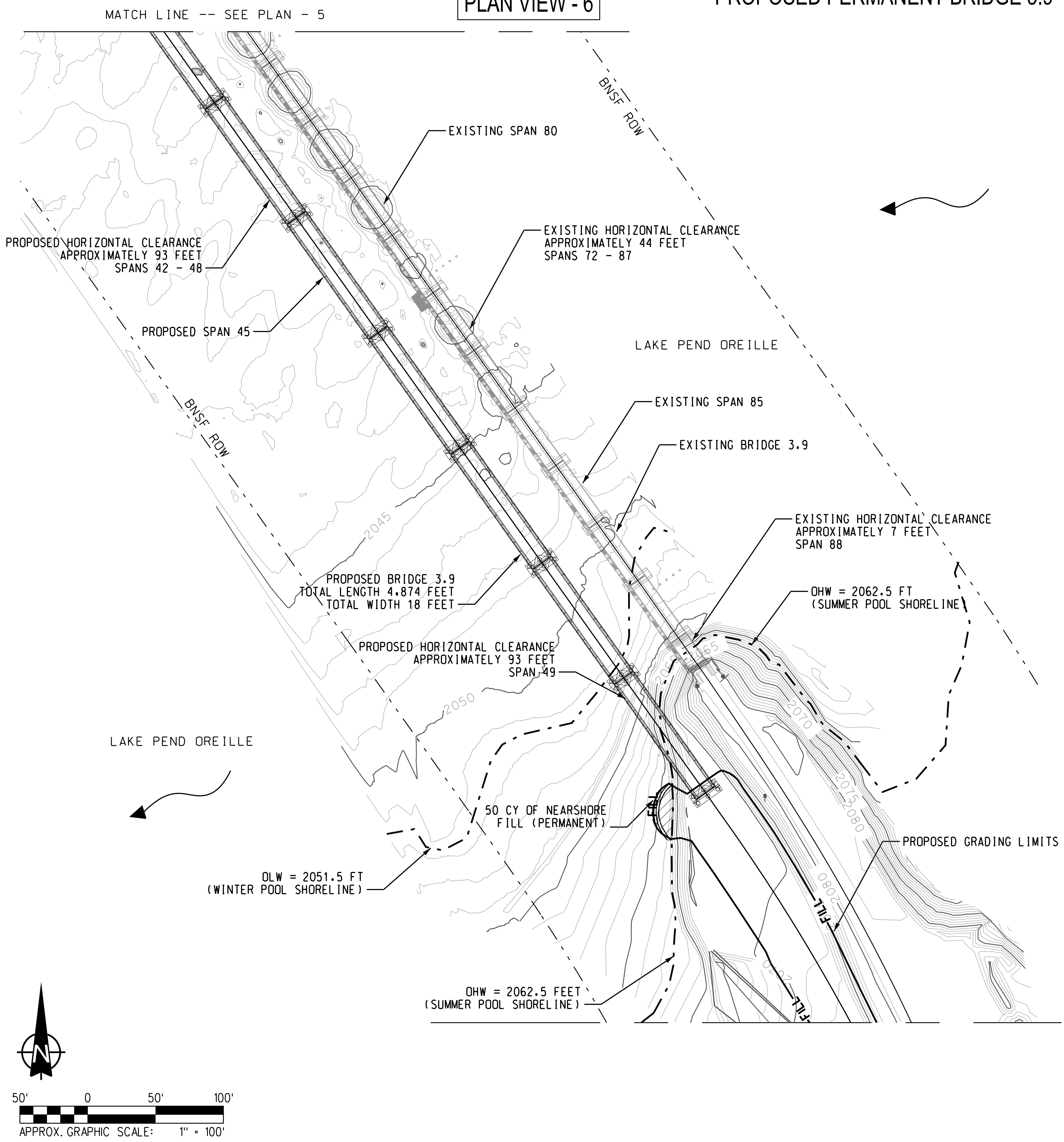
PLAN VIEW - 6

PROPOSED PERMANENT BRIDGE 3.9



BASED ON: HANSON PROFESSIONAL SERVICES, INC. PRELIMINARY PLANS. ELEVATIONS ARE RELATIVE TO NAVD88. CONCEPTUAL PLANS UTILIZED TO OBTAIN U.S. COAST GUARD BRIDGE PERMIT

LEGEND

— - - — - BNSF RIGHT-OF-WAY (ROW)

— — — — SHORELINE (SUMMER AND WINTER POOL)

——— STRUCTURE (ROADS, DOCKS)

EXISTING CONDITIONS / PROPOSED WORK

AGENCY REF. NO.:
PROJECT: BNSF / SANDPOINT JUNCTION CONNECTOR BRIDGE 3.9
OWNER: BNSF RAILWAY COMPANY
CONSULTANT: JACOBS ENGINEERING GROUP
LOCATION: BNSF BRIDGE 3.9 MONTANA DIVISION, KOOTENAI RIVER SUB, LINE SEGMENT 45, MP 3.9
MILE POINT OF BRIDGE LOCATION FROM MOUTH: 2.7
WATERWAY: LAKE PEND OREILLE
CITY: SANDPOINT **COUNTY:** BONNER **STATE:** IDAHO
DATE: 08/17/2018

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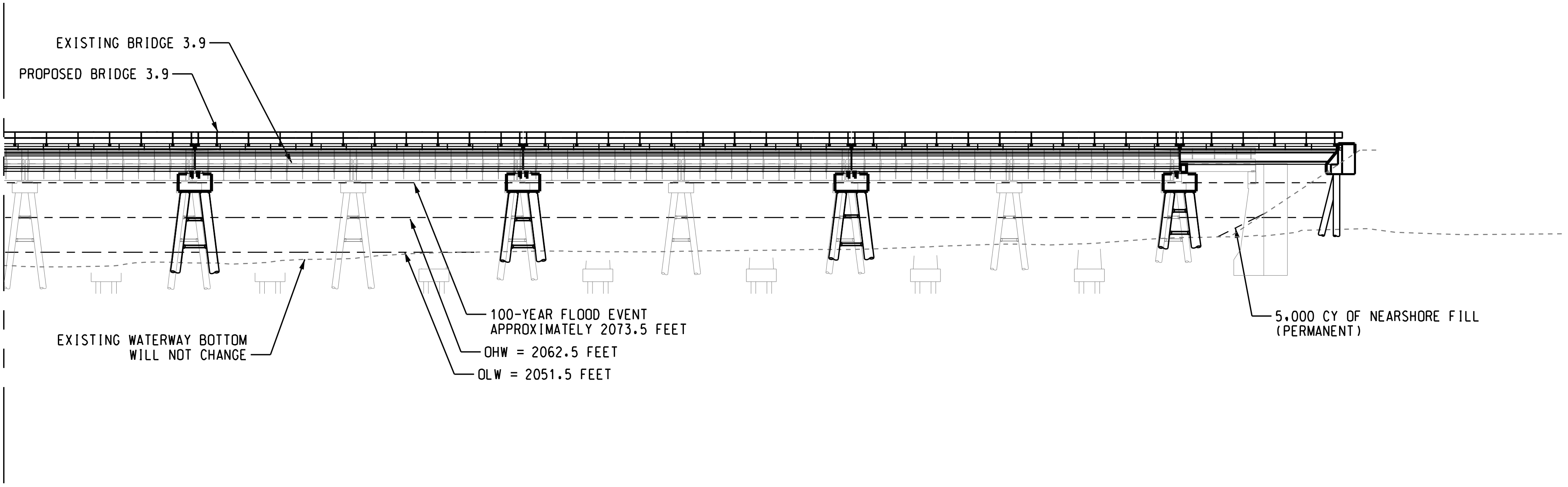
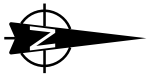
ELEVATION VIEW - 1 NORTH ABUTMENT

PROPOSED PERMANENT BRIDGE 3.9





APPROX. GRAPHIC SCALE: 1" = 50'

BASED ON: HANSON PROFESSIONAL SERVICES, INC. PRELIMINARY PLANS. ELEVATIONS ARE RELATIVE TO NAVD88. CONCEPTUAL PLANS UTILIZED TO OBTAIN U.S. COAST GUARD BRIDGE PERMIT

EXISTING CONDITIONS / PROPOSED WORK

AGENCY REF. NO.:
PROJECT: BNSF / SANDPOINT JUNCTION CONNECTOR BRIDGE 3.9
OWNER: BNSF RAILWAY COMPANY
CONSULTANT: JACOBS ENGINEERING GROUP
LOCATION: BNSF BRIDGE 3.9 MONTANA DIVISION, KOOTENAI RIVER SUB, LINE SEGMENT 45, MP 3.9
MILE POINT OF BRIDGE LOCATION FROM MOUTH: 2.7
WATERWAY: LAKE PEND OREILLE
CITY: SANDPOINT **COUNTY:** BONNER **STATE:** IDAHO
DATE: 08/17/2018

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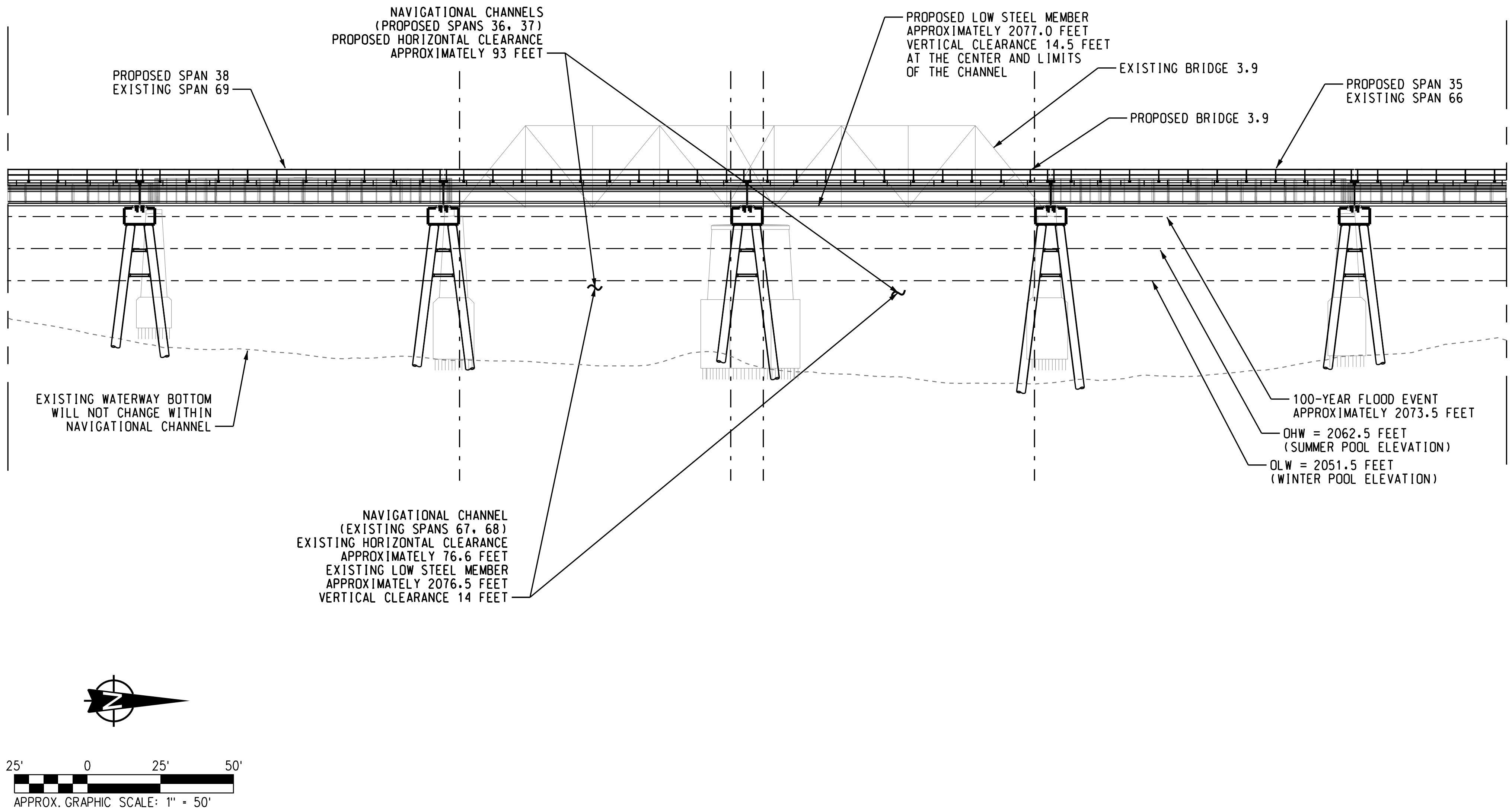
ELEVATION VIEW - 2 DEFINED NAVIGATIONAL CHANNEL PROFILE

PROPOSED PERMANENT BRIDGE 3.9



BASED ON: HANSON PROFESSIONAL SERVICES, INC. PRELIMINARY PLANS. ELEVATIONS ARE RELATIVE TO NAVD88. CONCEPTUAL PLANS UTILIZED TO OBTAIN U.S. COAST GUARD BRIDGE PERMIT

LEGEND

- - — - — LIMITS OF NAVIGATIONAL CHANNEL

EXISTING CONDITIONS / PROPOSED WORK

AGENCY REF. NO.:
PROJECT: BNSF / SANDPOINT JUNCTION CONNECTOR BRIDGE 3.9
OWNER: BNSF RAILWAY COMPANY
CONSULTANT: JACOBS ENGINEERING GROUP
LOCATION: BNSF BRIDGE 3.9 MONTANA DIVISION, KOOTENAI RIVER SUB, LINE SEGMENT 45, MP 3.9
MILE POINT OF BRIDGE LOCATION FROM MOUTH: 2.7
WATERWAY: LAKE PEND OREILLE
CITY: SANDPOINT **COUNTY:** BONNER **STATE:** IDAHO
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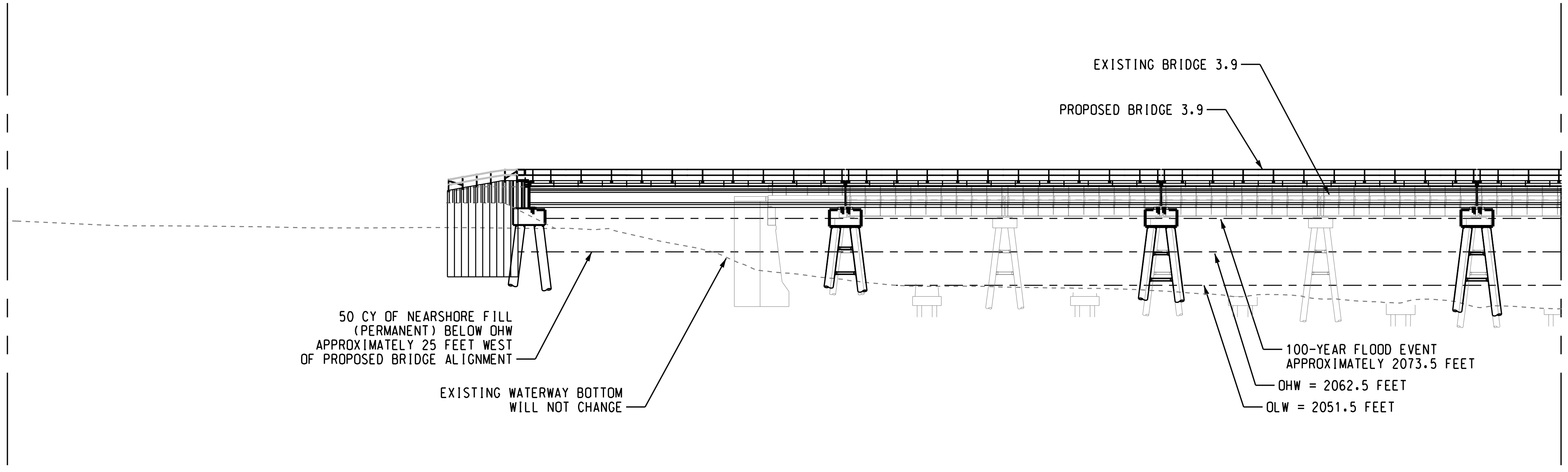
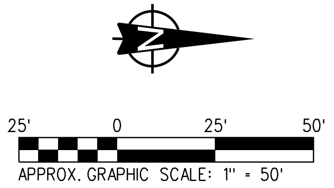
ELEVATION VIEW - 3 SOUTH ABUTMENT

PROPOSED PERMANENT BRIDGE 3.9





BASED ON: HANSON PROFESSIONAL SERVICES, INC. PRELIMINARY PLANS. ELEVATIONS ARE RELATIVE TO NAVD88. CONCEPTUAL PLANS UTILIZED TO OBTAIN U.S. COAST GUARD BRIDGE PERMIT

EXISTING CONDITIONS / PROPOSED WORK

AGENCY REF. NO.:
PROJECT: BNSF / SANDPOINT JUNCTION CONNECTOR BRIDGE 3.9
OWNER: BNSF RAILWAY COMPANY
CONSULTANT: JACOBS ENGINEERING GROUP
LOCATION: BNSF BRIDGE 3.9 MONTANA DIVISION, KOOTENAI RIVER SUB, LINE SEGMENT 45, MP 3.9
MILE POINT OF BRIDGE LOCATION FROM MOUTH: 2.7
WATERWAY: LAKE PEND OREILLE
CITY: SANDPOINT **COUNTY:** BONNER **STATE:** IDAHO
DATE: 08/17/2018

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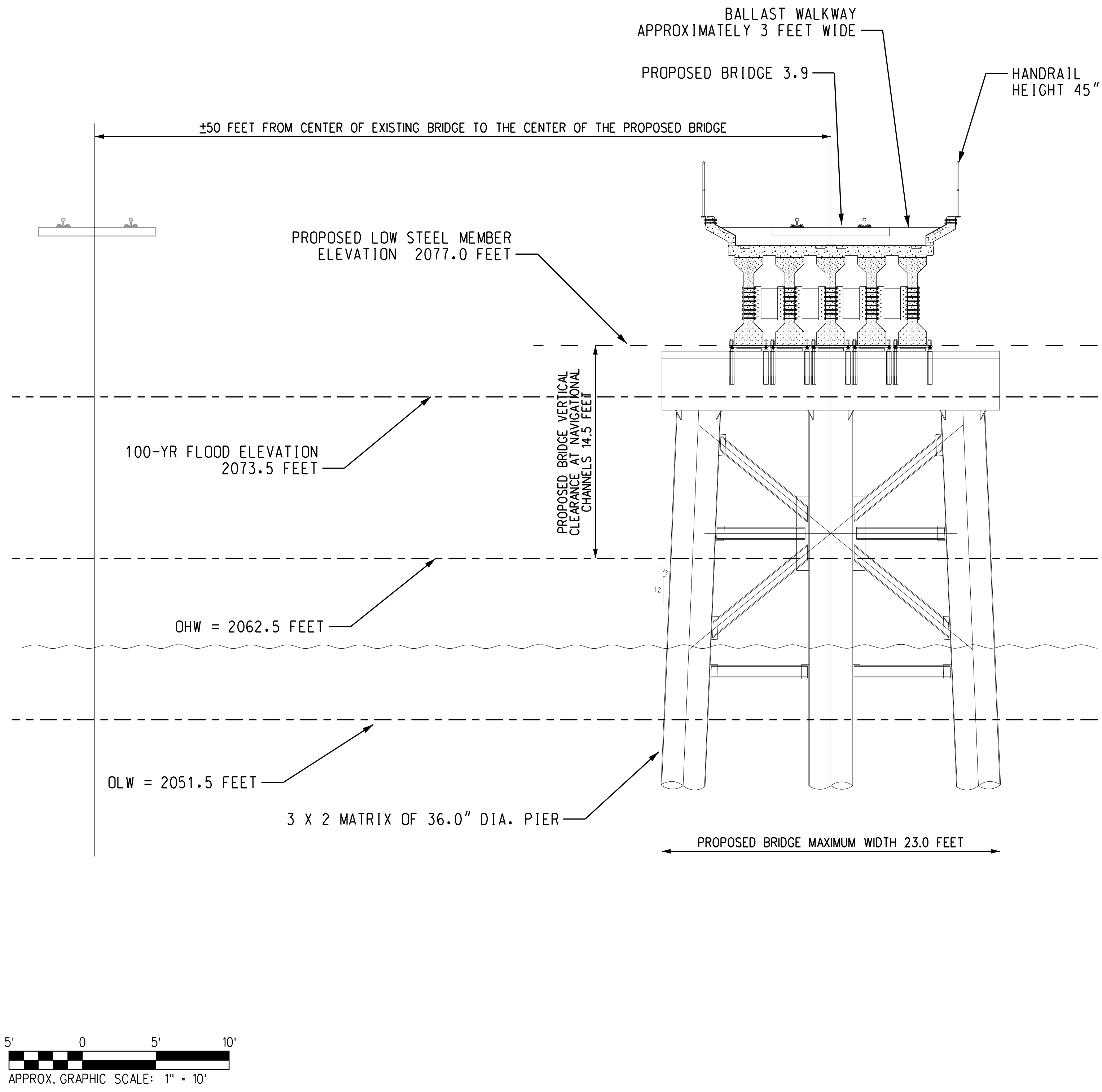
FINAL Review Draft - For USCG: 8/20/2018

TYPICAL SECTION VIEW

PROPOSED PERMANENT BRIDGE 3.9



BASED ON: HANSON PROFESSIONAL SERVICES, INC. PRELIMINARY PLANS. ELEVATIONS ARE RELATIVE TO NAVD88. CONCEPTUAL PLANS UTILIZED TO OBTAIN U.S. COAST GUARD BRIDGE PERMIT

EXISTING CONDITIONS / PROPOSED WORK

AGENCY REF. NO.:
PROJECT: BNSF / SANDPOINT JUNCTION CONNECTOR BRIDGE 3.9
OWNER: BNSF RAILWAY COMPANY
CONSULTANT: JACOBS ENGINEERING GROUP
LOCATION: BNSF BRIDGE 3.9 MONTANA DIVISION, KOOTENAI RIVER SUB, LINE SEGMENT 45, MP 3.9
MILE POINT OF BRIDGE LOCATION FROM MOUTH: 2.7
WATERWAY: LAKE PEND OREILLE
CITY: SANDPOINT **COUNTY:** BONNER **STATE:** IDAHO
DATE: 08/17/2018

SHEET 11 OF 11

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Appendix B

Official U.S. Fish and Wildlife Species List

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Idaho Fish And Wildlife Office
1387 South Vinnell Way, Suite 368
Boise, ID 83709-1657
Phone: (208) 378-5243 Fax: (208) 378-5262

In Reply Refer To: August 14, 2018
Consultation Code: 01EIFW00-2018-SLI-0158
Event Code: 01EIFW00-2018-E-03524
Project Name: BNSF Sandpoint Junction Connector Project - Official Species (County) List

Subject: Updated list of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (https://ww.fws.gov/migratorybirds/pdf/management/eagleconservtionplanguidance.pdf). Additionally, wind energy projects should follow the wind energy guidelines (https://www.fws.gov/ecologica-servces/energy-develpment/wind/html) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: https://www.fws.ov/bidsbird-enthusiasts/threats-to-birds/collisions/communication-towers.php.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds
- Wetlands

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

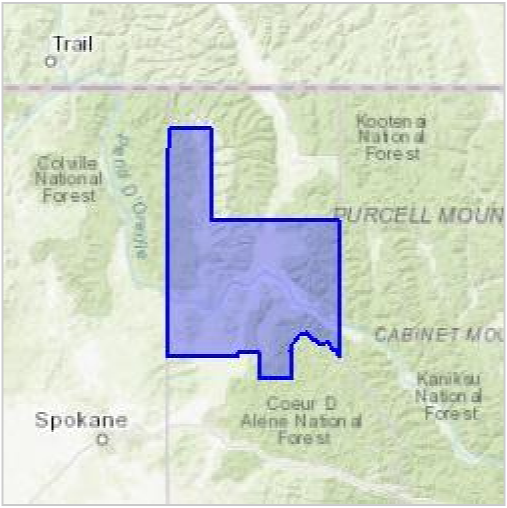
Idaho Fish And Wildlife Office
1387 South Vinnell Way, Suite 368
Boise, ID 83709-1657
(208) 378-5243

Project Summary

Consultation Code:	01EIFW00-2018-SLI-0158
Event Code:	01EIFW00-2018-E-03524
Project Name:	BNSF Sandpoint Junction Connector Project - Official Species (County) List
Project Type:	TRANSPORTATION
Project Description:	BNSF Railway Co. (BNSF) proposes to construct a second mainline track connection, which includes two new over-water bridges, between its Algoma Siding track and the Sandpoint Junction, where BNSF and the Montana Rail Link (MRL) mainlines join.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/48.36874949534075N116.54259694201099W



Counties: Bonner, ID

Endangered Species Act Species

There is a total of 6 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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[1] NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Canada Lynx *Lynx canadensis* Population: Wherever Found in Contiguous U.S. There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3652	Threatened
Grizzly Bear *Ursus arctos horribilis* Population: U.S.A., conterminous (lower 48) States, except where listed as an experimental population or delisted There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/7642	Threatened
North American Wolverine *Gulo gulo luscus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5123	Proposed Threatened
Woodland Caribou *Rangifer tarandus caribou* Population: Selkirk Mountain population There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/4618	Endangered

Fishes

NAME	STATUS
Bull Trout *Salvelinus confluentus* Population: U.S.A., conterminous, lower 48 states There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8212	Threatened

Conifers and Cycads

NAME	STATUS
Whitebark Pine *Pinus albicaulis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1748	Candidate

Critical habitats

There is 1 critical habitat wholly or partially within your project area under this office's jurisdiction.

NAME	STATUS
Bull Trout *Salvelinus confluentus* https://ecos.fws.gov/ecp/species/8212#crithab	Final

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Migratory Birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

---

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Jan 1 to Aug 31
Cassin's Finch *Carpodacus cassinii* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9462	Breeds May 15 to Jul 15

NAME	BREEDING SEASON
Clark's Grebe *Aechmophorus clarkii* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Jan 1 to Dec 31
Golden Eagle *Aquila chrysaetos* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds Jan 1 to Aug 31
Lesser Yellowlegs *Tringa flavipes* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Olive-sided Flycatcher *Contopus cooperi* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3914	Breeds May 20 to Aug 31
Rufous Hummingbird *selasphorus rufus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8002	Breeds Apr 15 to Jul 15

Probability Of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ “Proper Interpretation and Use of Your Migratory Bird Report” before using or attempting to interpret this report.

Probability of Presence (🟩)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee

was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.

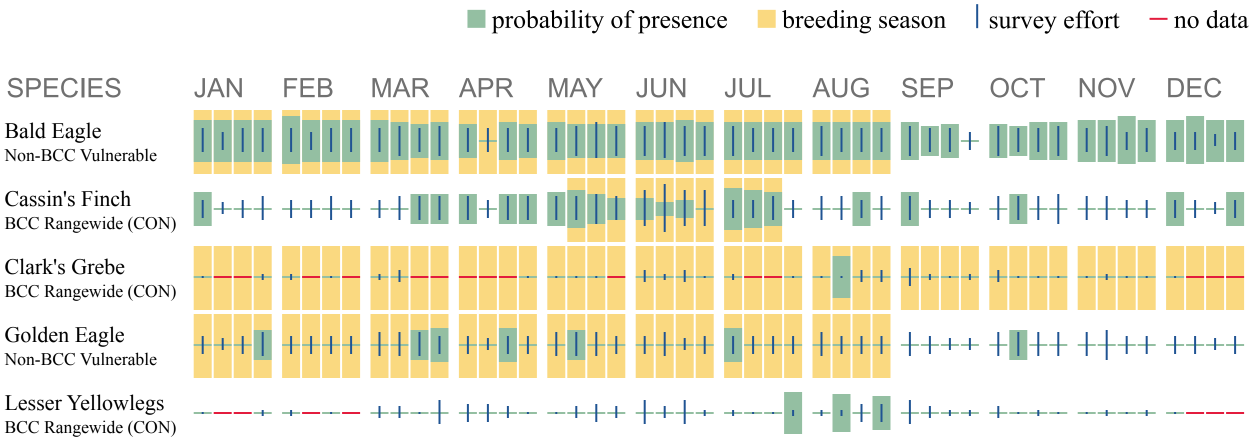
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

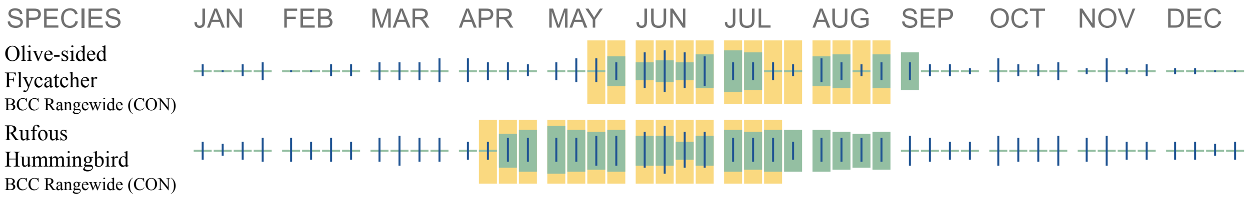
Breeding Season (🟨)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

No Data (−)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.





Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

Migratory Birds FAQ

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the E-bird Explore Data Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?
The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?
To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?
Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?
If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report
The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ “What does IPaC use to generate the migratory birds potentially occurring in my specified location”. Please be aware this report provides the “probability of presence” of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the “no data” indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ “Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds” at the bottom of your migratory bird trust resources page.

Wetlands

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

Due to your project's size, the list below may be incomplete, or the acreages reported may be inaccurate. For a full list, please contact the local U.S. Fish and Wildlife office or visit https://www.fws.gov/wetlands/data/mapper.HTML

FRESHWATER EMERGENT WETLAND

- PEM1A
- PEM1C
- PEM1F
- PEM1B
- PEM1Cb
- PEM1Fb
- PEM1Cx
- PEM1Fh

FRESHWATER FORESTED/SHRUB WETLAND

- PSS1A
- PFO1A
- PSS1C
- PFO4A
- PFO1C
- PSS1Ch
- PSS1F
- PSS1Fh
- PSS4A
- PFO4C
- PSS4C

FRESHWATER POND

- PABFb

- PABF
- PABFh
- PABFx
- PUBHb
- PUBHh
- PUBHx
- PAB4H
- PUBH
- PUSC
- PUSCh
- PUBF
- PUSA
- PUSAh

LAKE

- L2USCh
- L1UBH
- L1UBHh
- L2AB4H

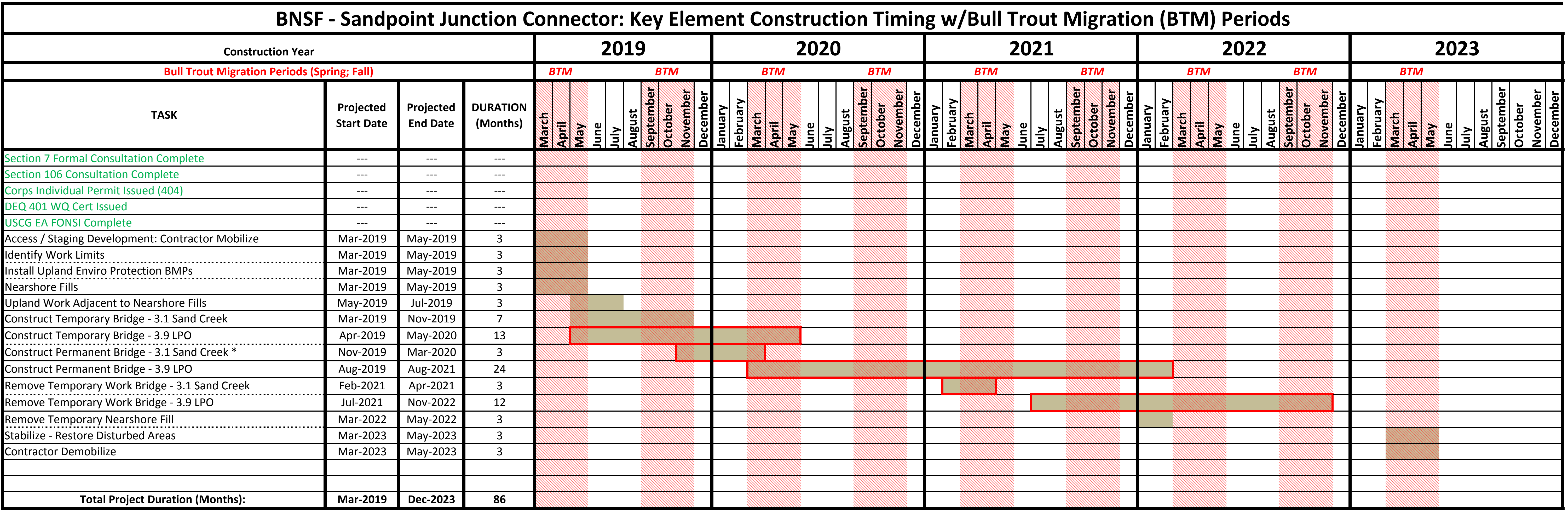
RIVERINE

- R3USC
- R3USA
- R5UBH
- R4SBC
- R3UBH
- R5UBFx

Appendix C

Construction Timing Table

BNSF - Sandpoint Junction Connector: Key Element Construction Timing w/Bull Trout Migration (BTM) Periods



	TASK	Projected Start Date	Projected End Date	DURATION (Months)
	Section 7 Formal Consultation Complete	---	---	---
	Section 106 Consultation Complete	---	---	---
	Corps Individual Permit Issued (404)	---	---	---
	DEQ 401 WQ Cert Issued	---	---	---
	USCG EA FONSI Complete	---	---	---
1	Access / Staging Development: Contractor Mobilize	Mar-2019	May-2019	3
2	Identify Work Limits	Mar-2019	May-2019	3
3	Install Upland Enviro Protection BMPs	Mar-2019	May-2019	3
4	Nearshore Fills	Mar-2019	May-2019	3
5	Upland Work Adjacent to Nearshore Fills	May-2019	Jul-2019	3
6	Construct Temporary Bridge - 3.1 Sand Creek	Mar-2019	Nov-2019	7
7	Construct Temporary Bridge - 3.9 LPO	Apr-2019	May-2020	13
8	Construct Permanent Bridge - 3.1 Sand Creek *	Nov-2019	Mar-2020	3
9	Construct Permanent Bridge - 3.9 LPO	Aug-2019	Aug-2021	24
10	Remove Temporary Work Bridge - 3.1 Sand Creek	Feb-2021	Apr-2021	3
11	Remove Temporary Work Bridge - 3.9 LPO	Jul-2021	Nov-2022	12
12	Remove Temporary Nearshore Fill	Mar-2022	May-2022	3
13	Stabilize - Restore Disturbed Areas	Mar-2023	May-2023	3
14	Contractor Demobilize	Mar-2023	May-2023	3
	Total Project Duration (Months):	**Mar-2019**	**Dec-2023**	**86**

* Note remove of center span/piles during OHW and reinstall during OLW

🟥 **Denotes Potential for LPO Pile Driving Activities During BTM**

Appendix D

Pile Driving Impact Calculators

Model last updated January 26, 2009

Project Title	BNSF SPJ - Sand Creek Temporary Work Bridge 3.1
Pile information (size, type, number, pile strikes, etc.)	Impact Proof 10 24-inch-diameter steel piles (1 pile per pier) after vibratory to refusal; maximum 60 strikes/pile; 2-3 hours each install; 4 piles/day (2 simultaneously). No bubble curtains.

Fill in green cells: estimated sound levels and distances at which they were measured, estimated number of pile strikes per day, and transmision loss constant.

	Acoustic Metric			
	Peak	SEL	RMS	Effective Quiet
Measured single strike level (dB)	**207**	**178**	**194**	**150**
Distance (m)	**10**	**10**	**10**	

Estimated number of strikes	**240**

Cumulative SEL at measured distance
202

	Distance (m) to threshold			
	Onset of Physical Injury			Behavior
	Peak dB	Cumulative SEL dB**		RMS dB
		Fish ≥ 2 g	Fish < 2 g	
Transmission loss constant (15 if unknown)	206	187	183	150
15	**12**	**97**	**179**	**8577**

** This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

Notes (source for estimates, etc.)

(This model was last updated January 26, 2009)

8,577meters = 5.33 miles; 97 meters = 0.60 mile; 12 meters = 0.007 mile (37 feet)

Unmitigated(levels for simultaneous driving of two piles at a time), measured 10 m from the pile, 24-inch steel pipe pile; per WSDOT BA Preparation Advanced Training Manual Version 4-2018, Table 7-12.

Number of strikes needed/24" pile for construction equipment load requirements - per BNSF

Project Title	BNSF SPJ - LPO Temporary Work Bridge 3.9
Pile information (size, type, number, pile strikes, etc.)	Impact Proof 76 24-inch-diameter steel piles (1 pile per pier) after vibratory to refusal; maximum 60 strikes/pile; 2-3 hours each install; 4 piles/day (2 simultaneously). No bubble curtains.

Fill in green cells: estimated sound levels and distances at which they were measured, estimated number of pile strikes per day, and transmision loss constant.

	Acoustic Metric			
	Peak	SEL	RMS	Effective Quiet
Measured single strike level (dB)	**207**	**178**	**194**	**150**
Distance (m)	**10**	**10**	**10**	

Estimated number of strikes	**240**

Cumulative SEL at measured distance

202

	Distance (m) to threshold			
	Onset of Physical Injury			Behavior
	Peak dB	Cumulative SEL dB**		RMS dB
		Fish ≥ 2 g	Fish < 2 g	
Transmission loss constant (15 if unknown)	206	187	183	150
15	**12**	**97**	**179**	**8577**

** This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

Notes (source for estimates, etc.)

(This model was last updated January 26, 2009)

8,577meters = 5.33 miles; 97 meters = 0.60 mile; 12 meters = 0.007 mile (37 feet)

Unmitigated(levels for simultaneous driving of two piles at a time), measured 10 m from the pile, 24-inch steel pipe pile; per WSDOT BA Preparation Advanced Training Manual Version 4-2018, Table 7-12.

Number of strikes needed/24" pile for construction equipment load requirements - per BNSF

Project Title	BNSF Sandpoint Junction Connector, Sand Ck Br. 3.1
Pile information (size, type, number, pile strikes, etc.)	64 24-inch-diameter steel pipe piles, 22 below OHWM. Maximum 1,200 strikes/pile, 1-2 hours each install; 4 piles/day (2 simultaneously). Install during winter pool/low-water conditions. Attenuated -3 dB for bubble curtains

Fill in green cells: estimated sound levels and distances at which they were measured, estimated number of pile strikes per day, and transmision loss constant.

	Acoustic Metric			
	Peak	SEL	RMS	Effective Quiet
Measured single strike level (dB)	**204**	**175**	**191**	**150**
Distance (m)	**10**	**10**	**10**	

Estimated number of strikes	**4,800**

Cumulative SEL at measured distance
212

	Distance (m) to threshold			
	Onset of Physical Injury			Behavior
	Peak dB	Cumulative SEL dB**		RMS dB
		Fish ≥ 2 g	Fish < 2 g	
Transmission loss constant (15 if unknown)	206	187	183	150
15	**7**	**451**	**464**	**5412**

** This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

Notes (source for estimates, etc.)

(This model was last updated January 25, 2009)

7 meters = 23 feet; 284 meters= 0.28 miles; 464 meters = 0.29 miles; 5,412 meters = 3.36 miles
LPO main waterbody is 0.25 mile downstream of Bridge 3.1; Sand Creek considered to be an inlet of LPO so within BT CH.

Per sound pressure levels attenuated -3 dB by using bubble curtain in water depths 2 feet or greater; for single strikes, measured 10 m from the pile, 24-inch steel pipe pile; per WSDOT BA Preparation Advanced Training Manual Version 4-2017, Table 7-12.

Dominant frequencies generated in pile driving are between 50 & 1000 Hz, so most of the energy is not propagated in water depths of 1.5 feet or less.

Underwater noise propagation is limited by sinusoity of a system (where river bends noise is unlikely to propagate; line-of-sight rule is used to determine the extent of noise propagation in river systems.)

Project Title	BNSF Sandpoint Junction Connector, LPO Bridge 3.9
Pile information (size, type, number, pile strikes, etc.)	288 36-inch-diameter steel piles; maximum 1600 strikes/pile; 2-3 hours each install; 4 piles/day (2 simultaneously) Attenuated by 3 dB for bubble curtains

Fill in green cells: estimated sound levels and distances at which they were measured, estimated number of pile strikes per day, and transmision loss constant.

	Acoustic Metric			
	Peak	SEL	RMS	Effective Quiet
Measured single strike level (dB)	**207**	**180**	**190**	**150**
Distance (m)	**10**	**10**	**10**	

Estimated number of strikes	**6,400**

Cumulative SEL at measured distance
218

	Distance (m) to threshold			
	Onset of Physical Injury			Behavior
	Peak dB	Cumulative SEL dB**		RMS dB
		Fish ≥ 2 g	Fish < 2 g	
Transmission loss constant (15 if unknown)	206	187	183	150
15	**12**	**1000**	**1000**	**4642**

** This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

Notes (source for estimates, etc.)

(This model was last updated January 26, 2009)

4,642 meters = 2.88 miles; 1,000 meters =0 .62 mile; 12 meters = 0.007 mile (37 feet)

Attenuated (-3 dB for bubble curtains, levels for simultaneous driving of two piles at a time), measured 10 m from the pile, 36-inch steel pipe pile; per WSDOT BA Preparation Advanced Training Manual Version 4-2017, Table 7-12.

Number of strikes needed/36" pile for rail load requirements - per BNSF

Appendix E

2008 Pier Replacements Underwater Sound Level Measurements Report

Robert Miner Dynamic Testing, Inc.
Consulting, Dynamic Measurements and Analyses for Deep Foundations

July 31, 2008

Mr. Rick Smith P.E.
Jacobs Engineering
811 1st Ave, Suite 407
Seattle, WA 98104-1418

Re: Underwater Sound Level Measurements
24" OD Steel Piles, Junttan HHK5a Hydraulic hammer
July 14-July 25, 2008
Pier Replacements, BNSF Long Bridge, Sandpoint, ID

Dear Mr. Smith,

This report presents results from underwater sound level measurements for the project referenced above. Robert Miner Dynamic Testing, Inc. (RMDT) completed these measurements and this report at your request.

MEASUREMENT OBJECTIVES

The underwater sound level measurements reported herein were requested by Jacobs Engineering and BNSF. At the request of the United States Fish and Wildlife Service, RMDT's procedure generally followed the procedures set forth by WSDOT. This procedure called for monitoring of peak sound pressure level (SPL), Sound Exposure Level (SEL), and Root Mean Square (RMS) during periods with air supply to the bubble curtain alternating on and off.

TEST DETAILS

Test Sequence

RMDT carried out hydro-acoustic monitoring during ACC West Coast's (Hurlen) pile driving operations on six days spanning the period of July 14 to July 25. Driving on all piles was completed with an impact hammer and RMDT monitored SPL values during impact driving. Generally, the pile penetration resistance (blows/ft) was relatively modest such that driving times for individual piles were relatively short with respect to the pile length.

Piles

All piles were 24" OD closed end steel piles with an 0.50" nominal wall thickness and a computed cross-sectional area of 36.9 square inches. During impact driving pile lengths were either approximately 80 ft or 160 ft, with approximately 160 ft final lengths and approximately 140 ft final penetration in soil. We understand that soils were predominantly clay, and that such clay extended to great depth below the pile tips. RMDT's measurements of water depth indicated that the water depth near the piles was typically between 14 and 19 ft, and that similar shallow depths persisted to great distance from the work site.

Hammer

The piles were driven with a Junttan HHK5a hydraulic hammer having a ram weighing 11,000 pounds and maximum potential energy of 43,400 ft-pounds (59 kJ), and a maximum stroke of 3.94 ft. (1.2 m). Dynamic pile measurements completed by RMDT at this site during separate foundation engineering investigations indicate that the HHK 5a hammer was typically operated so that it provided transfer energy ranging from 30,000 to 44,000 ft-pounds, with peak dynamic forces typically ranging from 660,000 to 890,000 pounds.

Bubble Curtain

The bubble curtain consisted of two submerged rings, each with an individual air supply line originating at a manifold on the deck of the work barge. One ring was placed at the mud line, and another approximately half way up the water column. For further details on the bubble curtain please refer to other project documents.

Instrumentation

Underwater sound levels were measured with one or two Reson Type 4013 hydrophones. Signals from these pressure transducers were recorded using a Dactron Photon 4-channel signal analyzer connected to a Fujitsu tablet computer. Hydrophone calibrations were checked in the field and in the laboratory using a Gras type 42AC piston-phone calibrator with hydrophone adaptor . For occasional measurement of airborne sound we used an Ono Sokki LA-4350 Type 1 integrating sound level meter.

All but three of our measurements were made by suspending the hydrophones in water adjacent to the work barge. Hydrophones were held at depth of approximately 4 and 2 m using lead weights. Some tests were made at distance of 80, 500, and 1000 ft from the pile, and for such tests the hydrophones were deployed over the side of a work skiff at depths of 3 and 2 m. Distances between the pile and our instruments were determined with a 100 foot fiber tape, or for longer distances by pier number and spacing.

ANALYSIS METHODOLOGY

Per the general procedure requested by the USFWS, results are provided in terms of peak Sound Pressure Level, Sound Exposure Level (SEL), and Root Mean Square (RMS). Each of these results are discussed and defined below.

Peak Sound Pressure Level

The peak "instantaneous" Sound Pressure Level (SPL_{peak}) is obtained from the maximum excursion (either positive or negative) from the ambient pressure. Although the pressure is measured in units such as Pascals or psi, SPL is expressed using the non-dimensional and logarithmic decibel scale. The formula for converting a measured peak pressure to SPL_{peak} is given below:

$SPL_{peak}= 20 \, Log(p/p_{ref})$,

where p is the measured peak in Pascals (Pa) divided by a customary reference pressure. For water the customary reference pressure, p_{ref} is 1 microPascal.

Thus, signals with for which the peak pressure is 1000, 3163, or 10,000 Pa would have SPL_{peak} values of 180 dB, 190 dB, or 200 dB, respectively. For this calculation the "peak" pressure is the greater of the maximum pressure and the absolute value of the minimum pressure.

Sound Exposure Level

The Sound Exposure Level, SEL is the cumulative energy expressed in decibels for a single hammer blow. It is computed as the cumulative sum of the square of individual values multiplied by time between values. For this report the SEL was computed using the individual values in units of Pascals, and then converted to dB scale for presentation.

Root Mean Square Sound Pressure Level

The root mean square Sound Pressure Level, RMS, is the square root of the SEL value computed for a specific interval within the wave form of an individual hammer blow. In this report we computed the RMS value for a time interval that contains 90 percent of the signal energy. This time was defined to begin and end when the SEL reached 5 percent and 95 percent of it's peak value, respectively.

MEASUREMENT RESULTS

Appendix A presents sound pressure measurements over time for each monitored pile. Most plots in Appendix A present results from 2 hydrophone depths, with the depths differentiated by color. Table 1 summarizes SPL_{peak} values for two or three measurement periods during driving for each pile. For those piles which were driven with the bubble curtain alternating on and off, a mean SPL_{peak} is also given in both Pascals and Decibels. All sound pressure levels for July 14-16 were measured with the bubble curtains on.

From among the series of hammer blows represented in Appendix A, we selected individual hammer blows and computed the detailed sound pressure metrics, SPL_{peak}, SEL, and RMS, as discussed above. Appendix B contains plots showing these metrics and Table 2 summarizes these results for individual pile and bubble curtain use. For each data set the blow selected for detailed analysis was the blow with the highest or second highest SPL_{peak}. The highest peak was not used if it was greater than 1.1 times the average of the next two highest peaks.

Appendix B contains plots for each selected blow showing the measurement, narrow band frequency spectra, Sound Exposure Level, and a summary of the computed sound pressure metrics.

I trust that this information will assist you and the project team. Please do not hesitate to contact us if you have any questions for RMDT regarding our measurements of this report.

Sincerely,

W. Javan Miner

Robert F. Miner

Robert Miner Dynamic Testing, Inc.

Table 1. Summary of Underwater Sound Levels.

Date and Time	Pile	SPL_{peak} dB	Mean SPL_{peak} Bubble Curtain ON		Mean SPL_{peak} Bubble Curtain OFF	
			Pa	dB	Pa	dB
July 14, 2008 - 15:01	Bent 9	197 dB	5600 Pa	195 dB	N/A	N/A
July 15, 2008 - 10:49	8-1-2	186 dB	1800 Pa	185 dB	N/A	N/A
July 15, 2008 - 13:18	8-1-2	187 dB	2000 Pa	186 dB	N/A	N/A
July 15, 2008 - 13:54	9-2-3	198 dB	6300 Pa	196 dB	N/A	N/A
July 16, 2008 - 09:29	9-2-1	162 dB	110 Pa	161 dB	N/A	N/A
July 16, 2008 - 09:49	9-2-2	166 dB	180 Pa	165 dB	N/A	N/A
July 16, 2008 - 11:49	9-2-1	196 dB	5000 Pa	194 dB	N/A	N/A
July 16, 2008 - 12:35	9-2-2	196 dB	5000 Pa	194 dB	N/A	N/A
July 21, 2008 - 14:25	N/A	195 dB	3500 Pa	191 dB	5000 Pa	194 dB
July 21, 2008 - 14:41	N/A	203 dB	5000 Pa	194 dB	10000 Pa	200 dB
July 21, 2008 - 14:51	N/A	201 dB	5000 Pa	194 dB	8900 Pa	199 dB
July 24, 2008 - 09:13	12-2-1	198 dB	4500 Pa	193 dB	5600 Pa	195 dB
July 24, 2008 - 09:38	12-2-1	199 dB	4500 Pa	193 dB	7900 Pa	198 dB
July 24, 2008 - 12:13	12-1-2	201 dB	7100 Pa	197 dB	8900 Pa	199 dB
July 24, 2008 - 12:44	12-1-2	200 dB	7100 Pa	197 dB	5600 Pa	195 dB
July 25, 2008 - 10:53	12-2-2	199 dB	5000 Pa	194 dB	7100 Pa	197 dB
July 25, 2008 - 11:21	12-2-2	197 dB	4500 Pa	193 dB	5000 Pa	194 dB
July 25, 2008 - 11:27	12-2-2	198 dB	5600 Pa	195 dB	5600 Pa	195 dB

Table 2. Summary of Detailed Waveform Analyses

Date and Time	Pile	Bubble Curtain ON / OFF	SPL_{Peak}		SEL		RMS	
			Pa	dB	Pa	dB	Pa	dB
July 21, 2008 - 14:51	N/A	ON	6300 Pa	196 dB	500 Pa	174 dB	1250 Pa	182 dB
		OFF	11000 Pa	201 dB	700 Pa	177 dB	1800 Pa	185 dB
July 24, 2008 - 09:38	12-2-1	ON	6300 Pa	196 dB	400 Pa	172 dB	1100 Pa	181 dB
		OFF	8900 Pa	199 dB	500 Pa	174 dB	1400 Pa	183 dB
July 24, 2008 - 12:13	12-1-2	ON	7900 Pa	198 dB	700 Pa	177 dB	1800 Pa	185 dB
		OFF	11000 Pa	201 dB	800 Pa	178 dB	2000 Pa	186 dB
July 25, 2008 - 11:21	12-2-2	ON	6300 Pa	196 dB	400 Pa	172 dB	1000 Pa	180 dB
		OFF	7900 Pa	198 dB	450 Pa	173 dB	1400 Pa	183 dB

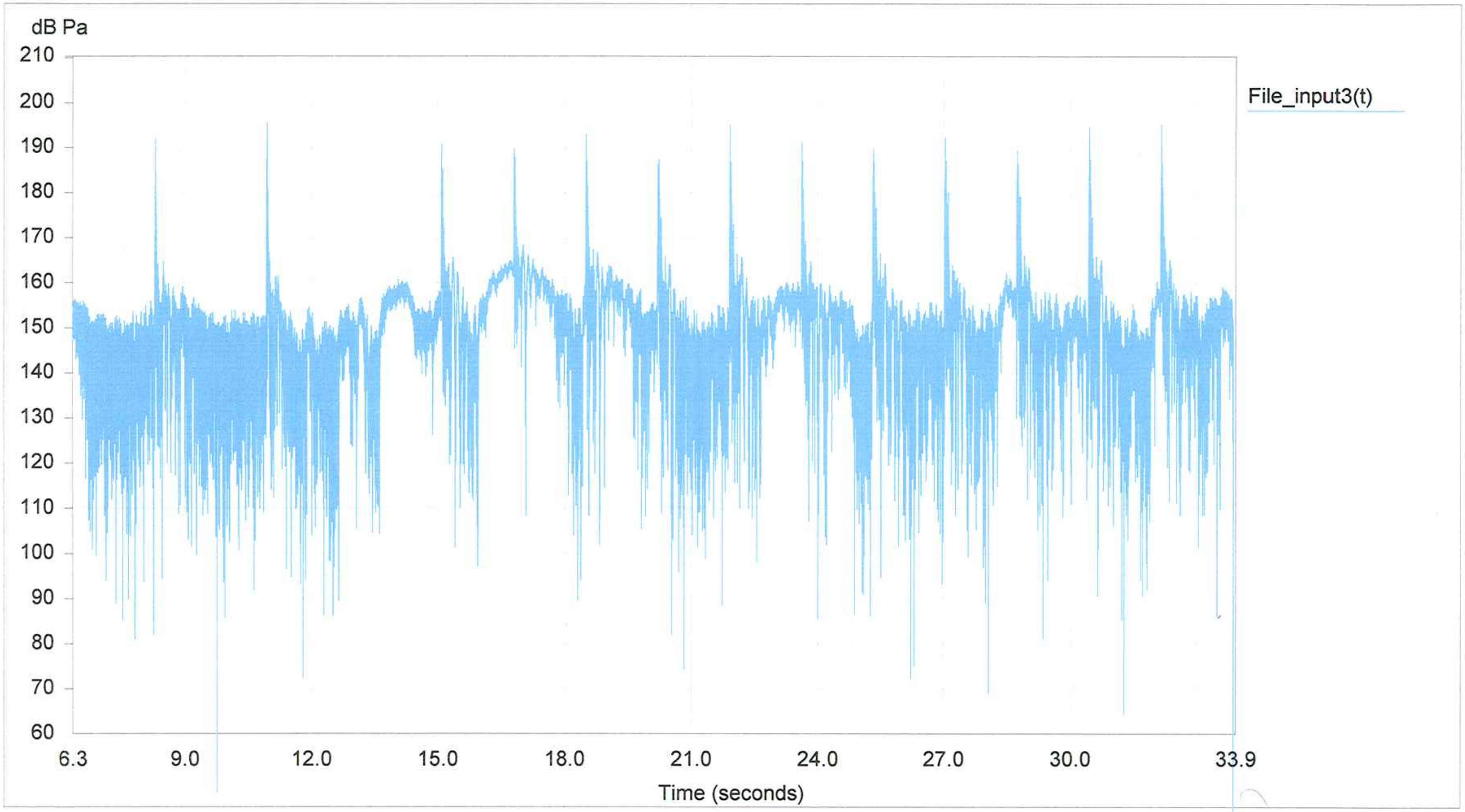
Appendix A

Time Histories for Peak Sound Pressure Measurements
and
Time Histories for Selected Individual Hammer Blows

BNSF. July 14, 2008. 15:01

Re-strike Bent 9, Bubble Curtain On (Two Rings)

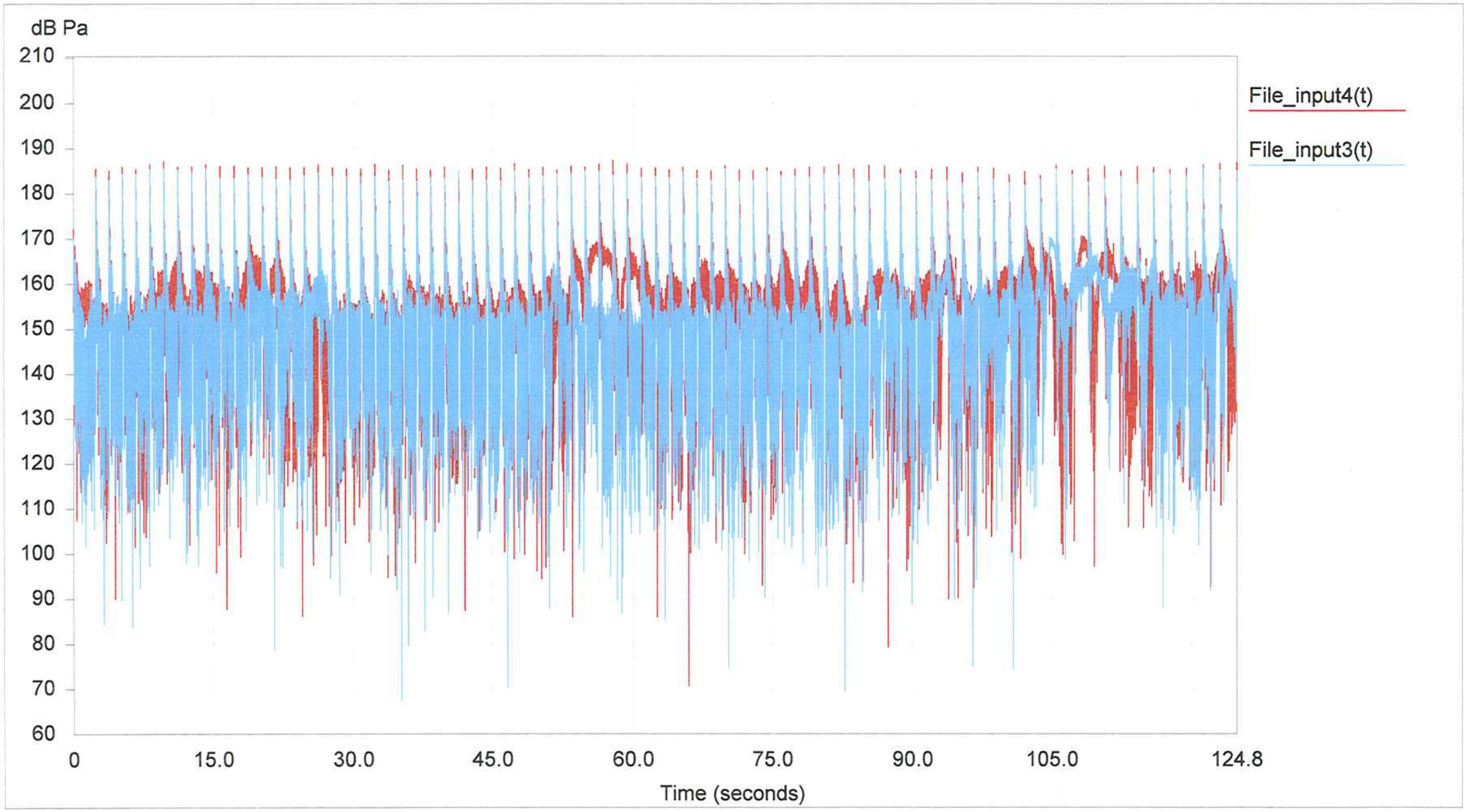
Channel 3 (blue) is ~ 20 m from pile



BNSF. July 15, 2008. 10:49

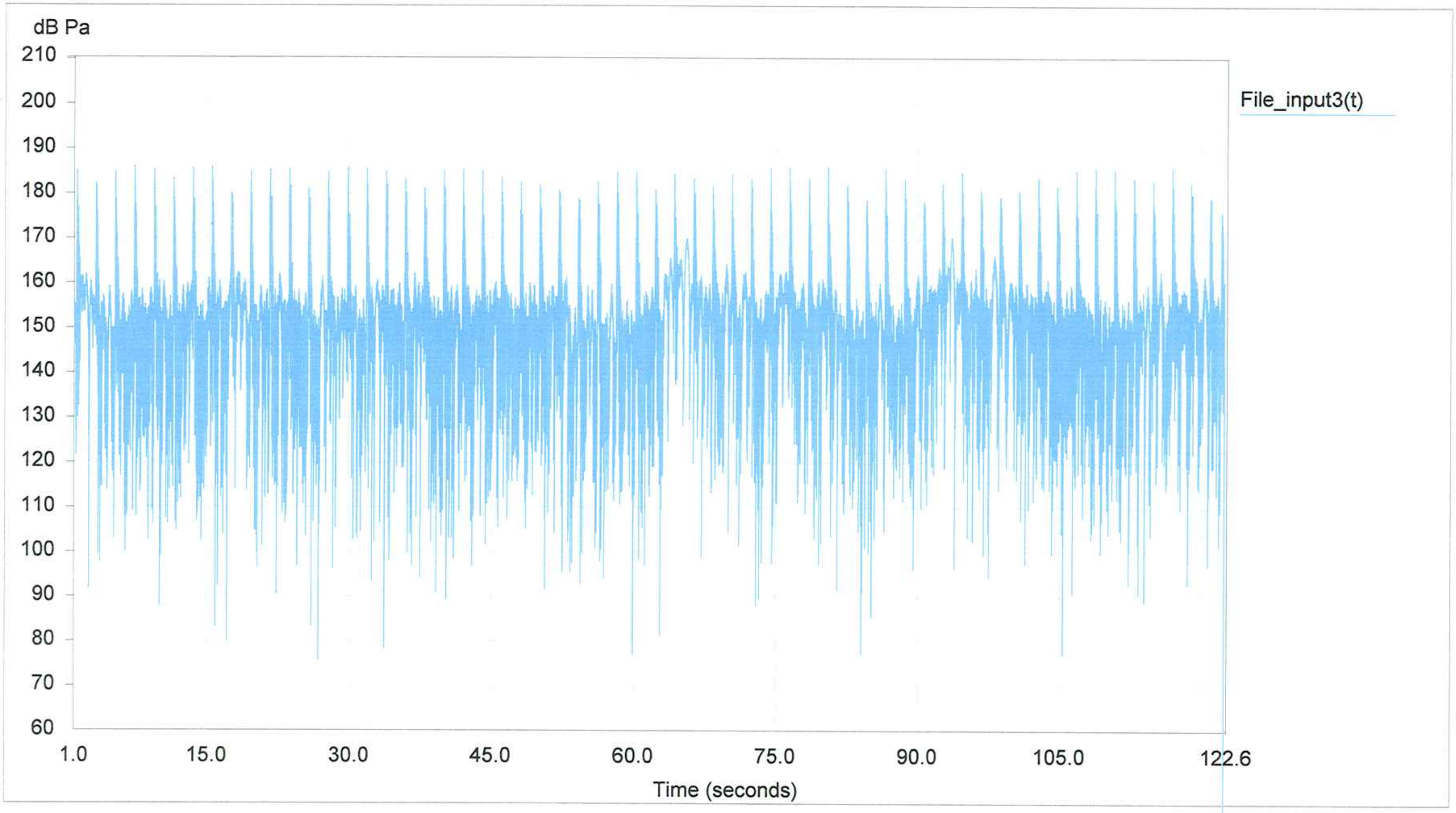
Pile 8-1-2, Bubble Curtain On (Two Rings)

Channel 3 (blue) is ~ 12 m from pile (4 m depth), Channel 4 (red) is ~ 12 m from pile (3 m depth)



BNSF. July 15, 2008. 13:18
Pile 8-1-2, Bubble Curtain On (Two Rings)

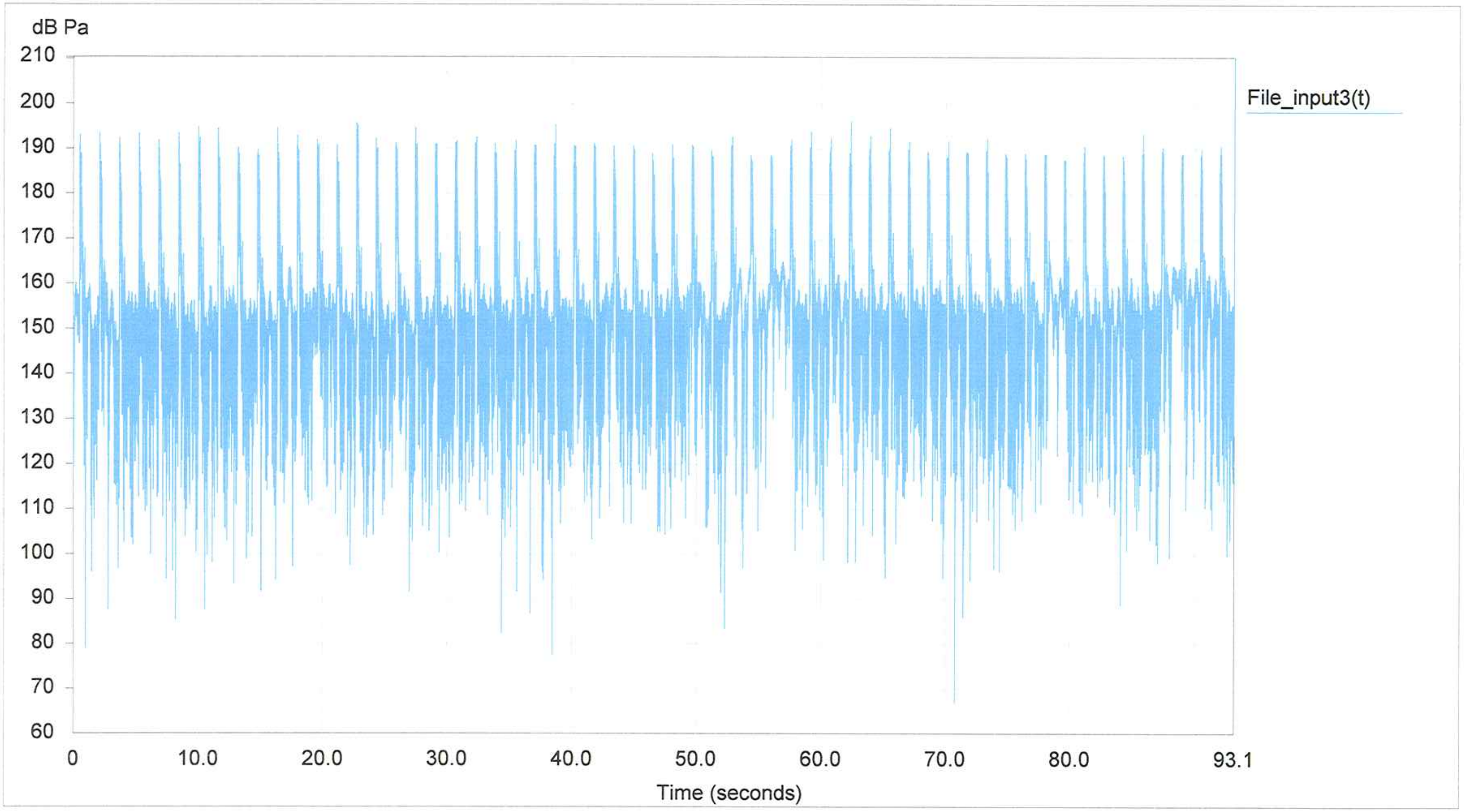
Channel 3 (blue) is ~ 12 m from pile (4 m depth)



BNSF. July 15, 2008. 13:54

Pile 9-2-3, Bubble Curtain On (Two Rings)

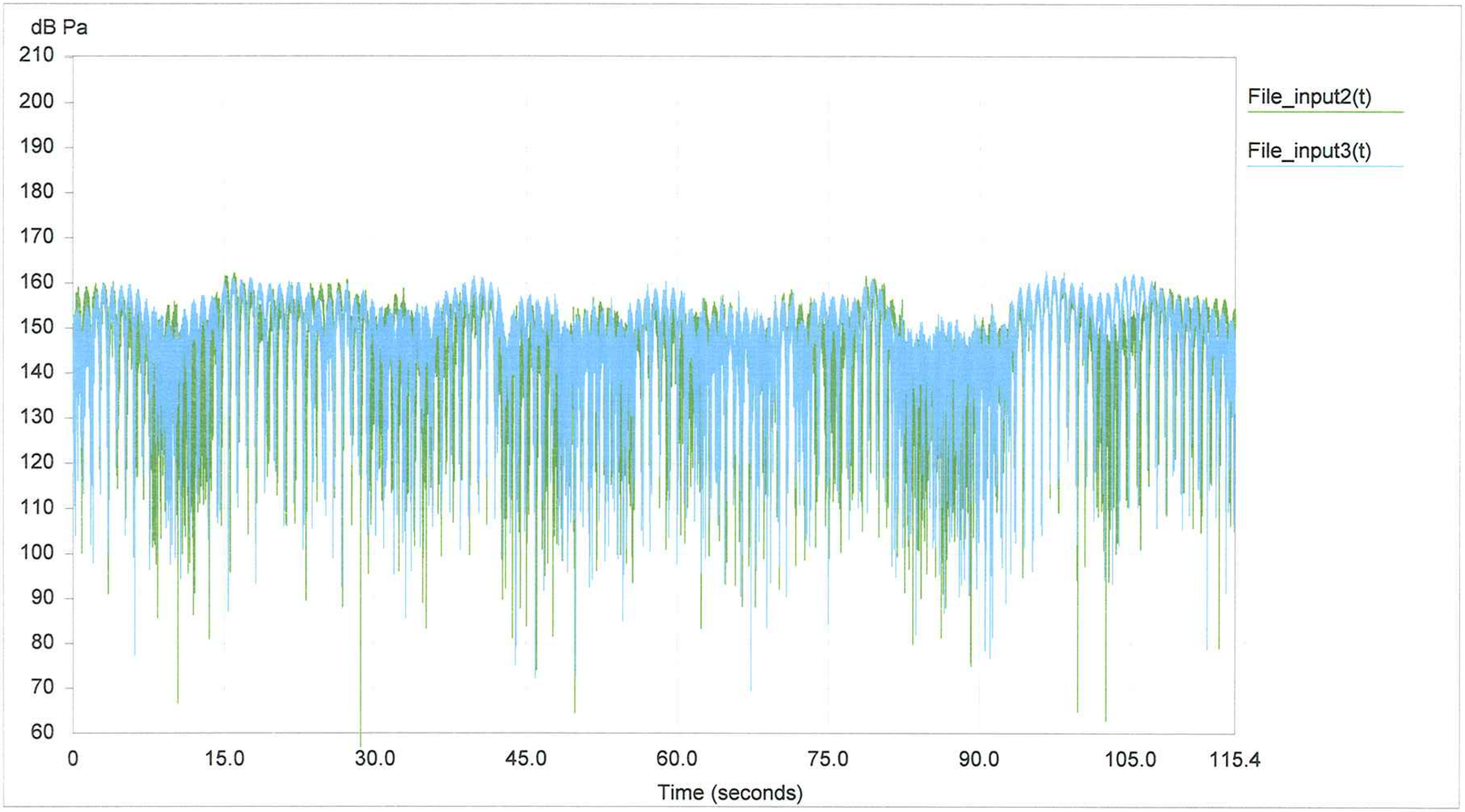
Channel 3 (blue) is ~ 10 m from pile (4 m depth)



BNSF. July 16, 2008. 09:29

Pile 9-2-1, Bubble Curtain On (Two Rings)

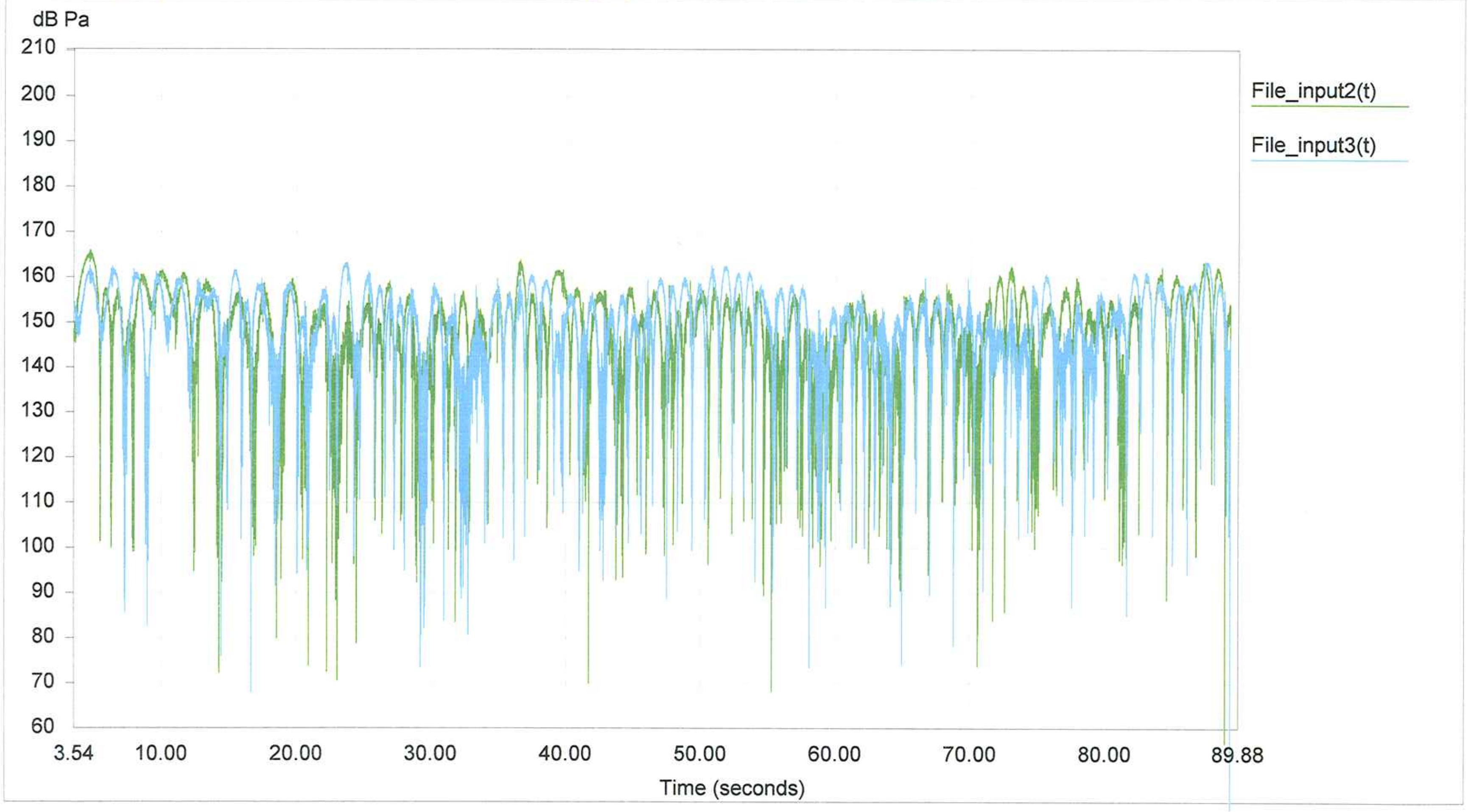
Channel 2 (green) is ~ 1000 ft from pile (10ft depth), Channel 3 (blue) is ~ 1000 ft from pile (8 ft depth)



BNSF. July 16, 2008. 09:49

Pile 9-2-2, Bubble Curtain On (Two Rings)

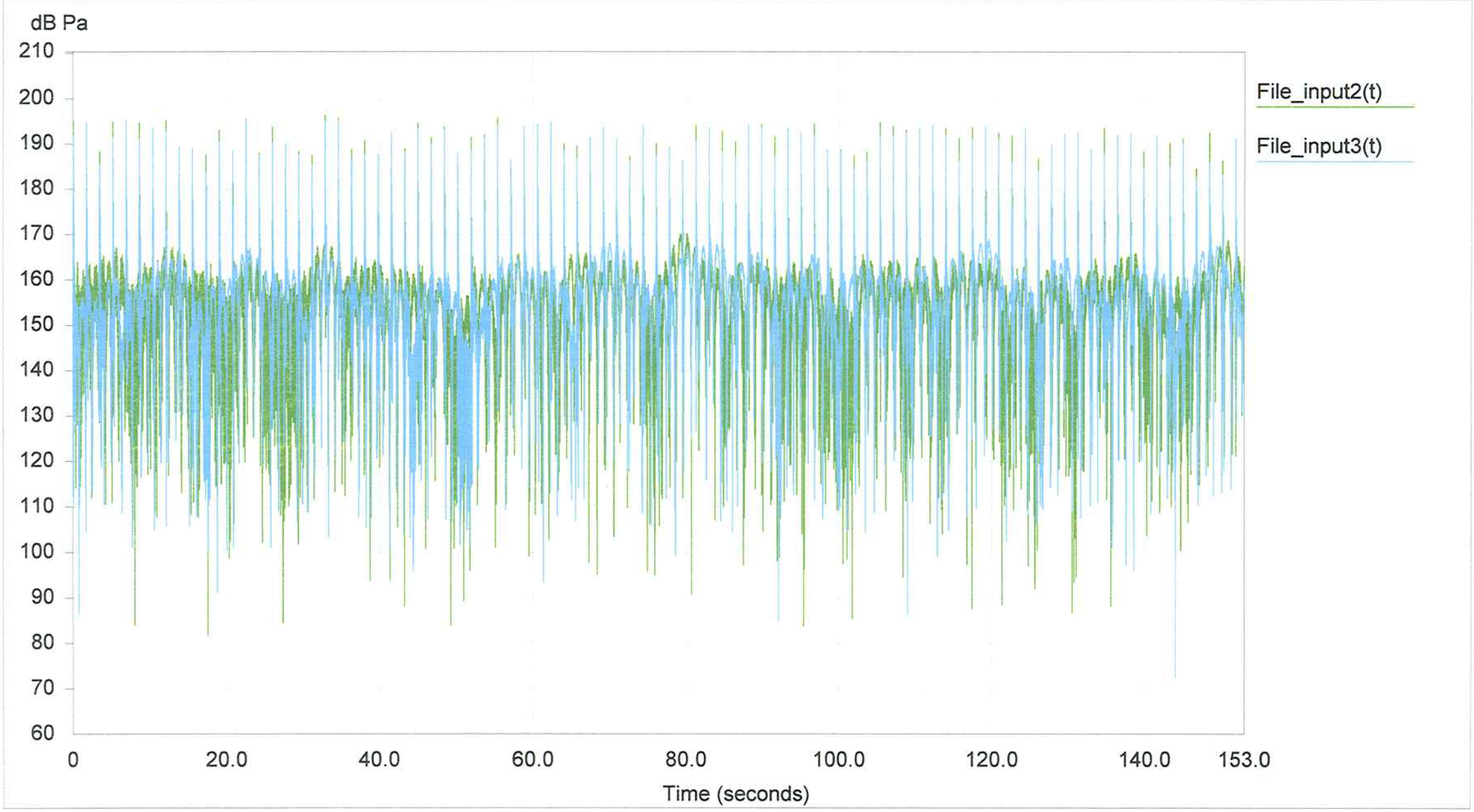
Channel 2 (green) is ~ 500 ft from pile (10ft depth), Channel 3 (blue) is ~ 500 ft from pile (8 ft depth)



BNSF. July 16, 2008. 11:49

Pile 9-2-1, Bubble Curtain On (Two Rings)

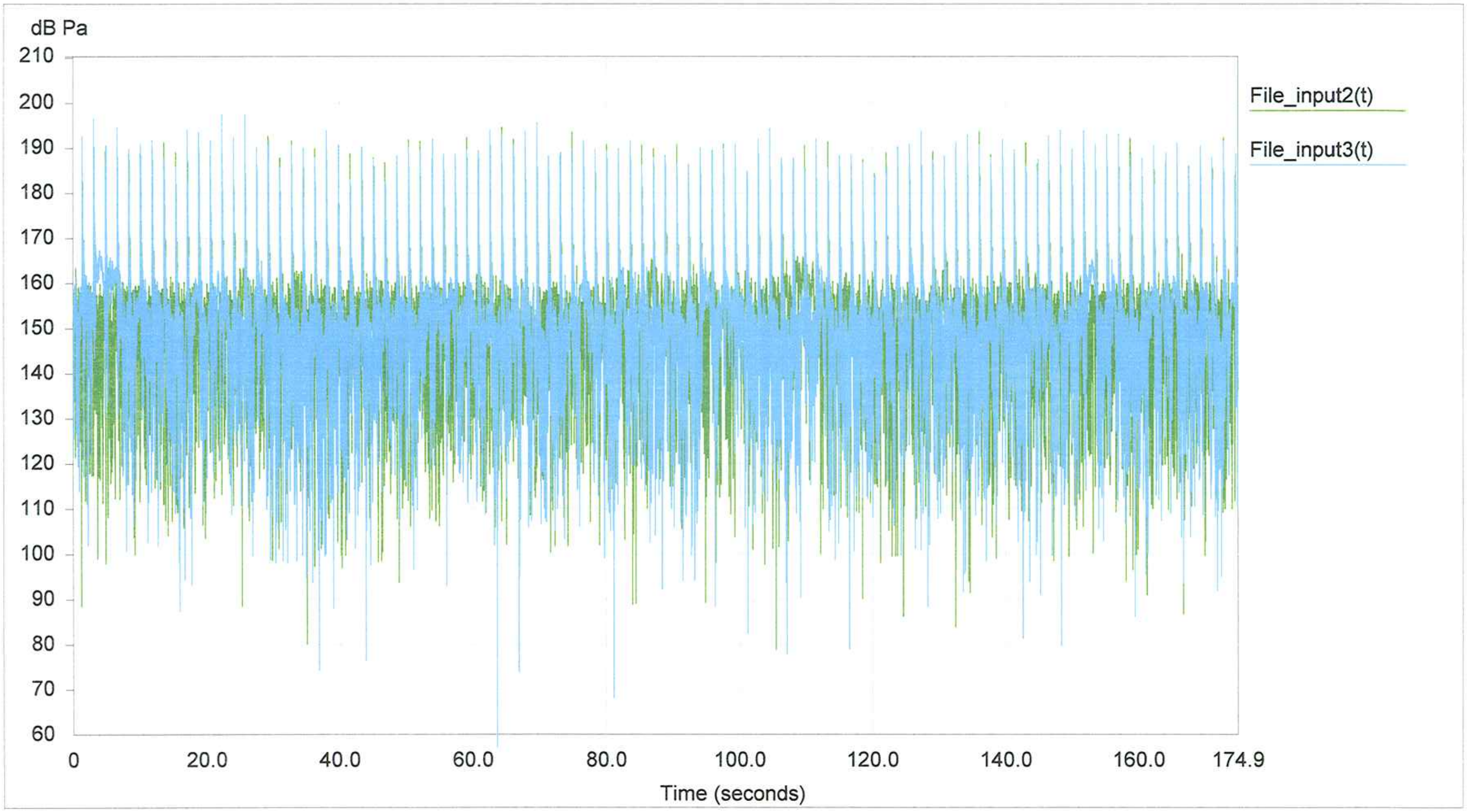
Channel 2 (green) is ~ 80 ft from pile (10 ft depth), Channel 3 (blue) is ~ 80 ft from pile (8 ft depth)



BNSF. July 16, 2008. 12:35

Pile 9-2-2, Bubble Curtain On (Two Rings)

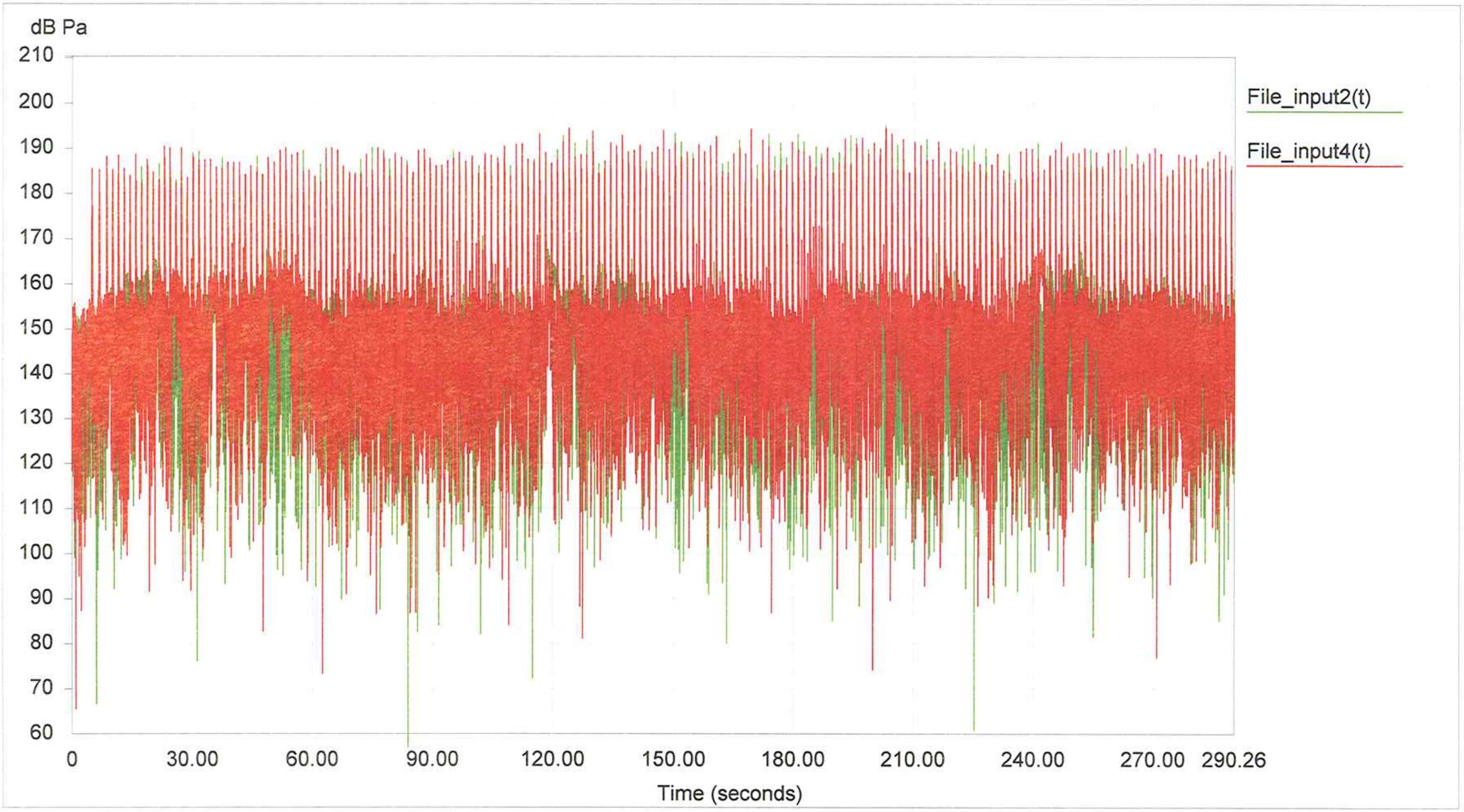
Channel 2 (green) is ~ 10 m from pile (4 m depth), Channel 3 (blue) is ~ 10 m from pile (2 m depth)



BNSF. July 21, 2008. 14:25

Bubble Curtain off between ~ 120 seconds and ~ 210 seconds (Two Rings)

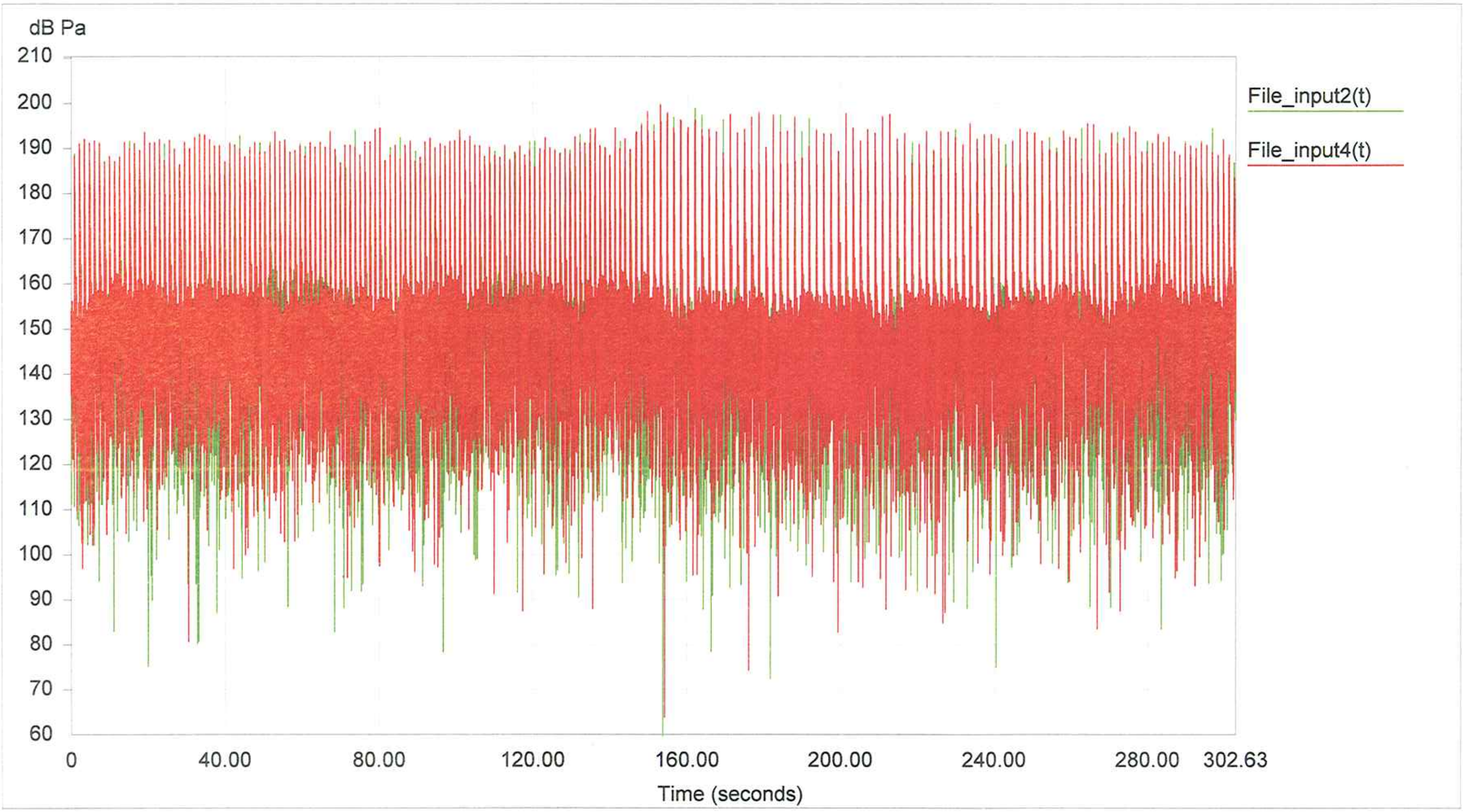
Channel 2 (green) is ~ 10 m from pile (4 m depth), Channel 4 (red) is ~ 10 m from pile (2 m depth)



BNSF. July 21, 2008. 14:41

Bubble Curtain off between ~145 seconds and 215 seconds (Two Rings)

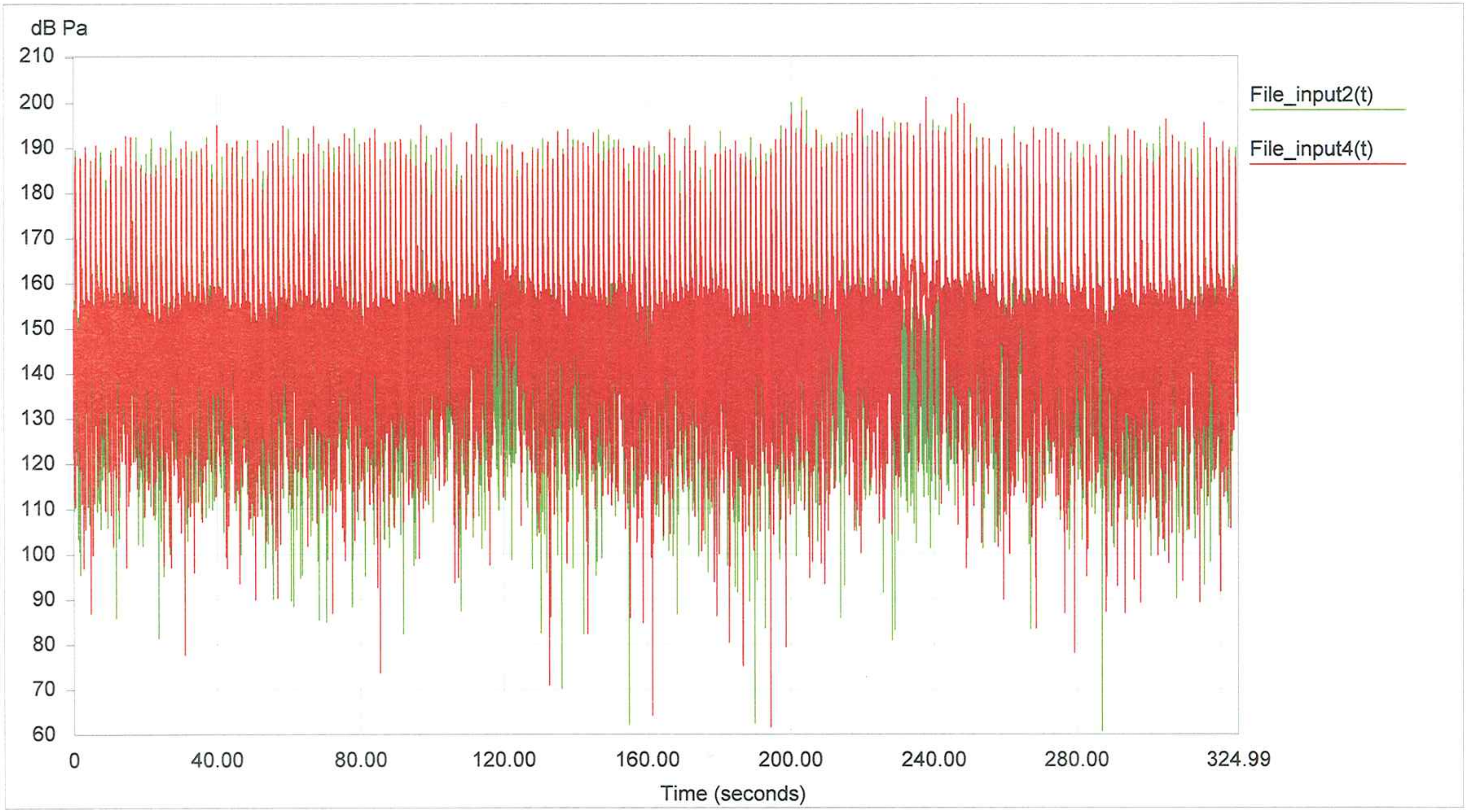
Channel 2 (green) is ~ 10 m from pile (4 m depth), Channel 4 (red) is ~ 10 m from pile (2 m depth)



BNSF. July 21, 2008. 14:51

Bubble Curtain off between ~200 seconds and 250 seconds (Two Rings)

Channel 2 (green) is ~ 10 m from pile (4 m depth), Channel 4 (red) is ~ 10 m from pile (2 m depth)

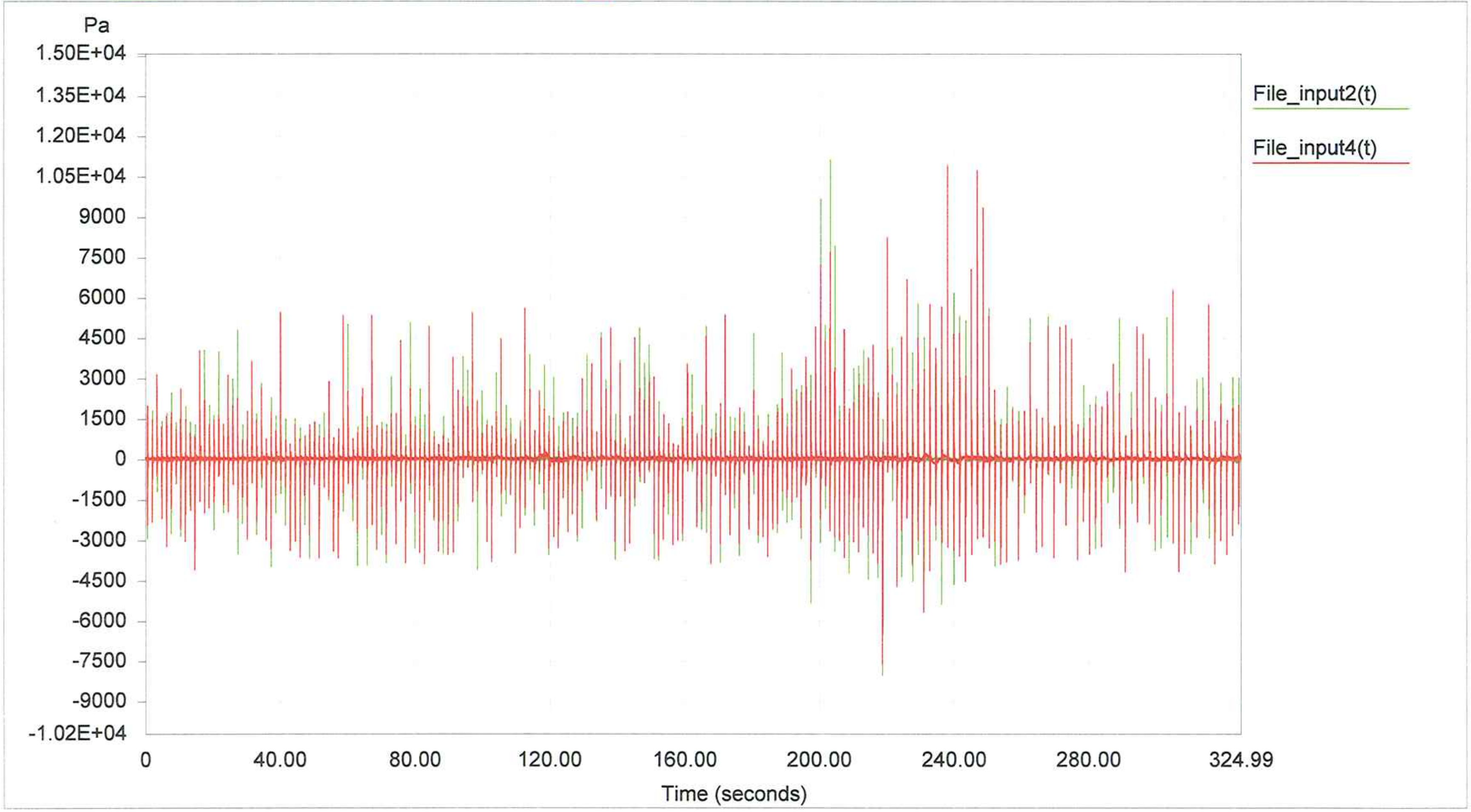


BNSF. July 21, 2008. 14:51

Bubble Curtain off between ~200 seconds and 250 seconds (Two Rings)

Shown in Pascals

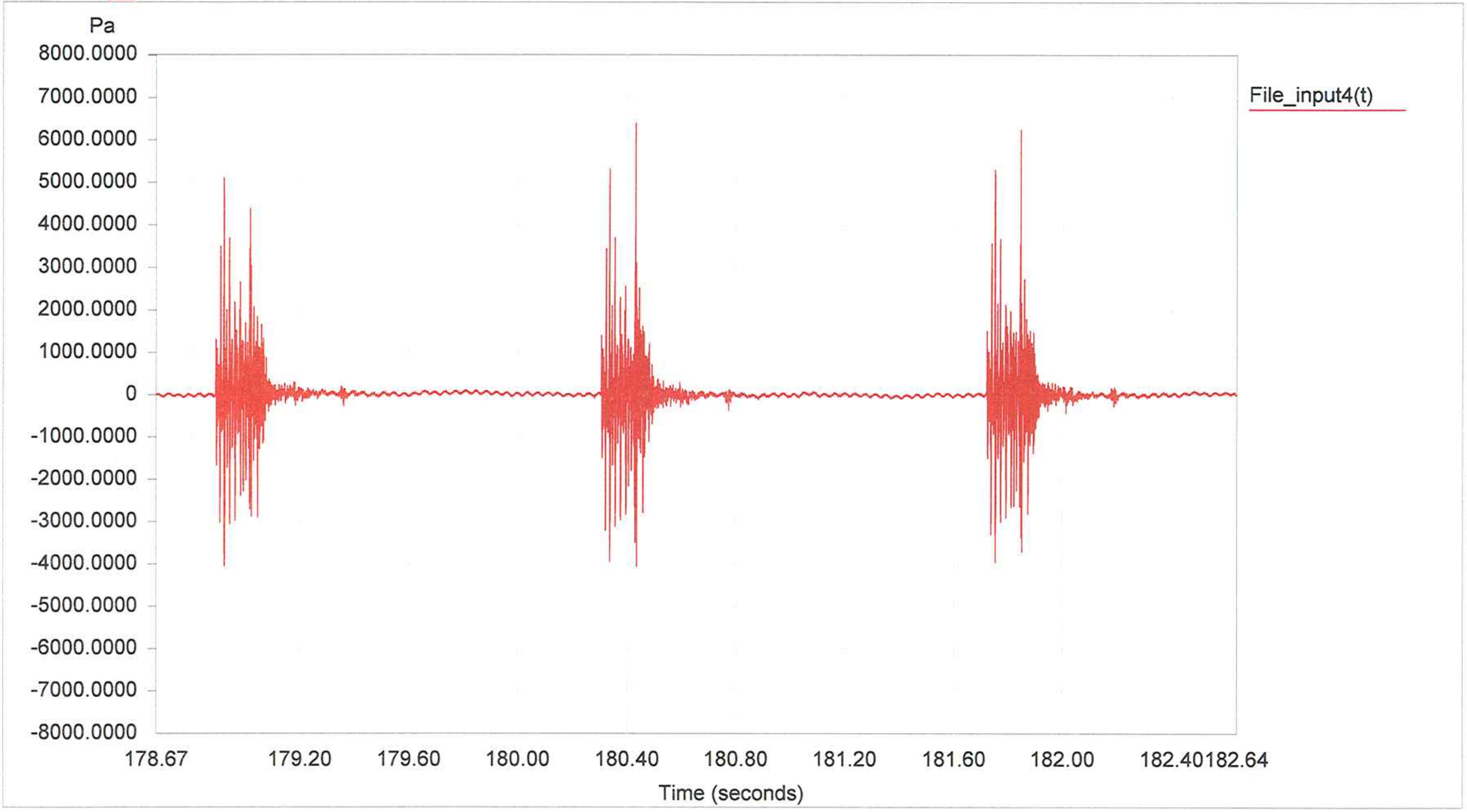
Channel 2 (green) is ~ 10 m from pile (4 m depth), Channel 4 (red) is ~ 10 m from pile (2 m depth)



BNSF. July 21, 2008. 14:51

Depiction of three sequential hammer blows in Pascals. Middle hammer blow selected for waveform analysis, expanded time-scale, bubble curtain on

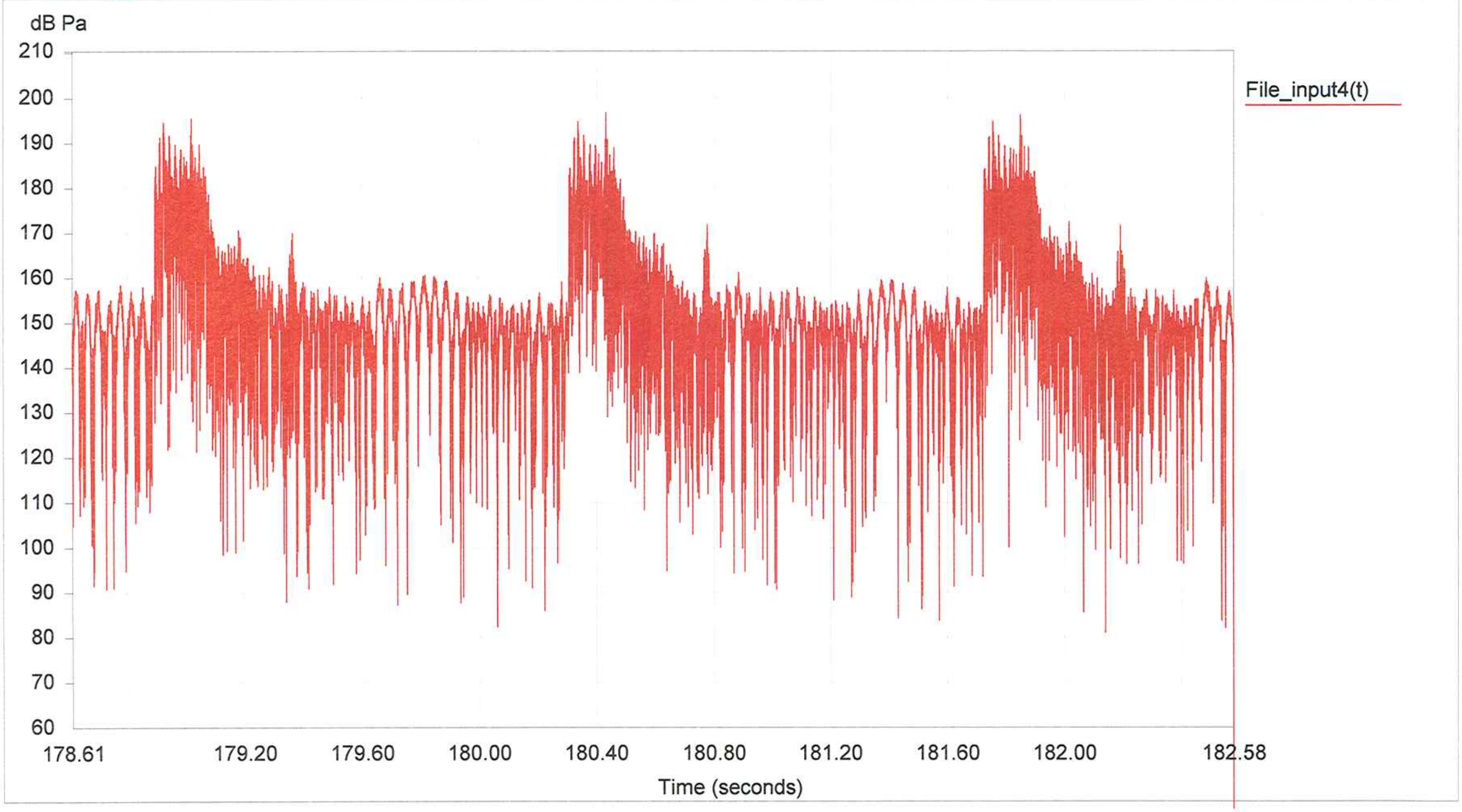
Channel 4 (red) is ~ 10 m from pile



BNSF. July 21, 2008. 14:51

Depiction of three sequential hammer blows in Decibels. Middle hammer blow selected for waveform analysis, expanded time-scale, bubble curtain on

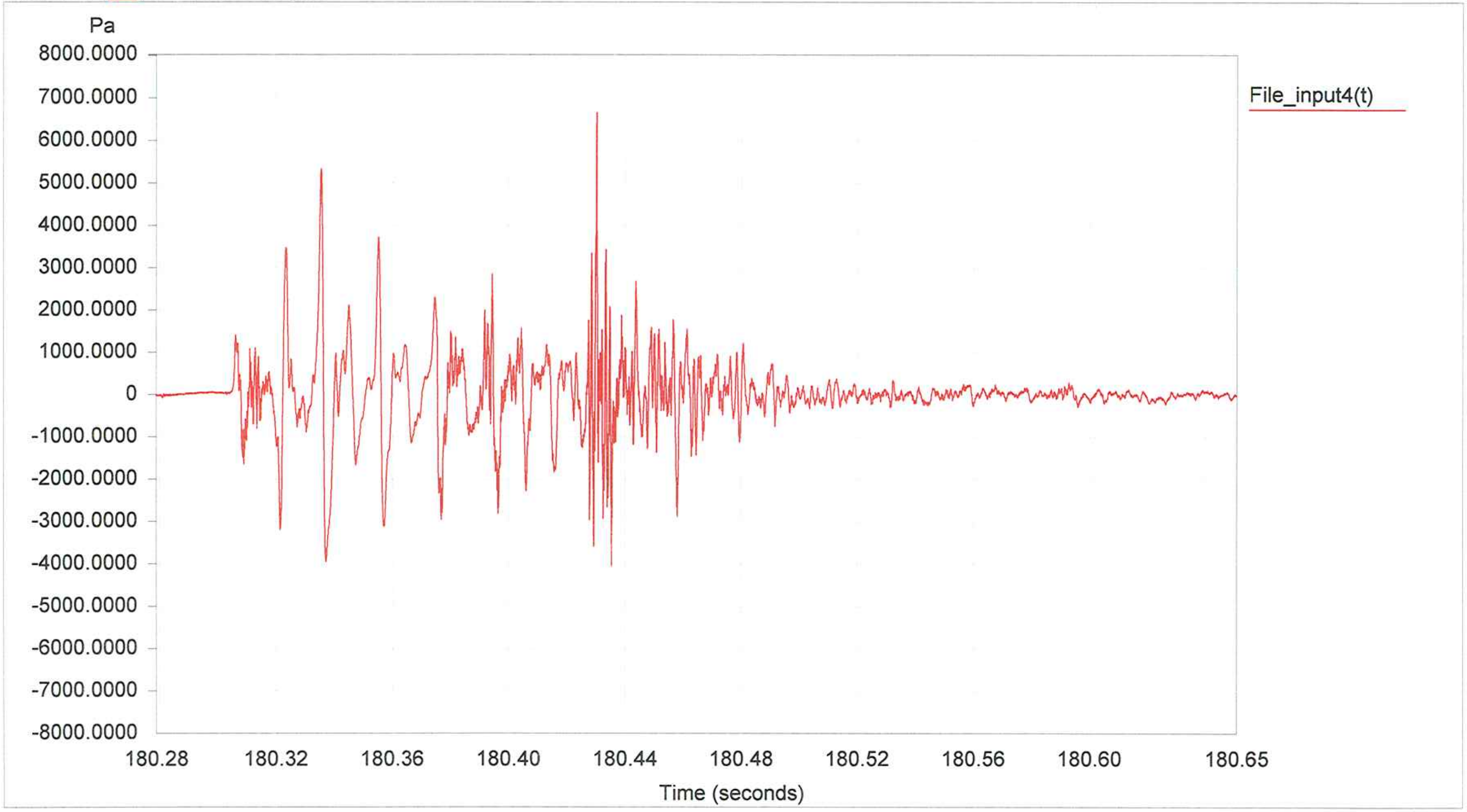
Channel 4 (red) is ~ 10 m from pile



BNSF. July 21, 2008. 14:51

Single hammer blow selected for waveform analysis, expanded time-scale (pulse duration ~ 200 ms), bubble curtain on
Shown in Pascals

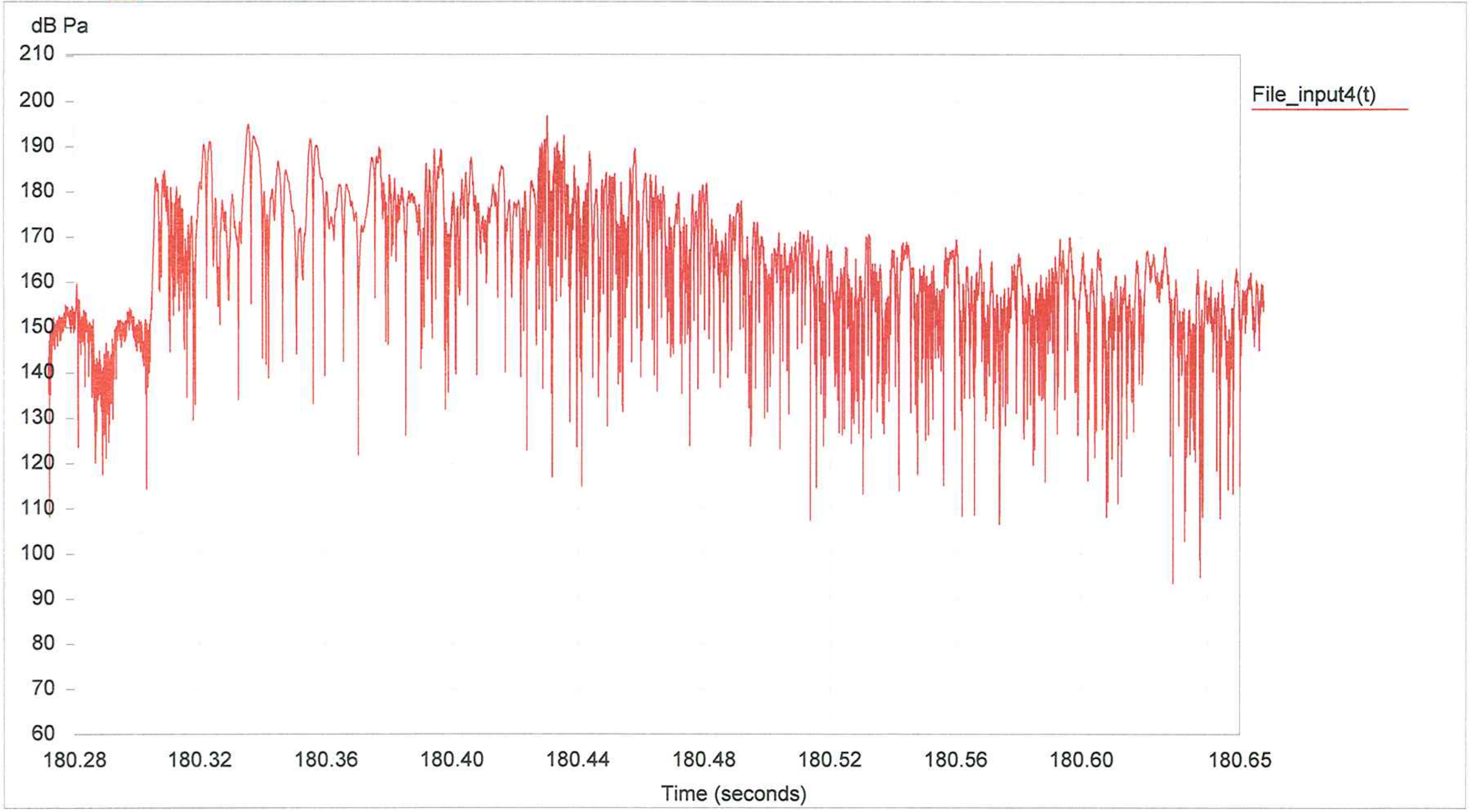
Channel 4 (red) is ~ 10 m from pile



BNSF. July 21, 2008. 14:51

Single hammer blow selected for waveform analysis, expanded time-scale (pulse duration ~ 200 ms), bubble curtain on
Shown in Decibels

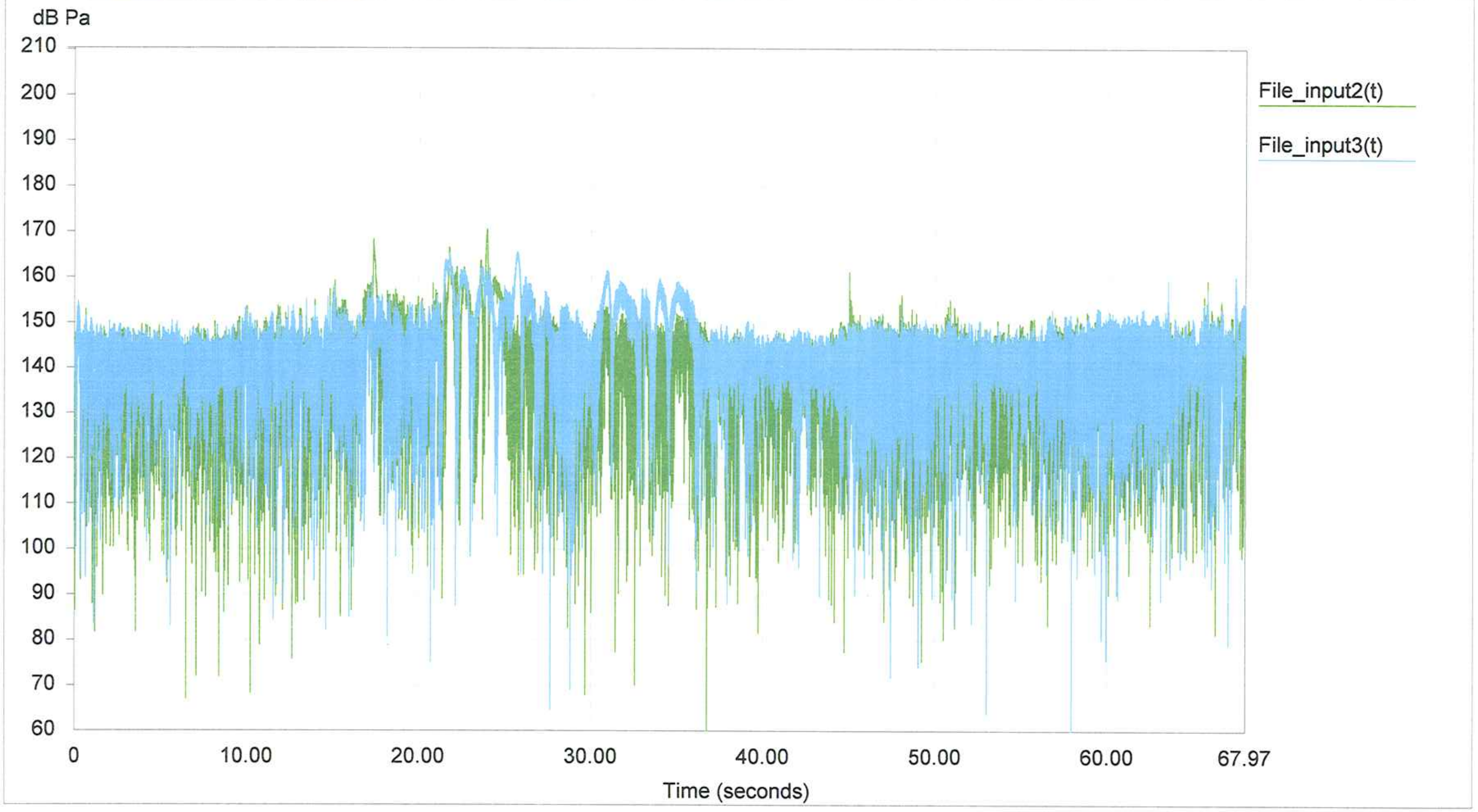
Channel 4 (red) is ~ 10 m from pile



BNSF. July 24, 2008. 08:43

Background Sound Pressure Level Measurement

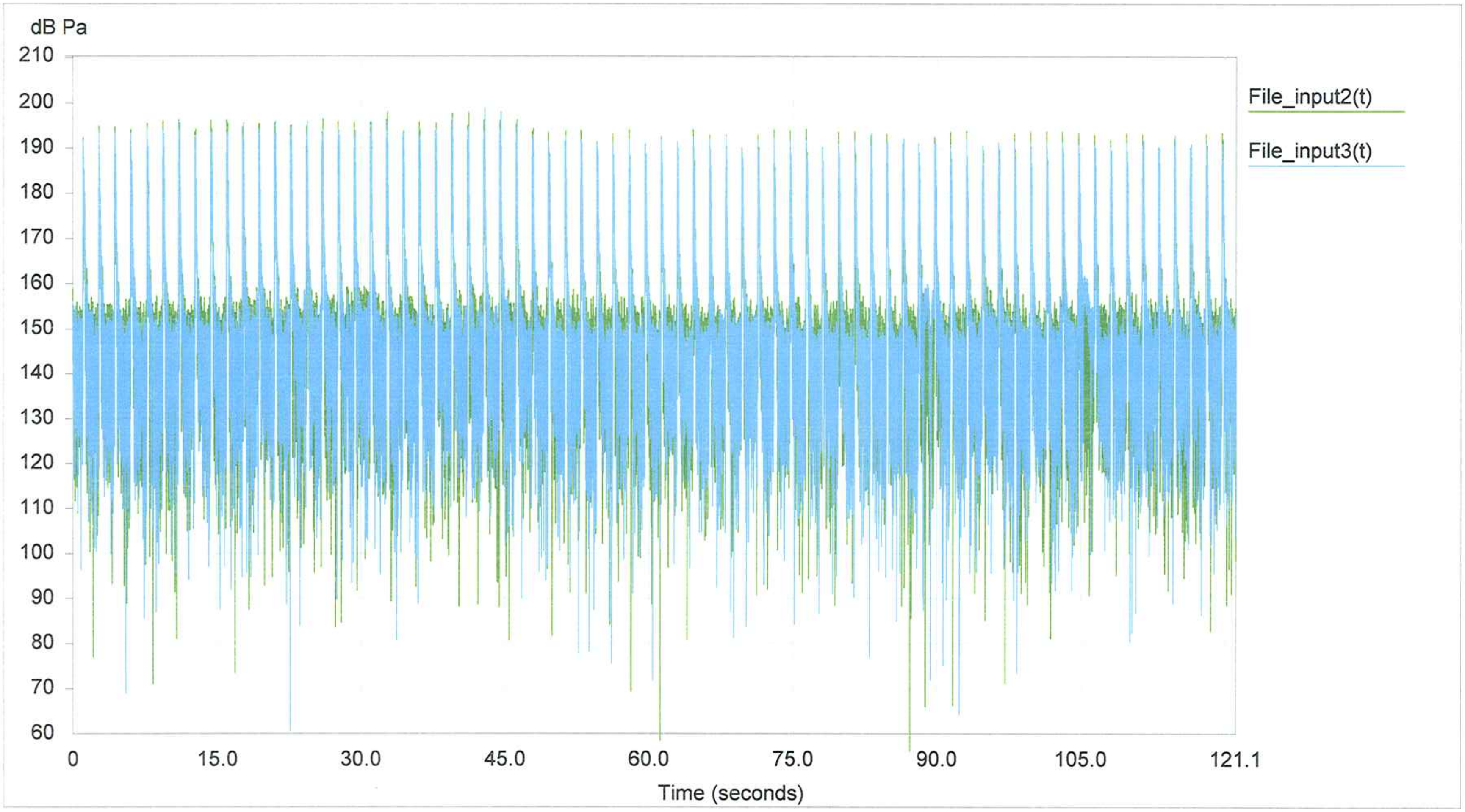
Channel 2 (green) and Channel 3 (blue) adjacent to work barge at ~ 10 ft depth.



BNSF. July 24, 2008. 09:13

Pile 12-2-1, Bubble curtain off between ~ 10 seconds and ~ 40 seconds (Two Rings)
Airborne Sound Pressure ~ 109 dBa

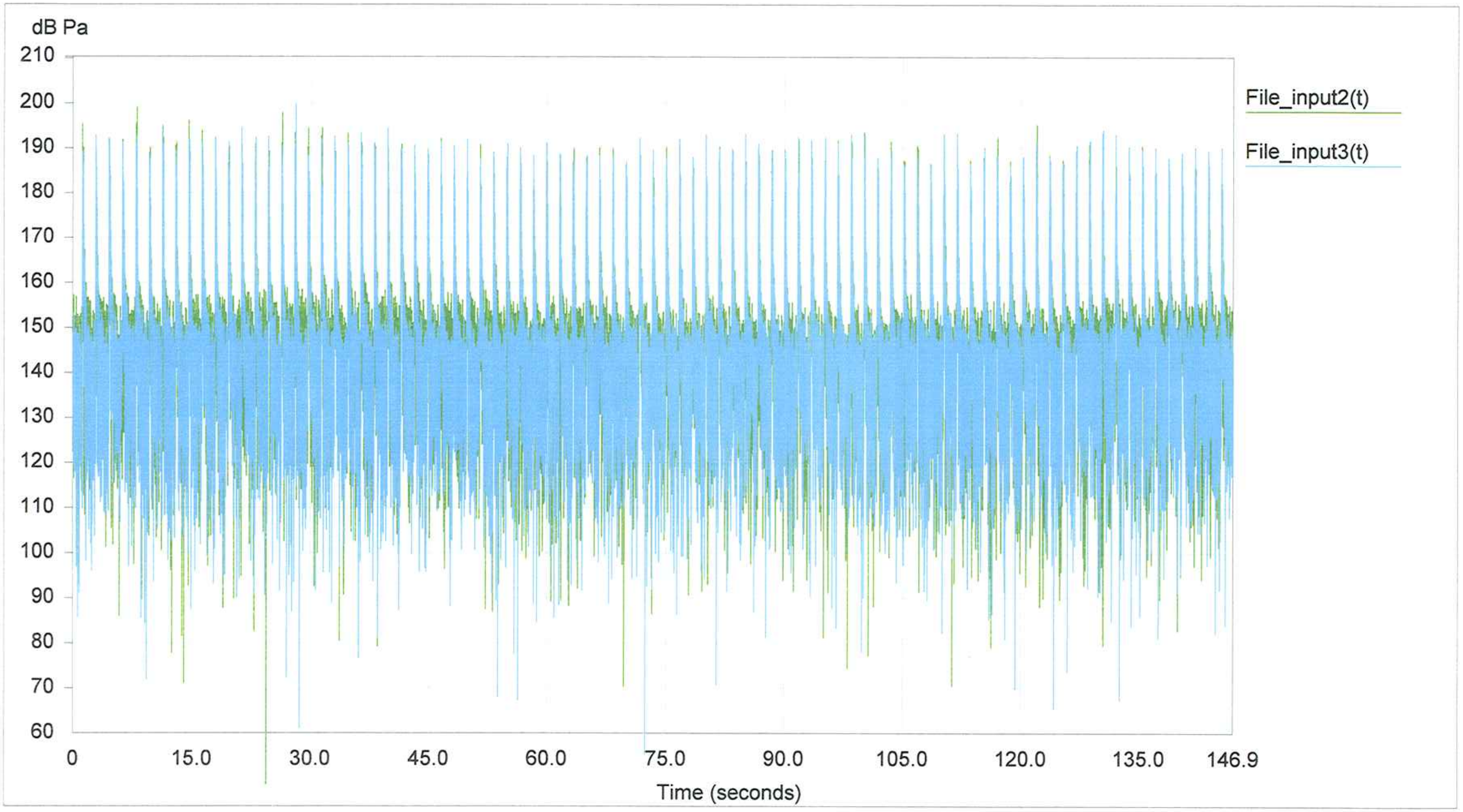
Channel 2 (green) is ~ 10 m from pile (4 m depth), Channel 3 (blue) is ~ 10 m from pile (2 m depth)



BNSF. July 24, 2008. 09:38

Pile 12-2-1, Bubble Curtain off for ~ first 30 seconds (Two Rings)

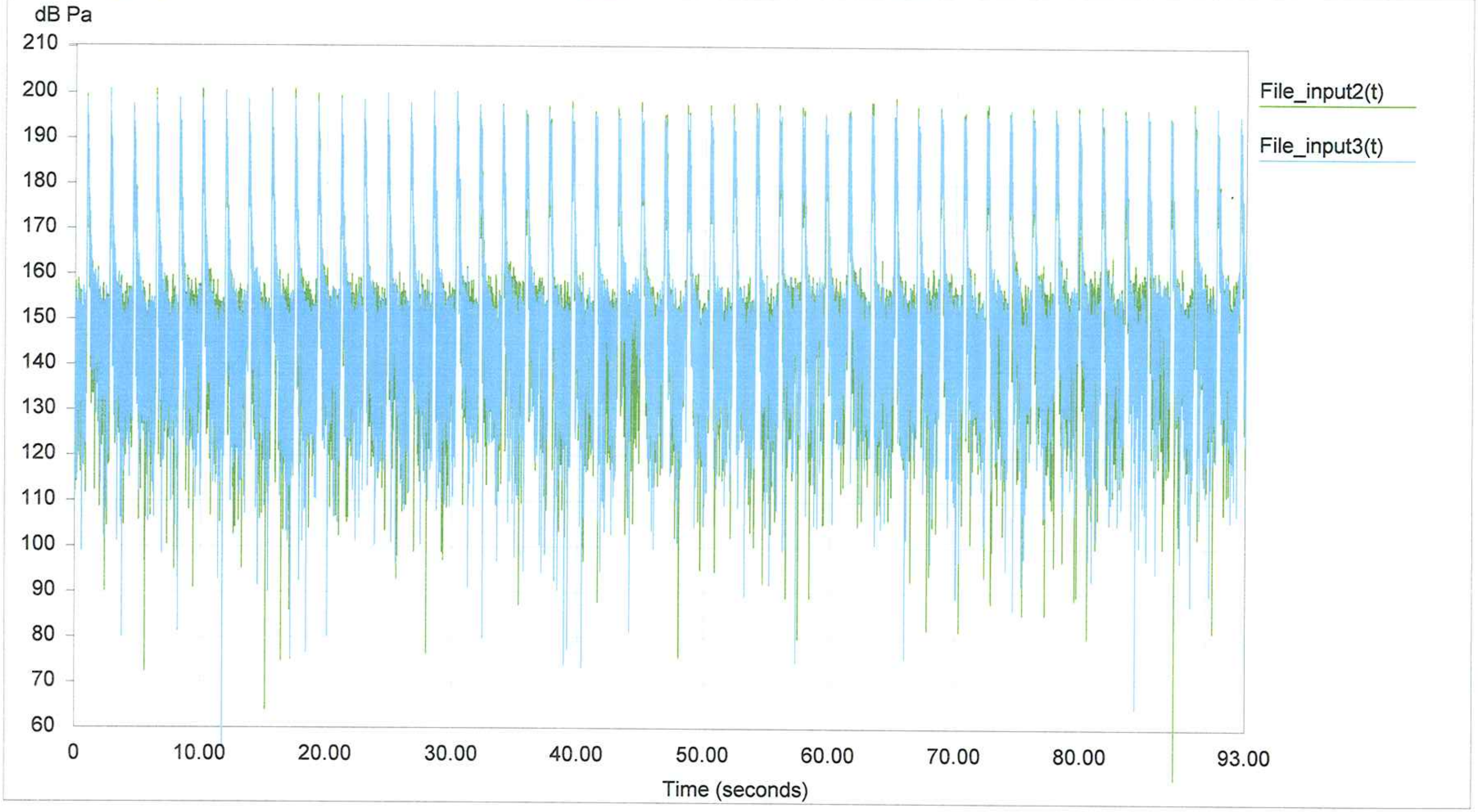
Channel 2 (green) is ~ 10 m from pile (4 m depth), Channel 3 (blue) is ~ 10 m from pile (2 m depth)



BNSF. July 24, 2008. 12:13

Pile 12-1-2, Bubble Curtain off for ~ first 30 seconds (Two Rings)

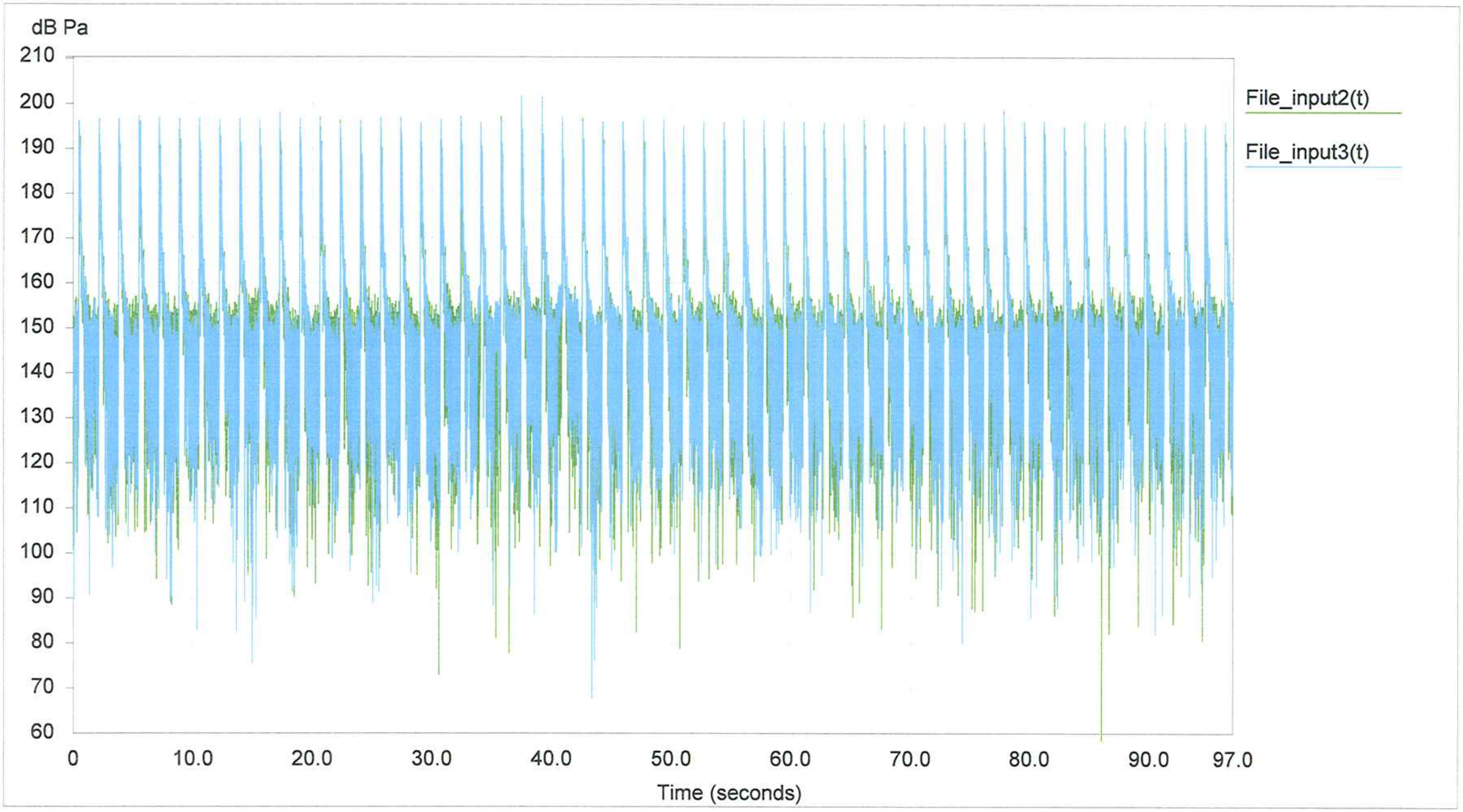
Channel 2 (green) is ~ 10 m from pile (4 m depth), Channel 3 (blue) is ~ 10 m from pile (2 m depth)



BNSF. July 24, 2008. 12:44

Pile 12-1-2, Bubble Curtain off for ~ first 30 seconds (Two Rings)

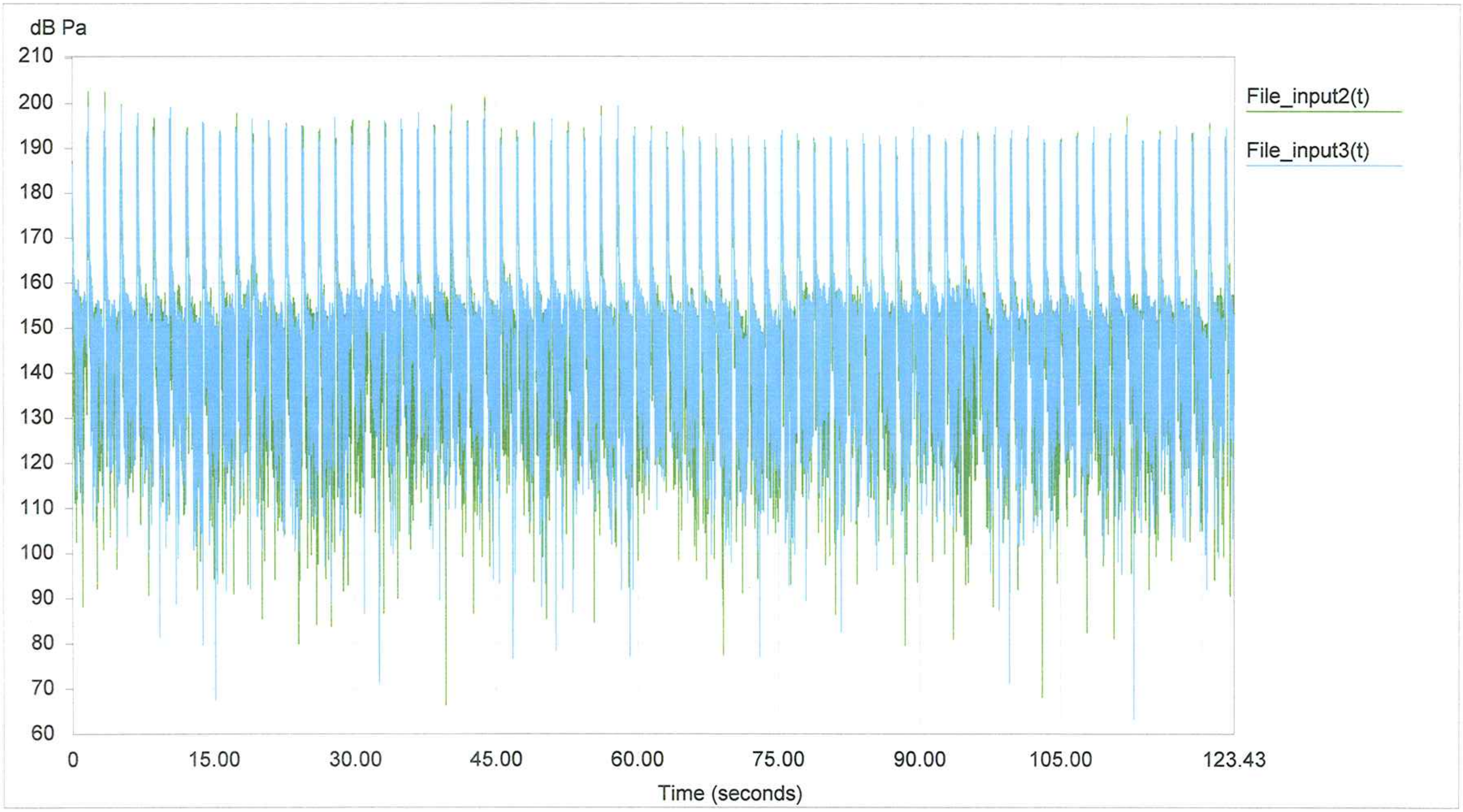
Channel 2 (green) is ~ 10 m from pile (4 m depth), Channel 3 (blue) is ~ 10 m from pile (2 m depth)



BNSF. July 25, 2008. 10:53

Pile 12-2-2, Bubble Curtain off for ~ first 45 seconds (Two Rings)
Airborne Sound Pressure ~ 108 dBa

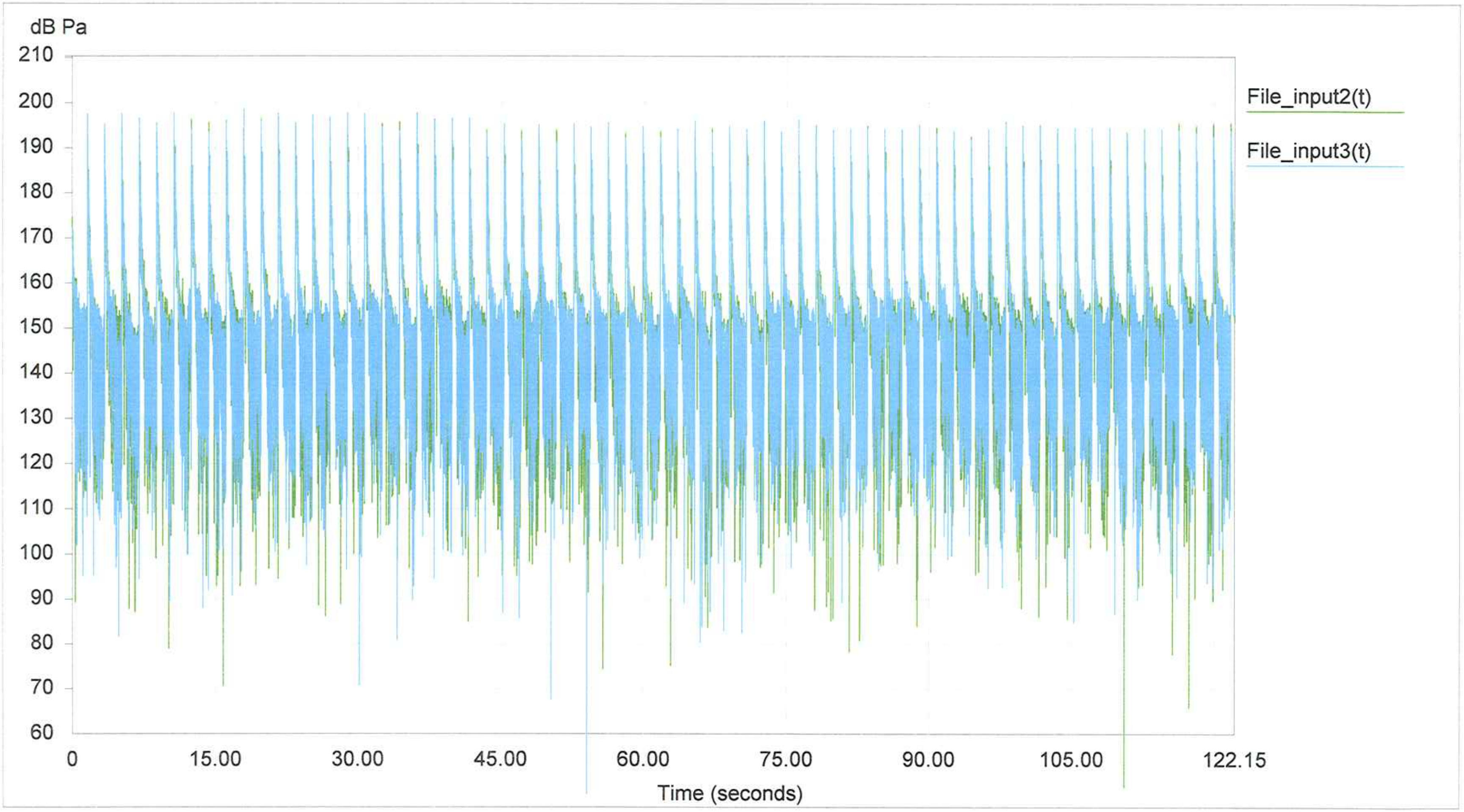
Channel 2 (green) is ~ 10 m from pile (4 m depth), Channel 3 (blue) is ~ 10 m from pile (2 m depth)



BNSF. July 25, 2008. 11:21

Pile 12-2-2, Bubble Curtain off for ~ first 35 seconds (Two Rings)

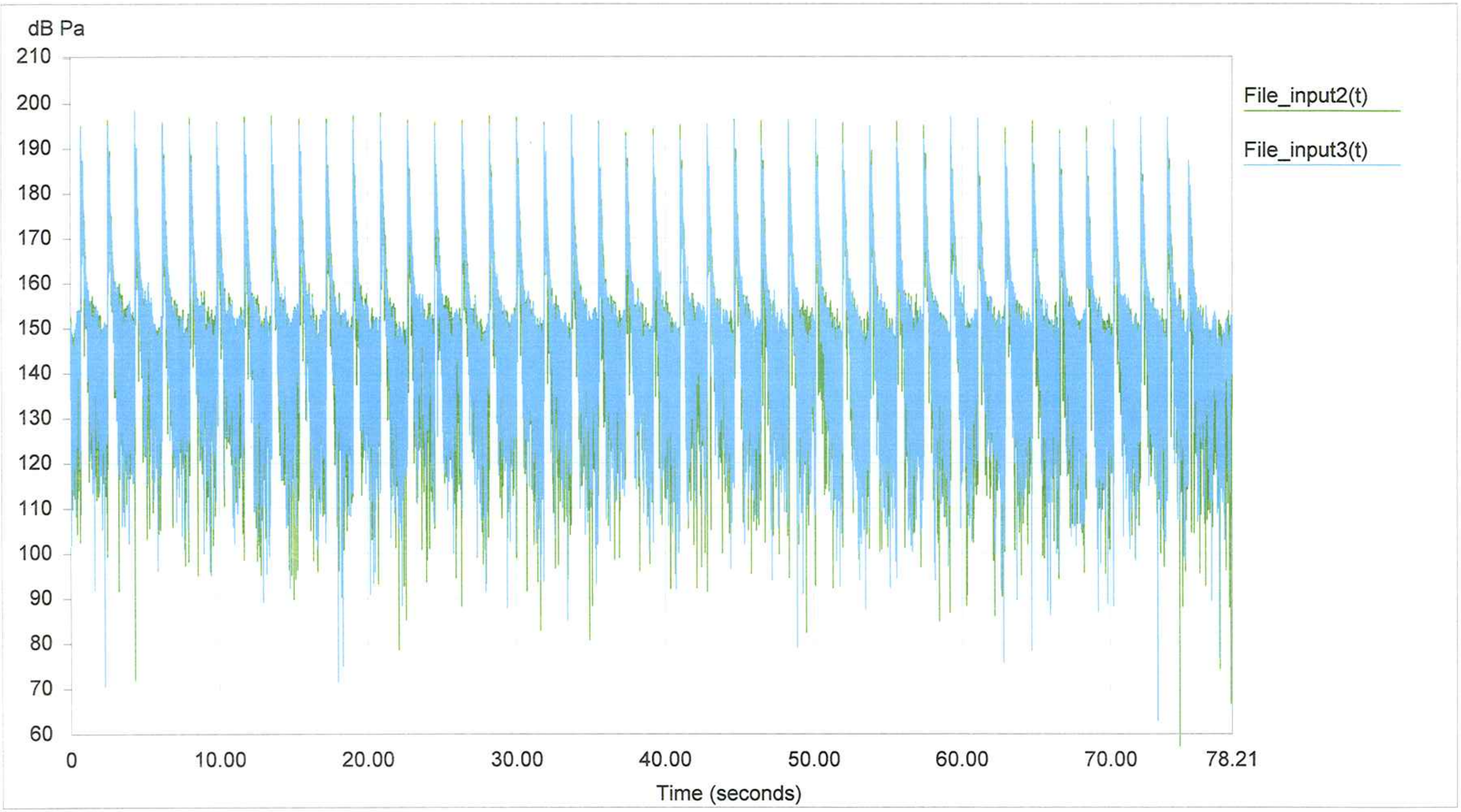
Channel 2 (green) is ~ 10 m from pile (4 m depth), Channel 3 (blue) is ~ 10 m from pile (2 m depth)



BNSF. July 25, 2008. 11:27

Pile 12-2-2, Bubble Curtain off for ~ first 35 seconds (Two Rings)
Airborne Sound Pressure ~ 110 dBa

Channel 2 (green) is ~ 10 m from pile (4 m depth), Channel 3 (blue) is ~ 10 m from pile (2 m depth)



Appendix B

Waveform Analyses

BNSF. July 21, 2008. 14:51. Bubble Curtain Turned Off

Figure a. Waveform

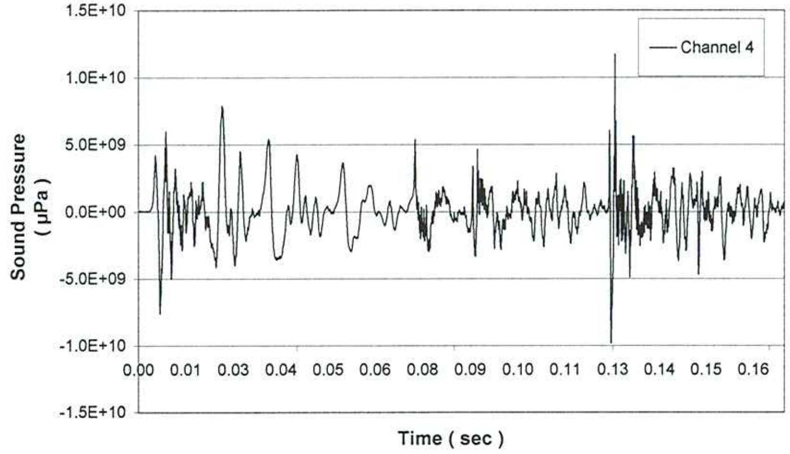


Figure b. Narrow Band Frequency Spectra

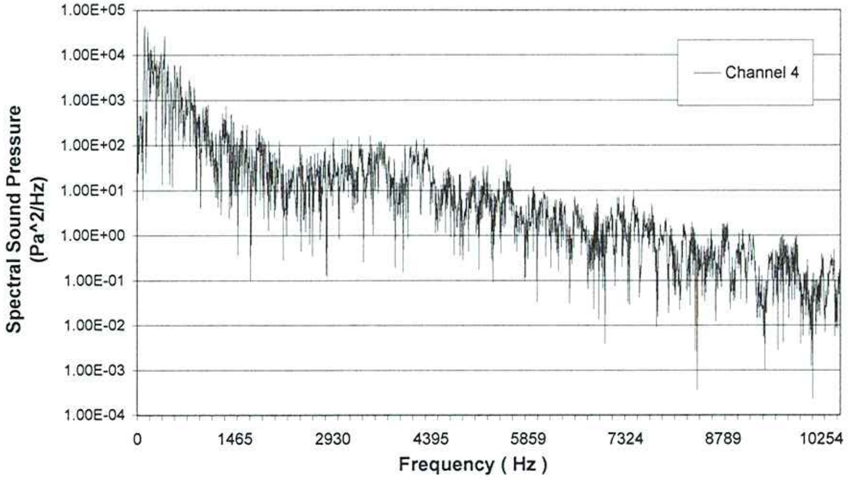


Figure c. Accumulation of Sound Energy

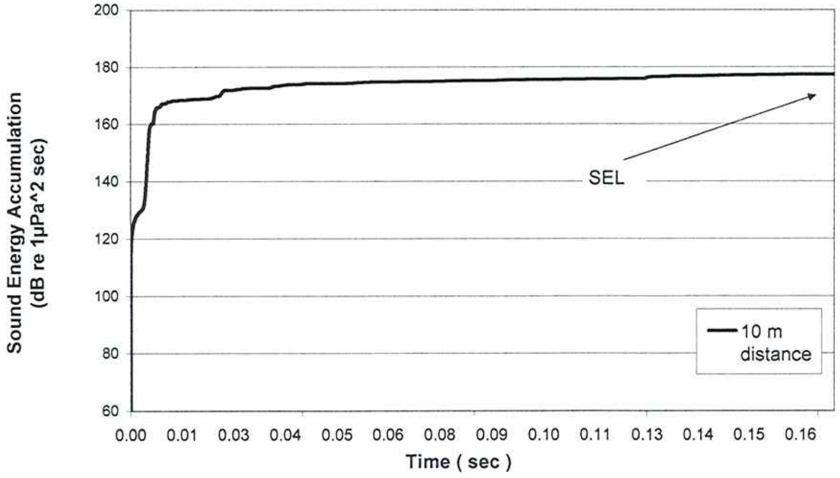


Figure d. Sound Pressure and Sound Energy Levels

Signal Analysis Sound Pressure / Energy Levels

10 m distance	Peak, dB	$RMS_{90\%}$*, dB	SEL, dB
Channel 4	201	185	177

*Impulse averaged over 90% of accumulated energy (5% to 95%)

BNSF. July 21, 2008. 14:51. Bubble Curtain Turned On

Figure a. Waveform

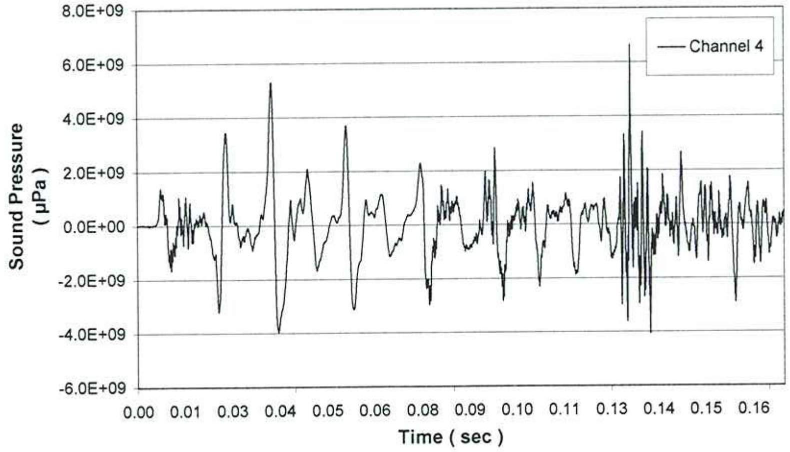


Figure b. Narrow Band Frequency Spectra

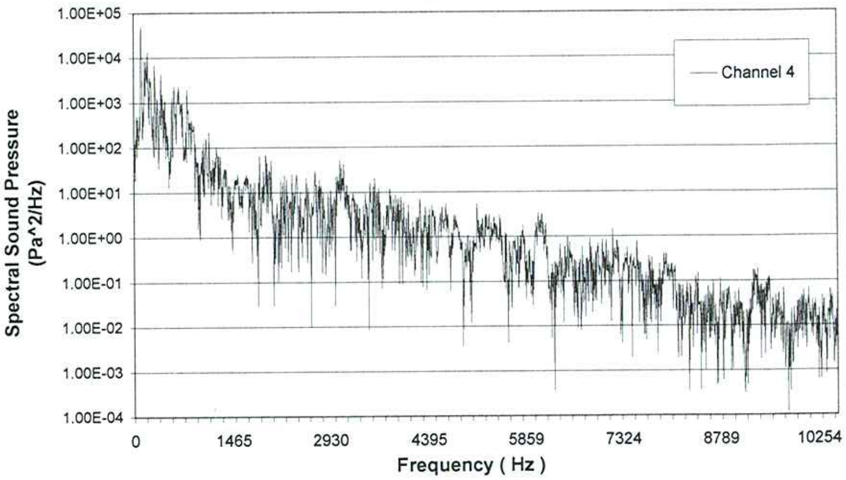


Figure c. Accumulation of Sound Energy

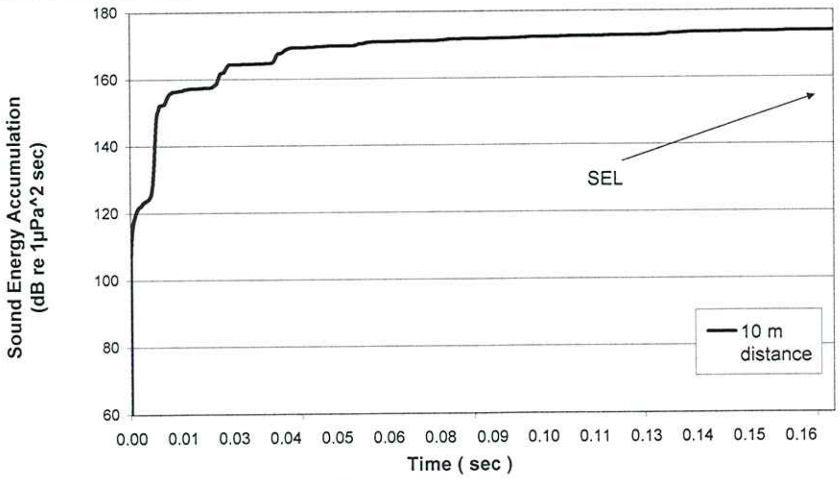


Figure d. Sound Pressure and Sound Energy Levels

Signal Analysis Sound Pressure / Energy Levels

10 m distance	Peak, dB	RMS$_{90\%}$*, dB	SEL, dB
Channel 4	196	182	174

*Impulse averaged over 90% of accumulated energy (5% to 95%)

BNSF. July 24, 2008. 09:38. Pile 12-2-1, Bubble Curtain Turned Off

Figure a. Waveform

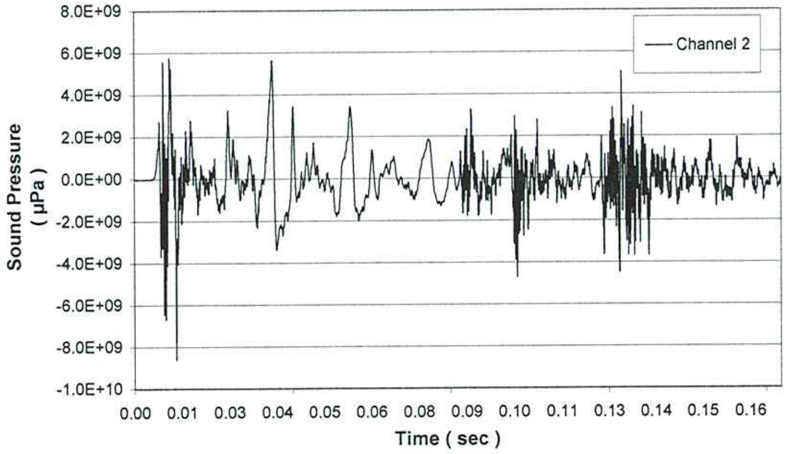


Figure b. Narrow Band Frequency Spectra

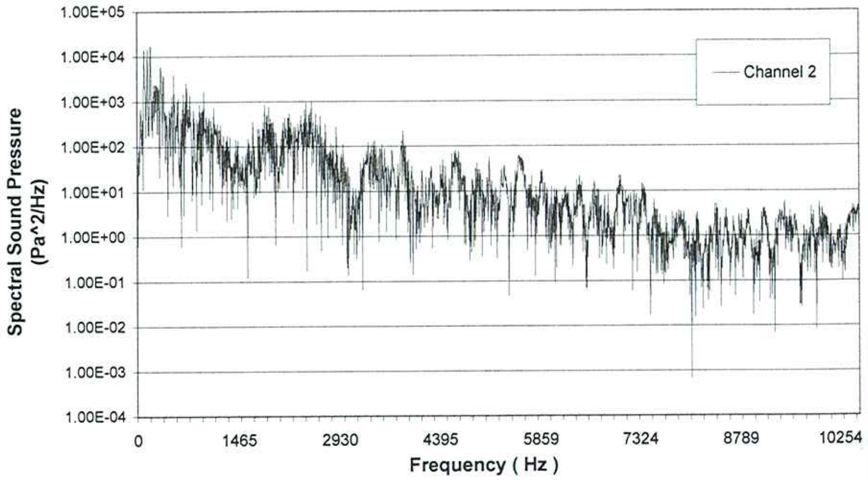


Figure c. Accumulation of Sound Energy

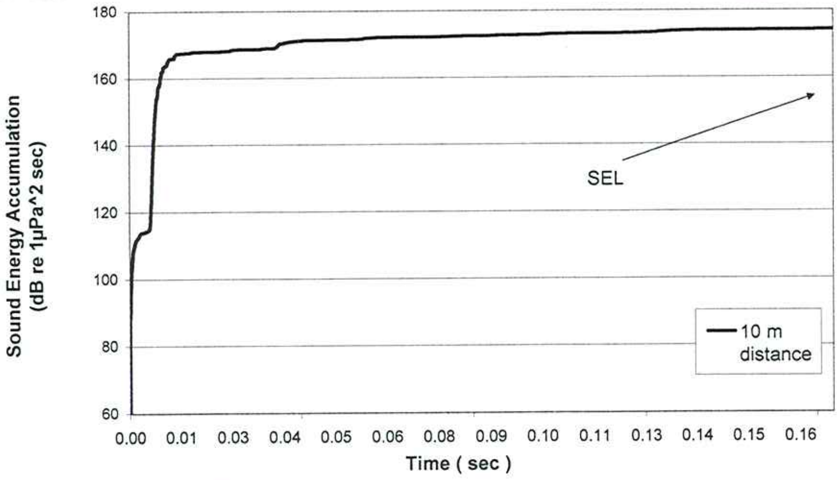


Figure d. Sound Pressure and Sound Energy Levels

Signal Analysis Sound Pressure / Energy Levels

Pile 12-2-1 - 10 m distance	Peak, dB	RMS$_{90\%}$*, dB	SEL, dB
Channel 2	199	183	174

*Impulse averaged over 90% of accumulated energy (5% to 95%)

BNSF. July 24, 2008. 09:38. Pile 12-2-1, Bubble Curtain Turned On

Figure a. Waveform

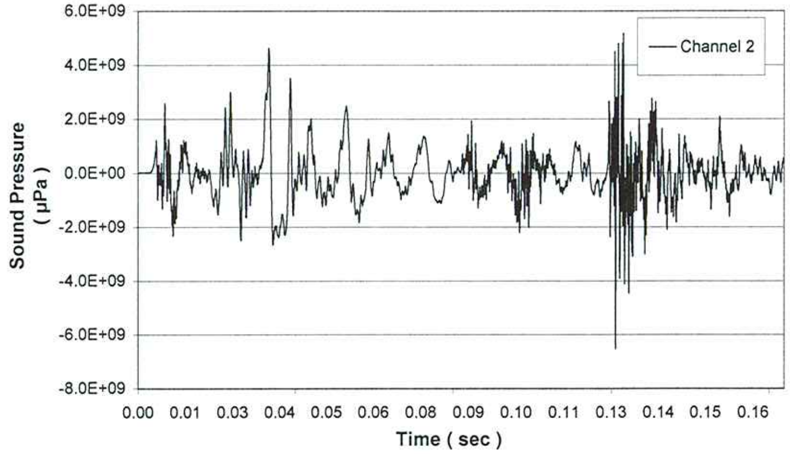


Figure b. Narrow Band Frequency Spectra

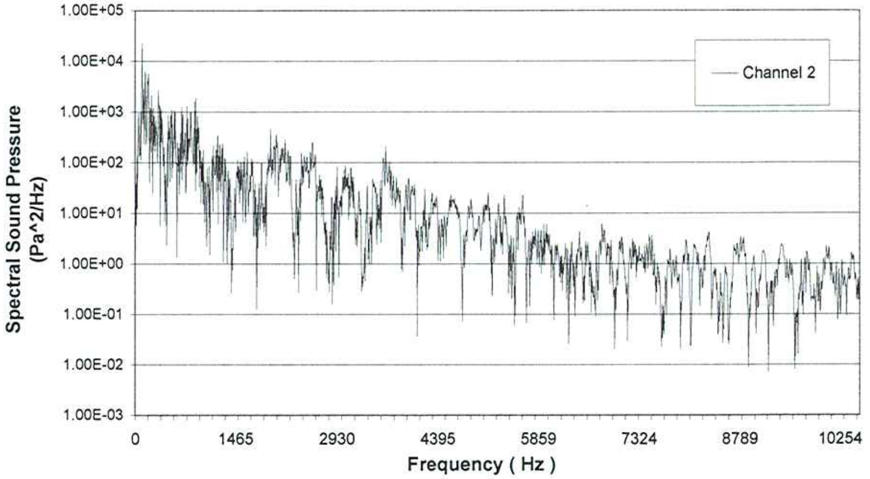


Figure c. Accumulation of Sound Energy

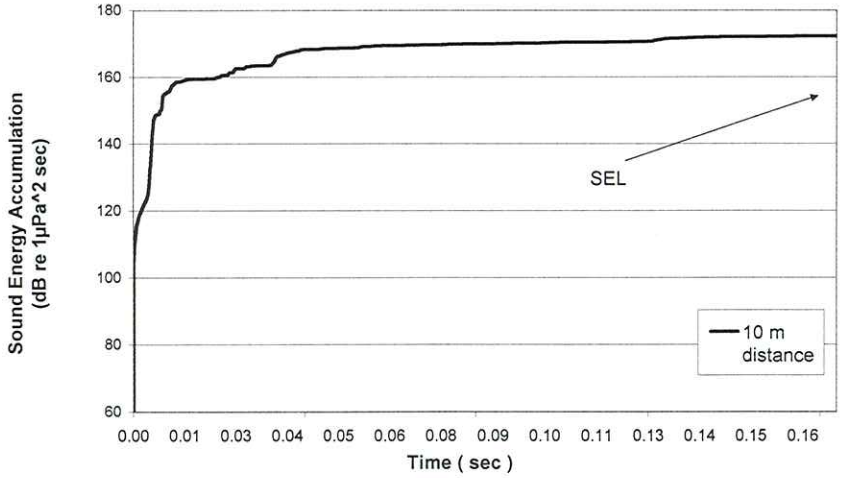


Figure d. Sound Pressure and Sound Energy Levels

Signal Analysis Sound Pressure / Energy Levels

Pile 12-2-1 - 10 m distance	Peak, dB	$\text{RMS}_{90\%}$*, dB	SEL, dB
Channel 2	196	181	172

*Impulse averaged over 90% of accumulated energy (5% to 95%)

BNSF. July 24, 2008. 12:13. Pile 12-1-2, Bubble Curtain Turned Off

Figure a. Waveform

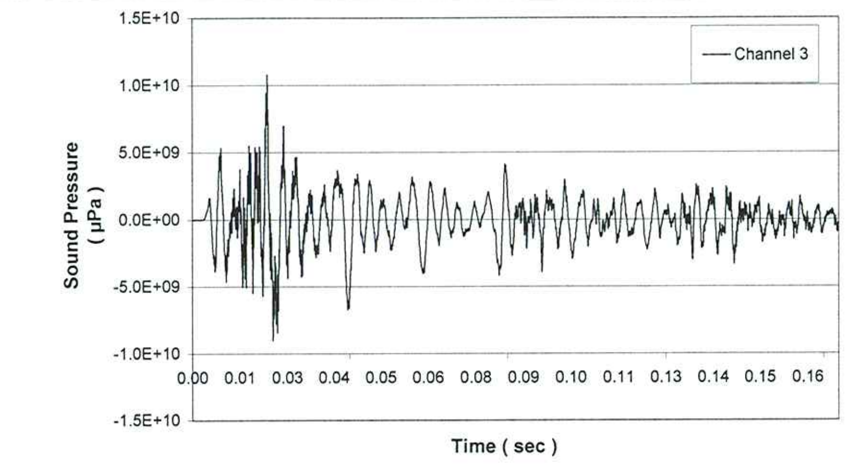


Figure b. Narrow Band Frequency Spectra

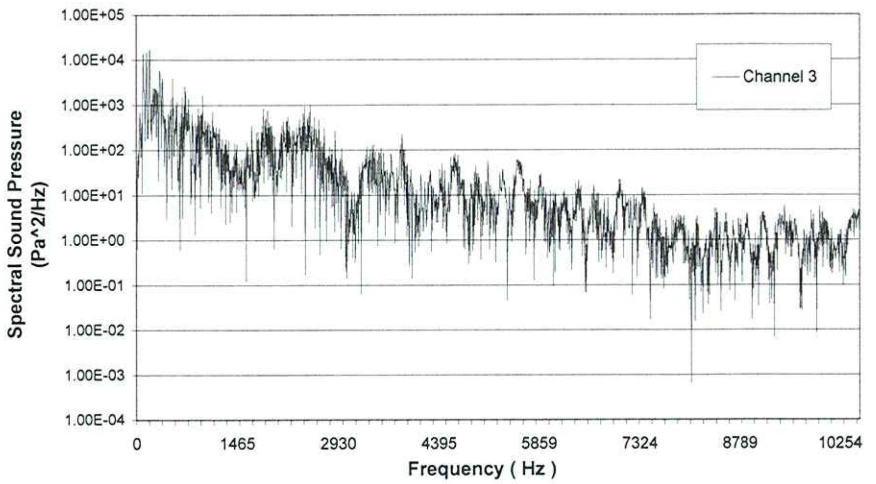


Figure c. Accumulation of Sound Energy

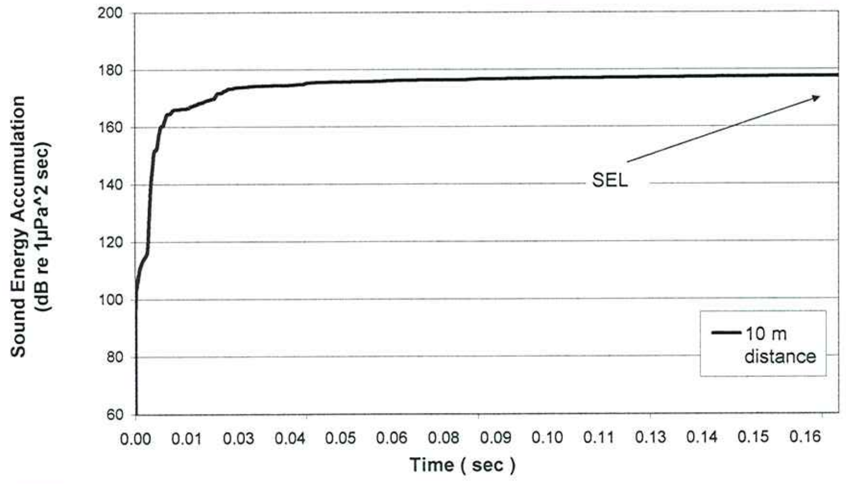


Figure d. Sound Pressure and Sound Energy Levels

Signal Analysis Sound Pressure / Energy Levels

Pile 12-1-2 - 10 m distance	Peak, dB	RMS$_{90\%}$*, dB	SEL, dB
Channel 3	201	186	178

*Impulse averaged over 90% of accumulated energy (5% to 95%)

BNSF. July 24, 2008. 12:13. Pile 12-1-2, Bubble Curtain Turned On

Figure a. Waveform

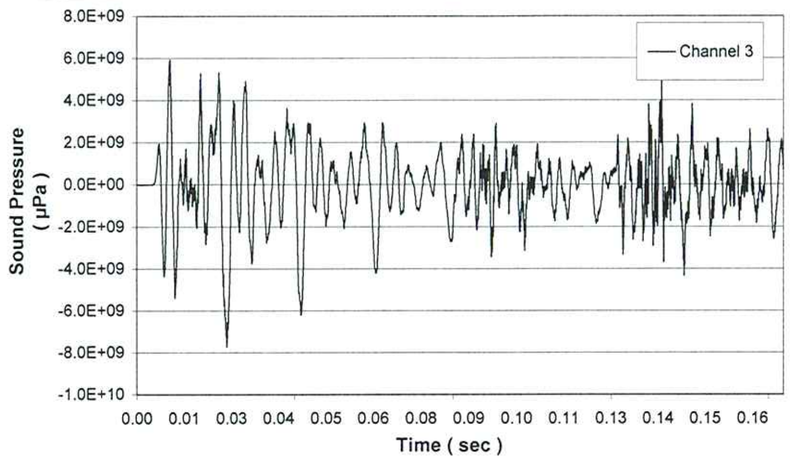


Figure b. Narrow Band Frequency Spectra

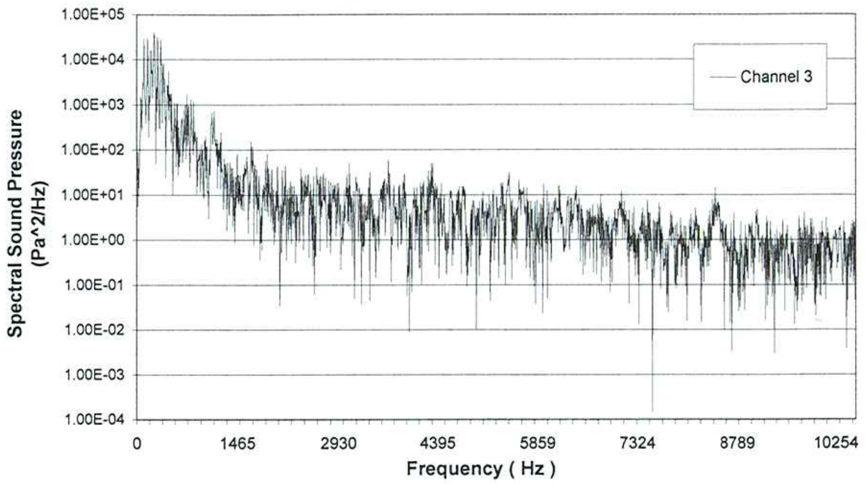


Figure c. Accumulation of Sound Energy

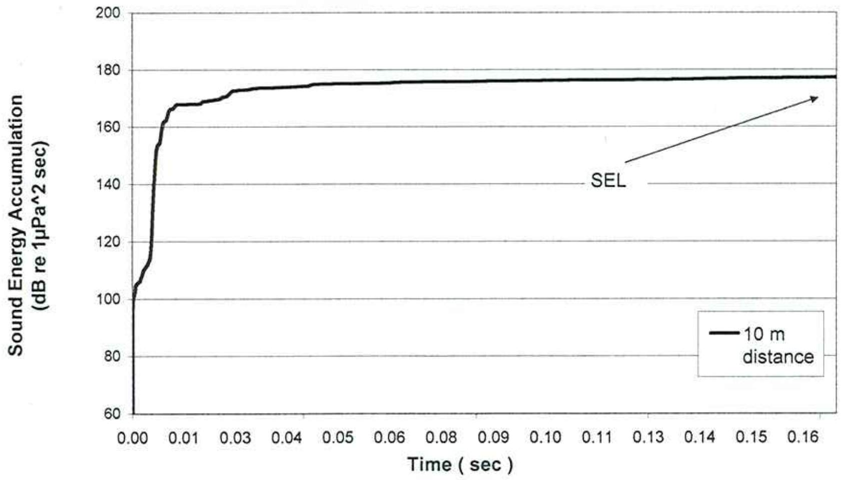


Figure d. Sound Pressure and Sound Energy Levels

Signal Analysis Sound Pressure / Energy Levels

Pile 12-1-2 - 10 m distance	Peak, dB	RMS$_{90\%}$*, dB	SEL, dB
Channel 3	198	185	177

*Impulse averaged over 90% of accumulated energy (5% to 95%)

BNSF. July 25, 2008. 11:21. Pile 12-2-2, Bubble Curtain Turned Off

Figure a. Waveform

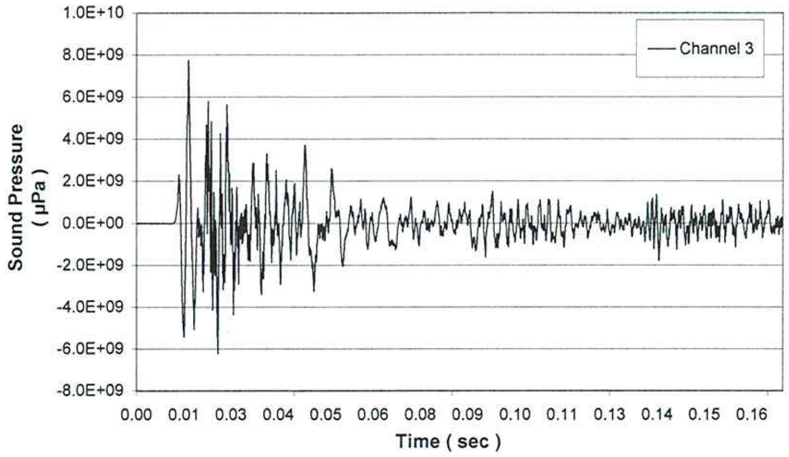


Figure b. Narrow Band Frequency Spectra

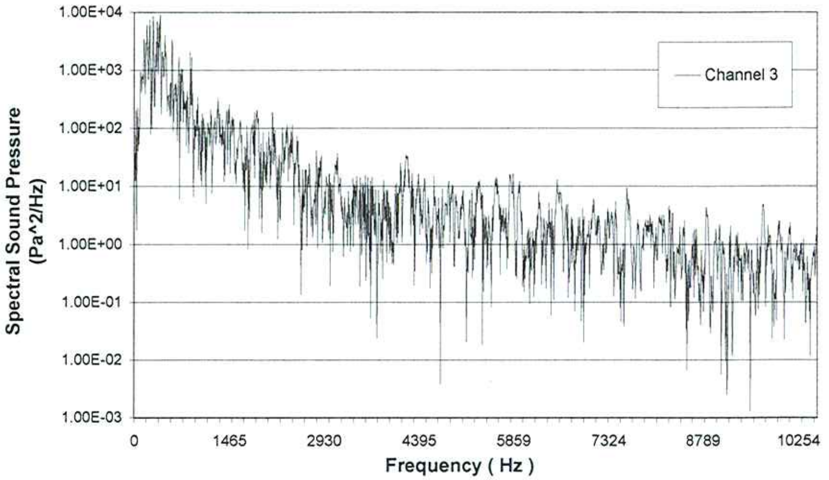


Figure c. Accumulation of Sound Energy

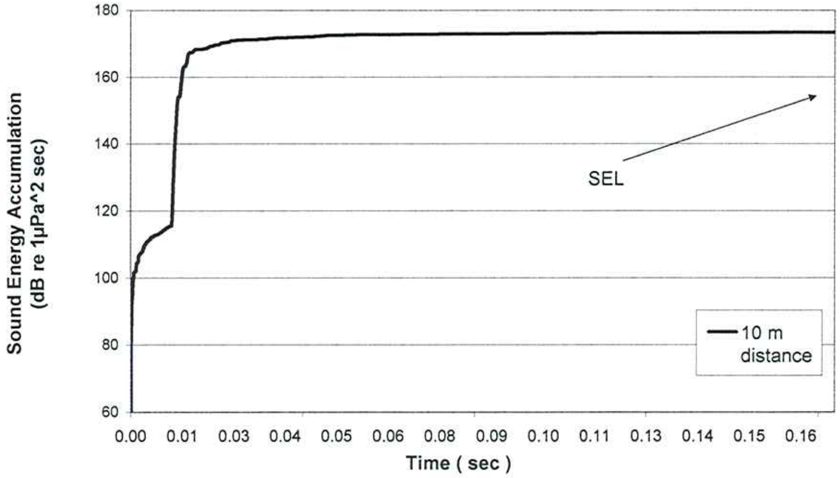


Figure d. Sound Pressure and Sound Energy Levels

Signal Analysis Sound Pressure / Energy Levels

Pile 12-2-2 - 10 m distance	Peak, dB	RMS$_{90\%}$*, dB	SEL, dB
Channel 3	198	183	173

*Impulse averaged over 90% of accumulated energy (5% to 95%)

BNSF. July 25, 2008. 11:21. Pile 12-2-2, Bubble Curtain Turned On

Figure a. Waveform

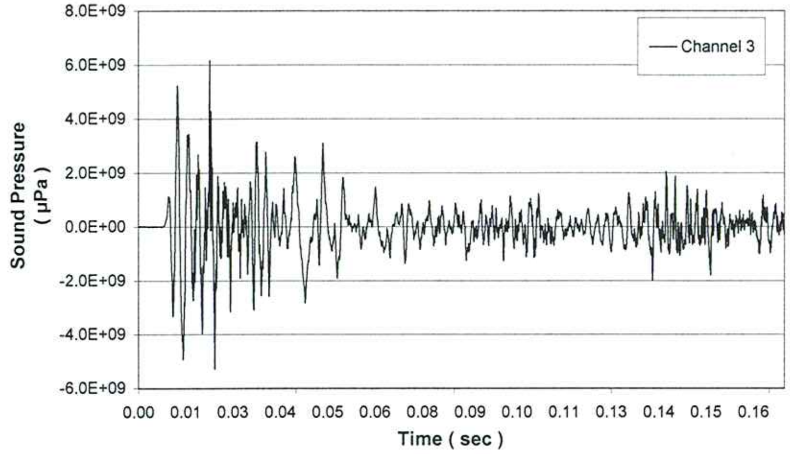


Figure b. Narrow Band Frequency Spectra

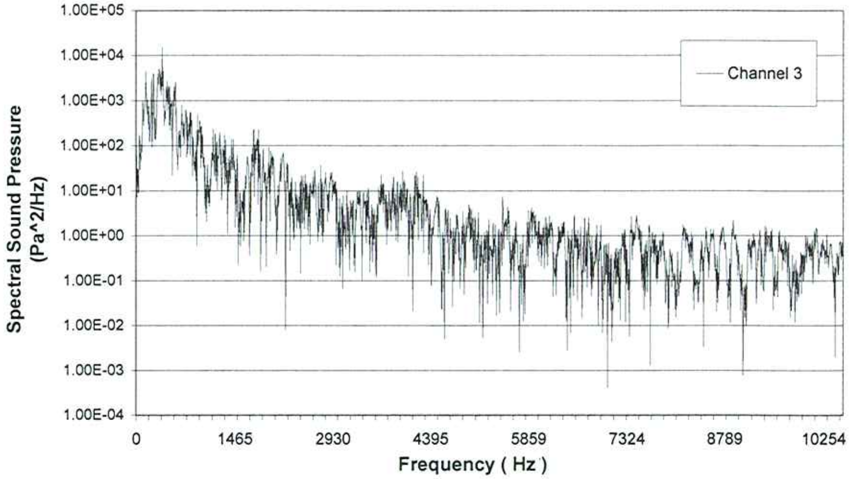


Figure c. Accumulation of Sound Energy

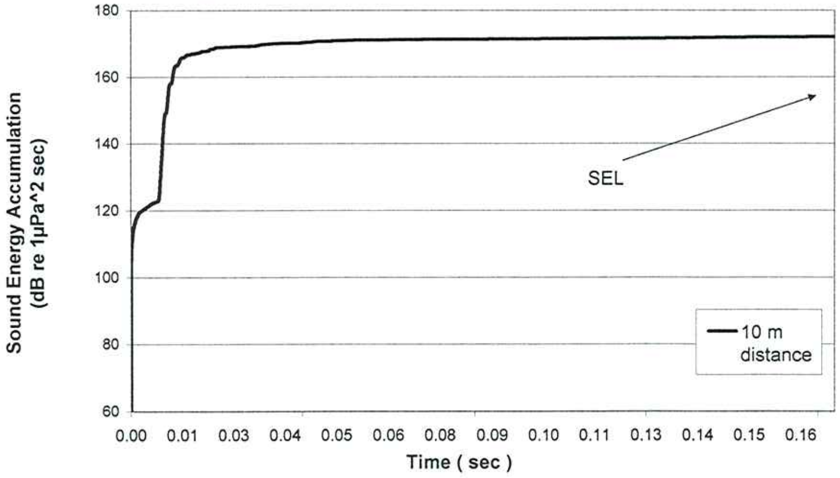


Figure d. Sound Pressure and Sound Energy Levels

Signal Analysis Sound Pressure / Energy Levels

Pile 12-2-2 - 10 m distance	Peak, dB	$RMS_{90\%}$*, dB	SEL, dB
Channel 3	196	180	172

*Impulse averaged over 90% of accumulated energy (5% to 95%)

Appendix F

Impact Pile Driving Durations and Impact Extents

Impact Pile Driving Durations and Impact Extents

Season	**Migration Period or Residence Only Period**	**Impact Pile Driving Impact Areas**	**Activity**
2019			
Spring (May only)	Migration	144 hours (continues to Spring 2020) Injury[1] = 97 m (0.06 mi) disturbance area = 5.3 mi	• Install Temporary bridge 3.1 • Install Temporary bridge 3.9
Summer	Residence Only		• Install Temporary bridge 3.1 • Install Temporary bridge 3.9
Fall	Migration	44 hours (continues to Spring 2020) Injury[1] = 0.28 mi disturbance area = 3.36 mi	• Install Temporary bridge 3.1 • Install Temporary bridge 3.9 • Install Permanent bridge 3.1 (starts in November)
2019 to 2020 winter	Residence Only		• Install Temporary bridge 3.1 • Install Temporary bridge 3.9 • Install permanent bridge 3.1
2020			
spring	Migration	“ “	• Install Permanent bridge 3.1 - finishing up in March • Install Temporary bridge 3.9 • Install Permanent bridge 3.9
summer	Residence Only	432 hours (continues to Winter 2021) Injury[1] = 0.62 mi disturbance area =2.88 mi	• Install Permanent bridge 3.9
Fall	Migration		• Install Permanent bridge 3.9
2020-2021 Winter	Residence Only		• Install Permanent bridge 3.9 • Removal of temporary bridge 3.1 starting in Feb
2021			
Spring	Migration	“ “	• Install Permanent bridge 3.9 • Removal of temporary bridge 3.1 Feb - April
summer	Residence Only		• Install Permanent bridge 3.9 • Removal of temporary bridge 3.9 starting in July
Fall	Migration		• Install Permanent bridge 3.9 • Removal of temporary bridge 3.9
2021-2022 Winter	Residence Only		• Install Permanent bridge 3.9 • Removal of temporary bridge 3.9
2022			
Spring	Migration	None (vibratory only)	• Removal of temporary bridge 3.9
summer	Residence Only	“ “	• Removal of temporary bridge 3.9
Fall	Migration	“ “	• Removal of temporary bridge 3.9
2022-2023 Winter	Residence Only	“ “	• Removal of temporary bridge 3.9
2023			
2022-2023 Winter	Residence Only	“ “	• Removal of temporary bridge 3.9

1. Injury spatial extent is in cumulative SEL dB to fish $\geq$ 2g

Appendix G

Sediment Assessment

Sediment Assessment

Clark Fork River Delta
Lake Pend Oreille
Bonner County, Idaho

for
Ducks Unlimited

May 29, 2014

GeoEngineers
Earth Science + Technology

Sediment Assessment

Clark Fork River Delta
Lake Pend Oreille
Bonner County, Idaho

for
Ducks Unlimited

May 29, 2014

GeoEngineers

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Spokane, Washington 99202
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Sediment Assessment

Clark Fork River Delta
Lake Pend Oreille
Bonner County, Idaho

File No. 15387-014-00

May 29, 2014

Prepared for:

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Attention: Brian Heck, PE

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GEOENGINEERS

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1.0 INTRODUCTION

This report presents results of a sediment assessment conducted in April 2014 at the Clark Fork River Delta in Bonner County, Idaho (herein referred as the Site). GeoEngineers has prepared this report for Ducks Unlimited (DU). DU has partnered with the Idaho Department of Fish and Game (IDFG) to restore the delta. Restoration will include excavating sediment from selected borrow areas within the delta to use as fill material elsewhere in the delta. To comply with conditions of the U.S. Army Corps of Engineers 404 permit, the Idaho Department of Environmental Quality (IDEQ) required that DU and IDFG assess the sediments in the borrow areas for metal content. The Site location is shown in Vicinity Map, Figure 1 and Site Plan, Figure 2.

GeoEngineers conducted this assessment in general accordance with our Revised Proposal dated April 3, 2014. This report references the Interim Final Sediment Evaluation Framework for the Pacific Northwest (SEF) (2006) and the Sediment Evaluation Framework for the Pacific Northwest (2009). The 2009 SEF does not contain freshwater contaminant screening levels; per IDEQ instructions, the screening levels from the 2006 edition were applied to this project. The SEF outlines the sediment evaluation requirements and the information reporting requirements. Per the SEF, a sediment evaluation generally begins with a Level 1 assessment that defines the objectives, develops a conceptual site model, collects historical site information and obtains preliminary data. Using the data developed during the Level 1 assessment, a Level 2 assessment, partially consisting of collecting and analyzing sediment samples, is planned and conducted. The Level 1 assessment was not performed at this Site. IDEQ allowed this one-time omission because of the unique circumstances associated with this project. Specifically, the sediment sampling needed to occur prior to the water level in Lake Pend Oreille being raised, preventing access to the sampling locations. This report describes the sediment sampling and analysis conducted as part of the Level 2 assessment. Other deviations from the procedures described in the SEF and in the project Sampling and Analysis Plan (SAP) (GeoEngineers 2014) are described in this report.

2.0 BACKGROUND SUMMARY

The Site is located in the Clark Fork River Delta on Lake Pend Oreille in Bonner County, Idaho, as shown in Figure 1 and Figure 2. The Site area and some of the surrounding area historically operated as a log yard. The log yard no longer operates. Historical data indicate mining activity on the Clark Fork River upstream from the Site could have deposited heavy metals.

Initial restoration dredging activities are planned on the portion of the Site designated as Area 3, located approximately in the middle of the delta (see Figure 2). Area 3 construction will include dredging about 600,000 cubic yards (CY) of sediment from areas designated as “shallow” and “deep” borrow areas for reuse on other areas of the Site. The shallow borrow areas will be excavated to depths between about 5 to 6 feet below ground surface (bgs); deep borrow areas will be excavated to depths between about 7 to 11 feet bgs. Three borrow areas located within Area 3 were planned to be sampled during this assessment. The Area 3 borrow areas are described below:

- Borrow Area 1 (BA-1): A combination of deep and shallow excavations covering about 37.7 acres. The estimated volume of the cut is 510,173 CY.
- Borrow Area 2 (BA-2): A shallow excavation covering about 3.8 acres with an estimated excavation volume of 30,148 CY.
- Borrow Area 3 (BA-3): A deep excavation covering about 5.1 acres with an estimated excavation volume of about 56,984 CY. This area was underwater during our assessment; therefore, samples were not collected from this area.

In addition to Area 3, three borrow areas (BA-1, BA-4 and BA-5) in Area 7, located north of Area 3, were sampled to prepare for future restoration actions in this area.

Based on their knowledge of potential upstream contaminant sources, specifically upstream mining, IDEQ identified the contaminants of concern as heavy metals (cadmium, copper, lead, mercury and zinc) potentially deposited by the Clark Fork River and originating from upstream mining sources.

3.0 SITE DESCRIPTION

The site is located in Bonner County, Idaho, at the mouth of the Clark Fork River entering Lake Pend Oreille. Site conditions generally consist of dried lakebed areas or sandbars deposited by the meandering of the Clark Fork River, tall dense grassy areas, and tree stumps. (See Site Photographs, Figures 3 through 5.) The sampling locations were located in the sandbar and dried lake bed areas. Sampling prior to elevated river levels from spring runoff was necessary in order to obtain the sediment samples. Area 3/BA-3 was underwater at the time of the assessment.

4.0 SCOPE OF SERVICES

The purpose of our activities was to assess the borrow areas in Area 3 and Area 7/BA-1, BA-4 and BA-5 for metals contamination. Samples were collected using hand augers and sediment samplers. IDFG provided boat transportation to and from the Site for our personnel and equipment, and was also responsible for boat safety, including provision of personal floatation devices (PFDs). Our specific scope of services included the following:

- Prepared a site-specific Health and Safety Plan (HASP) to govern the safety of our personnel on site.
- Completed a one-call utility locate request for the assessment area.
- Met IDFG on site to conduct a pre-sampling reconnaissance to prepare and plan for field conditions.
- Prepared a Sampling and Analysis Plan (SAP) describing the proposed sampling program, field procedures and documentation, and quality assurance/quality control (QA/QC) procedures. The SAP was prepared following the guidelines set forth in the referenced SEF.
- Augered 33 explorations in “deep” and “shallow” borrow areas in Area 3/BA-1 and B-2, and Area 7/BA-1, BA-4 and BA-5. Two to four sediment samples were collected from each

exploration location. Samples were collected using applicable environmental soil sampling protocols at variable depth intervals or when changes in the subsurface conditions were observed. Sample locations were logged using a global positioning system (GPS).

- Submitted 103 sediment samples to Anatek Laboratory Inc. (Anatek) located in Spokane, Washington for metals (cadmium, copper, lead, mercury and zinc) analysis using Environmental Protection Agency (EPA) Method 6020A.
- Prepared this report summarizing sediment sampling, chemical analytical results and recommendations.

5.0 FIELD ACTIVITIES

The sediment assessment was conducted in general accordance with the Revised Proposal dated April 3, 2014 and the SAP dated April 14, 2014. Field activities were performed by GeoEngineers' employees on April 15 and 16, 2014. Field methods used during the assessment are described in Appendix A.

5.1. Soil Explorations

Sediment samples from 33 locations (HA-1 through HA-33) were collected using hand augers, hand tools and disposable nitrile gloves. The approximate locations of sample locations are depicted in Figure 2. The sample locations are generally described below:

- HA-1 is located in Area 7, BA-4;
- HA-2 is located in the deep borrow area of BA-1 of Area 7;
- HA-3, HA-6 and HA-7 are located in BA-2 of Area 3. HA-3 was relocated from BA-3 of Area 3 because BA-3 was underwater;
- HA-4 and HA-8 through HA-33 are located in BA-1 of Area 3. HA-4 was relocated from BA-3 of Area 3 because BA-3 was underwater. Eleven sample locations are within the deep borrow areas and the remaining locations are in the shallow borrow areas; and
- HA-5 is located in BA-5 of Area 7.

Explorations located in the "Shallow Borrow Areas" were advanced to depths between 4 to 7 feet bgs and hand augers located in the "Deep Borrow Areas" were advanced to depths between 5 to 9½ feet bgs to assess the proposed restoration project excavation depths. Sediment generally consisted of brown or gray silty sand or sandy silt with varying clay percentages and occasional gravel. Relatively consistent sediment conditions were encountered across the site. Detailed sediment boring logs were prepared in general accordance with ASTM International (ASTM) Standard Practices D 2488, the Standard Practice for Classification of Soils, Visual-Manual Procedure. The sediment assessment field procedures and exploration log details are presented in Appendix A.

GeoEngineers collected two to four sediment samples from each exploration location for chemical analysis. Sediment samples were collected approximately every 1½ to 3 feet and were collected from intervals approximately 1½ to 2½ feet, 4½ to 5½ feet, 6½ to 7½ feet, and 8½ to 9½ feet bgs using a hand auger, hand tools and disposable nitrile gloves. The soil samples were transferred to two 2-ounce laboratory-prepared glass jars after collection and stored in iced coolers for transport to Anatek. Sediment exploration locations were logged using a GPS device accurate to at least 5 meters.

5.2. Sediment Sampling Deviations

The planned hand-auger exploration depths could not be reached at eight sample locations (HA-3, HA-5/5A, HA-11, HA-12, HA-13, HA-17, HA-19 and HA-33) because of refusal on gravel or severe caving caused by saturated sediment in the explorations. The number of samples specified in the SAP were not collected from these eight locations because the planned exploration depths were not reached (the SAP specified three samples from the shallow borrow explorations and four samples from the deep borrow locations). Other sediment sample deviations included the following:

- Sample location HA-5 initially was advanced in the planned location; however because of the proximity to the river (less than 10 feet south of the exploration location) the exploration was over-saturated and collapsed at about 2 feet bgs. An alternate exploration (HA-5A) was advanced about 20 feet north of the original location. The alternate exploration was advanced to about 4 feet bgs before saturated sediment conditions caused the exploration to collapse. Both locations are depicted on Figure 2.
- Samples were collected from exploration HA-11 on April 15, 2014 at depths of 1½ to 2 feet bgs and 4 to 4½ feet bgs using a hand auger. Saturated sediment caused severe caving. GeoEngineers returned to this exploration on April 16, 2014 to attempt to collect additional sediment samples from greater depths using a drop-hammer sediment sampler. One additional sample was collected from about 4½ to 5 feet bgs. Saturated sediment and associated caving prevented additional sampling from this exploration.
- Explorations HA-15 and HA-30 were both refused at about 3 and 5½ feet bgs, respectively, but the locations of both explorations were moved approximately 5 to 6 feet and re-augered to collect sediment samples from greater depths.

6.0 CHEMICAL ANALYTICAL RESULTS

6.1. Sediment Samples

A total of 103 sediment samples were collected from 33 hand-auger explorations. Sediment samples were submitted to Anatek for metals analysis using EPA Method 6020A. Sediment sample analytical results are compared to the SEF Interim Freshwater SL1 Concentrations (SL1 Concentrations) found in SEF Table 7-1 (included in Appendix C). Chemical analytical results are summarized by the following:

- Thirteen sediment samples contained concentrations of one or more metals exceeding the SL1 Concentrations.
- These 13 samples were collected from 10 exploration locations at depths ranging between 1½ to 6½ feet bgs.

- At least one sample from the three exploration locations in Area 7 (HA-1, HA-2, and HA-5) contained one or more metal exceeding SL1 Concentrations.
- Eight of the exceeding samples were collected from the shallowest sample depth (between 1½ and 2½ feet bgs) of their respective explorations.
- Cadmium exceeded the SL1 Concentration (1.1 milligrams per kilogram [mg/kg]) in eight sediment samples at concentrations ranging between 1.12 and 14.8 mg/kg.
- Copper exceeded the SL1 Concentration (80 mg/kg) in nine sediment samples at concentrations ranging between 94.8 and 425 mg/kg.
- None of the samples contained lead concentrations greater than the SL1 Concentration (340 mg/kg).
- Mercury exceeded the SL1 Concentration (0.280 mg/kg) in six sediment samples at concentrations ranging between 0.301 and 0.627 mg/kg.
- Zinc exceeded the SL1 Concentration (130 mg/kg) in 10 sediment samples at concentrations ranging between 171 and 648 mg/kg.
- We did not note a correlation between the metal concentrations and subsurface sediment characteristics.

Metal concentrations from the sediment samples are tabulated in Chemical Analytical Results, Table 1 and the laboratory report is included in Appendix B.

6.2. Quality Control Samples and Analyses

Two field blanks (Field Blank 1 and 2) and two equipment rinsate blanks (Rinsate Blank 1 and 2) were collected. The purpose of field blanks was to assess if the water used during decontamination contained the contaminants of concern and therefore would bias the sediment sample results high. Field blank samples were collected from the distilled water used during decontamination procedures, poured directly into a lab provided container. Rinsate blanks are collected to evaluate the decontamination procedure used between each sample location to assess whether contaminants encountered in a given exploration are potentially cross contaminating subsequent explorations. The rinsate blank samples were collected by pouring deionized water, provided by Anatek, over the thoroughly decontaminated sampling equipment (hand auger), into a laboratory provided container. The quality control samples were submitted to Anatek for metals (cadmium, copper, lead, mercury and zinc) analysis using EPA Method 6020A. Decontamination procedures are described in Appendix A. Quality control sample results are summarized by the following:

- Cadmium, copper, lead, mercury and zinc were not detected from the field blanks indicating that the distilled water used to decontaminate the sample equipment did not bias the sediment sample results.
- Zinc was detected in both rinsate blanks at 0.0120 and 0.00988 micrograms per liter (µg/L). In our opinion, these zinc concentrations are not a likely source of cross contamination and do not contribute to the zinc detected in the sediment samples. The other metals were not detected in the rinsate samples.

Laboratory QA/QC procedures and analyses are included in the attached laboratory report. No data quality exceptions were noted in Anatek's report.

7.0 CONCLUSION

7.1. Assessment Summary

GeoEngineers conducted sediment assessment activities at the Clark Fork River Delta site for DU on April 15 and 16, 2014. GeoEngineers hand-augered 33 explorations and collected 103 sediment samples from depths ranging between 1½ to 9½ feet bgs to characterize the sediment in planned borrow areas. Based on historic mining activities upstream on the Clark Fork River, the potential contaminants of concern were identified as cadmium, copper, lead, mercury and zinc. Analytical results indicated 13 sediment samples, from 10 exploration locations, contained metals concentrations greater than SL1 Concentrations. Sediment samples from each exploration located in Area 7 contained at least one metal at a concentration greater than the respective SL1 Concentration.

7.2. Recommendations

Based on the detected metal concentrations, DU and IDFG will need to manage the sediment excavated from the borrow areas in Area 3 in a manner to minimize risk particularly to aquatic life. GeoEngineers contacted IDEQ to discuss potential sediment management options. Additionally Chapter 9 of the SEF (2009) identifies general disposal options and requirements for sediment dredging projects. Chapter 9 of the SEF (2009) is included in Appendix C. These options include:

- **Limiting borrow excavations to areas where metals were not detected at concentrations greater than the SL1 Concentrations.** Metals at concentrations greater than the SL1 Concentrations (metals-impacted sediment) were only detected from seven exploration locations (HA-6, HA-14, HA-15, HA-17, HA-28, HA-32 and HA-33) in Area 3, primarily concentrated on the southern and eastern portions of Area 3. If sediments in these areas are not disturbed during dredging operations, then no additional effort is required to cap, dispose, or otherwise handle these sediments. We recommend leaving a buffer during excavation around each metals-impacted sample location extending to the adjacent non-impacted sample locations.

- **Placing metals-impacted sediment in locations to minimize exposure risks and covering them with a cap of non-impacted sediments.** If metals-impacted sediment is needed as fill material to accomplish the goals of the delta restoration, that sediment should be placed on the higher elevations of the planned fill areas. Placing the metals-impacted sediment at higher elevations reduces the risk associated with the sediments becoming washed out during flood events and exposing aquatic life to elevated metals concentrations.

  The restoration plan set provided to us indicates there are five planned fill locations in Area 3 that will be filled to an elevation of about 2066.5 feet. Though these elevated fill areas are relatively small, they might provide enough volume to place metals-impacted sediment. Metals-impacted sediment placed in the elevated fill areas should be covered with approximately 6 inches of non-metals-impacted sediment to reduce the direct contact exposure pathway to potential receptors. Capping limits the bioavailability and migration of contaminants by providing a physical barrier to exposure pathways. We further recommend re-vegetating the locations where metals-impacted sediment is placed. Vegetation will provide an additional barrier to limit potential exposure and reduce sediment erosion. A botanist or similar expert should evaluate the planned vegetation to confirm its compatibility with the metals-impacted sediment.

This option closely corresponds to the Thin Cap disposal alternative presented in the 2009 SEF ("Section 9.4.1.2"). The SEF recommends using the Thin Cap in low-energy environments where erosion and scour are less likely to expose the metals-impacted sediment.

We recommend a combination of both the options described above. If possible DU and IDFG should avoid excavating the metals-impacted sediments. If fill requirements cannot be satisfied using only the non-impacted sediments, then metals-impacted sediments should be placed in the planned higher elevation fill areas. At each exploration location in Area 3 containing metals-impacted sediments, a non-impacted sediment sample was collected at a greater depth. The sediment excavated from near the contaminated explorations should be considered metals-impacted until excavation reaches the depths where sample results indicate the metals concentrations are less than SL1 Concentrations. Sediment excavated below the non-impacted samples can be used as general fill throughout the site or as cap material covering the metals-impacted sediment. (This report only addresses the suitability of sediment for use as fill based on the metals concentrations evaluated compared to the SL1 Concentrations; no consideration is given to the sediment's structural or other properties required for the restoration project.)

We further recommend the selected contractor performing the work mark the locations of metals-impacted explorations and prepare a work plan that addresses metals-impacted sediment handling and placement. The metals-impacted sediment should be tracked during excavation and placement and final project as-built plans should indicate the placement so that the final disposition is known. DU and IDFG should plan to monitor capped metals-impacted sediment at least annually and after large flood events that might submerge the elevated fill areas. The purpose of the monitoring will be to assess the integrity of the non-impacted sediment and vegetation cap to limit potential exposure pathways. The selected contractor should have the appropriate qualifications to excavate and place contaminated sediment.

Other options to assess and handle the metals-impacted sediment are presented in the SEF (2009) and should be considered if the options described above do not achieve the overall project goals.

We also recommend additional sampling and analysis in Area 7 before construction begins in this area. Each exploration location in Area 7 contained at least one sample with metals concentration exceeding the SL1 Concentrations. An Area 7 assessment should be planned with enough time to conduct the full requirements outlined in the SEF, including the Level 1 assessment.

8.0 LIMITATIONS

We have prepared this assessment report for use by Ducks Unlimited. No other parties may place legal reliance on this work product. This report is not intended for use by others, and the information contained herein is not applicable to other sites.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted environmental science practices in this area at the time this work plan was prepared. No warranty or other conditions express, 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, Inc.

Our interpretations of subsurface conditions are based on field observations and chemical analytical data 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.

Please refer to Appendix D titled "Report Limitations and Guidelines for Use" for additional information pertaining to use of this report.

9.0 REFERENCES

U.S. Army Corps of Engineers, U.S. EPA Region 10, et al. (2006) "Interim Final Sediment Evaluation Framework for the Pacific Northwest." 2006.

U.S. Army Corps of Engineers, U.S. EPA Region 10, et al. (2009) "Sediment Evaluation Framework for the Pacific Northwest." 2009.

TABLES

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Table 1

Chemical Analytical Results[1]

Lower Clark Fork River Delta Sediment Assessment
Bonner County, Idaho

Sample ID (Sample Depth, feet)	Date Collected	Sample Moisture Content (%)	Cadmium[2]	Copper[2]	Lead[2]	Mercury[2]	Zinc[2]
Soil Samples (mg/kg)							
HA-1 (1.5 - 2)	04/16/14	30.8	0.213	70.7	34.9	0.177	66.3
HA-1 (4.5 - 5)	04/16/14	31.1	0.636	127	79.1	0.316	128
HA-1 (6.5 - 7)	04/16/14	36.2	ND	23.1	12.2	ND	54.3
HA-2 (1.5 - 2)	04/16/14	30.3	2.60	415	83.8	0.374	620
HA-2 (4.5 - 5)	04/16/14	28.4	ND	19.7	8.97	ND	36.1
HA-2 (6.5 - 7)	04/16/14	22.1	ND	11.2	6.22	ND	28.3
HA-2 (9 - 9.5)	04/16/14	22.7	ND	11.5	6.14	ND	29.3
HA-3 (1.5 - 2)	04/16/14	24	ND	10.5	6.15	ND	27.2
HA-3 (4 - 4.5)	04/16/14	27.4	ND	5.27	3.47	ND	18.7
HA-4 (1.5 - 2)	04/16/14	25.4	ND	22.5	12.5	ND	53.5
HA-4 (4 - 4.5)	04/16/14	23.3	ND	12.0	6.43	ND	29.6
HA-4 (6 - 6.5)	04/16/14	29.3	ND	18.1	8.20	ND	33.3
HA -5 (1.5 - 2)	04/16/14	35.8	2.23	100	78.5	0.119	648
HA-5A (3.5 - 4)[3]	04/16/14	27.7	1.64	78.9	84.7	0.116	417
HA-6 (2 - 2.5)	04/15/14	34.6	ND	73.9	28.6	0.111	130
HA-6 (4 - 4.5)	04/15/14	34.6	0.751	76.8	26.6	0.122	228
HA-6 (6 - 6.5)	04/15/14	29.3	0.752	94.8	30.9	0.116	299
HA-7 (1.5 - 2)	04/16/14	17.7	ND	11.4	6.82	ND	29.0
HA-7 (4 - 4.5)	04/16/14	23.3	ND	4.74	4.01	ND	16.4
HA-7 (6 - 6.5)	04/16/14	22.3	ND	5.01	3.33	ND	18.9
HA-8 (1.5 - 2)	04/16/14	30.1	ND	20.8	9.93	ND	47.4
HA-8 (4 - 4.5)	04/16/14	26.8	ND	18.6	10.6	ND	39.0
HA-8 (6 - 6.5)	04/16/14	30.5	ND	12.8	6.97	ND	28.9
HA-9 (1.5 - 2)	04/16/14	26.3	ND	23.9	14.7	ND	50.5
HA-9 (4 - 4.5)	04/16/14	26.1	ND	7.35	4.36	ND	22.3
HA-9 (6 - 6.5)	04/16/14	24.4	ND	5.69	4.77	ND	20.6
HA-10 (1.5 - 2)	04/16/14	30.2	ND	18.9	11.0	ND	49.2
HA-10 (4 - 4.5)	04/16/14	27.1	ND	16.9	9.32	ND	35.6
HA-10 (6 - 6.5)	04/16/14	21.9	ND	4.56	3.30	ND	15.9
HA-10 (7.5 - 8)	04/16/14	23	ND	5.37	3.39	ND	19.2
HA-11 (1.5 - 2)	04/16/14	31.5	ND	22.9	11.9	ND	57.3
HA-11 (4 - 4.5)	04/16/14	28.9	ND	24.0	14.0	ND	63.0
HA-11 (4.5 - 5)	04/16/14	30.8	ND	14.9	7.87	ND	37.5
HA-12 (1.5 - 2)	04/16/14	27.7	ND	22.8	13.6	ND	49.6
HA-12 (4 - 4.5)	04/16/14	27.6	ND	23.5	12.6	ND	47.4
HA-12 (5.5 - 6)	04/16/14	29.1	ND	16.8	9.74	ND	43.8
HA-13 (1.5 - 2)	04/15/14	25.8	ND	26.3	13.6	ND	52.3
HA-13 (4.5 - 5)	04/15/14	25.8	ND	20.7	11.6	ND	40.3
HA-14 (1.5 - 2)	04/15/14	39.1	1.46	176	43.2	0.193	368
HA-14 (4 - 4.5)	04/15/14	28.8	ND	27.7	13.9	ND	60.7
HA-14 (6 - 6.5)	04/16/14	30.3	ND	22.4	12.1	ND	51.9
HA-15 (1.5 - 2)	04/15/14	30.2	1.01	192	54.3	0.425	171

Sample ID (Sample Depth, feet)	Date Collected	Sample Moisture Content (%)	Cadmium[2]	Copper[2]	Lead[2]	Mercury[2]	Zinc[2]
HA-15 (4 - 4.5)	04/15/14	34.5	ND	25.4	12.6	ND	57.4
HA-15 (6 - 6.5)	04/15/14	22.7	ND	9.01	4.87	ND	22.6
HA-16 (2 - 2.5)	04/15/14	24.1	ND	15.0	12.0	ND	42.7
HA-16 (4 - 4.5)	04/15/14	31	ND	42.0	9.39	ND	39.6
HA-16 (6.5 - 7)	04/15/14	25.3	ND	20.9	11.4	ND	37.6
HA-17 (1.5 - 2)	04/15/14	29	ND	24.5	20.2	0.301	57.9
HA-17 (4 - 4.5)	04/15/14	25.6	ND	21.0	12.5	ND	44.6
HA-17 (6 - 6.5)	04/15/14	28.3	ND	16.8	12.2	ND	41.1
HA-18 (1.5 - 2)	04/15/14	31.9	ND	19.7	12.3	ND	48.2
HA-18 (4 - 4.5)	04/15/14	27.2	ND	25.6	14.8	ND	46.8
HA-18 (6 - 6.5)	04/15/14	23.5	ND	17.0	9.27	ND	35.2
HA-19 (1.5 - 2)	04/15/14	33	ND	25.7	14.1	0.0856	62.4
HA-19 (4 - 4.5)	04/15/14	26.4	ND	16.8	10.1	ND	34.0
HA-19 (6 - 6.5)	04/15/14	15.2	ND	8.66	5.20	ND	22.7
HA-20 (1.5 - 2)	04/15/14	19.1	ND	16.0	8.91	ND	33.1
HA-20 (4.5 - 5)	04/15/14	22.4	ND	12.4	7.51	ND	32.5
HA-20 (6.5 - 7)	04/15/14	25.1	ND	18.5	12.5	ND	42.6
HA-21 (1.5 - 2)	04/15/14	23.7	ND	21.4	13.2	ND	72.5
HA-21 (4.5 - 5)	04/15/14	23	ND	18.1	11.1	ND	42.5
HA-21 (6.5 - 7)	04/15/14	24.7	ND	19.9	11.3	ND	41.6
HA-21 (9 - 9.5)	04/15/14	23.5	ND	15.1	9.08	ND	34.9
HA-22 (2 - 2.5)	04/15/14	31.1	ND	26.3	15.4	ND	73.5
HA-22 (4.5 - 5)	04/15/14	25.7	ND	19.9	12.0	ND	37.8
HA-22 (6.5 - 7)	04/15/14	29.9	ND	20.5	10.5	ND	50.5
HA-23 (1.5 - 2)	04/15/14	25	0.662	21.1	13.9	ND	67.6
HA-23 (4.5 - 5)	04/15/14	23.3	ND	17.7	10.5	ND	36.7
HA-23 (6.5 - 7)	04/15/14	27.6	ND	21.6	12.3	ND	40.5
HA-24 (1.5 - 2)	04/15/14	26.7	ND	21.2	12.7	ND	38.3
HA-24 (4.5 - 5)	04/15/14	24.4	ND	17.2	9.43	ND	34.2
HA-24 (7 - 7.5)	04/15/14	24.3	ND	13.8	8.57	ND	32.5
HA-25 (2.5 - 3)	04/15/14	27.2	ND	17.2	9.26	ND	33.3
HA-25 (4.5 - 5)	04/15/14	24.1	ND	29.5	11.8	ND	37.7
HA-25 (6.5 - 7)	04/15/14	28	ND	10.6	6.98	ND	26.6
HA-25 (8.5 - 9)	04/15/14	18.3	ND	5.21	3.77	ND	17.4
HA-26 (1.5 - 2)	04/16/14	30.6	ND	13.3	8.59	ND	29.5
HA-26 (5 - 5.5)	04/16/14	30.4	ND	10.6	6.84	ND	26.6
HA-26 (6.5 - 7)	04/16/14	24.4	ND	5.40	4.01	ND	19.0
HA-26 (9 - 9.5)	04/16/14	23.9	ND	ND	ND	ND	ND
HA-27 (1.5 - 2)	04/15/14	31.4	ND	26.4	13.7	ND	59.1
HA-27 (4.5 -5)	04/15/14	21.3	ND	14.4	10.3	ND	36.8
HA-27 (6.5 - 7)	04/15/14	23.6	ND	14.9	8.46	ND	32.8
HA-28 (1.5 - 2)	04/16/14	27	14.8	14.8	8.96	ND	ND
HA-28 (4.5 - 5)	04/16/14	26.4	ND	15.5	9.41	ND	32.2
HA-28 (6.5 - 7)	04/16/14	26.8	ND	15.6	8.95	ND	29.7
HA-29 (1.5 - 2)	04/16/14	22.4	ND	15.2	9.21	ND	30.9
HA-29 (4.5 - 5)	04/16/14	27.2	ND	13.8	8.54	ND	27.0
HA-29 (6.5 - 7)	04/16/14	26.4	ND	13.9	9.07	ND	30.7
HA-29 (9 - 9.5)	04/16/14	27.4	ND	8.25	5.52	ND	23.0

Sample ID (Sample Depth, feet)	Date Collected	Sample Moisture Content (%)	Cadmium^2	Copper^2	Lead^2	Mercury^2	Zinc^2
HA-30 (1.5 - 2)	04/16/14	23.7	ND	18.4	12.0	ND	49.1
HA-30 (4 - 4.5)	04/16/14	28.1	ND	17.1	9.75	ND	40.1
HA-30 (6.5 - 7)	04/16/14	29.7	ND	16.6	9.32	ND	35.9
HA-31 (1.5 - 2)	04/16/14	21.6	ND	14.7	8.69	ND	31.1
HA-31 (2 - 2.5)	04/16/14	28	ND	17.7	10.5	ND	37.5
HA-31 (4.5 - 5)	04/16/14	28.8	ND	19.1	9.90	ND	38.8
HA-32 (1.5 - 2)	04/16/14	35.9	**1.12**	**98.1**	27.4	0.197	**194**
HA-32 (4.5 - 5)	04/16/14	31.1	**2.11**	**425**	97.4	**0.627**	**442**
HA-32 (6.5 - 7)	04/16/14	24.8	ND	15.2	8.88	ND	33.1
HA-32 (9 - 9.5)	04/16/14	25.6	ND	17.7	10.7	ND	40.7
HA-33 (2 - 2.5)	04/16/14	28.8	**1.97**	**238**	56.2	**0.303**	**497**
HA-33 (4 - 4.5)	04/16/14	22.9	ND	21.8	12.9	ND	54.1
HA-33 (6.5 - 7)	04/16/14	27.4	ND	12.0	7.67	ND	26.6
SEF - Interim Freshwater - SL1 Concentrations[4] (mg/kg)			**1.1**	**80**	**340**	**0.28**	**130**
QA/QC Samples (µg/L)							
Rinsate Blank 1	04/15/14		ND	ND	ND	ND	0.0120
Rinsate Blank 2	04/16/14		ND	ND	ND	ND	0.00988
Field Blank 1	04/15/14		ND	ND	ND	ND	ND
Field Blank 2	04/16/14		ND	ND	ND	ND	ND

Notes:

[1] Samples submitted to Anatek Labs, Inc. of Spokane, Washington

[2] Samples analyzed for metals using Environmental Protection Agency (EPA) Method 6020A.

[3] The planned location of HA-5 was too close to the river. Rapid groundwater seepage caused heavy caving and the boring was abandoned at about 2 feet bgs, An alternate location (HA-5A) was advanced about 20 feet north of HA-5.

[4] Northwest Regional Interim Sediment Evaluation Framework (SEF)

ND = Analyte not detected at concentrations greater than the laboratory method detection limit.

bgs = below ground surface; mg/kg = milligrams per kilogram

Bolding and shading indicates the analyte was detected at concentrations greater than SEF - Interim Freshwater - SL1 Concentrations.

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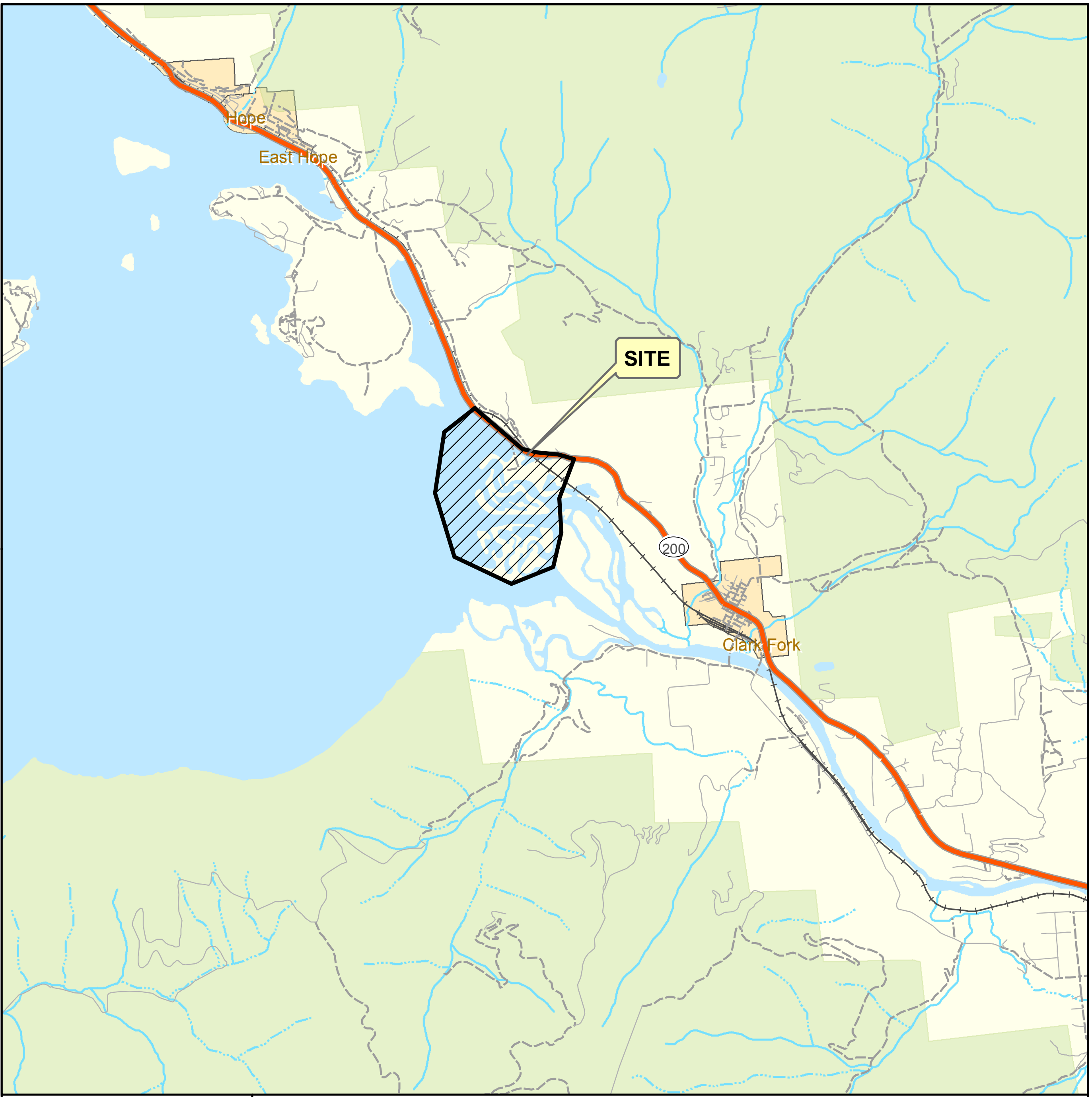

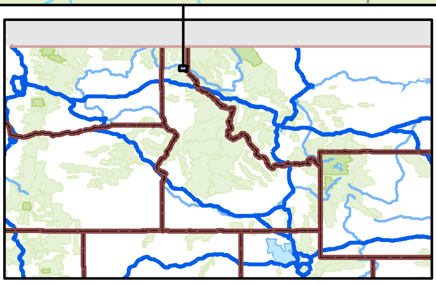

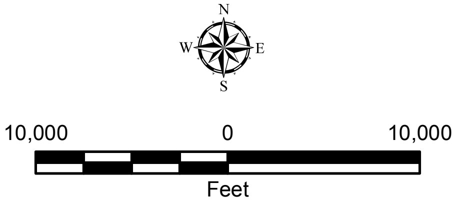

Notes:

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. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
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Data Sources: ESRI Data & Maps

Projection:

Vicinity Map

Lower Clark Fork River Delta Sediment Assessment
Bonner County, Idaho

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Figure 1

Office: SPO Path: W:\Spokane\Projects\15\15387014\GIS\15387014VicinityMap.mxd Map Revised: 09 April 2014 tkauhi

Legend

HA-3
⊕ Hand Auger Exploration Locations

HA-1
⊕ Exploration location with at least one sample containing one or more metal (cadmium, copper, lead, mercury or zinc) at a concentration greater than Interim SEF Freshwater SL1 levels.

▨ Deep Borrow Area EL = 2045.0

▨ Shallow Borrow Area EL = 2049.0

N
W E
S

1,000 0 1,000
Feet

Data Source: Imagery from ESRI Data Online.

Projection: NAD 1983 StatePlane Idaho East FIPS 1101 Feet

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 content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. SEF = Sediment Evaluation Framework; BA = Borrow Area

Site Plan

Lower Clark Fork River Delta Sediment Assessment
Bonner County, Idaho

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Figure 2

Typical sandbar conditions encountered at site.

Typical sandbar conditions.

Site Photographs

Lower Clark Fork River Delta Sediment Assessment

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Figure 3

Basic hand-auger sample procedures

Typical site conditions

Site Photographs

Lower Clark Fork River Delta Sediment Assessment

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Figure 4

Decontamination procedure.

Sediment conditions typical of site. (Wet silty sand)

Site Photographs

Lower Clark Fork River Delta Sediment Assessment

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Figure 5

APPENDICES

APPENDIX A

Field Procedures

APPENDIX A
FIELD PROCEDURES

GENERAL

This section of the report describes the field procedures, field Quality Assurance/Quality Control (QA/QC) protocol, and the chemical testing program that was implemented during the sediment assessment activities. The field activities included the following activities:

- Collection of sediment samples from hand auger explorations;
- Decontamination procedures;
- Location control;
- Handling of investigation derived waste (IDW); and
- Laboratory Analytical Plan.

Collecting Soil Samples from Hand-Auger Explorations

Soil Sampling

Sediment samples were collected using hand augers and/or other hand tools at approximately 1½ to 2-foot sample intervals. Sampling equipment was decontaminated between each sampling location.

Sediment samples were placed in an ice chest containing frozen blue ice or crushed ice for storage prior to delivery to the laboratory. Standard chain-of-custody procedures were observed during transport of the samples to the laboratory.

Decontamination Procedures

The objective of the decontamination procedures described herein was to minimize the potential for cross-contamination between sample locations.

Sampling equipment was decontaminated in accordance with the following procedures between each sample location and sampling attempt.

1. Brush equipment with a nylon brush to remove large particulate matter.
2. Rinse with distilled water.
3. Wash with non-phosphate detergent solution (Liquinox® and potable tap water).
4. Final rinse with distilled water.

Location Control

Horizontal sample control was maintained throughout the project. Horizontal control to locate sample locations in the field was established using an iPad with GPS software accurate to approximately 5 lateral meters

Vertical sample control was maintained during hand-auger operation. The depth of the augered boring was measured to the nearest inch using a metal tape measure before augering to acquire a sediment sample. The hand auger boring was measured with a metal measuring tape after the sample is retrieved from the auger boring.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% RETAINED ON NO. 200 SIEVE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)	▨	GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
			▨	GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	▨	GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
			▨	GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)	▨	SW	WELL-GRADED SANDS, GRAVELLY SANDS
			▨	SP	POORLY-GRADED SANDS, GRAVELLY SAND
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	▨	SM	SILTY SANDS, SAND - SILT MIXTURES
			▨	SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50	▨	ML	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY
			▨	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			▨	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50	▨	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS
			▨	CH	INORGANIC CLAYS OF HIGH PLASTICITY
			▨	OH	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS			▨	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: Multiple symbols are used to indicate borderline or dual soil classifications

ADDITIONAL MATERIAL SYMBOLS

SYMBOLS		TYPICAL DESCRIPTIONS
GRAPH	LETTER	
■	AC	Asphalt Concrete
▨	CC	Cement Concrete
▨	CR	Crushed Rock/ Quarry Spalls
▨	TS	Topsoil/ Forest Duff/Sod

Groundwater Contact

▼	**Measured groundwater level in exploration, well, or piezometer**
▼	**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**

Sampler Symbol Descriptions

◫	**2.4-inch I.D. split barrel**
◧	**Standard Penetration Test (SPT)**
■	**Shelby tube**
▤	**Piston**
◧	**Direct-Push**
☒	**Bulk or grab**

Blowcount is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted). See exploration log for hammer weight and drop.

A "P" indicates sampler pushed using the weight of the drill rig.

Laboratory / Field Tests

%F	**Percent fines**
AL	**Atterberg 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**
PI	**Plasticity index**
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**

NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative of subsurface conditions at other locations or times.

KEY TO EXPLORATION LOGS

GEOENGINEERS

FIGURE A-1

Date Excavated: 4/16/2014

Equipment: Hand Auger

Logged By: EBD

Total Depth (ft) 7.0

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	 Sample Name Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
					SM		Gray silty sand (very loose, moist)		
						▽	Becomes wet		
	1								
		☒	HA-1(1.5-2.0) CA					30.8	
	2						Becomes loose to medium dense		
	3								
	4								
		☒	HA-1(4.5-6.0) CA					31.1	
	5								
	6						Becomes medium dense		
		☒	HA-1(6.5-8.0) CA					36.2	
	7								

Hand auger completed at approximately 7 feet
Groundwater seepage observed at 0.5 feet
No caving observed

Note: See Figure A-1 for explanation of symbols

Log of Hand Auger HA-1

GeoEngineers

Project:	Lower Clark Fork River Delta Sediment Assessment
Project Location:	Bonner County, Idaho
Project Number:	15387-014-00

Figure A-2
Sheet 1 of 1

Date Excavated: 4/16/2014
Equipment: Hand Auger
Logged By: EBD
Total Depth (ft) 9.5

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	 Sample Name Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
					SP		Brown fine to medium sand with trace silt (loose, moist)		
	1				SM		Grayish-brown silty fine to medium sand with orange mottling (loose, moist)		
		☒	HA-2(1.5-2.0) CA					30.3	
	2				ML		Gray clayey silt with sand (soft, wet)		
	3								
	4					▽			
		☒	HA-2(4.5-6.0) CA		SM		Gray silty fine to medium sand with clay (loose, wet)	28.4	
	5								
	6				SP		Gray fine to medium sand with occasional silt (very loose, wet)		
		☒	HA-2(6.5-8.0) CA					22.1	
	7								
	8						With occasional orange mottling (very loose, moist)		
	9	☒	HA-2(9.0-9.5) CA					22.7	

Hand auger completed at approximately 9.5 feet
Groundwater seepage observed at 4 feet
No caving observed

Note: See Figure A-1 for explanation of symbols

Log of Hand Auger HA-2

GeoEngineers

Project: Lower Clark Fork River Delta Sediment Assessment
Project Location: Bonner County, Idaho
Project Number: 15387-014-00

Figure A-3
Sheet 1 of 1

Spokane: Date:5/14/14 Path:P:\15\15387014\00\GINT\1538701400.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GE8_TESTPIT_1P_GEOTEC

Date Excavated: 4/16/2014
Equipment: Hand Auger
Logged By: EBD
Total Depth (ft) 5.0

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	 Sample Name Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
				▨	SP		Brown fine to medium sand with trace silt (loose, moist)		
	1			▨					
		☒	HA-3(1.5-2.0) CA	▨				24	
	2			▨		▽			
	3			▨			Grades to gray		
	4			▨					
		☒	HA-3(4.5-6.0) CA	▨				27.4	
	5								

Hand auger completed at approximately 5 feet
Slight to moderate groundwater seepage observed at 2 feet
Slight caving observed at 2 feet
Severe caving observed and refusal at 4.5 feet

Note: See Figure A-1 for explanation of symbols

Log of Hand Auger HA-3

GeoEngineers

Project: Lower Clark Fork River Delta Sediment Assessment
Project Location: Bonner County, Idaho
Project Number: 15387-014-00

Figure A-4
Sheet 1 of 1

Date Excavated: 4/16/2014

Equipment: Hand Auger

Logged By: EBD

Total Depth (ft) 6.5

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	 Sample Name Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
					ML		Brownish-gray sandy silt with organic matter (soft, moist0		
							Grades to gray with brown mottling		
	1								
		☒	HA-4(1.5-2.0) CA					25.4	
	2								
	3				SM		Gray silty fine sand (loose, moist)		
	4	☒	HA-4(4.0-4.5) CA					23.3	
	5								
	6	☒	HA-4(6.0-6.5) CA					29.3	

Hand auger completed at approximately 6.5 feet
Moderate to rapid groundwater seepage observed at 3.5 feet
Severe caving observed and refusal at 6.5 feet

Note: See Figure A-1 for explanation of symbols

Spokane: Date:5/14/14 Path:P:\15\15387014\00\GINT\1538701400.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GE8_TESTPIT_1P_GEOTEC

Log of Hand Auger HA-4

GEOENGINEERS

Project: Lower Clark Fork River Delta Sediment Assessment
Project Location: Bonner County, Idaho
Project Number: 15387-014-00

Figure A-5
Sheet 1 of 1

Date Excavated: 4/16/2014
Equipment: Hand Auger

Logged By: EBD
Total Depth (ft) 2.0

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	 Sample Name Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
					SP-SM		Brown and gray mottled fine to medium sand with silt (loose, moist)		
	1								
		☒	HA-5(1.5-2.0) CA					35.8	
	2					▽			

Refusal at 2 feet, move 20 feet north for HA-5A
Hand auger completed at approximately 2 feet
Moderate to rapid groundwater seepage observed at 2
Severe caving observed and refusal at 2 feet

Note: See Figure A-1 for explanation of symbols

Log of Hand Auger HA-5

GeoEngineers

Project: Lower Clark Fork River Delta Sediment Assessment
Project Location: Bonner County, Idaho
Project Number: 15387-014-00

Figure A-6
Sheet 1 of 1

Date Excavated: 4/16/2014
Equipment: Hand Auger

Logged By: EBD
Total Depth (ft) 4.5

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	 Sample Name Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
					SP-SM		Brown and gray mottled fine to medium sand with silt (loose, moist)		
	1								
	2								Rapid water seepage and heavy caving caused exploration HA-5 to collapse at about 2 feet below ground surface. An alternate location (HA-5A) was advanced about 20 feet north of HA-5 to achieve greater sample depths.
	3				SM		Gray fine silty sand (loose, moist)		
		☒	HA-5A(3.5-4.0) CA					27.7	
	4								
						▽			

Hand auger completed at approximately 4.5 feet
Moderate to rapid groundwater seepage observed at 4.5 feet
Severe caving and refusal at 4.5 feet

Note: See Figure A-1 for explanation of symbols

Log of Hand Auger HA-5A

GEOENGINEERS

Project: Lower Clark Fork River Delta Sediment Assessment
Project Location: Bonner County, Idaho
Project Number: 15387-014-00

Figure A-7
Sheet 1 of 1

Date Excavated: 4/15/2014

Equipment: Hand Auger

Logged By: EBD

Total Depth (ft) 6.5

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	SAMPLE Sample Name Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
					SM		Gray silty fine to medium sand (very loose, moist)		
	1								
	2	☒	HA-6(2.0-2.5) CA			∇		34.6	
	3								
	4	☒	HA-6(4.0-4.5) CA					34.6	
					SM		Gray silty fine to coarse sand (loose, moist)		
	5								
	6	☒	HA-6(6.0-6.5) CA					29.3	

Hand auger completed at approximately 6.5 feet
Rapid groundwater seepage observed at 2 feet
Moderate caving observed

Note: See Figure A-1 for explanation of symbols

Log of Hand Auger HA-6

GEOENGINEERS

Project: Lower Clark Fork River Delta Sediment Assessment
Project Location: Bonner County, Idaho
Project Number: 15387-014-00

Figure A-8
Sheet 1 of 1

Date Excavated: 4/15/2014
Equipment: Hand Auger
Logged By: SWM
Total Depth (ft) 6.5

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	 Sample Name Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
	0				SP		Brown fine to coarse sand (loose, moist)		
	1				SP-SM		Brown fine sand with silt (loose, moist)		
	1.5	☒	HA-7(1.5-2.0) CA					17.7	
	3						With increased fines content		
	4	☒	HA-7(4.0-4.5) CA					23.3	
	5					▽	Becomes wet at 5 feet		
	6	☒	HA-7(6.0-6.5) CA					22.3	

Hand auger completed at approximately 6.5 feet
Moderate to rapid groundwater seepage observed at 5 feet
Severe caving observed at 5 feet

Note: See Figure A-1 for explanation of symbols

Log of Hand Auger HA-7

Project: Lower Clark Fork River Delta Sediment Assessment
Project Location: Bonner County, Idaho
Project Number: 15387-014-00

Figure A-9
Sheet 1 of 1

Date Excavated: 4/16/2014
Equipment: Hand Auger

Logged By: SWM
Total Depth (ft) 7.0

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	 Sample Name Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
					SM		Brownish-gray fine silty sand with organic matter (loose, moist)		
	1								
		☒	HA-8(1.5-2.0) CA		ML		Gray and brown mottled sandy silt with organic matter (soft, moist)	30.1	
	2								
	3								
						▽			
	4	☒	HA-8(4.0-4.5) CA		SM		Gray and brown mottled silty fine sand with organic matter (loose, wet)	26.8	
	5								
	6	☒	HA-8(6.0-6.5) CA					30.5	
	7								

Hand auger completed at approximately 7 feet
Moderate groundwater seepage observed at 3.5 feet
Moderate caving observed

Note: See Figure A-1 for explanation of symbols

Log of Hand Auger HA-8

GEOENGINEERS

Project: Lower Clark Fork River Delta Sediment Assessment
Project Location: Bonner County, Idaho
Project Number: 15387-014-00

Figure A-10
Sheet 1 of 1

Date Excavated: 4/16/2014

Equipment: Hand Auger

Logged By: EBD

Total Depth (ft) 6.5

		SAMPLE							
Elevation (feet)	Depth (feet)	Testing Sample	Sample Name Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
	0				ML		Gray and brown mottled sandy silt with organic matter (soft, moist)		
	1.5	☒	HA-9(1.5-2.0) CA					26.3	
	3				SP-SM		Gray and brown mottled fine to medium sand with silt (loose, moist)		
	4	☒	HA-9(4.0-4.5) CA			▽		26.1	
	6	☒	HA-9(6.0-6.5) CA				With gravel	24.4	

Hand auger completed at approximately 6.5 feet
Moderate to rapid groundwater seepage observed at 4 feet
Severe caving observed at 6.5 feet

Note: See Figure A-1 for explanation of symbols

Log of Hand Auger HA-9

GeoEngineers

Project: Lower Clark Fork River Delta Sediment Assessment
Project Location: Bonner County, Idaho
Project Number: 15387-014-00

Figure A-11
Sheet 1 of 1

Date Excavated: 4/16/2014
Equipment: Hand Auger
Logged By: EBD
Total Depth (ft) 8.0

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	SAMPLE Sample Name Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
					SM		Brownish-gray silty fine sand with organic matter (loose, moist)		
	1								
		☒	HA-10(1.5-2.0) CA					30.2	
	2								
					ML		Gray and brown mottled sandy silt with organic matter (soft, moist)		
	3								
					SM		Light gray and brown mottled silty fine sand with organic matter (loose,wet)		
	4	☒	HA-10(4.0-4.5) CA					27.1	
	5								
					SP-SM		Light gray and brown mottled fine to medium sand with silt and organic matter (loose, wet)		
	6	☒	HA-10(6.0-6.5) CA			▽		21.9	
	7								
		☒	HA-10(7.5-8.0) CA					23	
	8								

Hand auger completed at 8 approximately feet
Rapid groundwater seepage observed at 6 feet
Severe caving observed and refusal at 8 feet

Note: See Figure A-1 for explanation of symbols

Log of Hand Auger HA-10

GeoEngineers

Project: Lower Clark Fork River Delta Sediment Assessment
Project Location: Bonner County, Idaho
Project Number: 15387-014-00

Figure A-12
Sheet 1 of 1

Date Excavated: 4/15/2014
Logged By: EBD
Equipment: Hand Auger
Total Depth (ft) 5.0

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	 Sample Name Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
	0				SM		Brownish-gray silty fine sand with organic matter (very loose, moist)		
	0.5					▽			
	1								
	1.5	☒	HA-11(1.5-2.0) CA					31.5	
	2								
	3				ML		Gray sandy silt with organic matter (soft, wet)		
	4	☒	HA-11(4.0-4.5) CA					28.9	
	4.5	☒	HA-11(4.5-5.0) CA					30.8	Returned on 4/16/14 to use sediment sampler to obtain sample from 4.5 to 5 feet
	5								

Hand auger completed at approximately 5 feet
Moderate groundwater seepage observed at 0.5 feet
Severe caving observed and refusal at 4.5 feet

Note: See Figure A-1 for explanation of symbols

Log of Hand Auger HA-11

GEOENGINEERS

Project: Lower Clark Fork River Delta Sediment Assessment
Project Location: Bonner County, Idaho
Project Number: 15387-014-00

Date Excavated: 4/16/2014
Equipment: Hand Auger

Logged By: EBD
Total Depth (ft) 6.5

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	 Sample Name Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
					ML		Brownish-gray sandy silt with organic matter (soft, moist)		
	1								
		☒	HA-12(1.5-2.0) CA					27.7	
	2								
	3				SM		Gray and brown mottled silty fine sand with organic matter (loose, wet)		
	4	☒	HA-12(4.0-4.5) CA			▽		27.6	
	5								
		☒	HA-12(5.5-6.0) CA					29.1	
	6								

Hand auger completed at approximately 6.5 feet
Moderate groundwater seepage observed at 4 feet
Severe caving observed and refusal at 6.5 feet

Note: See Figure A-1 for explanation of symbols

Spokane: Date:5/14/14 Path:P:\15\15387014\00\GINT\1538701400.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GE8_TESTPIT_1P_GEOTEC

Log of Hand Auger HA-12

GEOENGINEERS

Project: Lower Clark Fork River Delta Sediment Assessment
Project Location: Bonner County, Idaho
Project Number: 15387-014-00

Figure A-14
Sheet 1 of 1

Date Excavated: 4/15/2014
Equipment: Hand Auger

Logged By: EBD
Total Depth (ft) 5.0

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	SAMPLE Sample Name Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
	0				ML		Brownish-gray sandy silt with organic matter (medium stiff, moist)		
	1								
	1.5–2	☒	HA-13(1.5-2.0) CA					25.8	
	2								
	3								
	3.5				SM	▽	Light gray to brown mottled silty fine sand (loose, wet)		
	4								
	4.5–5	☒	HA-13(4.5-5.0) CA					25.8	
	5								

Hand auger completed at approximately 5 feet
Moderate groundwater seepage observed at 3.5 feet
Severe caving observed and refusal on gravel at 5 feet

Note: See Figure A-1 for explanation of symbols

Log of Hand Auger HA-13

GEOENGINEERS

Project: Lower Clark Fork River Delta Sediment Assessment
Project Location: Bonner County, Idaho
Project Number: 15387-014-00

Figure A-15
Sheet 1 of 1

Date Excavated: 4/15/2014

Equipment: Hand Auger

Logged By: EBD

Total Depth (ft) 6.5

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	 Sample Name Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
					SM		Brownish-gray silty fine sand with organic matter (loose, moist)		
	1								
		☒	HA-14(1.5-2.0) CA					39.1	
	2				ML	▽	Gray sandy silt with organic matter (medium stiff, wet)		
	3								
	4	☒	HA-14(4.0-4.5) CA					28.8	
	5				SM		Gray silty fine to medium sand (loose, wet)		
	6	☒	HA-14(6.0-6.5) CA		SP-SM		Gray fine to medium sand with silt (loose, wet)	30.3	

Hand auger completed at approximately 6.5 feet
Moderate groundwater seepage observed at 2 feet
Severe caving observed and refusal at 6.5 feet

Note: See Figure A-1 for explanation of symbols

Log of Hand Auger HA-14

GEOENGINEERS

Project: Lower Clark Fork River Delta Sediment Assessment
Project Location: Bonner County, Idaho
Project Number: 15387-014-00

Figure A-16
Sheet 1 of 1

Spokane: Date:5/14/14 Path:P:\15\15387014\00\GINT\1538701400.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_TESTPIT_1P_GEOTEC

Date Excavated: 4/15/2014
Equipment: Hand Auger

Logged By: EBD
Total Depth (ft) 7.0

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	 Sample Name Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
	0				SP-SM		Gray fine to medium sand with silt (loose, wet)		
	1				ML		Gray sandy silt with organic matter (soft, wet)		
	1.5	☒	HA-15(1.5-2.0) CA					30.2	
	2					∇			
	3								Refusal at 3 feet; the boring was moved about 6 feet north and re-augered
	4	☒	HA-15(4.0-4.5) CA					34.5	
					SM		Brownish-gray silty fine sand with organic matter (loose, wet)		
	5								
	6	☒	HA-15(6.0-6.5) CA		SP		Gray fine to medium sand with trace silt (loose, wet)	22.7	
	7								

Hand auger completed at approximately 7 feet
Moderate groundwater seepage observed at 2 feet
Severe caving observed at 7 feet

Note: See Figure A-1 for explanation of symbols

Log of Hand Auger HA-15

GEOENGINEERS

Project: Lower Clark Fork River Delta Sediment Assessment
Project Location: Bonner County, Idaho
Project Number: 15387-014-00

Figure A-17
Sheet 1 of 1

Date Excavated: 4/15/2014

Equipment: Hand Auger

Logged By: SWM

Total Depth (ft) 7.0

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	 Sample Name Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
					ML		Gray silt with trace fine sand (stiff, moist)		
	1				ML		Gray with orange mottled clayey silt and trace fine sand (stiff, moist)		
	2	☒	HA-16(2.0-2.5) CA					24.1	
	3				SM		Gray silty fine to medium sand (loose, moist)		
	4	☒	HA-16(4.0-4.5) CA					31	
	5								
	6				ML		Gray silt (stiff, wet)		
		☒	HA-16(6.5-7.0) CA					25.3	
					SP		Gray fine to coarse sand with trace silt (medium dense, wet)		
	7								

Hand auger completed at approximately 7 feet
No groundwater seepage observed
No caving observed

Note: See Figure A-1 for explanation of symbols

Log of Hand Auger HA-16

GEOENGINEERS

Project: Lower Clark Fork River Delta Sediment Assessment
Project Location: Bonner County, Idaho
Project Number: 15387-014-00

Figure A-18
Sheet 1 of 1

Date Excavated: 4/15/2014
Equipment: Hand Auger

Logged By: EBD
Total Depth (ft) 8.0

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	 Sample Name Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
					ML		Brownish-gray sandy silt with organic matter (soft, moist)		
	1								
		☒	HA-17(1.5-2.0) CA					29	
	2								
	3					∇			
	4	☒	HA-17(4.0-4.5) CA		SM		Grayish-brown mottled silty fine sand with organic matter (medium dense, wet)	25.6	
	5								
	6	☒	HA-17(6.0-6.5) CA					28.3	
	7				SP-SM		Gray fine sand with silt (loose, wet)		
	8								

Hand auger completed at approximately 8 feet
Moderate groundwater seepage observed at 3 feet
Severe caving observed and refusal at 8 feet

Note: See Figure A-1 for explanation of symbols

Spokane: Date:5/14/14 Path:P:\15\15387014\00\GINT\1538701400.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_TESTPIT_1P_GEOTEC

Log of Hand Auger HA-17

GEOENGINEERS

Project: Lower Clark Fork River Delta Sediment Assessment
Project Location: Bonner County, Idaho
Project Number: 15387-014-00

Figure A-19
Sheet 1 of 1

Date Excavated: 4/15/2014
Equipment: Hand Auger
Logged By: EBD
Total Depth (ft) 7.0

Elevation (feet)	Depth (feet)	SAMPLE Sample Name Testing	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
			SM		Gray silty fine sand with organic matter (loose, moist)		
	1						
		HA-18(1.5-2.0) CA				31.9	
	2						
	3		ML		Gray and brown mottled sandy silt (very soft, moist)		
	4	HA-18(4.0-4.5) CA		∇		27.2	
	5						
	6	HA-18(6.0-6.5) CA	SP-SM		Gray fine to medium sand with silt (loose, moist)	23.5	
	7						

Hand auger completed at approximately 7 feet
Moderate groundwater seepage observed at 4 feet
Severe caving observed at 7 feet

Note: See Figure A-1 for explanation of symbols

Log of Hand Auger HA-18

GeoEngineers

Project: Lower Clark Fork River Delta Sediment Assessment
Project Location: Bonner County, Idaho
Project Number: 15387-014-00

Figure A-20
Sheet 1 of 1

Date Excavated: 4/15/2014
Equipment: Hand Auger
Logged By: EBD
Total Depth (ft) 6.5

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	 Sample Name Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
	0				SM		Gray and brown mottled fine silty sand with organic matter, with sandy silt seams (loose, moist)		
	1								
	1.5	☒	HA-19(1.5-2.0) CA					33	
	2				ML		Gray and brown mottled sandy silt with organic matter (soft, moist)		
	3								
	4	☒	HA-19(4.0-4.5) CA		SM		Gray silty fine sand with organic matter (loose, moist)	26.4	
	5								
	5.5				SP		Gray fine to medium sand with trace silt (loose, moist)		
	6	☒	HA-19(6.0-6.5) CA			▽		15.2	

Hand auger completed at approximately 6.5 feet
Slight groundwater seepage observed at 6 feet
Severe caving observed and refusal on gravel at 6.5 feet

Note: See Figure A-1 for explanation of symbols

Log of Hand Auger HA-19

GeoEngineers

Project: Lower Clark Fork River Delta Sediment Assessment
Project Location: Bonner County, Idaho
Project Number: 15387-014-00

Figure A-21
Sheet 1 of 1

Date Excavated: 4/15/2014

Equipment: Hand Auger

Logged By: SWM

Total Depth (ft) 7.0

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	SAMPLE Sample Name Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
					ML		Gray silt with trace fine sand (stiff, moist)		
	1								
		☒	HA-20(1.5-2.0) CA					19.1	
	2				SM		Grayish-brown silty fine to medium sand (loose, moist)		
	3					▽			
	4								
		☒	HA-20(4.5-5.0) CA					22.4	
	5								
	6								
		☒	HA-20(6.5-7.0) CA					25.1	
	7								

Hand auger completed at approximately 7 feet
Slight groundwater seepage observed at 3 feet
No caving observed

Note: See Figure A-1 for explanation of symbols

Log of Hand Auger HA-20

GEOENGINEERS

Project:	Lower Clark Fork River Delta Sediment Assessment
Project Location:	Bonner County, Idaho
Project Number:	15387-014-00

Figure A-22
Sheet 1 of 1

Date Excavated: 4/15/2014
Equipment: Hand Auger
Logged By: SWM
Total Depth (ft) 9.5

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	 Sample Name Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
					SC-SM		Gray silty clayey fine sand (loose, moist)		
	1								
		☒	HA-21(1.5-2.0) CA					23.7	
	2								
	3								
	4				SM		Gray silty fine to medium sand (loose, moist)		
		☒	HA-21(4.5-5.0) CA			▽		23	
	5								
					ML		Gray sandy silt (soft, wet)		
	6								
		☒	HA-21(6.5-7.0) CA					24.7	
	7								
	8				SM		Gray silty fine to medium sand (loose, wet)		
	9	☒	HA-21(9.0-9.5) CA					23.5	

Hand auger completed at approximately 9.5 feet
Moderate to rapid groundwater seepage observed at 4.5 feet
No caving observed

Note: See Figure A-1 for explanation of symbols

Log of Hand Auger HA-21

GEOENGINEERS

Project: Lower Clark Fork River Delta Sediment Assessment
Project Location: Bonner County, Idaho
Project Number: 15387-014-00

Figure A-23
Sheet 1 of 1

Date Excavated: 4/15/2014
Equipment: Hand Auger
Logged By: SWM
Total Depth (ft) 7.0

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	SAMPLE Sample Name Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
	0				SP-SM		Gray fine to coarse sand with silt (loose, moist)		
	1				ML		Gray silt with fine sand (soft, moist)		
							With increased clay fines		
	2	☒	HA-22(2.0-2.5) CA				Grades to light gray with increased silt content	31.1	
	3								
	4								
		☒	HA-22(4.5-5.0) CA					25.7	
	5				SM		Light gray silty fine to medium sand (loose, moist)		
	6					▽	Becomes medium dense and wet		
		☒	HA-22(6.5-7.0) CA				With seams of black organic matter and brown decomposing wood (medium dense, wet)		29.9
	7								

Hand auger completed at approximately 7 feet
Moderate to rapid groundwater seepage observed at 6 feet
No caving observed

Note: See Figure A-1 for explanation of symbols

Log of Hand Auger HA-22

GeoEngineers

Project: Lower Clark Fork River Delta Sediment Assessment
Project Location: Bonner County, Idaho
Project Number: 15387-014-00

Figure A-24
Sheet 1 of 1

Date Excavated: 4/15/2014

Equipment: Hand Auger

Logged By: SWM

Total Depth (ft) 7.0

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	 Sample Name Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
	0				ML		Gray silt with sand and organic matter (wood debris) (soft, moist)		
	1								
	1.5–2	☒	HA-23(1.5-2.0) CA					25	
	3								
	4					▽			
	4.5–5	☒	HA-23(4.5-5.0) CA					23.3	
	5				SM		Gray silty fine to medium sand (loose, wet)		
	6								
	6.5–7	☒	HA-23(6.5-7.0) CA					27.6	
	7								

Hand auger completed at approximately 7 feet
Moderate to rapid groundwater seepage observed at 4 feet
No caving observed

Note: See Figure A-1 for explanation of symbols

Log of Hand Auger HA-23

GEOENGINEERS

Project: Lower Clark Fork River Delta Sediment Assessment
Project Location: Bonner County, Idaho
Project Number: 15387-014-00

Figure A-25
Sheet 1 of 1

Date Excavated: 4/15/2014
Equipment: Hand Auger

Logged By: SWM
Total Depth (ft) 7.5

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	SAMPLE Sample Name Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
	0				ML		Gray sandy silt with brown mottling (soft, moist)		
	1.5–2	☒	HA-24(1.5-2.0) CA					26.7	
	4					▽			
	4.5–5	☒	HA-24(4.5-5.0) CA					24.4	
	6.5				SP-SM		Gray fine to medium sand with silt (loose, wet)		
	7–7.5	☒	HA-24(7.0-7.5) CA					24.3	

Depth scale: 1, 2, 3, 4, 5, 6, 7

Hand auger completed at approximately 7.5 feet
Moderate to rapid groundwater seepage observed at 4 feet
No caving observed

Note: See Figure A-1 for explanation of symbols

Log of Hand Auger HA-24

GEOENGINEERS

Project: Lower Clark Fork River Delta Sediment Assessment
Project Location: Bonner County, Idaho
Project Number: 15387-014-00

Figure A-26
Sheet 1 of 1

Date Excavated: 4/15/2014
Equipment: Hand Auger

Logged By: SWM
Total Depth (ft) 9.0

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	 Sample Name Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
	0				ML		Brown and gray mottled sandy silt (soft, moist)		
	1								
	2					▽			
	2.5–3	☒	HA-25(2.5-3.0) CA					27.2	
	4								
	4.5–5	☒	HA-25(4.5-5.0) CA					24.1	
	5				SM		Brown silty fine to medium sand (loose, wet)		
	6								
	6.5–7	☒	HA-25(6.5-7.0) CA					28	
	8								
	8.5–9	☒	HA-25(8.5-9.0) CA					18.3	

Hand auger completed at approximately 9 feet
Moderate to rapid groundwater seepage observed at 2 feet
No caving observed

Note: See Figure A-1 for explanation of symbols

Log of Hand Auger HA-25

GEOENGINEERS

Project: Lower Clark Fork River Delta Sediment Assessment
Project Location: Bonner County, Idaho
Project Number: 15387-014-00

Figure A-27
Sheet 1 of 1

Date Excavated: 4/16/2014

Equipment: Hand Auger

Logged By: SWM

Total Depth (ft) 9.5

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	 Sample Name Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
					SM		Grayish-brown silty fine sand with orange mottling (loose, moist)		
	1								
		☒	HA-26(1.5-2.0) CA			▽		30.6	
	2								
	3								
	4						Lacking mottling		
	5	☒	HA-25(5.0-5.5) CA					30.4	
	6						Grayish-brown silty fine to medium sand (dense, wet)		
		☒	HA-25(6.5-7.0) CA					24.4	
	7								
	8								
	9	☒	HA-25(9.0-9.5) CA					23.9	
							With increased silt and clay		

Hand auger completed at approximately 9.5 feet
Moderate to rapid groundwater seepage observed at 1.5 feet
No caving observed

Note: See Figure A-1 for explanation of symbols

Spokane: Date:5/14/14 Path:P:\15\15387014\00\GINT\1538701400.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_TESTPIT_1P_GEOTEC

Log of Hand Auger HA-26

GeoEngineers

Project: Lower Clark Fork River Delta Sediment Assessment
Project Location: Bonner County, Idaho
Project Number: 15387-014-00

Figure A-28
Sheet 1 of 1

Date Excavated: 4/15/2014
Equipment: Hand Auger
Logged By: SWM
Total Depth (ft) 7.0

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	 Sample Name Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
					SM		Gray and brown mottled silty fine to medium sand with clay and organic matter (decomposed wood) (loose, moist)		
	1								
		☒	HA-27(1.5-2.0) CA					31.4	
	2					▽			
	3				ML		Gray and brown mottled sandy silt (oxidation stains) (very stiff, wet)		
	4								
		☒	HA-27(4.5-5.0) CA					21.3	
	5								
	6								
		☒	HA-27(6.5-7.0) CA					23.6	
	7								

Hand auger completed at approximately 7 feet
Moderate to rapid groundwater seepage observed at 2 feet
No caving observed

Note: See Figure A-1 for explanation of symbols

Spokane: Date:5/14/14 Path:P:\15\15387014\00\GINT\1538701400.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_TESTPIT_1P_GEOTEC

Log of Hand Auger HA-27

GEOENGINEERS

Project: Lower Clark Fork River Delta Sediment Assessment
Project Location: Bonner County, Idaho
Project Number: 15387-014-00

Figure A-29
Sheet 1 of 1

Date Excavated: 4/16/2014
Equipment: Hand Auger
Logged By: SWM
Total Depth (ft) 7.0

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	SAMPLE Sample Name / Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
	0			▒	SP-SM		Grayish-brown fine to medium sand with silt (loose, moist)		
	1								
	1.25				ML		Brownish-gray sandy silt (soft, wet)		
	1.5	☒	HA-28(1.5-2.0) CA					27	
	2					▽			
	3								
	4								
	4.5	☒	HA-28(4.5-5.0) CA					26.4	
	5			▒	SM		Brownish-gray silty fine to medium sand with organic matter (black decomposed wood) (loose, wet)		
	6								
	6.5	☒	HA-28(6.5-7.0) CA					26.8	
	7								

Hand auger completed at approximately 7 feet
Moderate to rapid groundwater seepage observed at 2 feet
No caving observed

Note: See Figure A-1 for explanation of symbols

Log of Hand Auger HA-28

GeoEngineers

Project: Lower Clark Fork River Delta Sediment Assessment
Project Location: Bonner County, Idaho
Project Number: 15387-014-00

Figure A-30
Sheet 1 of 1

Date Excavated: 4/16/2014

Equipment: Hand Auger

Logged By: SWM

Total Depth (ft) 9.5

		SAMPLE							
Elevation (feet)	Depth (feet)	Testing Sample	Sample Name Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
					SM		Brown silty fine to medium sand with orange mottling (loose, moist)		
	1								
		☒	HA-29(1.5-2.0) CA					22.4	
	2								
	3								
						▽			
							Becomes wet		
	4						Grades to fine sand		
		☒	HA-29(4.5-5.0) CA					27.2	
	5								
	6								
		☒	HA-29(6.5-7.0) CA					26.4	
	7								
	8								
	9	☒	HA-29(9.0-9.5) CA					27.4	
							Gravel at 9.5 feet (2" diameter)		

Hand auger completed at approximately 9.5 feet
Moderate to rapid groundwater seepage observed at 3.5 feet
No caving observed

Note: See Figure A-1 for explanation of symbols

Log of Hand Auger HA-29

GEOENGINEERS

Project: Lower Clark Fork River Delta Sediment Assessment
Project Location: Bonner County, Idaho
Project Number: 15387-014-00

Figure A-31
Sheet 1 of 1

Date Excavated: 4/16/2014
Equipment: Hand Auger
Logged By: SWM
Total Depth (ft) 7.0

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	SAMPLE Sample Name Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
					SM		Grayish-brown silty fine to medium sand with slight orange mottling (loose, moist)		
	1								
		☒	HA-30(1.5-2.0) CA					23.7	
	2								
						▽	Becomes wet		
	3						With increased fines content		
	4	☒	HA-30(4.0-4.5) CA					28.1	
	5						With increased sand at 5 feet		
									Refusal at 5.5 feet, boring moved 5 feet and advanced to 7 feet below ground surface
	6								
		☒	HA-30(6.5-7.0) CA					29.7	
	7								

Hand auger completed at 7 approximately feet
Moderate to rapid groundwater seepage observed at 2.5 feet
No caving observed

Note: See Figure A-1 for explanation of symbols

Log of Hand Auger HA-30

GeoEngineers

Project: Lower Clark Fork River Delta Sediment Assessment
Project Location: Bonner County, Idaho
Project Number: 15387-014-00

Date Excavated: 4/16/2014

Equipment: Hand Auger

Logged By: SWM

Total Depth (ft) 8.0

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	SAMPLE Sample Name Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
	0				SM		Brown with orange mottled silty fine to medium sand (loose, moist)		
	1.5	☒	HA-31(1.5-2.0) CA					21.6	
	2	☒	HA-31(2.0-2.5) CA				Becomes less dense and with increased moisture (very loose, moist)	28	
	4					▽	Becomes wet		
	4.5	☒	HA-31(4.5-5.0) CA				Increased sand content	28.8	
	8								

Hand auger completed at approximately 8 feet
Moderate to rapid groundwater seepage observed at 4 feet
No caving observed

Note: See Figure A-1 for explanation of symbols

Log of Hand Auger HA-31

GEOENGINEERS

Project: Lower Clark Fork River Delta Sediment Assessment
Project Location: Bonner County, Idaho
Project Number: 15387-014-00

Figure A-33
Sheet 1 of 1

Spokane: Date:5/14/14 Path:P:\15\1538701400\GINT\1538701400.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_TESTPIT_1P_GEOTEC

Date Excavated: 4/16/2014
Equipment: Hand Auger
Logged By: SWM
Total Depth (ft) 9.5

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	SAMPLE Sample Name Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
					SM		Brown silty fine to medium sand with orange mottling (loose, moist)		
		☒	HA-32(1.5-2.0) CA		ML		Dark gray sandy silt with black organic matter (soft, moist)	35.9	
	3						Grades to light gray with wood debris and roots (stiff, moist)		
		☒	HA-32(4.5-5.0) CA					31.1	
	5						With increased silt content		
	6						Becomes soft		
		☒	HA-32(6.5-7.0) CA					24.8	
	7				SM		Gray silty fine to medium sand (loose, moist)		
						▽			
	8				ML		Gray sandy silt (soft, moist)		
	9	☒	HA-32(9.0-9.5) CA					25.6	

Hand auger completed at approximately 9.5 feet
Moderate to rapid groundwater seepage observed at 7.5 feet
No caving observed

Note: See Figure A-1 for explanation of symbols

Spokane: Date:5/14/14 Path:P:\15\15387014\00\GINT\1538701400.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_TESTPIT_1P_GEOTEC

Log of Hand Auger HA-32

GEOENGINEERS

Project: Lower Clark Fork River Delta Sediment Assessment
Project Location: Bonner County, Idaho
Project Number: 15387-014-00

Figure A-34
Sheet 1 of 1

Date Excavated: 4/16/2014
Equipment: Hand Auger
Logged By: SWM
Total Depth (ft) 7.0

Elevation (feet)	Depth (feet)	SAMPLE Testing Sample	SAMPLE Sample Name Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
					ML		Grayish-brown with orange mottling sandy silt with organic matter (wood debris) (soft, moist)		
	1								
	2	☒	HA-33(2.0-2.5) CA					28.8	
	3						Grades to light gray silt with trace fine sand (stiff, moist)		
	4	☒	HA-33(4.0-4.5) CA					22.9	
							Becomes soft with increase silt and sand and moisture		
	5								
	6				SM	▽	Light brown silty fine to medium sand (loose, wet)		
		☒	HA-33(6.5-7.0) CA					27.4	
	7								

Hand auger completed at approximately 7 feet
Moderate to rapid groundwater seepage observed at 6 feet
No caving observed

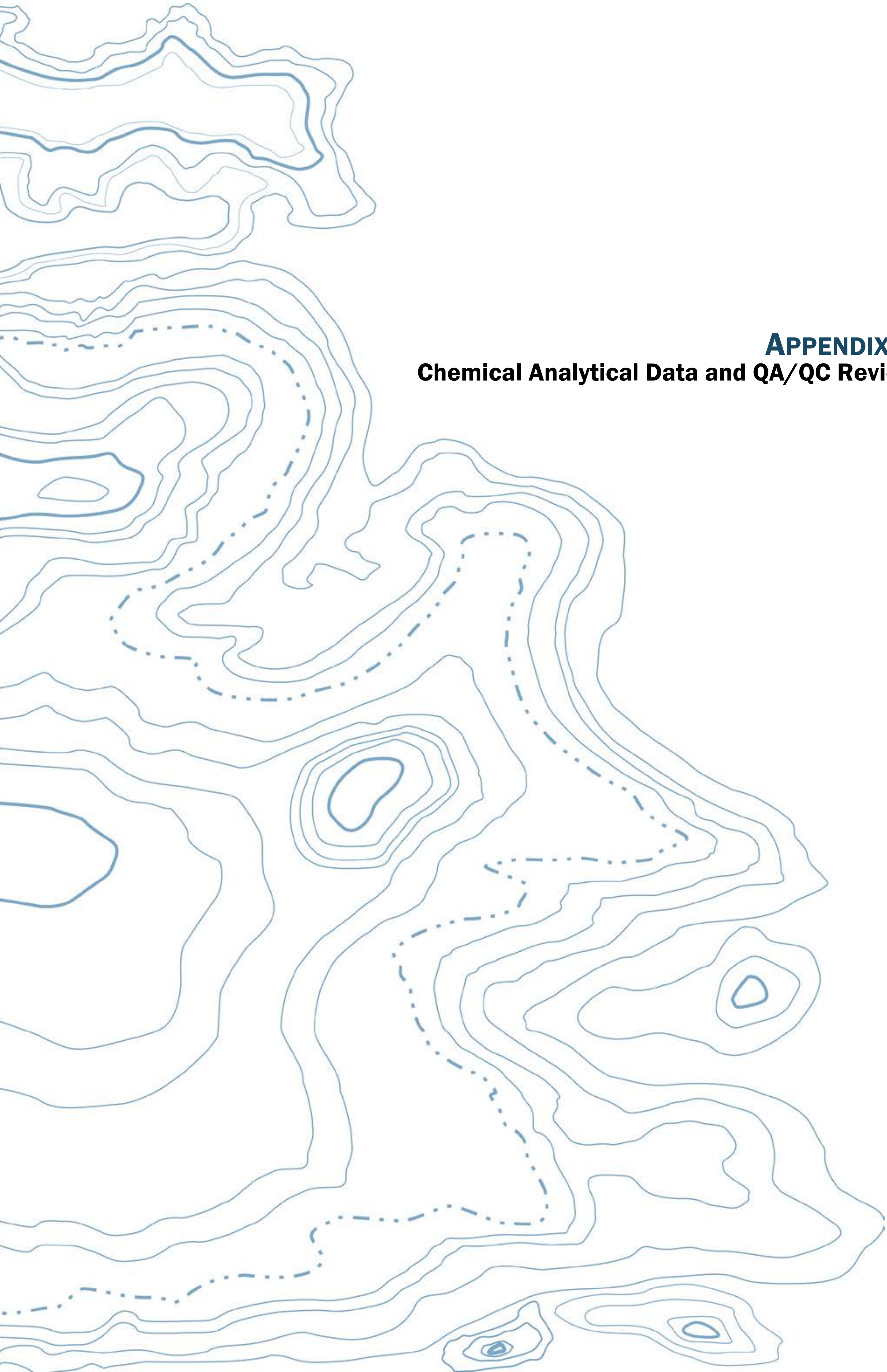
Note: See Figure A-1 for explanation of symbols

Log of Hand Auger HA-33

GEOENGINEERS

Project: Lower Clark Fork River Delta Sediment Assessment
Project Location: Bonner County, Idaho
Project Number: 15387-014-00

Figure A-35
Sheet 1 of 1



Appendix B

Chemical Analytical Data and QA/QC Review

APPENDIX B
CHEMICAL ANALYTICAL DATA AND QA/QC REVIEW

Sample Custody

Sample Containers and Storage

Soil samples obtained for chemical analysis were transferred in the field to laboratory-prepared sample containers and kept cool during transport to the testing laboratory.

Field Custody Procedures

Samples obtained for chemical analysis were transferred into clean sample containers supplied by the project analytical laboratory. Sufficient sample volume was obtained for the laboratory to complete the method-specific QC analyses. Possession of the samples was documented by the chain-of-custody. The chain-of-custody form were signed and dated in the appropriate places by parties involved with a transfer of custody.

Field Blank Samples

Two field blank samples were collected and analyzed. The analytical results for the field blanks were reviewed to evaluate the distilled water used on site for decontamination. Distilled water was used to fill a laboratory supplied sample container. Field blanks were analyzed for total metals (cadmium, copper, lead, mercury and zinc). No analytes were detected in the field blank samples.

Field Rinsate Samples

Two equipment rinsate blanks were collected. The analytical results for the rinsate blanks were reviewed to evaluate the adequacy of the equipment decontamination procedures and the possibility of cross-contamination caused by sampling equipment. The rinsate sample was collected using laboratory supplied deionized water used to rinse sampling equipment after decontamination. Low zinc concentrations (0.0120 and 0.00988 micrograms per liter) were detected from both rinsate samples. In our opinion, these low zinc concentrations do not indicate the likely potential for zinc cross contamination in the sediment samples.

Laboratory Custody Procedures

Upon receipt of the samples at the laboratory, whether delivered by GeoEngineers personnel or a courier service, the following procedures were followed.

The custody seals were broken, the chain-of-custody form was signed by the laboratory personnel, and the conditions of the samples were recorded on the form. The original chain-of-custody form remains with the laboratory and copies were returned to GeoEngineers.

LABORATORY QUALITY CONTROL

The laboratory maintains an internal quality assurance program as documented in its laboratory quality assurance manual. The laboratory uses a combination of blanks, surrogate recoveries, duplicates, matrix spike recoveries, matrix spike duplicate recoveries, blank spike recoveries and blank spike duplicate recoveries to evaluate the analytical results. The laboratory also uses data quality goals for individual chemicals or groups of chemicals based on the long-term performance of the test methods.

ANALYTICAL DATA REVIEW

GeoEngineers reviewed the laboratory reports for qualifiers; no qualifiers were noted in the laboratory report. In our opinion, the data is acceptable for its intended use.

Anatek Labs, Inc.

1282 Alturas Drive • Moscow, ID 83843 • (208) 883-2839 • Fax (208) 882-9246 • email moscow@anateklabs.com
504 E Sprague Ste. D • Spokane WA 99202 • (509) 838-3999 • Fax (509) 838-4433 • email spokane@anateklabs.com

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-001
Client Sample ID HA-1(1.5-2.0)
Matrix Soil
Comments
Sampling Date 4/16/2014
Sampling Time 2:20 PM
Sample Location
Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	0.213	mg/Kg	0.073	4/28/2014 3:30:00 PM	KEB	EPA 6020A	
Copper	70.7	mg/Kg	0.073	4/28/2014 3:30:00 PM	KEB	EPA 6020A	
Lead	34.9	mg/Kg	0.073	4/28/2014 3:30:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	0.177	mg/Kg	0.0073	4/28/2014 3:30:00 PM	KEB	EPA 6020A	
Zinc	66.3	mg/Kg	0.073	4/28/2014 3:30:00 PM	KEB	EPA 6020A	
%moisture	30.8	Percent		4/18/2014	BJR	%moisture	

Sample Number 140417045-002
Client Sample ID HA-1(4.5-5.0)
Matrix Soil
Comments
Sampling Date 4/16/2014
Sampling Time 2:24 PM
Sample Location
Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	0.636	mg/Kg	0.07	4/28/2014 3:56:00 PM	KEB	EPA 6020A	
Copper	127	mg/Kg	0.702	4/28/2014 5:16:00 PM	KEB	EPA 6020A	
Lead	79.1	mg/Kg	0.07	4/28/2014 3:56:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	0.316	mg/Kg	0.007	4/28/2014 3:56:00 PM	KEB	EPA 6020A	
Zinc	128	mg/Kg	0.702	4/28/2014 5:16:00 PM	KEB	EPA 6020A	
%moisture	31.1	Percent		4/18/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-003
Client Sample ID HA-1(6.5-7.0)
Matrix Soil
Comments

Sampling Date 4/16/2014
Sampling Time 2:30 PM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.762	4/28/2014 5:24:00 PM	KEB	EPA 6020A	
Copper	23.1	mg/Kg	0.762	4/28/2014 5:24:00 PM	KEB	EPA 6020A	
Lead	12.2	mg/Kg	0.762	4/28/2014 5:24:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0762	4/28/2014 5:24:00 PM	KEB	EPA 6020A	
Zinc	54.3	mg/Kg	0.762	4/28/2014 5:24:00 PM	KEB	EPA 6020A	
%moisture	36.2	Percent		4/18/2014	BJR	%moisture	

Sample Number 140417045-004
Client Sample ID HA-2(1.5-2.0)
Matrix Soil
Comments

Sampling Date 4/16/2014
Sampling Time 1:34 PM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	2.60	mg/Kg	0.679	4/28/2014 5:31:00 PM	KEB	EPA 6020A	
Copper	415	mg/Kg	0.679	4/28/2014 5:31:00 PM	KEB	EPA 6020A	
Lead	83.8	mg/Kg	0.679	4/28/2014 5:31:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	0.374	mg/Kg	0.0679	4/28/2014 5:31:00 PM	KEB	EPA 6020A	
Zinc	620	mg/Kg	0.679	4/28/2014 5:31:00 PM	KEB	EPA 6020A	
%moisture	30.3	Percent		4/18/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-005
Client Sample ID HA-2(4.5-5.0)
Matrix Soil
Comments

Sampling Date 4/16/2014
Sampling Time 1:40 PM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.698	4/28/2014 5:39:00 PM	KEB	EPA 6020A	
Copper	19.7	mg/Kg	0.698	4/28/2014 5:39:00 PM	KEB	EPA 6020A	
Lead	8.97	mg/Kg	0.698	4/28/2014 5:39:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0698	4/28/2014 5:39:00 PM	KEB	EPA 6020A	
Zinc	36.1	mg/Kg	0.698	4/28/2014 5:39:00 PM	KEB	EPA 6020A	
%moisture	28.4	Percent		4/18/2014	BJR	%moisture	

Sample Number 140417045-006
Client Sample ID HA-2(6.5-7.0)
Matrix Soil
Comments

Sampling Date 4/16/2014
Sampling Time 1:45 PM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.626	4/28/2014 5:46:00 PM	KEB	EPA 6020A	
Copper	11.2	mg/Kg	0.626	4/28/2014 5:46:00 PM	KEB	EPA 6020A	
Lead	6.22	mg/Kg	0.626	4/28/2014 5:46:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0626	4/28/2014 5:46:00 PM	KEB	EPA 6020A	
Zinc	28.3	mg/Kg	0.626	4/28/2014 5:46:00 PM	KEB	EPA 6020A	
%moisture	22.1	Percent		4/18/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-007
Client Sample ID HA-2(9-9.5)
Matrix Soil
Comments
Sampling Date 4/16/2014
Sampling Time 1:50 PM
Sample Location
Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.633	4/28/2014 5:53:00 PM	KEB	EPA 6020A	
Copper	11.5	mg/Kg	0.633	4/28/2014 5:53:00 PM	KEB	EPA 6020A	
Lead	6.14	mg/Kg	0.633	4/28/2014 5:53:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0633	4/28/2014 5:53:00 PM	KEB	EPA 6020A	
Zinc	29.3	mg/Kg	0.633	4/28/2014 5:53:00 PM	KEB	EPA 6020A	
%moisture	22.7	Percent		4/18/2014	BJR	%moisture	

Sample Number 140417045-008
Client Sample ID HA-3A(1.5-2)
Matrix Soil
Comments
Sampling Date 4/16/2014
Sampling Time 12:39 PM
Sample Location
Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.657	4/28/2014 5:02:00 PM	KEB	EPA 6020A	
Copper	10.5	mg/kg	0.657	4/28/2014 5:02:00 PM	KEB	EPA 6020A	
Lead	6.15	mg/Kg	0.657	4/28/2014 5:02:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0657	4/28/2014 5:02:00 PM	KEB	EPA 6020A	
Zinc	27.2	mg/Kg	0.657	4/28/2014 5:02:00 PM	KEB	EPA 6020A	
%moisture	24	Percent		4/18/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-009
Client Sample ID HA-3A(4-4.5)
Matrix Soil
Comments

Sampling Date 4/16/2014
Sampling Time 12:48 PM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.687	4/28/2014 6:01:00 PM	KEB	EPA 6020A	
Copper	5.27	mg/Kg	0.687	4/28/2014 6:01:00 PM	KEB	EPA 6020A	
Lead	3.47	mg/Kg	0.687	4/28/2014 6:01:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0687	4/28/2014 6:01:00 PM	KEB	EPA 6020A	
Zinc	18.7	mg/Kg	0.687	4/28/2014 6:01:00 PM	KEB	EPA 6020A	
%moisture	27.4	Percent		4/18/2014	BJR	%moisture	

Sample Number 140417045-010
Client Sample ID HA-4A(1.5-2)
Matrix Soil
Comments

Sampling Date 4/16/2014
Sampling Time 9:47 AM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.662	4/28/2014 6:08:00 PM	KEB	EPA 6020A	
Copper	22.5	mg/Kg	0.662	4/28/2014 6:08:00 PM	KEB	EPA 6020A	
Lead	12.5	mg/Kg	0.662	4/28/2014 6:08:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0662	4/28/2014 6:08:00 PM	KEB	EPA 6020A	
Zinc	53.5	mg/Kg	0.662	4/28/2014 6:08:00 PM	KEB	EPA 6020A	
%moisture	25.4	Percent		4/18/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-011
Client Sample ID HA-4A(4-4.5)
Matrix Soil
Comments

Sampling Date 4/16/2014
Sampling Time 9:55 AM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.639	4/28/2014 6:38:00 PM	KEB	EPA 6020A	
Copper	12.0	mg/Kg	0.639	4/28/2014 6:38:00 PM	KEB	EPA 6020A	
Lead	6.43	mg/Kg	0.639	4/28/2014 6:38:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0639	4/28/2014 6:38:00 PM	KEB	EPA 6020A	
Zinc	29.6	mg/Kg	0.639	4/28/2014 6:38:00 PM	KEB	EPA 6020A	
%moisture	23.3	Percent		4/18/2014	BJR	%moisture	

Sample Number 140417045-012
Client Sample ID HA-4A(6-6.5)
Matrix Soil
Comments

Sampling Date 4/16/2014
Sampling Time 10:08 AM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.714	4/28/2014 6:45:00 PM	KEB	EPA 6020A	
Copper	18.1	mg/Kg	0.714	4/28/2014 6:45:00 PM	KEB	EPA 6020A	
Lead	8.20	mg/Kg	0.714	4/28/2014 6:45:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0714	4/28/2014 6:45:00 PM	KEB	EPA 6020A	
Zinc	33.3	mg/Kg	0.714	4/28/2014 6:45:00 PM	KEB	EPA 6020A	
%moisture	29.3	Percent		4/18/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-013
Client Sample ID HA-5(1.5-2)
Matrix Soil
Comments

Sampling Date 4/16/2014
Sampling Time 1:57 PM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	2.23	mg/Kg	0.78	4/28/2014 6:52:00 PM	KEB	EPA 6020A	
Copper	100	mg/Kg	0.78	4/28/2014 6:52:00 PM	KEB	EPA 6020A	
Lead	78.5	mg/Kg	0.78	4/28/2014 6:52:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	0.119	mg/Kg	0.078	4/28/2014 6:52:00 PM	KEB	EPA 6020A	
Zinc	648	mg/Kg	0.78	4/28/2014 6:52:00 PM	KEB	EPA 6020A	
%moisture	35.8	Percent		4/18/2014	BJR	%moisture	

Sample Number 140417045-014
Client Sample ID HA-5A(3.5-4)
Matrix Soil
Comments

Sampling Date 4/16/2014
Sampling Time 2:04 PM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	1.64	mg/Kg	0.696	4/30/2014 11:11:00 PM	KEB	EPA 6020A	
Copper	78.9	mg/Kg	0.696	4/30/2014 11:11:00 PM	KEB	EPA 6020A	
Lead	84.7	mg/Kg	0.696	4/30/2014 11:11:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	0.116	mg/Kg	0.0696	4/30/2014 11:11:00 PM	KEB	EPA 6020A	
Zinc	417	mg/Kg	0.696	4/30/2014 11:11:00 PM	KEB	EPA 6020A	
%moisture	27.7	Percent		4/18/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-015
Client Sample ID HA-6(2-2.5)
Matrix Soil
Comments

Sampling Date 4/15/2014
Sampling Time
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.771	4/28/2014 7:07:00 PM	KEB	EPA 6020A	
Copper	73.9	mg/Kg	0.771	4/28/2014 7:07:00 PM	KEB	EPA 6020A	
Lead	28.6	mg/Kg	0.771	4/28/2014 7:07:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	0.111	mg/Kg	0.0771	4/28/2014 7:07:00 PM	KEB	EPA 6020A	
Zinc	130	mg/Kg	0.771	4/28/2014 7:07:00 PM	KEB	EPA 6020A	
%moisture	34.6	Percent		4/18/2014	BJR	%moisture	

Sample Number 140417045-016
Client Sample ID HA-6(4-4.5)
Matrix Soil
Comments

Sampling Date 4/15/2014
Sampling Time
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	0.751	mg/Kg	0.751	4/28/2014 7:15:00 PM	KEB	EPA 6020A	
Copper	76.8	mg/Kg	0.751	4/28/2014 7:15:00 PM	KEB	EPA 6020A	
Lead	26.6	mg/Kg	0.751	4/28/2014 7:15:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	0.122	mg/Kg	0.0751	4/28/2014 7:15:00 PM	KEB	EPA 6020A	
Zinc	228	mg/Kg	0.751	4/28/2014 7:15:00 PM	KEB	EPA 6020A	
%moisture	34.6	Percent		4/18/2014	BJR	%moisture	

Client:	GEO ENGINEERS	**Batch #:**	140417045
Address:	523 E 2ND SPOKANE, WA 99202	**Project Name:**	CLARK FORK RIVER DELTA 15387-014-00
Attn:	SCOTT LATHEN		

Analytical Results Report

Sample Number	140417045-017	**Sampling Date**	4/15/2014	**Date/Time Received**	4/17/2014 12:00 PM
Client Sample ID	HA-6(6-6.5)	**Sampling Time**		**Extraction Date**	
Matrix	Soil	**Sample Location**			
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	0.752	mg/Kg	0.702	4/28/2014 8:14:00 PM	KEB	EPA 6020A	
Copper	94.8	mg/Kg	0.702	4/28/2014 8:14:00 PM	KEB	EPA 6020A	
Lead	30.9	mg/Kg	0.702	4/28/2014 8:14:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	0.116	mg/Kg	0.0702	4/28/2014 8:14:00 PM	KEB	EPA 6020A	
Zinc	299	mg/Kg	0.702	4/28/2014 8:14:00 PM	KEB	EPA 6020A	
%moisture	29.3	Percent		4/18/2014	BJR	%moisture	

Sample Number	140417045-018	**Sampling Date**	4/16/2014	**Date/Time Received**	4/17/2014 12:00 PM
Client Sample ID	HA-7(1.5-2)	**Sampling Time**	10:05 AM	**Extraction Date**	
Matrix	Soil	**Sample Location**			
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.602	4/28/2014 8:21:00 PM	KEB	EPA 6020A	
Copper	11.4	mg/Kg	0.602	4/28/2014 8:21:00 PM	KEB	EPA 6020A	
Lead	6.82	mg/Kg	0.602	4/28/2014 8:21:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0602	4/28/2014 8:21:00 PM	KEB	EPA 6020A	
Zinc	29.0	mg/Kg	0.602	4/28/2014 8:21:00 PM	KEB	EPA 6020A	
%moisture	17.7	Percent		4/18/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-019
Client Sample ID HA-7(4-4.5)
Matrix Soil
Comments

Sampling Date 4/16/2014
Sampling Time 10:10 AM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.64	4/28/2014 7:37:00 PM	KEB	EPA 6020A	
Copper	4.74	mg/Kg	0.64	4/28/2014 7:37:00 PM	KEB	EPA 6020A	
Lead	4.01	mg/Kg	0.64	4/28/2014 7:37:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.064	4/28/2014 7:37:00 PM	KEB	EPA 6020A	
Zinc	16.4	mg/Kg	0.64	4/28/2014 7:37:00 PM	KEB	EPA 6020A	
%moisture	23.3	Percent		4/18/2014	BJR	%moisture	

Sample Number 140417045-020
Client Sample ID HA-7(6-6.5)
Matrix Soil
Comments

Sampling Date 4/16/2014
Sampling Time 10:15 AM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.628	4/28/2014 7:44:00 PM	KEB	EPA 6020A	
Copper	5.01	mg/Kg	0.628	4/28/2014 7:44:00 PM	KEB	EPA 6020A	
Lead	3.33	mg/Kg	0.628	4/28/2014 7:44:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0628	4/28/2014 7:44:00 PM	KEB	EPA 6020A	
Zinc	18.9	mg/Kg	0.628	4/28/2014 7:44:00 PM	KEB	EPA 6020A	
%moisture	22.3	Percent		4/18/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-021
Client Sample ID HA-8(1.5-2)
Matrix Soil
Comments

Sampling Date 4/16/2014
Sampling Time 11:52 AM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.703	4/30/2014 2:13:00 PM	KEB	EPA 6020A	
Copper	20.8	mg/Kg	0.703	4/30/2014 2:13:00 PM	KEB	EPA 6020A	
Lead	9.93	mg/Kg	0.703	4/30/2014 2:13:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0703	4/30/2014 2:13:00 PM	KEB	EPA 6020A	
Zinc	47.4	mg/Kg	0.703	4/30/2014 2:13:00 PM	KEB	EPA 6020A	
%moisture	30.1	Percent		4/18/2014	BJR	%moisture	

Sample Number 140417045-022
Client Sample ID HA-8(4-4.5)
Matrix Soil
Comments

Sampling Date 4/16/2014
Sampling Time 12:02 PM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.679	4/30/2014 2:38:00 PM	KEB	EPA 6020A	
Copper	18.6	mg/Kg	0.679	4/30/2014 2:38:00 PM	KEB	EPA 6020A	
Lead	10.6	mg/Kg	0.679	4/30/2014 2:38:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0679	4/30/2014 2:38:00 PM	KEB	EPA 6020A	
Zinc	39.0	mg/Kg	0.679	4/30/2014 2:38:00 PM	KEB	EPA 6020A	
%moisture	26.8	Percent		4/18/2014	BJR	%moisture	

Client:	GEO ENGINEERS	**Batch #:**	140417045
Address:	523 E 2ND SPOKANE, WA 99202	**Project Name:**	CLARK FORK RIVER DELTA 15387-014-00
Attn:	SCOTT LATHEN		

Analytical Results Report

Sample Number	140417045-023	**Sampling Date**	4/16/2014	**Date/Time Received**	4/17/2014	12:00 PM
Client Sample ID	HA-8(6-6.5)	**Sampling Time**	12:07 PM	**Extraction Date**		
Matrix	Soil	**Sample Location**				
Comments						

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.704	4/30/2014 3:17:00 PM	KEB	EPA 6020A	
Copper	12.8	mg/Kg	0.704	4/30/2014 3:17:00 PM	KEB	EPA 6020A	
Lead	6.97	mg/Kg	0.704	4/30/2014 3:17:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0704	4/30/2014 3:17:00 PM	KEB	EPA 6020A	
Zinc	28.9	mg/Kg	0.704	4/30/2014 3:17:00 PM	KEB	EPA 6020A	
%moisture	30.5	Percent		4/18/2014	BJR	%moisture	

Sample Number	140417045-024	**Sampling Date**	4/16/2014	**Date/Time Received**	4/17/2014	12:00 PM
Client Sample ID	HA-9(1.5-2)	**Sampling Time**	9:07 AM	**Extraction Date**		
Matrix	Soil	**Sample Location**				
Comments						

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.677	4/30/2014 3:24:00 PM	KEB	EPA 6020A	
Copper	23.9	mg/Kg	0.677	4/30/2014 3:24:00 PM	KEB	EPA 6020A	
Lead	14.7	mg/Kg	0.677	4/30/2014 3:24:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0677	4/30/2014 3:24:00 PM	KEB	EPA 6020A	
Zinc	50.5	mg/Kg	0.677	4/30/2014 3:24:00 PM	KEB	EPA 6020A	
%moisture	26.3	Percent		4/18/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-025
Client Sample ID HA-9(4-4.5)
Matrix Soil
Comments

Sampling Date 4/16/2014
Sampling Time 9:17 AM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.656	4/30/2014 3:39:00 PM	KEB	EPA 6020A	
Copper	7.35	mg/Kg	0.656	4/30/2014 3:39:00 PM	KEB	EPA 6020A	
Lead	4.36	mg/Kg	0.656	4/30/2014 3:39:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0656	4/30/2014 3:39:00 PM	KEB	EPA 6020A	
Zinc	22.3	mg/Kg	0.656	4/30/2014 3:39:00 PM	KEB	EPA 6020A	
%moisture	26.1	Percent		4/18/2014	BJR	%moisture	

Sample Number 140417045-026
Client Sample ID HA-9(6-6.5)
Matrix Soil
Comments

Sampling Date 4/16/2014
Sampling Time 9:23 AM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.659	4/30/2014 3:46:00 PM	KEB	EPA 6020A	
Copper	5.69	mg/Kg	0.659	4/30/2014 3:46:00 PM	KEB	EPA 6020A	
Lead	4.77	mg/Kg	0.659	4/30/2014 3:46:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0659	4/30/2014 3:46:00 PM	KEB	EPA 6020A	
Zinc	20.6	mg/Kg	0.659	4/30/2014 3:46:00 PM	KEB	EPA 6020A	
%moisture	24.4	Percent		4/18/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-027
Client Sample ID HA-10(1.5-2)
Matrix Soil
Comments

Sampling Date 4/16/2014
Sampling Time 11:00 AM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.711	4/30/2014 3:54:00 PM	KEB	EPA 6020A	
Copper	18.9	mg/Kg	0.711	4/30/2014 3:54:00 PM	KEB	EPA 6020A	
Lead	11.0	mg/Kg	0.711	4/30/2014 3:54:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0711	4/30/2014 3:54:00 PM	KEB	EPA 6020A	
Zinc	49.2	mg/Kg	0.711	4/30/2014 3:54:00 PM	KEB	EPA 6020A	
%moisture	30.2	Percent		4/18/2014	BJR	%moisture	

Sample Number 140417045-028
Client Sample ID HA-10(4-4.5)
Matrix Soil
Comments

Sampling Date 4/16/2014
Sampling Time 11:09 AM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.682	4/30/2014 4:01:00 PM	KEB	EPA 6020A	
Copper	16.9	mg/Kg	0.682	4/30/2014 4:01:00 PM	KEB	EPA 6020A	
Lead	9.32	mg/Kg	0.682	4/30/2014 4:01:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0682	4/30/2014 4:01:00 PM	KEB	EPA 6020A	
Zinc	35.6	mg/Kg	0.682	4/30/2014 4:01:00 PM	KEB	EPA 6020A	
%moisture	27.1	Percent		4/18/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-029
Client Sample ID HA-10(6-6.5)
Matrix Soil
Comments

Sampling Date 4/16/2014
Sampling Time 11:15 AM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.628	4/30/2014 4:08:00 PM	KEB	EPA 6020A	
Copper	4.56	mg/Kg	0.628	4/30/2014 4:08:00 PM	KEB	EPA 6020A	
Lead	3.30	mg/Kg	0.628	4/30/2014 4:08:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0628	4/30/2014 4:08:00 PM	KEB	EPA 6020A	
Zinc	15.9	mg/Kg	0.628	4/30/2014 4:08:00 PM	KEB	EPA 6020A	
%moisture	21.9	Percent		4/18/2014	BJR	%moisture	

Sample Number 140417045-030
Client Sample ID HA-10(7.5-8)
Matrix Soil
Comments

Sampling Date 4/16/2014
Sampling Time 11:23 AM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.632	4/30/2014 4:16:00 PM	KEB	EPA 6020A	
Copper	5.37	mg/Kg	0.632	4/30/2014 4:16:00 PM	KEB	EPA 6020A	
Lead	3.39	mg/Kg	0.632	4/30/2014 4:16:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0632	4/30/2014 4:16:00 PM	KEB	EPA 6020A	
Zinc	19.2	mg/Kg	0.632	4/30/2014 4:16:00 PM	KEB	EPA 6020A	
%moisture	23	Percent		4/18/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-031
Client Sample ID HA-11(1.5-2)
Matrix Soil
Comments

Sampling Date 4/15/2014
Sampling Time 1:51 PM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.703	4/30/2014 5:06:00 PM	KEB	EPA 6020A	
Copper	22.9	mg/Kg	0.703	4/30/2014 5:06:00 PM	KEB	EPA 6020A	
Lead	11.9	mg/Kg	0.703	4/30/2014 5:06:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0703	4/30/2014 5:06:00 PM	KEB	EPA 6020A	
Zinc	57.3	mg/Kg	0.703	4/30/2014 5:06:00 PM	KEB	EPA 6020A	
%moisture	31.5	Percent		4/18/2014	BJR	%moisture	

Sample Number 140417045-032
Client Sample ID HA-11(4-4.5)
Matrix Soil
Comments

Sampling Date 4/15/2014
Sampling Time 2:04 PM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.689	4/30/2014 5:14:00 PM	KEB	EPA 6020A	
Copper	24.0	mg/Kg	0.689	4/30/2014 5:14:00 PM	KEB	EPA 6020A	
Lead	14.0	mg/Kg	0.689	4/30/2014 5:14:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0689	4/30/2014 5:14:00 PM	KEB	EPA 6020A	
Zinc	63.0	mg/Kg	0.689	4/30/2014 5:14:00 PM	KEB	EPA 6020A	
%moisture	28.9	Percent		4/18/2014	BJR	%moisture	

Client:	GEO ENGINEERS	**Batch #:**	140417045
Address:	523 E 2ND SPOKANE, WA 99202	**Project Name:**	CLARK FORK RIVER DELTA 15387-014-00
Attn:	SCOTT LATHEN		

Analytical Results Report

Sample Number	140417045-033	**Sampling Date**	4/16/2014	**Date/Time Received**	4/17/2014 12:00 PM
Client Sample ID	HA-11(4.5-5)	**Sampling Time**	8:17 AM	**Extraction Date**	
Matrix	Soil	**Sample Location**			
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.704	4/30/2014 5:21:00 PM	KEB	EPA 6020A	
Copper	14.9	mg/Kg	0.704	4/30/2014 5:21:00 PM	KEB	EPA 6020A	
Lead	7.87	mg/Kg	0.704	4/30/2014 5:21:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0704	4/30/2014 5:21:00 PM	KEB	EPA 6020A	
Zinc	37.5	mg/Kg	0.704	4/30/2014 5:21:00 PM	KEB	EPA 6020A	
%moisture	30.8	Percent		4/21/2014	BJR	%moisture	

Sample Number	140417045-034	**Sampling Date**	4/16/2014	**Date/Time Received**	4/17/2014 12:00 PM
Client Sample ID	HA-12(1.5-2)	**Sampling Time**	10:27 AM	**Extraction Date**	
Matrix	Soil	**Sample Location**			
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.683	4/30/2014 5:28:00 PM	KEB	EPA 6020A	
Copper	22.8	mg/Kg	0.683	4/30/2014 5:28:00 PM	KEB	EPA 6020A	
Lead	13.6	mg/Kg	0.683	4/30/2014 5:28:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0683	4/30/2014 5:28:00 PM	KEB	EPA 6020A	
Zinc	49.6	mg/Kg	0.683	4/30/2014 5:28:00 PM	KEB	EPA 6020A	
%moisture	27.7	Percent		4/21/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-035
Client Sample ID HA-12(4-4.5)
Matrix Soil
Comments

Sampling Date 4/16/2014
Sampling Time 10:35 AM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.68	4/30/2014 5:36:00 PM	KEB	EPA 6020A	
Copper	23.5	mg/Kg	0.68	4/30/2014 5:36:00 PM	KEB	EPA 6020A	
Lead	12.6	mg/Kg	0.68	4/30/2014 5:36:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.068	4/30/2014 5:36:00 PM	KEB	EPA 6020A	
Zinc	47.4	mg/Kg	0.68	4/30/2014 5:36:00 PM	KEB	EPA 6020A	
%moisture	27.6	Percent		4/21/2014	BJR	%moisture	

Sample Number 140417045-036
Client Sample ID HA-12(5.5-6)
Matrix Soil
Comments

Sampling Date 4/16/2014
Sampling Time 10:38 AM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.697	4/30/2014 5:43:00 PM	KEB	EPA 6020A	
Copper	16.8	mg/Kg	0.697	4/30/2014 5:43:00 PM	KEB	EPA 6020A	
Lead	9.74	mg/Kg	0.697	4/30/2014 5:43:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0697	4/30/2014 5:43:00 PM	KEB	EPA 6020A	
Zinc	43.8	mg/Kg	0.697	4/30/2014 5:43:00 PM	KEB	EPA 6020A	
%moisture	29.1	Percent		4/21/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-037
Client Sample ID HA-13(1.5-2)
Matrix Soil
Comments

Sampling Date 4/15/2014
Sampling Time 2:54 PM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.674	4/30/2014 5:50:00 PM	KEB	EPA 6020A	
Copper	26.3	mg/Kg	0.674	4/30/2014 5:50:00 PM	KEB	EPA 6020A	
Lead	13.6	mg/Kg	0.674	4/30/2014 5:50:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0674	4/30/2014 5:50:00 PM	KEB	EPA 6020A	
Zinc	52.3	mg/Kg	0.674	4/30/2014 5:50:00 PM	KEB	EPA 6020A	
%moisture	25.8	Percent		4/21/2014	BJR	%moisture	

Sample Number 140417045-038
Client Sample ID HA-13(4.5-5)
Matrix Soil
Comments

Sampling Date 4/15/2014
Sampling Time 3:06 PM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.658	4/30/2014 5:58:00 PM	KEB	EPA 6020A	
Copper	20.7	mg/Kg	0.658	4/30/2014 5:58:00 PM	KEB	EPA 6020A	
Lead	11.6	mg/Kg	0.658	4/30/2014 5:58:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0658	4/30/2014 5:58:00 PM	KEB	EPA 6020A	
Zinc	40.3	mg/Kg	0.658	4/30/2014 5:58:00 PM	KEB	EPA 6020A	
%moisture	25.8	Percent		4/21/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-039
Client Sample ID HA-14(1.5-2)
Matrix Soil
Comments

Sampling Date 4/15/2014
Sampling Time 1:12 PM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	1.46	mg/Kg	0.813	4/30/2014 6:05:00 PM	KEB	EPA 6020A	
Copper	176	mg/Kg	0.813	4/30/2014 6:05:00 PM	KEB	EPA 6020A	
Lead	43.2	mg/Kg	0.813	4/30/2014 6:05:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	0.193	mg/Kg	0.0813	4/30/2014 6:05:00 PM	KEB	EPA 6020A	
Zinc	368	mg/Kg	0.813	4/30/2014 6:05:00 PM	KEB	EPA 6020A	
%moisture	39.1	Percent		4/21/2014	BJR	%moisture	

Sample Number 140417045-040
Client Sample ID HA-14(4-4.5)
Matrix Soil
Comments

Sampling Date 4/15/2014
Sampling Time 1:20 PM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.693	4/30/2014 8:00:00 PM	KEB	EPA 6020A	
Copper	27.7	mg/Kg	0.693	4/30/2014 8:00:00 PM	KEB	EPA 6020A	
Lead	13.9	mg/Kg	0.693	4/30/2014 8:00:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0693	4/30/2014 8:00:00 PM	KEB	EPA 6020A	
Zinc	60.7	mg/Kg	0.693	4/30/2014 8:00:00 PM	KEB	EPA 6020A	
%moisture	28.8	Percent		4/21/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-041
Client Sample ID HA-14(6-6.5)
Matrix Soil
Comments

Sampling Date 4/16/2014
Sampling Time 8:48 AM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.673	4/30/2014 7:28:00 PM	KEB	EPA 6020A	
Copper	22.4	mg/Kg	0.673	4/30/2014 7:28:00 PM	KEB	EPA 6020A	
Lead	12.1	mg/Kg	0.673	4/30/2014 7:28:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0673	4/30/2014 7:28:00 PM	KEB	EPA 6020A	
Zinc	51.9	mg/Kg	0.673	4/30/2014 7:28:00 PM	KEB	EPA 6020A	
%moisture	30.3	Percent		4/22/2014	BJR	%moisture	

Sample Number 140417045-042
Client Sample ID HA-15(1.5-2)
Matrix Soil
Comments

Sampling Date 4/15/2014
Sampling Time 11:27 AM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	1.01	mg/Kg	0.7	4/30/2014 8:07:00 PM	KEB	EPA 6020A	
Copper	192	mg/Kg	0.7	4/30/2014 8:07:00 PM	KEB	EPA 6020A	
Lead	54.3	mg/Kg	0.7	4/30/2014 8:07:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	0.425	mg/Kg	0.07	4/30/2014 8:07:00 PM	KEB	EPA 6020A	
Zinc	171	mg/Kg	0.7	4/30/2014 8:07:00 PM	KEB	EPA 6020A	
%moisture	30.2	Percent		4/22/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-043
Client Sample ID HA-15(4-4.5)
Matrix Soil
Comments

Sampling Date 4/15/2014
Sampling Time 11:43 AM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.741	4/30/2014 8:14:00 PM	KEB	EPA 6020A	
Copper	25.4	mg/Kg	0.741	4/30/2014 8:14:00 PM	KEB	EPA 6020A	
Lead	12.6	mg/Kg	0.741	4/30/2014 8:14:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0741	4/30/2014 8:14:00 PM	KEB	EPA 6020A	
Zinc	57.4	mg/Kg	0.741	4/30/2014 8:14:00 PM	KEB	EPA 6020A	
%moisture	34.5	Percent		4/22/2014	BJR	%moisture	

Sample Number 140417045-044
Client Sample ID HA-15(6-6.5)
Matrix Soil
Comments

Sampling Date 4/15/2014
Sampling Time 11:51 AM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.629	4/30/2014 8:22:00 PM	KEB	EPA 6020A	
Copper	9.01	mg/Kg	0.629	4/30/2014 8:22:00 PM	KEB	EPA 6020A	
Lead	4.87	mg/Kg	0.629	4/30/2014 8:22:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0629	4/30/2014 8:22:00 PM	KEB	EPA 6020A	
Zinc	22.6	mg/Kg	0.629	4/30/2014 8:22:00 PM	KEB	EPA 6020A	
%moisture	22.7	Percent		4/22/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-045 **Sampling Date** 4/15/2014 **Date/Time Received** 4/17/2014 12:00 PM
Client Sample ID HA-16(2-2.5) **Sampling Time** 10:50 AM **Extraction Date**
Matrix Soil **Sample Location**
Comments

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.654	4/30/2014 8:51:00 PM	KEB	EPA 6020A	
Copper	15.0	mg/Kg	0.654	4/30/2014 8:51:00 PM	KEB	EPA 6020A	
Lead	12.0	mg/Kg	0.654	4/30/2014 8:51:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0654	4/30/2014 8:51:00 PM	KEB	EPA 6020A	
Zinc	42.7	mg/Kg	0.654	4/30/2014 8:51:00 PM	KEB	EPA 6020A	
%moisture	24.1	Percent		4/22/2014	BJR	%moisture	

Sample Number 140417045-046 **Sampling Date** 4/15/2014 **Date/Time Received** 4/17/2014 12:00 PM
Client Sample ID HA-16(4-4.5) **Sampling Time** 10:55 AM **Extraction Date**
Matrix Soil **Sample Location**
Comments

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.716	4/30/2014 9:06:00 PM	KEB	EPA 6020A	
Copper	42.0	mg/Kg	0.716	4/30/2014 9:06:00 PM	KEB	EPA 6020A	
Lead	9.39	mg/Kg	0.716	4/30/2014 9:06:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0716	4/30/2014 9:06:00 PM	KEB	EPA 6020A	
Zinc	39.6	mg/Kg	0.716	4/30/2014 9:06:00 PM	KEB	EPA 6020A	
%moisture	31	Percent		4/22/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-047
Client Sample ID HA-16(6.5-7)
Matrix Soil
Comments
Sampling Date 4/15/2014
Sampling Time 11:00 AM
Sample Location
Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.661	4/30/2014 9:13:00 PM	KEB	EPA 6020A	
Copper	20.9	mg/Kg	0.661	4/30/2014 9:13:00 PM	KEB	EPA 6020A	
Lead	11.4	mg/Kg	0.661	4/30/2014 9:13:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0661	4/30/2014 9:13:00 PM	KEB	EPA 6020A	
Zinc	37.6	mg/Kg	0.661	4/30/2014 9:13:00 PM	KEB	EPA 6020A	
%moisture	25.3	Percent		4/22/2014	BJR	%moisture	

Sample Number 140417045-048
Client Sample ID HA-17(1.5-2)
Matrix Soil
Comments
Sampling Date 4/15/2014
Sampling Time 12:31 PM
Sample Location
Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.689	4/30/2014 9:21:00 PM	KEB	EPA 6020A	
Copper	24.5	mg/Kg	0.689	4/30/2014 9:21:00 PM	KEB	EPA 6020A	
Lead	20.2	mg/Kg	0.689	4/30/2014 9:21:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	0.301	mg/Kg	0.0689	4/30/2014 9:21:00 PM	KEB	EPA 6020A	
Zinc	57.9	mg/Kg	0.689	4/30/2014 9:21:00 PM	KEB	EPA 6020A	
%moisture	29	Percent		4/22/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number	140417045-049	**Sampling Date**	4/15/2014	**Date/Time Received**	4/17/2014 12:00 PM
Client Sample ID	HA-17(4-4.5)	**Sampling Time**	12:37 PM	**Extraction Date**	
Matrix	Soil	**Sample Location**			
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.664	4/30/2014 9:28:00 PM	KEB	EPA 6020A	
Copper	21.0	mg/Kg	0.664	4/30/2014 9:28:00 PM	KEB	EPA 6020A	
Lead	12.5	mg/Kg	0.664	4/30/2014 9:28:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0664	4/30/2014 9:28:00 PM	KEB	EPA 6020A	
Zinc	44.6	mg/Kg	0.664	4/30/2014 9:28:00 PM	KEB	EPA 6020A	
%moisture	25.6	Percent		4/22/2014	BJR	%moisture	

Sample Number	140417045-050	**Sampling Date**	4/15/2014	**Date/Time Received**	4/17/2014 12:00 PM
Client Sample ID	HA-17(6-6.5)	**Sampling Time**	12:47 PM	**Extraction Date**	
Matrix	Soil	**Sample Location**			
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.688	4/30/2014 9:35:00 PM	KEB	EPA 6020A	
Copper	16.8	mg/Kg	0.688	4/30/2014 9:35:00 PM	KEB	EPA 6020A	
Lead	12.2	mg/Kg	0.688	4/30/2014 9:35:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0688	4/30/2014 9:35:00 PM	KEB	EPA 6020A	
Zinc	41.1	mg/Kg	0.688	4/30/2014 9:35:00 PM	KEB	EPA 6020A	
%moisture	28.3	Percent		4/22/2014	BJR	%moisture	

Client:	GEO ENGINEERS	**Batch #:**	140417045
Address:	523 E 2ND SPOKANE, WA 99202	**Project Name:**	CLARK FORK RIVER DELTA 15387-014-00
Attn:	SCOTT LATHEN		

Analytical Results Report

Sample Number	140417045-051	**Sampling Date**	4/15/2014	**Date/Time Received**	4/17/2014 12:00 PM
Client Sample ID	HA-18(1.5-2)	**Sampling Time**	10:24 AM	**Extraction Date**	
Matrix	Soil	**Sample Location**			
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.731	4/30/2014 9:43:00 PM	KEB	EPA 6020A	
Copper	19.7	mg/Kg	0.731	4/30/2014 9:43:00 PM	KEB	EPA 6020A	
Lead	12.3	mg/Kg	0.731	4/30/2014 9:43:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0731	4/30/2014 9:43:00 PM	KEB	EPA 6020A	
Zinc	48.2	mg/Kg	0.731	4/30/2014 9:43:00 PM	KEB	EPA 6020A	
%moisture	31.9	Percent		4/22/2014	BJR	%moisture	

Sample Number	140417045-052	**Sampling Date**	4/15/2014	**Date/Time Received**	4/17/2014 12:00 PM
Client Sample ID	HA-18(4-4.5)	**Sampling Time**	10:33 AM	**Extraction Date**	
Matrix	Soil	**Sample Location**			
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.676	5/1/2014 5:43:00 PM	KEB	EPA 6020A	
Copper	25.6	mg/Kg	0.676	5/1/2014 5:43:00 PM	KEB	EPA 6020A	
Lead	14.8	mg/Kg	0.676	5/1/2014 5:43:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0676	5/1/2014 5:43:00 PM	KEB	EPA 6020A	
Zinc	46.8	mg/Kg	0.676	5/1/2014 5:43:00 PM	KEB	EPA 6020A	
%moisture	27.2	Percent		4/22/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-053
Client Sample ID HA-18(6-6.5)
Matrix Soil
Comments

Sampling Date 4/15/2014
Sampling Time 10:40 AM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.64	4/30/2014 9:50:00 PM	KEB	EPA 6020A	
Copper	17.0	mg/Kg	0.64	4/30/2014 9:50:00 PM	KEB	EPA 6020A	
Lead	9.27	mg/Kg	0.64	4/30/2014 9:50:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.064	4/30/2014 9:50:00 PM	KEB	EPA 6020A	
Zinc	35.2	mg/Kg	0.64	4/30/2014 9:50:00 PM	KEB	EPA 6020A	
%moisture	23.5	Percent		4/22/2014	BJR	%moisture	

Sample Number 140417045-054
Client Sample ID HA-19(1.5-2)
Matrix Soil
Comments

Sampling Date 4/15/2014
Sampling Time 10:58 AM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.722	4/30/2014 9:58:00 PM	KEB	EPA 6020A	
Copper	25.7	mg/Kg	0.722	4/30/2014 9:58:00 PM	KEB	EPA 6020A	
Lead	14.1	mg/Kg	0.722	4/30/2014 9:58:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	0.0856	mg/Kg	0.0722	4/30/2014 9:58:00 PM	KEB	EPA 6020A	
Zinc	62.4	mg/Kg	0.722	4/30/2014 9:58:00 PM	KEB	EPA 6020A	
%moisture	33	Percent		4/22/2014	BJR	%moisture	

Client:	GEO ENGINEERS	**Batch #:**	140417045
Address:	523 E 2ND SPOKANE, WA 99202	**Project Name:**	CLARK FORK RIVER DELTA 15387-014-00
Attn:	SCOTT LATHEN		

Analytical Results Report

Sample Number	140417045-055	**Sampling Date**	4/15/2014	**Date/Time Received**	4/17/2014 12:00 PM
Client Sample ID	HA-19(4-4.5)	**Sampling Time**	11:06 AM	**Extraction Date**	
Matrix	Soil	**Sample Location**			
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.679	4/30/2014 10:27:00 PM	KEB	EPA 6020A	
Copper	16.8	mg/Kg	0.679	4/30/2014 10:27:00 PM	KEB	EPA 6020A	
Lead	10.1	mg/Kg	0.679	4/30/2014 10:27:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0679	4/30/2014 10:27:00 PM	KEB	EPA 6020A	
Zinc	34.0	mg/Kg	0.679	4/30/2014 10:27:00 PM	KEB	EPA 6020A	
%moisture	26.4	Percent		4/22/2014	BJR	%moisture	

Sample Number	140417045-056	**Sampling Date**	4/15/2014	**Date/Time Received**	4/17/2014 12:00 PM
Client Sample ID	HA-19(6-6.5)	**Sampling Time**	11:11 AM	**Extraction Date**	
Matrix	Soil	**Sample Location**			
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.583	4/30/2014 10:35:00 PM	KEB	EPA 6020A	
Copper	8.66	mg/Kg	0.583	4/30/2014 10:35:00 PM	KEB	EPA 6020A	
Lead	5.20	mg/Kg	0.583	4/30/2014 10:35:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0583	4/30/2014 10:35:00 PM	KEB	EPA 6020A	
Zinc	22.7	mg/Kg	0.583	4/30/2014 10:35:00 PM	KEB	EPA 6020A	
%moisture	15.2	Percent		4/22/2014	BJR	%moisture	

Client:	GEO ENGINEERS	**Batch #:**	140417045
Address:	523 E 2ND SPOKANE, WA 99202	**Project Name:**	CLARK FORK RIVER DELTA 15387-014-00
Attn:	SCOTT LATHEN		

Analytical Results Report

Sample Number	140417045-057	**Sampling Date**	4/15/2014	**Date/Time Received**	4/17/2014 12:00 PM
Client Sample ID	HA-20(1.5-2)	**Sampling Time**	11:22 AM	**Extraction Date**	
Matrix	Soil	**Sample Location**			
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.61	4/30/2014 10:42:00 PM	KEB	EPA 6020A	
Copper	16.0	mg/Kg	0.61	4/30/2014 10:42:00 PM	KEB	EPA 6020A	
Lead	8.91	mg/Kg	0.61	4/30/2014 10:42:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.061	4/30/2014 10:42:00 PM	KEB	EPA 6020A	
Zinc	33.1	mg/Kg	0.61	4/30/2014 10:42:00 PM	KEB	EPA 6020A	
%moisture	19.1	Percent		4/22/2014	BJR	%moisture	

Sample Number	140417045-058	**Sampling Date**	4/15/2014	**Date/Time Received**	4/17/2014 12:00 PM
Client Sample ID	HA-20(4.5-5)	**Sampling Time**	11:25 AM	**Extraction Date**	
Matrix	Soil	**Sample Location**			
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.622	4/30/2014 10:49:00 PM	KEB	EPA 6020A	
Copper	12.4	mg/Kg	0.622	4/30/2014 10:49:00 PM	KEB	EPA 6020A	
Lead	7.51	mg/Kg	0.622	4/30/2014 10:49:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0622	4/30/2014 10:49:00 PM	KEB	EPA 6020A	
Zinc	32.5	mg/Kg	0.622	4/30/2014 10:49:00 PM	KEB	EPA 6020A	
%moisture	22.4	Percent		4/22/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-059
Client Sample ID HA-20(6.5-7)
Matrix Soil
Comments

Sampling Date 4/15/2014
Sampling Time 11:31 AM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.66	4/30/2014 10:57:00 PM	KEB	EPA 6020A	
Copper	18.5	mg/Kg	0.66	4/30/2014 10:57:00 PM	KEB	EPA 6020A	
Lead	12.5	mg/Kg	0.66	4/30/2014 10:57:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.066	4/30/2014 10:57:00 PM	KEB	EPA 6020A	
Zinc	42.6	mg/Kg	0.66	4/30/2014 10:57:00 PM	KEB	EPA 6020A	
%moisture	25.1	Percent		4/22/2014	BJR	%moisture	

Sample Number 140417045-060
Client Sample ID HA-21(1.5-2)
Matrix Soil
Comments

Sampling Date 4/15/2014
Sampling Time 11:56 AM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.651	4/30/2014 11:04:00 PM	KEB	EPA 6020A	
Copper	21.4	mg/Kg	0.651	4/30/2014 11:04:00 PM	KEB	EPA 6020A	
Lead	13.2	mg/Kg	0.651	4/30/2014 11:04:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0651	4/30/2014 11:04:00 PM	KEB	EPA 6020A	
Zinc	72.5	mg/Kg	0.651	4/30/2014 11:04:00 PM	KEB	EPA 6020A	
%moisture	23.7	Percent		4/22/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-061
Client Sample ID HA-21(4.5-5)
Matrix Soil
Comments

Sampling Date 4/15/2014
Sampling Time 12:01 PM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.634	5/1/2014 12:17:00 AM	KEB	EPA 6020A	
Copper	18.1	mg/Kg	0.634	5/1/2014 12:17:00 AM	KEB	EPA 6020A	
Lead	11.1	mg/Kg	0.634	5/1/2014 12:17:00 AM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0634	5/1/2014 12:17:00 AM	KEB	EPA 6020A	
Zinc	42.5	mg/Kg	0.634	5/1/2014 12:17:00 AM	KEB	EPA 6020A	
%moisture	23	Percent		4/23/2014	BJR	%moisture	

Sample Number 140417045-062
Client Sample ID HA-21(6.5-7)
Matrix Soil
Comments

Sampling Date 4/15/2014
Sampling Time 12:10 PM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.652	5/1/2014 12:39:00 AM	KEB	EPA 6020A	
Copper	19.9	mg/Kg	0.652	5/1/2014 12:39:00 AM	KEB	EPA 6020A	
Lead	11.3	mg/Kg	0.652	5/1/2014 12:39:00 AM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0652	5/1/2014 12:39:00 AM	KEB	EPA 6020A	
Zinc	41.6	mg/Kg	0.652	5/1/2014 12:39:00 AM	KEB	EPA 6020A	
%moisture	24.7	Percent		4/23/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-063
Client Sample ID HA-21(9-9.5)
Matrix Soil
Comments

Sampling Date 4/15/2014
Sampling Time 12:15 PM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.632	5/1/2014 12:46:00 AM	KEB	EPA 6020A	
Copper	15.1	mg/Kg	0.632	5/1/2014 12:46:00 AM	KEB	EPA 6020A	
Lead	9.08	mg/Kg	0.632	5/1/2014 12:46:00 AM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0632	5/1/2014 12:46:00 AM	KEB	EPA 6020A	
Zinc	34.9	mg/Kg	0.632	5/1/2014 12:46:00 AM	KEB	EPA 6020A	
%moisture	23.5	Percent		4/23/2014	BJR	%moisture	

Sample Number 140417045-064
Client Sample ID HA-22(2-2.5)
Matrix Soil
Comments

Sampling Date 4/15/2014
Sampling Time 1:25 PM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.721	5/1/2014 12:54:00 AM	KEB	EPA 6020A	
Copper	26.3	mg/Kg	0.721	5/1/2014 12:54:00 AM	KEB	EPA 6020A	
Lead	15.4	mg/Kg	0.721	5/1/2014 12:54:00 AM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0721	5/1/2014 12:54:00 AM	KEB	EPA 6020A	
Zinc	73.5	mg/Kg	0.721	5/1/2014 12:54:00 AM	KEB	EPA 6020A	
%moisture	31.1	Percent		4/23/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-065
Client Sample ID HA-22(4.5-5)
Matrix Soil
Comments

Sampling Date 4/15/2014
Sampling Time 1:31 PM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.648	5/1/2014 1:01:00 AM	KEB	EPA 6020A	
Copper	19.9	mg/Kg	0.648	5/1/2014 1:01:00 AM	KEB	EPA 6020A	
Lead	12.0	mg/Kg	0.648	5/1/2014 1:01:00 AM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0648	5/1/2014 1:01:00 AM	KEB	EPA 6020A	
Zinc	37.8	mg/Kg	0.648	5/1/2014 1:01:00 AM	KEB	EPA 6020A	
%moisture	25.7	Percent		4/23/2014	BJR	%moisture	

Sample Number 140417045-066
Client Sample ID HA-22(6.5-7)
Matrix Soil
Comments

Sampling Date 4/15/2014
Sampling Time 1:41 PM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.698	5/1/2014 1:38:00 AM	KEB	EPA 6020A	
Copper	20.5	mg/Kg	0.698	5/1/2014 1:38:00 AM	KEB	EPA 6020A	
Lead	10.5	mg/Kg	0.698	5/1/2014 1:38:00 AM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0698	5/1/2014 1:38:00 AM	KEB	EPA 6020A	
Zinc	50.5	mg/Kg	0.698	5/1/2014 1:38:00 AM	KEB	EPA 6020A	
%moisture	29.9	Percent		4/23/2014	BJR	%moisture	

Client:	GEO ENGINEERS	**Batch #:**	140417045
Address:	523 E 2ND SPOKANE, WA 99202	**Project Name:**	CLARK FORK RIVER DELTA 15387-014-00
Attn:	SCOTT LATHEN		

Analytical Results Report

Sample Number	140417045-067	**Sampling Date**	4/15/2014	**Date/Time Received**	4/17/2014 12:00 PM
Client Sample ID	HA-23(1.5-2)	**Sampling Time**	2:24 PM	**Extraction Date**	
Matrix	Soil	**Sample Location**			
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	0.662	mg/Kg	0.644	5/1/2014 1:45:00 AM	KEB	EPA 6020A	
Copper	21.1	mg/Kg	0.644	5/1/2014 1:45:00 AM	KEB	EPA 6020A	
Lead	13.9	mg/Kg	0.644	5/1/2014 1:45:00 AM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0644	5/1/2014 1:45:00 AM	KEB	EPA 6020A	
Zinc	67.6	mg/Kg	0.644	5/1/2014 1:45:00 AM	KEB	EPA 6020A	
%moisture	25	Percent		4/23/2014	BJR	%moisture	

Sample Number	140417045-068	**Sampling Date**	4/15/2014	**Date/Time Received**	4/17/2014 12:00 PM
Client Sample ID	HA-23(4.5-5)	**Sampling Time**	2:32 PM	**Extraction Date**	
Matrix	Soil	**Sample Location**			
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.627	5/1/2014 1:53:00 AM	KEB	EPA 6020A	
Copper	17.7	mg/Kg	0.627	5/1/2014 1:53:00 AM	KEB	EPA 6020A	
Lead	10.5	mg/Kg	0.627	5/1/2014 1:53:00 AM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0627	5/1/2014 1:53:00 AM	KEB	EPA 6020A	
Zinc	36.7	mg/Kg	0.627	5/1/2014 1:53:00 AM	KEB	EPA 6020A	
%moisture	23.3	Percent		4/23/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-069
Client Sample ID HA-23(6.5-7)
Matrix Soil
Comments

Sampling Date 4/15/2014
Sampling Time 2:37 PM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.673	5/1/2014 2:00:00 AM	KEB	EPA 6020A	
Copper	21.6	mg/Kg	0.673	5/1/2014 2:00:00 AM	KEB	EPA 6020A	
Lead	12.3	mg/Kg	0.673	5/1/2014 2:00:00 AM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0673	5/1/2014 2:00:00 AM	KEB	EPA 6020A	
Zinc	40.5	mg/Kg	0.673	5/1/2014 2:00:00 AM	KEB	EPA 6020A	
%moisture	27.6	Percent		4/23/2014	BJR	%moisture	

Sample Number 140417045-070
Client Sample ID HA-24(1.5-2)
Matrix Soil
Comments

Sampling Date 4/15/2014
Sampling Time 12:45 PM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.662	5/1/2014 2:08:00 AM	KEB	EPA 6020A	
Copper	21.2	mg/Kg	0.662	5/1/2014 2:08:00 AM	KEB	EPA 6020A	
Lead	12.7	mg/Kg	0.662	5/1/2014 2:08:00 AM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0662	5/1/2014 2:08:00 AM	KEB	EPA 6020A	
Zinc	38.3	mg/Kg	0.662	5/1/2014 2:08:00 AM	KEB	EPA 6020A	
%moisture	26.7	Percent		4/23/2014	BJR	%moisture	

Client:	GEO ENGINEERS	**Batch #:**	140417045
Address:	523 E 2ND SPOKANE, WA 99202	**Project Name:**	CLARK FORK RIVER DELTA 15387-014-00
Attn:	SCOTT LATHEN		

Analytical Results Report

Sample Number	140417045-071	**Sampling Date**	4/15/2014	**Date/Time Received**	4/17/2014	12:00 PM
Client Sample ID	HA-24(4.5-5)	**Sampling Time**	12:52 PM	**Extraction Date**		
Matrix	Soil	**Sample Location**				
Comments						

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.64	5/1/2014 2:15:00 AM	KEB	EPA 6020A	
Copper	17.2	mg/Kg	0.64	5/1/2014 2:15:00 AM	KEB	EPA 6020A	
Lead	9.43	mg/Kg	0.64	5/1/2014 2:15:00 AM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.064	5/1/2014 2:15:00 AM	KEB	EPA 6020A	
Zinc	34.2	mg/Kg	0.64	5/1/2014 2:15:00 AM	KEB	EPA 6020A	
%moisture	24.4	Percent		4/23/2014	BJR	%moisture	

Sample Number	140417045-072	**Sampling Date**	4/15/2014	**Date/Time Received**	4/17/2014	12:00 PM
Client Sample ID	HA-24(7-7.5)	**Sampling Time**	12:56 PM	**Extraction Date**		
Matrix	Soil	**Sample Location**				
Comments						

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.63	5/1/2014 2:22:00 AM	KEB	EPA 6020A	
Copper	13.8	mg/Kg	0.63	5/1/2014 2:22:00 AM	KEB	EPA 6020A	
Lead	8.57	mg/Kg	0.63	5/1/2014 2:22:00 AM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.063	5/1/2014 2:22:00 AM	KEB	EPA 6020A	
Zinc	32.5	mg/Kg	0.63	5/1/2014 2:22:00 AM	KEB	EPA 6020A	
%moisture	24.3	Percent		4/23/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-073
Client Sample ID HA-25(2.5-3)
Matrix Soil
Comments

Sampling Date 4/15/2014
Sampling Time 1:59 PM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.666	5/1/2014 2:30:00 AM	KEB	EPA 6020A	
Copper	17.2	mg/Kg	0.666	5/1/2014 2:30:00 AM	KEB	EPA 6020A	
Lead	9.26	mg/Kg	0.666	5/1/2014 2:30:00 AM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0666	5/1/2014 2:30:00 AM	KEB	EPA 6020A	
Zinc	33.3	mg/Kg	0.666	5/1/2014 2:30:00 AM	KEB	EPA 6020A	
%moisture	27.2	Percent		4/23/2014	BJR	%moisture	

Sample Number 140417045-074
Client Sample ID HA-25(4.5-5)
Matrix Soil
Comments

Sampling Date 4/15/2014
Sampling Time 2:02 PM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.636	5/1/2014 4:37:00 AM	KEB	EPA 6020A	
Copper	29.5	mg/Kg	0.636	5/1/2014 4:37:00 AM	KEB	EPA 6020A	
Lead	11.8	mg/Kg	0.636	5/1/2014 4:37:00 AM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0636	5/1/2014 4:37:00 AM	KEB	EPA 6020A	
Zinc	37.7	mg/Kg	0.636	5/1/2014 4:37:00 AM	KEB	EPA 6020A	
%moisture	24.1	Percent		4/23/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-075
Client Sample ID HA-25(6.5-7)
Matrix Soil
Comments
Sampling Date 4/15/2014
Sampling Time 2:07 PM
Sample Location
Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.678	5/1/2014 2:44:00 AM	KEB	EPA 6020A	
Copper	10.6	mg/Kg	0.678	5/1/2014 2:44:00 AM	KEB	EPA 6020A	
Lead	6.98	mg/kg	0.678	5/1/2014 2:44:00 AM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0678	5/1/2014 2:44:00 AM	KEB	EPA 6020A	
Zinc	26.6	mg/Kg	0.678	5/1/2014 2:44:00 AM	KEB	EPA 6020A	
%moisture	28	Percent		4/23/2014	BJR	%moisture	

Sample Number 140417045-076
Client Sample ID HA-25(8.5-9)
Matrix Soil
Comments
Sampling Date 4/15/2014
Sampling Time 2:11 PM
Sample Location
Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.612	5/1/2014 7:25:00 PM	KEB	EPA 6020A	
Copper	5.21	mg/Kg	0.612	5/1/2014 7:25:00 PM	KEB	EPA 6020A	
Lead	3.77	mg/Kg	0.612	5/1/2014 7:25:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0612	5/1/2014 7:25:00 PM	KEB	EPA 6020A	
Zinc	17.4	mg/Kg	0.612	5/1/2014 7:25:00 PM	KEB	EPA 6020A	
%moisture	18.3	Percent		4/23/2014	BJR	%moisture	

Client:	GEO ENGINEERS	**Batch #:**	140417045
Address:	523 E 2ND SPOKANE, WA 99202	**Project Name:**	CLARK FORK RIVER DELTA 15387-014-00
Attn:	SCOTT LATHEN		

Analytical Results Report

Sample Number	140417045-077	**Sampling Date**	4/16/2014	**Date/Time Received**	4/17/2014 12:00 PM
Client Sample ID	HA-26(1.5-2)	**Sampling Time**	11:21 AM	**Extraction Date**	
Matrix	Soil	**Sample Location**			
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.706	5/1/2014 3:14:00 AM	KEB	EPA 6020A	
Copper	13.3	mg/Kg	0.706	5/1/2014 3:14:00 AM	KEB	EPA 6020A	
Lead	8.59	mg/Kg	0.706	5/1/2014 3:14:00 AM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0706	5/1/2014 3:14:00 AM	KEB	EPA 6020A	
Zinc	29.5	mg/Kg	0.706	5/1/2014 3:14:00 AM	KEB	EPA 6020A	
%moisture	30.6	Percent		4/23/2014	BJR	%moisture	

Sample Number	140417045-078	**Sampling Date**	4/16/2014	**Date/Time Received**	4/17/2014 12:00 PM
Client Sample ID	HA-26(5-5.5)	**Sampling Time**	11:25 AM	**Extraction Date**	
Matrix	Soil	**Sample Location**			
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.687	5/1/2014 3:21:00 AM	KEB	EPA 6020A	
Copper	10.6	mg/Kg	0.687	5/1/2014 3:21:00 AM	KEB	EPA 6020A	
Lead	6.84	mg/Kg	0.687	5/1/2014 3:21:00 AM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0687	5/1/2014 3:21:00 AM	KEB	EPA 6020A	
Zinc	26.6	mg/Kg	0.687	5/1/2014 3:21:00 AM	KEB	EPA 6020A	
%moisture	30.4	Percent		4/23/2014	BJR	%moisture	

Client:	GEO ENGINEERS	**Batch #:**	140417045
Address:	523 E 2ND SPOKANE, WA 99202	**Project Name:**	CLARK FORK RIVER DELTA 15387-014-00
Attn:	SCOTT LATHEN		

Analytical Results Report

Sample Number	140417045-079	**Sampling Date**	4/16/2014	**Date/Time Received**	4/17/2014	12:00 PM
Client Sample ID	HA-26(6.5-7)	**Sampling Time**	11:28 AM	**Extraction Date**		
Matrix	Soil	**Sample Location**				
Comments						

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.657	5/1/2014 3:29:00 AM	KEB	EPA 6020A	
Copper	5.40	mg/Kg	0.657	5/1/2014 3:29:00 AM	KEB	EPA 6020A	
Lead	4.01	mg/Kg	0.657	5/1/2014 3:29:00 AM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0657	5/1/2014 3:29:00 AM	KEB	EPA 6020A	
Zinc	19.0	mg/Kg	0.657	5/1/2014 3:29:00 AM	KEB	EPA 6020A	
%moisture	24.4	Percent		4/23/2014	BJR	%moisture	

Sample Number	140417045-080	**Sampling Date**	4/16/2014	**Date/Time Received**	4/17/2014	12:00 PM
Client Sample ID	HA-26(9-9.5)	**Sampling Time**	11:34 AM	**Extraction Date**		
Matrix	Soil	**Sample Location**				
Comments						

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.001	5/1/2014 3:36:00 AM	KEB	EPA 6020A	
Copper	ND	mg/Kg	0.001	5/1/2014 3:36:00 AM	KEB	EPA 6020A	
Lead	ND	mg/Kg	0.001	5/1/2014 3:36:00 AM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0001	5/1/2014 3:36:00 AM	KEB	EPA 6020A	
Zinc	ND	mg/Kg	0.001	5/1/2014 3:36:00 AM	KEB	EPA 6020A	
%moisture	23.9	Percent		4/23/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number	140417045-081	**Sampling Date**	4/15/2014	**Date/Time Received**	4/17/2014 12:00 PM
Client Sample ID	HA-27(1.5-2)	**Sampling Time**	3:02 PM	**Extraction Date**	
Matrix	Soil	**Sample Location**			
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.717	5/1/2014 8:16:00 AM	KEB	EPA 6020A	
Copper	26.4	mg/Kg	0.717	5/1/2014 8:16:00 AM	KEB	EPA 6020A	
Lead	13.7	mg/Kg	0.717	5/1/2014 8:16:00 AM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0717	5/1/2014 8:16:00 AM	KEB	EPA 6020A	
Zinc	59.1	mg/Kg	0.717	5/1/2014 8:16:00 AM	KEB	EPA 6020A	
%moisture	31.4	Percent		4/23/2014	BJR	%moisture	

Sample Number	140417045-082	**Sampling Date**	4/15/2014	**Date/Time Received**	4/17/2014 12:00 PM
Client Sample ID	HA-27(4.5-5)	**Sampling Time**	3:06 PM	**Extraction Date**	
Matrix	Soil	**Sample Location**			
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.622	5/1/2014 9:34:00 AM	KEB	EPA 6020A	
Copper	14.4	mg/Kg	0.622	5/1/2014 9:34:00 AM	KEB	EPA 6020A	
Lead	10.3	mg/Kg	0.622	5/1/2014 9:34:00 AM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0622	5/1/2014 9:34:00 AM	KEB	EPA 6020A	
Zinc	36.8	mg/Kg	0.622	5/1/2014 9:34:00 AM	KEB	EPA 6020A	
%moisture	21.3	Percent		4/23/2014	BJR	%moisture	

Client:	GEO ENGINEERS	**Batch #:**	140417045
Address:	523 E 2ND SPOKANE, WA 99202	**Project Name:**	CLARK FORK RIVER DELTA 15387-014-00
Attn:	SCOTT LATHEN		

Analytical Results Report

Sample Number	140417045-083	**Sampling Date**	4/15/2014	**Date/Time Received**	4/17/2014 12:00 PM
Client Sample ID	HA-27(6.5-7)	**Sampling Time**	3:13 PM	**Extraction Date**	
Matrix	Soil	**Sample Location**			
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.642	5/1/2014 9:41:00 AM	KEB	EPA 6020A	
Copper	14.9	mg/Kg	0.642	5/1/2014 9:41:00 AM	KEB	EPA 6020A	
Lead	8.46	mg/Kg	0.642	5/1/2014 9:41:00 AM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0642	5/1/2014 9:41:00 AM	KEB	EPA 6020A	
Zinc	32.8	mg/Kg	0.642	5/1/2014 9:41:00 AM	KEB	EPA 6020A	
%moisture	23.6	Percent		4/23/2014	BJR	%moisture	

Sample Number	140417045-084	**Sampling Date**	4/16/2014	**Date/Time Received**	4/17/2014 12:00 PM
Client Sample ID	HA-28(1.5-2)	**Sampling Time**	11:54 AM	**Extraction Date**	
Matrix	Soil	**Sample Location**			
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	14.8	mg/Kg	0.671	5/1/2014 9:49:00 AM	KEB	EPA 6020A	
Copper	14.8	mg/Kg	0.671	5/1/2014 9:49:00 AM	KEB	EPA 6020A	
Lead	8.96	mg/Kg	0.671	5/1/2014 9:49:00 AM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0001	5/1/2014 9:49:00 AM	KEB	EPA 6020A	
Zinc	ND	mg/Kg	0.001	5/1/2014 9:49:00 AM	KEB	EPA 6020A	
%moisture	27	Percent		4/23/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-085
Client Sample ID HA-28(4.5-5)
Matrix Soil
Comments
Sampling Date 4/16/2014
Sampling Time 11:59 AM
Sample Location
Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.645	5/1/2014 10:18:00 AM	KEB	EPA 6020A	
Copper	15.5	mg/Kg	0.645	5/1/2014 10:18:00 AM	KEB	EPA 6020A	
Lead	9.41	mg/Kg	0.645	5/1/2014 10:18:00 AM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0645	5/1/2014 10:18:00 AM	KEB	EPA 6020A	
Zinc	32.2	mg/Kg	0.645	5/1/2014 10:18:00 AM	KEB	EPA 6020A	
%moisture	26.4	Percent		4/23/2014	BJR	%moisture	

Sample Number 140417045-086
Client Sample ID HA-28(6.5-7)
Matrix Soil
Comments
Sampling Date 4/16/2014
Sampling Time 12:03 PM
Sample Location
Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.753	5/1/2014 10:33:00 AM	KEB	EPA 6020A	
Copper	15.6	mg/Kg	0.753	5/1/2014 10:33:00 AM	KEB	EPA 6020A	
Lead	8.95	mg/Kg	0.753	5/1/2014 10:33:00 AM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0753	5/1/2014 10:33:00 AM	KEB	EPA 6020A	
Zinc	29.7	mg/Kg	0.753	5/1/2014 10:33:00 AM	KEB	EPA 6020A	
%moisture	26.8	Percent		4/23/2014	BJR	%moisture	

Client:	GEO ENGINEERS	**Batch #:**	140417045
Address:	523 E 2ND SPOKANE, WA 99202	**Project Name:**	CLARK FORK RIVER DELTA 15387-014-00
Attn:	SCOTT LATHEN		

Analytical Results Report

Sample Number	140417045-087	**Sampling Date**	4/16/2014	**Date/Time Received**	4/17/2014 12:00 PM
Client Sample ID	HA-29(1.5-2)	**Sampling Time**	9:30 AM	**Extraction Date**	
Matrix	Soil	**Sample Location**			
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.612	5/1/2014 10:40:00 AM	KEB	EPA 6020A	
Copper	15.2	mg/Kg	0.612	5/1/2014 10:40:00 AM	KEB	EPA 6020A	
Lead	9.21	mg/Kg	0.612	5/1/2014 10:40:00 AM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0612	5/1/2014 10:40:00 AM	KEB	EPA 6020A	
Zinc	30.9	mg/Kg	0.612	5/1/2014 10:40:00 AM	KEB	EPA 6020A	
%moisture	22.4	Percent		4/23/2014	BJR	%moisture	

Sample Number	140417045-088	**Sampling Date**	4/16/2014	**Date/Time Received**	4/17/2014 12:00 PM
Client Sample ID	HA-29(4.5-5)	**Sampling Time**	9:35 AM	**Extraction Date**	
Matrix	Soil	**Sample Location**			
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.681	5/1/2014 10:48:00 AM	KEB	EPA 6020A	
Copper	13.8	mg/Kg	0.681	5/1/2014 10:48:00 AM	KEB	EPA 6020A	
Lead	8.54	mg/Kg	0.681	5/1/2014 10:48:00 AM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0681	5/1/2014 10:48:00 AM	KEB	EPA 6020A	
Zinc	27.0	mg/Kg	0.681	5/1/2014 10:48:00 AM	KEB	EPA 6020A	
%moisture	27.2	Percent		4/23/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-089
Client Sample ID HA-29(6.5-7)
Matrix Soil
Comments

Sampling Date 4/16/2014
Sampling Time 9:41 AM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.635	5/1/2014 10:55:00 AM	KEB	EPA 6020A	
Copper	13.9	mg/Kg	0.635	5/1/2014 10:55:00 AM	KEB	EPA 6020A	
Lead	9.07	mg/Kg	0.635	5/1/2014 10:55:00 AM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0635	5/1/2014 10:55:00 AM	KEB	EPA 6020A	
Zinc	30.7	mg/Kg	0.635	5/1/2014 10:55:00 AM	KEB	EPA 6020A	
%moisture	26.4	Percent		4/23/2014	BJR	%moisture	

Sample Number 140417045-090
Client Sample ID HA-29(9-9.5)
Matrix Soil
Comments

Sampling Date 4/16/2014
Sampling Time 9:48 AM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.655	5/1/2014 11:03:00 AM	KEB	EPA 6020A	
Copper	8.25	mg/Kg	0.655	5/1/2014 11:03:00 AM	KEB	EPA 6020A	
Lead	5.52	mg/Kg	0.655	5/1/2014 11:03:00 AM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0655	5/1/2014 11:03:00 AM	KEB	EPA 6020A	
Zinc	23.0	mg/Kg	0.655	5/1/2014 11:03:00 AM	KEB	EPA 6020A	
%moisture	27.4	Percent		4/23/2014	BJR	%moisture	

Client:	GEO ENGINEERS	**Batch #:**	140417045
Address:	523 E 2ND SPOKANE, WA 99202	**Project Name:**	CLARK FORK RIVER DELTA 15387-014-00
Attn:	SCOTT LATHEN		

Analytical Results Report

Sample Number	140417045-091	**Sampling Date**	4/16/2014	**Date/Time Received**	4/17/2014 12:00 PM
Client Sample ID	HA-30(1.5-2)	**Sampling Time**	10:42 AM	**Extraction Date**	
Matrix	Soil	**Sample Location**			
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.616	5/1/2014 11:10:00 AM	KEB	EPA 6020A	
Copper	18.4	mg/Kg	0.616	5/1/2014 11:10:00 AM	KEB	EPA 6020A	
Lead	12.0	mg/Kg	0.616	5/1/2014 11:10:00 AM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0616	5/1/2014 11:10:00 AM	KEB	EPA 6020A	
Zinc	49.1	mg/Kg	0.616	5/1/2014 11:10:00 AM	KEB	EPA 6020A	
%moisture	23.7	Percent		4/23/2014	BJR	%moisture	

Sample Number	140417045-092	**Sampling Date**	4/16/2014	**Date/Time Received**	4/17/2014 12:00 PM
Client Sample ID	HA-30(4-4.5)	**Sampling Time**	10:56 AM	**Extraction Date**	
Matrix	Soil	**Sample Location**			
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.675	5/1/2014 11:17:00 AM	KEB	EPA 6020A	
Copper	17.1	mg/Kg	0.675	5/1/2014 11:17:00 AM	KEB	EPA 6020A	
Lead	9.75	mg/Kg	0.675	5/1/2014 11:17:00 AM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0675	5/1/2014 11:17:00 AM	KEB	EPA 6020A	
Zinc	40.1	mg/Kg	0.675	5/1/2014 11:17:00 AM	KEB	EPA 6020A	
%moisture	28.1	Percent		4/23/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-093
Client Sample ID HA-30(6.5-7)
Matrix Soil
Comments

Sampling Date 4/16/2014
Sampling Time 11:05 AM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.687	5/1/2014 11:25:00 AM	KEB	EPA 6020A	
Copper	16.6	mg/Kg	0.687	5/1/2014 11:25:00 AM	KEB	EPA 6020A	
Lead	9.32	mg/Kg	0.687	5/1/2014 11:25:00 AM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0687	5/1/2014 11:25:00 AM	KEB	EPA 6020A	
Zinc	35.9	mg/Kg	0.687	5/1/2014 11:25:00 AM	KEB	EPA 6020A	
%moisture	29.7	Percent		4/23/2014	BJR	%moisture	

Sample Number 140417045-094
Client Sample ID HA-31(1.5-2)
Matrix Soil
Comments

Sampling Date 4/16/2014
Sampling Time 10:15 AM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.635	5/1/2014 5:36:00 PM	KEB	EPA 6020A	
Copper	14.7	mg/Kg	0.635	5/1/2014 5:36:00 PM	KEB	EPA 6020A	
Lead	8.69	mg/Kg	0.635	5/1/2014 5:36:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0635	5/1/2014 5:36:00 PM	KEB	EPA 6020A	
Zinc	31.1	mg/Kg	0.635	5/1/2014 5:36:00 PM	KEB	EPA 6020A	
%moisture	21.6	Percent		4/23/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-095
Client Sample ID HA-31(2-2.5)
Matrix Soil
Comments

Sampling Date 4/16/2014
Sampling Time 10:27 AM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.697	5/1/2014 6:20:00 PM	KEB	EPA 6020A	
Copper	17.7	mg/Kg	0.697	5/1/2014 6:20:00 PM	KEB	EPA 6020A	
Lead	10.5	mg/Kg	0.697	5/1/2014 6:20:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0697	5/1/2014 6:20:00 PM	KEB	EPA 6020A	
Zinc	37.5	mg/Kg	0.697	5/1/2014 6:20:00 PM	KEB	EPA 6020A	
%moisture	28	Percent		4/23/2014	BJR	%moisture	

Sample Number 140417045-096
Client Sample ID HA-31(4.5-5)
Matrix Soil
Comments

Sampling Date 4/16/2014
Sampling Time 10:19 AM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.695	5/1/2014 6:27:00 PM	KEB	EPA 6020A	
Copper	19.1	mg/Kg	0.695	5/1/2014 6:27:00 PM	KEB	EPA 6020A	
Lead	9.90	mg/Kg	0.695	5/1/2014 6:27:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0695	5/1/2014 6:27:00 PM	KEB	EPA 6020A	
Zinc	38.8	mg/Kg	0.698	5/1/2014 6:27:00 PM	KEB	EPA 6020A	
%moisture	28.8	Percent		4/23/2014	BJR	%moisture	

Client:	GEO ENGINEERS	**Batch #:**	140417045
Address:	523 E 2ND SPOKANE, WA 99202	**Project Name:**	CLARK FORK RIVER DELTA 15387-014-00
Attn:	SCOTT LATHEN		

Analytical Results Report

Sample Number	140417045-097	**Sampling Date**	4/16/2014	**Date/Time Received**	4/17/2014 12:00 PM
Client Sample ID	HA-32(1.5-2)	**Sampling Time**	8:50 AM	**Extraction Date**	
Matrix	Soil	**Sample Location**			
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	1.12	mg/Kg	0.746	5/1/2014 6:34:00 PM	KEB	EPA 6020A	
Copper	98.1	mg/Kg	0.746	5/1/2014 6:34:00 PM	KEB	EPA 6020A	
Lead	27.4	mg/Kg	0.746	5/1/2014 6:34:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	0.197	mg/Kg	0.0746	5/1/2014 6:34:00 PM	KEB	EPA 6020A	
Zinc	194	mg/Kg	0.746	5/1/2014 6:34:00 PM	KEB	EPA 6020A	
%moisture	35.9	Percent		4/23/2014	BJR	%moisture	

Sample Number	140417045-098	**Sampling Date**	4/16/2014	**Date/Time Received**	4/17/2014 12:00 PM
Client Sample ID	HA-32(4.5-5)	**Sampling Time**	8:57 AM	**Extraction Date**	
Matrix	Soil	**Sample Location**			
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	2.11	mg/kg	0.705	5/1/2014 6:41:00 PM	KEB	EPA 6020A	
Copper	425	mg/Kg	0.705	5/1/2014 6:41:00 PM	KEB	EPA 6020A	
Lead	97.4	mg/Kg	0.705	5/1/2014 6:41:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	0.627	mg/Kg	0.0705	5/1/2014 6:41:00 PM	KEB	EPA 6020A	
Zinc	442	mg/Kg	0.705	5/1/2014 6:41:00 PM	KEB	EPA 6020A	
%moisture	31.1	Percent		4/23/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-099
Client Sample ID HA-32(6.5-7)
Matrix Soil
Comments

Sampling Date 4/16/2014
Sampling Time 9:07 AM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.661	5/1/2014 6:49:00 PM	KEB	EPA 6020A	
Copper	15.2	mg/Kg	0.661	5/1/2014 6:49:00 PM	KEB	EPA 6020A	
Lead	8.88	mg/Kg	0.661	5/1/2014 6:49:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0661	5/1/2014 6:49:00 PM	KEB	EPA 6020A	
Zinc	33.1	mg/Kg	0.661	5/1/2014 6:49:00 PM	KEB	EPA 6020A	
%moisture	24.8	Percent		4/23/2014	BJR	%moisture	

Sample Number 140417045-100
Client Sample ID HA-32(9-9.5)
Matrix Soil
Comments

Sampling Date 4/16/2014
Sampling Time 9:15 AM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.656	5/1/2014 6:56:00 PM	KEB	EPA 6020A	
Copper	17.7	mg/Kg	0.656	5/1/2014 6:56:00 PM	KEB	EPA 6020A	
Lead	10.7	mg/Kg	0.656	5/1/2014 6:56:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0656	5/1/2014 6:56:00 PM	KEB	EPA 6020A	
Zinc	40.7	mg/Kg	0.656	5/1/2014 6:56:00 PM	KEB	EPA 6020A	
%moisture	25.6	Percent		4/23/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-101
Client Sample ID HA-33(2-2.5)
Matrix Soil
Comments

Sampling Date 4/16/2014
Sampling Time 8:23 AM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	1.97	mg/Kg	0.698	5/1/2014 5:27:00 PM	KEB	EPA 6020A	
Copper	238	mg/Kg	0.698	5/1/2014 5:27:00 PM	KEB	EPA 6020A	
Lead	56.2	mg/Kg	0.698	5/1/2014 5:27:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	0.303	mg/Kg	0.0698	5/1/2014 5:27:00 PM	KEB	EPA 6020A	
Zinc	497	mg/Kg	0.698	5/1/2014 5:27:00 PM	KEB	EPA 6020A	
%moisture	28.8	Percent		4/23/2014	BJR	%moisture	

Sample Number 140417045-102
Client Sample ID HA-33(4-4.5)
Matrix Soil
Comments

Sampling Date 4/16/2014
Sampling Time 8:28 AM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.624	5/1/2014 7:03:00 PM	KEB	EPA 6020A	
Copper	21.8	mg/Kg	0.624	5/1/2014 7:03:00 PM	KEB	EPA 6020A	
Lead	12.9	mg/Kg	0.624	5/1/2014 7:03:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0624	5/1/2014 7:03:00 PM	KEB	EPA 6020A	
Zinc	54.1	mg/Kg	0.624	5/1/2014 7:03:00 PM	KEB	EPA 6020A	
%moisture	22.9	Percent		4/23/2014	BJR	%moisture	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-103
Client Sample ID HA-33(6.5-7)
Matrix Soil
Comments

Sampling Date 4/16/2014
Sampling Time 8:36 AM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/Kg	0.663	5/1/2014 7:11:00 PM	KEB	EPA 6020A	
Copper	12.0	mg/Kg	0.663	5/1/2014 7:11:00 PM	KEB	EPA 6020A	
Lead	7.67	mg/Kg	0.663	5/1/2014 7:11:00 PM	KEB	EPA 6020A	
Mercury-ICPMS	ND	mg/Kg	0.0663	5/1/2014 7:11:00 PM	KEB	EPA 6020A	
Zinc	26.6	mg/Kg	0.663	5/1/2014 7:11:00 PM	KEB	EPA 6020A	
%moisture	27.4	Percent		4/23/2014	BJR	%moisture	

Sample Number 140417045-104
Client Sample ID RINSEATE BLANK 1
Matrix Water
Comments

Sampling Date 4/15/2014
Sampling Time 5:05 PM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/L	0.001	4/29/2014 4:01:00 PM	KEB	EPA 200.8	
Copper	ND	mg/L	0.001	4/29/2014 4:01:00 PM	KEB	EPA 200.8	
Lead	ND	mg/L	0.001	4/29/2014 4:01:00 PM	KEB	EPA 200.8	
Mercury-ICPMS	ND	mg/L	0.0001	4/29/2014 4:01:00 PM	KEB	EPA 200.8	
Zinc	0.0120	mg/L	0.001	4/29/2014 4:01:00 PM	KEB	EPA 200.8	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number 140417045-105
Client Sample ID RINSEATE BLANK 2
Matrix Water
Comments

Sampling Date 4/16/2014
Sampling Time 6:05 PM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/L	0.001	4/29/2014 4:08:00 PM	KEB	EPA 200.8	
Copper	ND	mg/L	0.001	4/29/2014 4:08:00 PM	KEB	EPA 200.8	
Lead	ND	mg/L	0.001	4/29/2014 4:08:00 PM	KEB	EPA 200.8	
Mercury-ICPMS	ND	mg/L	0.0001	4/29/2014 4:08:00 PM	KEB	EPA 200.8	
Zinc	0.00988	mg/L	0.001	4/29/2014 4:08:00 PM	KEB	EPA 200.8	

Sample Number 140417045-108
Client Sample ID FIELD BLANK 1
Matrix Water
Comments

Sampling Date 4/18/2014
Sampling Time 10:44 AM
Sample Location

Date/Time Received 4/17/2014 12:00 PM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/L	0.001	4/29/2014 4:18:00 PM	KEB	EPA 200.8	
Copper	ND	mg/L	0.001	4/29/2014 4:18:00 PM	KEB	EPA 200.8	
Lead	ND	mg/L	0.001	4/29/2014 4:18:00 PM	KEB	EPA 200.8	
Mercury-ICPMS	ND	mg/L	0.0001	4/29/2014 4:18:00 PM	KEB	EPA 200.8	
Zinc	ND	mg/L	0.001	4/29/2014 4:18:00 PM	KEB	EPA 200.8	

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Sample Number	140417045-109	**Sampling Date**	4/18/2014	**Date/Time Received**	4/17/2014 12:00 PM
Client Sample ID	FIELD BLANK 2	**Sampling Time**	10:44 AM	**Extraction Date**	
Matrix	Water	**Sample Location**			
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Cadmium	ND	mg/L	0.001	4/29/2014 4:33:00 PM	KEB	EPA 200.8	
Copper	ND	mg/L	0.001	4/29/2014 4:33:00 PM	KEB	EPA 200.8	
Lead	ND	mg/L	0.001	4/29/2014 4:33:00 PM	KEB	EPA 200.8	
Mercury-ICPMS	ND	mg/L	0.0001	4/29/2014 4:33:00 PM	KEB	EPA 200.8	
Zinc	ND	mg/L	0.001	4/29/2014 4:33:00 PM	KEB	EPA 200.8	

Authorized Signature Kathleen A. Sattler
Kathy Sattler, Lab Manager

MCL	EPA's Maximum Contaminant Level
ND	Not Detected
PQL	Practical Quantitation Limit

This report shall not be reproduced except in full, without the written approval of the laboratory.
The results reported relate only to the samples indicated.
Soil/solid results are reported on a dry-weight basis unless otherwise noted.

Anatek Labs, Inc.

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Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Quality Control Data

Lab Control Sample

Parameter	LCS Result	Units	LCS Spike	%Rec	AR %Rec	Prep Date	Analysis Date
Lead	0.0485	mg/L	0.05	97.0	85-115	4/23/2014	4/30/2014
Cadmium	0.0410	mg/kg	0.04	102.5	80-120	4/25/2014	4/30/2014
Zinc	0.0386	mg/kg	0.04	96.5	80-120	4/24/2014	4/30/2014
MERCURY-ICPMS	0.00191	mg/kg	0.002	95.5	80-120	4/24/2014	4/30/2014
Lead	0.0353	mg/kg	0.04	88.3	80-120	4/24/2014	4/30/2014
Copper	0.0362	mg/kg	0.04	90.5	80-120	4/24/2014	4/30/2014
Cadmium	0.0382	mg/kg	0.04	95.5	80-120	4/24/2014	4/30/2014
Cadmium	0.0406	mg/kg	0.04	101.5	80-120	4/29/2014	4/28/2014
MERCURY-ICPMS	0.00250	mg/L	0.0025	100.0	85-115	4/23/2014	4/30/2014
MERCURY-ICPMS	0.00198	mg/kg	0.002	99.0	80-120	4/25/2014	4/30/2014
Copper	0.0468	mg/L	0.05	93.6	85-115	4/23/2014	4/30/2014
Cadmium	0.0496	mg/L	0.05	99.2	85-115	4/23/2014	4/30/2014
Zinc	0.0410	mg/kg	0.04	102.5	80-120	4/29/2014	4/28/2014
MERCURY-ICPMS	0.00197	mg/kg	0.002	98.5	80-120	4/29/2014	4/28/2014
Lead	0.0406	mg/kg	0.04	101.5	80-120	4/29/2014	4/28/2014
Copper	0.0395	mg/kg	0.04	98.8	80-120	4/29/2014	4/28/2014
Zinc	0.0564	mg/L	0.05	112.8	85-115	4/23/2014	4/30/2014
Cadmium	0.0403	mg/kg	0.04	100.8	80-120	4/28/2014	4/30/2014
MERCURY-ICPMS	0.00203	mg/kg	0.002	101.5	80-120	4/28/2014	5/1/2014
Lead	0.0409	mg/kg	0.04	102.3	80-120	4/28/2014	5/1/2014
Copper	0.0374	mg/kg	0.04	93.5	80-120	4/28/2014	5/1/2014
Cadmium	0.0408	mg/kg	0.04	102.0	80-120	4/28/2014	5/1/2014
Zinc	0.0413	mg/kg	0.04	103.3	80-120	4/28/2014	4/30/2014
MERCURY-ICPMS	0.00199	mg/kg	0.002	99.5	80-120	4/28/2014	4/30/2014
Copper	0.0367	mg/kg	0.04	91.8	80-120	4/25/2014	4/30/2014
Copper	0.0372	mg/kg	0.04	93.0	80-120	4/28/2014	4/30/2014
Lead	0.0410	mg/kg	0.04	102.5	80-120	4/25/2014	4/30/2014
Zinc	0.0376	mg/kg	0.04	94.0	80-120	4/25/2014	4/30/2014
MERCURY-ICPMS	0.00198	mg/kg	0.002	99.0	80-120	4/25/2014	4/30/2014
Lead	0.0411	mg/kg	0.04	102.8	80-120	4/25/2014	4/30/2014
Copper	0.0367	mg/kg	0.04	91.8	80-120	4/25/2014	4/30/2014
Cadmium	0.0392	mg/kg	0.04	98.0	80-120	4/25/2014	4/30/2014
Zinc	0.0384	mg/kg	0.04	96.0	80-120	4/25/2014	4/30/2014
Zinc	0.0392	mg/kg	0.04	98.0	80-120	4/28/2014	5/1/2014
Lead	0.0418	mg/kg	0.04	104.5	80-120	4/28/2014	4/30/2014

Comments:

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Quality Control Data

Matrix Spike

Sample Number	Parameter	Sample Result	MS Result	Units	MS Spike	%Rec	AR %Rec	Prep Date	Analysis Date
140417059-001A	Copper	0.00620	0.0472	mg/L	0.05	82.0	70-130	4/23/2014	4/30/2014
140417045-001	Lead	34.9	67.7	mg/kg	28.2	116.3	75-125	4/29/2014	4/28/2014
140417059-001A	Lead	ND	0.0438	mg/L	0.05	87.6	70-130	4/23/2014	4/30/2014
140417045-052	Copper	25.6	47.7	mg/kg	27.2	81.3	75-125	4/28/2014	5/1/2014
140417045-081	Copper	26.4	49.9	mg/kg	28.6	82.2	75-125	4/28/2014	4/30/2014
140417045-061	Copper	18.1	38.7	mg/kg	25.2	81.7	75-125	4/25/2014	4/30/2014
140417045-041	Copper	22.4	45.0	mg/kg	25.9	87.3	75-125	4/25/2014	4/30/2014
140417059-001A	Cadmium	ND	0.0452	mg/L	0.05	90.4	70-130	4/23/2014	4/30/2014
140417045-001	Copper	70.7	99.5	mg/kg	28.2	102.1	75-125	4/29/2014	4/28/2014
140417045-061	Lead	11.1	33.9	mg/kg	25.2	90.5	75-125	4/25/2014	4/30/2014
140417045-052	Cadmium	ND	25.6	mg/kg	27.2	94.1	75-125	4/28/2014	5/1/2014
140417045-081	Cadmium	ND	26.7	mg/kg	28.6	93.4	75-125	4/28/2014	4/30/2014
140417045-061	Cadmium	ND	22.6	mg/kg	25.2	89.7	75-125	4/25/2014	4/30/2014
140417045-041	Cadmium	ND	24.7	mg/kg	25.9	95.4	75-125	4/25/2014	4/30/2014
140417045-021	Cadmium	ND	27.4	mg/kg	27.2	100.7	75-125	4/24/2014	4/30/2014
140417045-001	Cadmium	0.213	29.7	mg/kg	28.2	104.6	75-125	4/29/2014	4/28/2014
140417045-021	Copper	20.8	49.1	mg/kg	27.2	104.0	75-125	4/24/2014	4/30/2014
140417045-061	MERCURY-ICPMS	ND	1.13	mg/kg	1.26	89.7	75-125	4/25/2014	4/30/2014
140417045-081	Zinc	59.1	82.1	mg/kg	28.6	80.4	75-125	4/28/2014	4/30/2014
140417045-061	Zinc	42.5	66.7	mg/kg	25.2	96.0	75-125	4/25/2014	4/30/2014
140417045-041	Zinc	51.9	76.3	mg/kg	25.9	94.2	75-125	4/25/2014	4/30/2014
140417045-021	Zinc	47.4	79.7	mg/kg	27.2	118.8	75-125	4/24/2014	4/30/2014
140417045-001	Zinc	66.3	99.0	mg/kg	28.2	116.0	75-125	4/29/2014	4/28/2014
140417059-001A	Zinc	0.0414	0.0845	mg/L	0.05	86.2	70-130	4/23/2014	4/30/2014
140417045-021	Lead	9.93	37.1	mg/kg	27.2	99.9	75-125	4/24/2014	4/30/2014
140417045-081	MERCURY-ICPMS	ND	1.30	mg/kg	1.43	90.9	75-125	4/28/2014	4/30/2014
140417045-041	Lead	12.1	36.9	mg/kg	25.9	95.8	75-125	4/25/2014	4/30/2014
140417045-041	MERCURY-ICPMS	ND	1.36	mg/kg	1.3	104.6	75-125	4/25/2014	4/30/2014
140417045-021	MERCURY-ICPMS	ND	1.49	mg/kg	1.36	109.6	75-125	4/24/2014	4/30/2014
140417045-001	MERCURY-ICPMS	0.177	1.56	mg/kg	1.41	98.1	75-125	4/29/2014	4/28/2014
140417059-001A	MERCURY-ICPMS	ND	0.00234	mg/L	0.003	93.6	70-130	4/23/2014	4/30/2014
140417045-052	Lead	14.8	39.0	mg/kg	27.2	89.0	75-125	4/28/2014	5/1/2014
140417045-081	Lead	13.7	40.6	mg/kg	28.6	94.1	75-125	4/28/2014	4/30/2014
140417045-052	Zinc	46.8	80.4	mg/kg	27.2	123.5	75-125	4/28/2014	5/1/2014
140417045-052	MERCURY-ICPMS	ND	1.22	mg/kg	1.36	89.7	75-125	4/28/2014	5/1/2014

Comments:

Certifications held by Anatek Labs ID: EPA:ID00013; AZ:0701; CO:ID00013; FL(NELAP):E87893; ID:ID00013; MT:CERT0028; NM: ID00013; OR:ID200001-002; WA:C595
Certifications held by Anatek Labs WA: EPA:WA00169; ID:WA00169; WA:C585; MT:Cert0095; FL(NELAP): E871099

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Quality Control Data

Matrix Spike Duplicate

Parameter	MSD Result	Units	MSD Spike	%Rec	%RPD	AR %RPD	Prep Date	Analysis Date
Copper	0.0463	mg/L	0.05	80.2	1.9	0-20	4/23/2014	4/30/2014
Lead	68.3	mg/kg	28.2	118.4	0.9	0-20	4/29/2014	4/28/2014
Lead	0.0450	mg/L	0.05	90.0	2.7	0-20	4/23/2014	4/30/2014
Copper	47.8	mg/kg	27.2	81.6	0.2	0-20	4/28/2014	5/1/2014
Copper	50.3	mg/kg	28.6	83.6	0.8	0-20	4/28/2014	4/30/2014
Copper	39.3	mg/kg	25.2	84.1	1.5	0-20	4/25/2014	4/30/2014
Copper	48.6	mg/kg	25.9	101.2	7.7	0-20	4/25/2014	4/30/2014
Cadmium	0.0458	mg/L	0.05	91.6	1.3	0-20	4/23/2014	4/30/2014
Copper	99.1	mg/kg	28.2	100.7	0.4	0-20	4/29/2014	4/28/2014
Lead	34.6	mg/kg	25.2	93.3	2.0	0-20	4/25/2014	4/30/2014
Cadmium	27.7	mg/kg	27.2	101.8	7.9	0-20	4/28/2014	5/1/2014
Cadmium	26.6	mg/kg	28.6	93.0	0.4	0-20	4/28/2014	4/30/2014
Cadmium	23.4	mg/kg	25.2	92.9	3.5	0-20	4/25/2014	4/30/2014
Cadmium	25.8	mg/kg	25.9	99.6	4.4	0-20	4/25/2014	4/30/2014
Cadmium	28.3	mg/kg	27.2	104.0	3.2	0-20	4/24/2014	4/30/2014
Cadmium	29.9	mg/kg	28.2	105.3	0.7	0-20	4/29/2014	4/28/2014
Copper	48.1	mg/kg	27.2	100.4	2.1	0-20	4/24/2014	4/30/2014
MERCURY-ICPMS	1.23	mg/kg	1.26	97.6	8.5	0-20	4/25/2014	4/30/2014
Zinc	82.9	mg/kg	28.6	83.2	1.0	0-20	4/28/2014	4/30/2014
Zinc	70.2	mg/kg	25.2	109.9	5.1	0-20	4/25/2014	4/30/2014
Zinc	81.7	mg/kg	25.9	115.1	6.8	0-20	4/25/2014	4/30/2014
Zinc	79.4	mg/kg	27.2	117.6	0.4	0-20	4/24/2014	4/30/2014
Zinc	99.5	mg/kg	28.2	117.7	0.5	0-20	4/29/2014	4/28/2014
Zinc	0.0796	mg/L	0.05	76.4	6.0	0-20	4/23/2014	4/30/2014
Lead	37.7	mg/kg	27.2	102.1	1.6	0-20	4/24/2014	4/30/2014
MERCURY-ICPMS	1.33	mg/kg	1.43	93.0	2.3	0-20	4/28/2014	4/30/2014
Lead	37.6	mg/kg	25.9	98.5	1.9	0-20	4/25/2014	4/30/2014
MERCURY-ICPMS	1.25	mg/kg	1.3	96.2	8.4	0-20	4/25/2014	4/30/2014
MERCURY-ICPMS	1.51	mg/kg	1.36	111.0	1.3	0-20	4/24/2014	4/30/2014
MERCURY-ICPMS	1.68	mg/kg	1.41	106.6	7.4	0-20	4/29/2014	4/28/2014
MERCURY-ICPMS	0.00229	mg/L	0.0025	91.6	2.2	0-20	4/23/2014	4/30/2014
Lead	39.8	mg/kg	27.2	91.9	2.0	0-20	4/28/2014	5/1/2014
Lead	40.6	mg/kg	28.6	94.1	0.0	0-20	4/28/2014	4/30/2014
Zinc	73.2	mg/kg	27.2	97.1	9.4	0-20	4/28/2014	5/1/2014
MERCURY-ICPMS	1.33	mg/kg	1.36	97.8	8.6	0-20	4/28/2014	5/1/2014

Method Blank

Comments:

Client: GEO ENGINEERS
Address: 523 E 2ND
SPOKANE, WA 99202
Attn: SCOTT LATHEN

Batch #: 140417045
Project Name: CLARK FORK RIVER DELTA 15387-014-00

Analytical Results Report

Quality Control Data

Parameter	Result	Units	PQL	Prep Date	Analysis Date
Cadmium	ND	mg/L	0.001	4/23/2014	4/30/2014
Cadmium	ND	mg/Kg	0.001	4/24/2014	4/30/2014
Cadmium	ND	mg/Kg	0.001	4/25/2014	4/30/2014
Cadmium	ND	mg/Kg	0.001	4/25/2014	4/30/2014
Cadmium	ND	mg/Kg	0.001	4/28/2014	4/30/2014
Cadmium	ND	mg/Kg	0.001	4/28/2014	5/1/2014
Cadmium	ND	mg/Kg	0.001	4/29/2014	4/28/2014
Copper	ND	mg/Kg	0.001	4/29/2014	4/28/2014
Copper	ND	mg/Kg	0.001	4/28/2014	5/1/2014
Copper	ND	mg/Kg	0.001	4/28/2014	4/30/2014
Copper	ND	mg/Kg	0.001	4/25/2014	4/30/2014
Copper	ND	mg/Kg	0.001	4/25/2014	4/30/2014
Copper	ND	mg/L	0.001	4/23/2014	4/30/2014
Copper	ND	mg/Kg	0.001	4/24/2014	4/30/2014
Lead	ND	mg/Kg	0.001	4/25/2014	4/30/2014
Lead	ND	mg/Kg	0.001	4/29/2014	4/28/2014
Lead	ND	mg/L	0.001	4/23/2014	4/30/2014
Lead	ND	mg/Kg	0.001	4/24/2014	4/30/2014
Lead	ND	mg/Kg	0.001	4/28/2014	4/30/2014
Lead	ND	mg/Kg	0.001	4/28/2014	5/1/2014
Lead	ND	mg/Kg	0.001	4/25/2014	4/30/2014
Mercury-ICPMS	ND	mg/Kg	0.0001	4/25/2014	4/30/2014
Mercury-ICPMS	ND	mg/Kg	0.0001	4/28/2014	4/30/2014
Mercury-ICPMS	ND	mg/Kg	0.0001	4/25/2014	4/30/2014
Mercury-ICPMS	ND	mg/Kg	0.0001	4/24/2014	4/30/2014
Mercury-ICPMS	ND	mg/L	0.0001	4/23/2014	4/30/2014
Mercury-ICPMS	ND	mg/Kg	0.0001	4/29/2014	4/28/2014
Mercury-ICPMS	ND	mg/Kg	0.0001	4/28/2014	5/1/2014
Zinc	ND	mg/Kg	0.001	4/28/2014	5/1/2014
Zinc	ND	mg/Kg	0.001	4/29/2014	4/28/2014
Zinc	ND	mg/L	0.001	4/23/2014	4/30/2014
Zinc	ND	mg/Kg	0.001	4/24/2014	4/30/2014
Zinc	ND	mg/Kg	0.001	4/25/2014	4/30/2014
Zinc	ND	mg/Kg	0.001	4/25/2014	4/30/2014
Zinc	ND	mg/Kg	0.001	4/28/2014	4/30/2014

Duplicate

Sample Numbe	Parameter	Sample Result	Duplicate Result	Units	%RPD	AR %RPD	Prep Date	Analysis Date

Comments:

Certifications held by Anatek Labs ID: EPA:ID00013; AZ:0701; CO:ID00013; FL(NELAP):E87893; ID:ID00013; MT:CERT0028; NM: ID00013; OR:ID200001-002; WA:C595
Certifications held by Anatek Labs WA: EPA:WA00169; ID:WA00169; WA:C585; MT:Cert0095; FL(NELAP): E871099

Anatek Labs, Inc.

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504 E Sprague Ste. D • Spokane WA 99202 • (509) 838-3999 • Fax (509) 838-4433 • email spokane@anateklabs.com

Client:	GEO ENGINEERS	**Batch #:**	140417045
Address:	523 E 2ND SPOKANE, WA 99202	**Project Name:**	CLARK FORK RIVER DELTA 15387-014-00
Attn:	SCOTT LATHEN		

Analytical Results Report

Quality Control Data

Duplicate

Sample Numbe	Parameter	Sample Result	Duplicate Result	Units	%RPD	AR %RPD	Prep Date	Analysis Date
140417045-065	Lead	12.0	12.3	mg/Kg	2.5	0-20	4/25/2014	4/30/2014
140417045-024	Cadmium	ND	ND	mg/Kg	0.0	0-20	4/24/2014	4/30/2014
140417045-045	Cadmium	ND	ND	mg/Kg	0.0	0-20	4/25/2014	4/30/2014
140417045-065	Cadmium		ND	mg/Kg	0.0	0-20	4/25/2014	4/30/2014
140417045-085	Cadmium	ND	ND	mg/Kg	0.0	0-20	4/28/2014	4/30/2014
140417045-103	Cadmium	ND	ND	mg/Kg	0.0	0-20	4/28/2014	5/1/2014
140417045-008	Copper	10.5	11.0	mg/Kg	4.7	0-20	4/29/2014	4/28/2014
140417045-024	Copper	23.9	21.1	mg/Kg	12.4	0-20	4/24/2014	4/30/2014
140417045-045	Copper	15.0	14.7	mg/Kg	2.0	0-20	4/25/2014	4/30/2014
140417045-065	Copper	19.9	21.3	mg/Kg	6.8	0-20	4/25/2014	4/30/2014
140417045-085	Copper	15.5	14.1	mg/Kg	9.5	0-20	4/28/2014	4/30/2014
140417045-103	Copper	12.0	11.0	mg/Kg	8.7	0-20	4/28/2014	5/1/2014
140417045-008	Lead	6.15	6.24	mg/Kg	1.5	0-20	4/29/2014	4/28/2014
140417045-008	Cadmium	ND	ND	mg/Kg	0.0	0-20	4/29/2014	4/28/2014
140417045-045	Lead	12.0	11.7	mg/Kg	2.5	0-20	4/25/2014	4/30/2014
140417045-103	Zinc	26.6	25.1	mg/Kg	5.8	0-20	4/28/2014	5/1/2014
140417045-085	Lead	9.41	8.97	mg/Kg	4.8	0-20	4/28/2014	4/30/2014
140417045-103	Lead	7.67	7.10	mg/Kg	7.7	0-20	4/28/2014	5/1/2014
140417045-008	Mercury-ICPMS	ND	ND	mg/Kg	0.0	0-20	4/29/2014	4/28/2014
140417045-024	Mercury-ICPMS	ND	ND	mg/Kg	0.0	0-20	4/24/2014	4/30/2014
140417045-045	Mercury-ICPMS	ND	ND	mg/Kg	0.0	0-20	4/25/2014	4/30/2014
140417045-065	Mercury-ICPMS	ND	0	mg/Kg	0.0	0-20	4/25/2014	4/30/2014
140417045-085	Mercury-ICPMS	ND	ND	mg/Kg	0.0	0-20	4/28/2014	4/30/2014
140417045-103	Mercury-ICPMS	ND	ND	mg/Kg	0.0	0-20	4/28/2014	5/1/2014
140417045-008	Zinc	27.2	27.5	mg/Kg	1.1	0-20	4/29/2014	4/28/2014
140417045-024	Zinc	50.5	51.8	mg/Kg	2.5	0-20	4/24/2014	4/30/2014
140417045-045	Zinc	42.7	41.6	mg/Kg	2.6	0-20	4/25/2014	4/30/2014
140417045-065	Zinc	37.8	40.8	mg/Kg	7.6	0-20	4/25/2014	4/30/2014
140417045-085	Zinc	32.2	31.5	mg/Kg	2.2	0-20	4/28/2014	4/30/2014
140417045-024	Lead	14.7	12.7	mg/Kg	14.6	0-20	4/24/2014	4/30/2014

AR	Acceptable Range
ND	Not Detected
PQL	Practical Quantitation Limit
RPD	Relative Percentage Difference

Comments:

Certifications held by Anatek Labs ID: EPA:ID00013; AZ:0701; CO:ID00013; FL(NELAP):E87893; ID:ID00013; MT:CERT0028; NM: ID00013; OR:ID200001-002; WA:C595
Certifications held by Anatek Labs WA: EPA:WA00169; ID:WA00169; WA:C585; MT:Cert0095; FL(NELAP): E871099

Anatek Labs, Inc.

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504 E Sprague Ste. D • Spokane WA 99202 • (509) 838-3999 • Fax (509) 838-4433 • email spokane@anateklabs.com

Login Report

Customer Name: GEO ENGINEERS
523 E 2ND
SPOKANE WA 99202

Order ID: 140417045
Order Date: 4/17/2014

Contact Name: SCOTT LATHEN

Project Name: CLARK FORK RIVER DELTA 15387-014-00

Comment:

Sample #: 140417045-001 **Customer Sample #:** HA-1(1.5-2.0)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-002 **Customer Sample #:** HA-1(4.5-5.0)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS
523 E 2ND
SPOKANE WA 99202

Order ID: 14041704

Order Date: 4/17/2014

Contact Name: SCOTT LATHEN

Project Name: CLARK FORK RIVER DELTA 15387-014-00

Comment:

Sample #: 140417045-003 **Customer Sample #:** HA-1(6.5-7.0)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014

Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM

Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-004 **Customer Sample #:** HA-2(1.5-2.0)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014

Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM

Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-005 **Customer Sample #:** HA-2(4.5-5.0)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014

Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM

Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS
523 E 2ND
SPOKANE WA 99202

Order ID: 140417045
Order Date: 4/17/2014

Contact Name: SCOTT LATHEN

Project Name: CLARK FORK RIVER DELTA 15387-014-00

Comment:

MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-006 **Customer Sample #:** HA-2(6.5-7.0)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-007 **Customer Sample #:** HA-2(9-9.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-008 **Customer Sample #:** HA-3A(1.5-2)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS
523 E 2ND
SPOKANE WA 99202

Order ID: 140417045
Order Date: 4/17/2014

Contact Name: SCOTT LATHEN

Project Name: CLARK FORK RIVER DELTA 15387-014-00

Comment:

COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-009 **Customer Sample #:** HA-3A(4-4.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-010 **Customer Sample #:** HA-4A(1.5-2)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS
523 E 2ND
SPOKANE WA 99202

Order ID: 140417045
Order Date: 4/17/2014

Contact Name: SCOTT LATHEN

Project Name: CLARK FORK RIVER DELTA 15387-014-00

Comment:

Sample #: 140417045-011 **Customer Sample #:** HA-4A(4-4.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-012 **Customer Sample #:** HA-4A(6-6.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-013 **Customer Sample #:** HA-5(1.5-2)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS

523 E 2ND
SPOKANE WA 99202

Order ID: 140417045

Order Date: 4/17/2014

Contact Name: SCOTT LATHEN

Project Name: CLARK FORK RIVER
DELTA 15387-014-00

Comment:

MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-014 **Customer Sample #:** HA-5A(3.5-4)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-015 **Customer Sample #:** HA-6(2-2.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-016 **Customer Sample #:** HA-6(4-4.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS
523 E 2ND
SPOKANE WA 99202

Order ID: 140417045
Order Date: 4/17/2014

Contact Name: SCOTT LATHEN

Project Name: CLARK FORK RIVER DELTA 15387-014-00

Comment:

COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-017 **Customer Sample #:** HA-6(6-6.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-018 **Customer Sample #:** HA-7(1.5-2)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS
523 E 2ND
SPOKANE WA 99202

Order ID: 140417045
Order Date: 4/17/2014

Contact Name: SCOTT LATHEN

Project Name: CLARK FORK RIVER DELTA 15387-014-00

Comment:

Sample #: 140417045-019 **Customer Sample #:** HA-7(4-4.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-020 **Customer Sample #:** HA-7(6-6.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-021 **Customer Sample #:** HA-8(1.5-2)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS
523 E 2ND
SPOKANE WA 99202

Order ID: 140417045
Order Date: 4/17/2014

Contact Name: SCOTT LATHEN

Project Name: CLARK FORK RIVER DELTA 15387-014-00

Comment:

MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-022 **Customer Sample #:** HA-8(4-4.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-023 **Customer Sample #:** HA-8(6-6.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-024 **Customer Sample #:** HA-9(1.5-2)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS
523 E 2ND
SPOKANE WA 99202

Order ID: 140417045
Order Date: 4/17/2014

Contact Name: SCOTT LATHEN

Project Name: CLARK FORK RIVER DELTA 15387-014-00

Comment:

COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-025 **Customer Sample #:** HA-9(4-4.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-026 **Customer Sample #:** HA-9(6-6.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS
523 E 2ND
SPOKANE WA 99202

Order ID: 14041704
Order Date: 4/17/2014

Contact Name: SCOTT LATHEN

Project Name: CLARK FORK RIVER DELTA 15387-014-00

Comment:

Sample #: 140417045-027 **Customer Sample #:** HA-10(1.5-2)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-028 **Customer Sample #:** HA-10(4-4.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-029 **Customer Sample #:** HA-10(6-6.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-030 **Customer Sample #:** HA-10(7.5-8)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014

Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM

Comment:

Test	**Lab**	**Method**	**Due Date**	**Priority**
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-031 **Customer Sample #:** HA-11(1.5-2)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014

Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM

Comment:

Test	**Lab**	**Method**	**Due Date**	**Priority**
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-032 **Customer Sample #:** HA-11(4-4.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014

Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM

Comment:

Test	**Lab**	**Method**	**Due Date**	**Priority**
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS

523 E 2ND
SPOKANE WA 99202

Order ID: 140417045

Order Date: 4/17/2014

Contact Name: SCOTT LATHEN

Project Name: CLARK FORK RIVER DELTA 15387-014-00

Comment:

COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-033 **Customer Sample #:** HA-11(4.5-5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014

Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM

Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-034 **Customer Sample #:** HA-12(1.5-2)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014

Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM

Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS
523 E 2ND
SPOKANE WA 99202

Order ID: 14041704

Order Date: 4/17/2014

Contact Name: SCOTT LATHEN

Project Name: CLARK FORK RIVER DELTA 15387-014-00

Comment:

Sample #: 140417045-035 **Customer Sample #:** HA-12(4-4.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-036 **Customer Sample #:** HA-12(5.5-6)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-037 **Customer Sample #:** HA-13(1.5-2)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS
523 E 2ND
SPOKANE WA 99202

Order ID: 140417045
Order Date: 4/17/2014

Contact Name: SCOTT LATHEN

Project Name: CLARK FORK RIVER DELTA 15387-014-00

Comment:

MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-038 **Customer Sample #:** HA-13(4.5-5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-039 **Customer Sample #:** HA-14(1.5-2)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-040 **Customer Sample #:** HA-14(4-4.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS **Order ID:** 14041704

523 E 2ND **Order Date:** 4/17/2014
SPOKANE WA 99202

Contact Name: SCOTT LATHEN **Project Name:** CLARK FORK RIVER DELTA 15387-014-00

Comment:

COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-041 **Customer Sample #:** HA-14(6-6.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-042 **Customer Sample #:** HA-15(1.5-2)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS
523 E 2ND
SPOKANE WA 99202

Order ID: 140417045
Order Date: 4/17/2014

Contact Name: SCOTT LATHEN

Project Name: CLARK FORK RIVER DELTA 15387-014-00

Comment:

Sample #: 140417045-043 **Customer Sample #:** HA-15(4-4.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-044 **Customer Sample #:** HA-15(6-6.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-045 **Customer Sample #:** HA-16(2-2.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS **Order ID:** 140417045
523 E 2ND **Order Date:** 4/17/2014
SPOKANE WA 99202

Contact Name: SCOTT LATHEN **Project Name:** CLARK FORK RIVER DELTA 15387-014-00

Comment:

MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-046 **Customer Sample #:** HA-16(4-4.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-047 **Customer Sample #:** HA-16(6.5-7)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-048 **Customer Sample #:** HA-17(1.5-2)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS
523 E 2ND
SPOKANE WA 99202

Order ID: 140417045
Order Date: 4/17/2014

Contact Name: SCOTT LATHEN

Project Name: CLARK FORK RIVER DELTA 15387-014-00

Comment:

COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-049 **Customer Sample #:** HA-17(4-4.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-050 **Customer Sample #:** HA-17(6-6.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS
523 E 2ND
SPOKANE WA 99202

Order ID: 140417045
Order Date: 4/17/2014

Contact Name: SCOTT LATHEN

Project Name: CLARK FORK RIVER DELTA 15387-014-00

Comment:

Sample #: 140417045-051 **Customer Sample #:** HA-18(1.5-2)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-052 **Customer Sample #:** HA-18(4-4.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-053 **Customer Sample #:** HA-18(6-6.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS
523 E 2ND
SPOKANE WA 99202

Order ID: 140417045
Order Date: 4/17/2014

Contact Name: SCOTT LATHEN

Project Name: CLARK FORK RIVER DELTA 15387-014-00

Comment:

MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-054 **Customer Sample #:** HA-19(1.5-2)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-055 **Customer Sample #:** HA-19(4-4.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-056 **Customer Sample #:** HA-19(6-6.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS
523 E 2ND
SPOKANE WA 99202

Order ID: 140417045
Order Date: 4/17/2014

Contact Name: SCOTT LATHEN

Project Name: CLARK FORK RIVER DELTA 15387-014-00

Comment:

COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-057 **Customer Sample #:** HA-20(1.5-2)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-058 **Customer Sample #:** HA-20(4.5-5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS
523 E 2ND
SPOKANE WA 99202

Order ID: 140417045
Order Date: 4/17/2014

Contact Name: SCOTT LATHEN

Project Name: CLARK FORK RIVER DELTA 15387-014-00

Comment:

Sample #: 140417045-059 **Customer Sample #:** HA-20(6.5-7)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-060 **Customer Sample #:** HA-21(1.5-2)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-061 **Customer Sample #:** HA-21(4.5-5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS **Order ID:** 140417045
523 E 2ND **Order Date:** 4/17/2014
SPOKANE WA 99202

Contact Name: SCOTT LATHEN **Project Name:** CLARK FORK RIVER DELTA 15387-014-00

Comment:

MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-062 **Customer Sample #:** HA-21(6.5-7)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-063 **Customer Sample #:** HA-21(9-9.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-064 **Customer Sample #:** HA-22(2-2.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS

523 E 2ND
SPOKANE WA 99202

Order ID: 140417045

Order Date: 4/17/2014

Contact Name: SCOTT LATHEN

Project Name: CLARK FORK RIVER DELTA 15387-014-00

Comment:

COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-065 **Customer Sample #:** HA-22(4.5-5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014

Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM

Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-066 **Customer Sample #:** HA-22(6.5-7)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014

Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM

Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS
523 E 2ND
SPOKANE WA 99202

Order ID: 140417045
Order Date: 4/17/2014

Contact Name: SCOTT LATHEN

Project Name: CLARK FORK RIVER DELTA 15387-014-00

Comment:

Sample #: 140417045-067 **Customer Sample #:** HA-23(1.5-2)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-068 **Customer Sample #:** HA-23(4.5-5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-069 **Customer Sample #:** HA-23(6.5-7)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS
523 E 2ND
SPOKANE WA 99202

Order ID: 140417045
Order Date: 4/17/2014

Contact Name: SCOTT LATHEN

Project Name: CLARK FORK RIVER DELTA 15387-014-00

Comment:

MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-070 **Customer Sample #:** HA-24(1.5-2)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-071 **Customer Sample #:** HA-24(4.5-5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-072 **Customer Sample #:** HA-24(7-7.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS
523 E 2ND
SPOKANE WA 99202

Order ID: 140417045
Order Date: 4/17/2014

Contact Name: SCOTT LATHEN

Project Name: CLARK FORK RIVER DELTA 15387-014-00

Comment:

COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-073 **Customer Sample #:** HA-25(2.5-3)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-074 **Customer Sample #:** HA-25(4.5-5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS
523 E 2ND
SPOKANE WA 99202

Order ID: 140417045
Order Date: 4/17/2014

Contact Name: SCOTT LATHEN

Project Name: CLARK FORK RIVER DELTA 15387-014-00

Comment:

Sample #: 140417045-075 **Customer Sample #:** HA-25(6.5-7)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-076 **Customer Sample #:** HA-25(8.5-9)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-077 **Customer Sample #:** HA-26(1.5-2)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS **Order ID:** 140417045

523 E 2ND **Order Date:** 4/17/2014

SPOKANE WA 99202

Contact Name: SCOTT LATHEN **Project Name:** CLARK FORK RIVER DELTA 15387-014-00

Comment:

MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-078 **Customer Sample #:** HA-26(5-5.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014

Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM

Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-079 **Customer Sample #:** HA-26(6.5-7)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014

Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM

Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-080 **Customer Sample #:** HA-26(9-9.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014

Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM

Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS
523 E 2ND
SPOKANE WA 99202

Order ID: 140417045
Order Date: 4/17/2014

Contact Name: SCOTT LATHEN

Project Name: CLARK FORK RIVER DELTA 15387-014-00

Comment:

COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-081 **Customer Sample #:** HA-27(1.5-2)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-082 **Customer Sample #:** HA-27(4.5-5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS
523 E 2ND
SPOKANE WA 99202

Order ID: 14041704

Order Date: 4/17/201

Contact Name: SCOTT LATHEN

Project Name: CLARK FORK RIVER DELTA 15387-014-00

Comment:

Sample #: 140417045-083 **Customer Sample #:** HA-27(6.5-7)

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014

Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM

Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-084 **Customer Sample #:** HA-28(1.5-2)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014

Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM

Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-085 **Customer Sample #:** HA-28(4.5-5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014

Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM

Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS
523 E 2ND
SPOKANE WA 99202

Order ID: 140417045
Order Date: 4/17/2014

Contact Name: SCOTT LATHEN

Project Name: CLARK FORK RIVER DELTA 15387-014-00

Comment:

MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-086 **Customer Sample #:** HA-28(6.5-7)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-087 **Customer Sample #:** HA-29(1.5-2)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-088 **Customer Sample #:** HA-29(4.5-5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS
523 E 2ND
SPOKANE WA 99202

Order ID: 140417045
Order Date: 4/17/2014

Contact Name: SCOTT LATHEN

Project Name: CLARK FORK RIVER DELTA 15387-014-00

Comment:

COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-089 **Customer Sample #:** HA-29(6.5-7)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-090 **Customer Sample #:** HA-29(9-9.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS
523 E 2ND
SPOKANE WA 99202

Order ID: 140417045
Order Date: 4/17/2014

Contact Name: SCOTT LATHEN

Project Name: CLARK FORK RIVER DELTA 15387-014-00

Comment:

Sample #: 140417045-091 **Customer Sample #:** HA-30(1.5-2)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-092 **Customer Sample #:** HA-30(4-4.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-093 **Customer Sample #:** HA-30(6.5-7)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS
523 E 2ND
SPOKANE WA 99202

Order ID: 140417045
Order Date: 4/17/2014

Contact Name: SCOTT LATHEN

Project Name: CLARK FORK RIVER DELTA 15387-014-00

Comment:

MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-094 **Customer Sample #:** HA-31(1.5-2)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-095 **Customer Sample #:** HA-31(2-2.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-096 **Customer Sample #:** HA-31(4.5-5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS
523 E 2ND
SPOKANE WA 99202

Order ID: 140417045
Order Date: 4/17/2014

Contact Name: SCOTT LATHEN

Project Name: CLARK FORK RIVER DELTA 15387-014-00

Comment:

COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-097 **Customer Sample #:** HA-32(1.5-2)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-098 **Customer Sample #:** HA-32(4.5-5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS
523 E 2ND
SPOKANE WA 99202

Order ID: 140417045
Order Date: 4/17/2014

Contact Name: SCOTT LATHEN

Project Name: CLARK FORK RIVER DELTA 15387-014-00

Comment:

Sample #: 140417045-099 **Customer Sample #:** HA-32(6.5-7)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-100 **Customer Sample #:** HA-32(9-9.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-101 **Customer Sample #:** HA-33(2-2.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS
523 E 2ND
SPOKANE WA 99202

Order ID: 140417045
Order Date: 4/17/2014

Contact Name: SCOTT LATHEN

Project Name: CLARK FORK RIVER DELTA 15387-014-00

Comment:

MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-102 **Customer Sample #:** HA-33(4-4.5)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-103 **Customer Sample #:** HA-33(6.5-7)

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014
Quantity: 1 **Matrix:** Soil **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
%Moisture	S	%moisture	4/29/2014	***Normal (~10 Days)***
CADMIUM	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 6020A	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-104 **Customer Sample #:** RINSEATE BLANK 1

Recv'd: ☑ **Collector:** **Date Collected:** 4/15/2014
Quantity: 1 **Matrix:** Water **Date Received:** 4/17/2014 12:00:00 PM
Comment:

Test	Lab	Method	Due Date	Priority
CADMIUM	S	EPA 200.8	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 200.8	4/29/2014	***Normal (~10 Days)***

Customer Name: GEO ENGINEERS **Order ID:** 140417045

523 E 2ND **Order Date:** 4/17/2014

SPOKANE WA 99202

Contact Name: SCOTT LATHEN **Project Name:** CLARK FORK RIVER DELTA 15387-014-00

Comment:

LEAD	S	EPA 200.8	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 200.8	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 200.8	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-105 **Customer Sample #:** RINSEATE BLANK 2

Recv'd: ☑ **Collector:** **Date Collected:** 4/16/2014

Quantity: 1 **Matrix:** Water **Date Received:** 4/17/2014 12:00:00 PM

Comment:

Test	Lab	Method	Due Date	Priority
CADMIUM	S	EPA 200.8	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 200.8	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 200.8	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 200.8	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 200.8	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-108 **Customer Sample #:** FIELD BLANK 1

Recv'd: ☑ **Collector:** **Date Collected:** 4/18/2014

Quantity: 1 **Matrix:** Water **Date Received:** 4/17/2014 12:00:00 PM

Comment:

Test	Lab	Method	Due Date	Priority
CADMIUM	S	EPA 200.8	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 200.8	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 200.8	4/29/2014	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 200.8	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 200.8	4/29/2014	***Normal (~10 Days)***

Sample #: 140417045-109 **Customer Sample #:** FIELD BLANK 2

Recv'd: ☑ **Collector:** **Date Collected:** 4/18/2014

Quantity: 1 **Matrix:** Water **Date Received:** 4/17/2014 12:00:00 PM

Comment:

Test	Lab	Method	Due Date	Priority
CADMIUM	S	EPA 200.8	4/29/2014	***Normal (~10 Days)***
COPPER	S	EPA 200.8	4/29/2014	***Normal (~10 Days)***
LEAD	S	EPA 200.8	4/29/2014	***Normal (~10 Days)***

Customer Name:	GEO ENGINEERS	**Order ID:**	140417045
	523 E 2ND	**Order Date:**	4/17/2014
	SPOKANE WA 99202		
Contact Name:	SCOTT LATHEN	**Project Name:**	CLARK FORK RIVER DELTA 15387-014-00
Comment:			

MERCURY-ICPMS	S	EPA 200.8	4/29/2014	***Normal (~10 Days)***
ZINC	S	EPA 200.8	4/29/2014	***Normal (~10 Days)***

SAMPLE CONDITION RECORD

Samples received in a cooler?	Yes
Samples received intact?	Yes
What is the temperature inside the cooler?	1.6/0.6
Samples received with a COC?	Yes
Samples received within holding time?	Yes
Are all sample bottles properly preserved?	N/A
Are VOC samples free of headspace?	N/A
Is there a trip blank to accompany VOC samples?	N/A
Labels and chain agree?	Yes

Anatek Labs, Inc.

Chain of Custody Record

1282 Alturas Drive, Moscow ID 83843 (208) 883-2839 FAX 882-9246
504 E Sprague Ste D, Spokane WA 99202 (509) 838-3999 FAX 838-4433

140417 045 GEOE Last Due 4/29/2014
1st SAMP 4/15/2014 1st RCVD 4/17/2014
CLARK FORK RIVER DELTA

http://www.anateklabs.com/services/guidelines/reporting.asp

Company Name: GeoEngineers, Inc
Address: 523 E 2nd Ave
City: Spokane State: WA Zip: 99202
Phone: 509.363.3125
Fax:

Project Manager: Scott Lathen
Project Name & #: Clark Fork River Delta
Email Address:
Purchase Order #:
Sampler Name & phone:

☒ Normal
☐ Next Day*
☐ 2nd Day*
☐ Other*______

*All rush order requests must be prior approved.

☐ Phone
☐ Mail
☐ Fax
☐ Email

Provide Sample Description

List Analyses Requested

Preservative:

Note Special Instructions/Comments

Lab ID	Sample Identification	Sampling Date/Time	Matrix	# of Containers	Sample Volume	Cadmium	Copper	Lead	Mercury	Zinc					
	HA-1 (1.5-2.0)	04/16/14 1420	S	1	4oz	X	↓	↓	↓	↓					
	HA-1 (4.5-5.0)	04/16/14 1424	↓	↓	↓	↓									
	HA-1 (6.5-7.0)	04/16/14 1430													
	HA-2 (1.5-2.0)	04/16/14 1334													
	HA-2 (4.5-5.0)	04/16/14 1340													
	HA-2 (6.5-7.0)	04/16/14 1345													
	HA-2 (9-9.5)	04/16/14 1350													
	HA-3a (1.5-2)	04/16/14 1239													
	HA-3a (4-4.5)	04/16/14 1248													
	HA-4a (1.5-2)	04/16/14 0947													
	HA-4a (4-4.5)	04/16/14 0955													
	HA-4a (6-6.5)	04/16/14 1008													
	HA-5 (1.5-2)	04/16/14 1357													

	Printed Name	Signature	Company	Date	Time
Relinquished by	Scott Lathen		GEI	4/17/14	1200
Received by	K Scott		Anatek	4/17/14	1200
Relinquished by					
Received by					
Relinquished by					
Received by					

Inspection Checklist

Received Intact? [✓ Y] N
Labels & Chains Agree? [✓ Y] N
Containers Sealed? Y N
VOC Head Space? Y [✓ N]

hand / 2 Cooler

Temperature (°C): 1.6 / 0.6
Preservative: Ice

Date & Time: 4-17-14
Inspected By: KS

1 of 10

Anatek Labs, Inc.

Chain of Custody Record

1282 Alturas Drive, Moscow ID 83843 (208) 883-2839 FAX 882-9246
504 E Sprague Ste D, Spokane WA 99202 (509) 838-3999 FAX 838-4433

140417 045 **GEOE** Last Due 4/29/2014
1st SAMP 4/15/2014 1st RCVD 4/17/2014
CLARK FORK RIVER DELTA

Company Name: GeoEngineers, Inc.
Address: 523 E 2nd Ave
City: Spokane State: WA Zip: 99202
Phone: 509.363.3125
Fax:

Project Manager: Scott Lathen
Project Name & #: Clark Fork River Delta
Email Address :
Purchase Order #: 15387-014-00
Sampler Name & phone:

Please refer to our normal turn around times at: http://www.anateklabs.com/services/guidelines/reporting.asp

X Normal
__Next Day*
__2nd Day*
__Other*______

*All rush order requests must be prior approved.

__Phone
__Mail
__Fax
__Email

Provide Sample Description

List Analyses Requested

Note Special Instructions/Comments

Lab ID	Sample Identification	Sampling Date/Time	Matrix	# of Containers	Sample Volume	Cd	Cu	Pb	Hg	Zn					
	HA-5a(3.5-4)	04/16/14 1404	S	1	4oz	X	X	X	X	X					
	HA-6(2-2.5)	04/15/14													
	HA-6(4-4.5)	04/15/14													
	HA-6(6-6.5)	04/15/14													
	HA-7(1.5-2)	04/16/14 1005													
	HA-7(4-4.5)	04/16/14 1010													
	HA-7(6-6.5)	04/16/14 1015													
	HA-8(1.5-2)	04/16/14 1152													
	HA-8(4-4.5)	04/16/14 1202													
	HA-8(6-6.5)	04/16/14 1207													
	HA-9(1.5-2)	04/16/14 0907													
	HA-9(4-4.5)	04/16/14 0917													
	HA-9(6-6.5)	04/16/14 0923	↓	↓	↓	↓	↓	↓	↓	↓					

	Printed Name	Signature	Company	Date	Time
Relinquished by	Scott Lathen		GEI	4/17/14	1200
Received by	K Scott	K Scott	Anatek	4/17/14	1200
Relinquished by					
Received by					
Relinquished by					
Received by					

Inspection Checklist

Received Intact? [✓ Y] N
Labels & Chains Agree? [✓ Y] N
Containers Sealed? ~~Y~~ N
VOC Head Space? Y ~~N~~
hand / 2 Coolers
Temperature (°C): 1.6 / 0.6
Preservative: ice
Date & Time: 4-17-14
Inspected By: KS

2/10

Anatek Labs, Inc.

Chain of Custody Record

○ 1282 Alturas Drive, Moscow ID 83843 (208) 883-2839 FAX 882-9246 ○
○ 504 E Sprague Ste D, Spokane WA 99202 (509) 838-3999 FAX 838-4433 ○

140417 045 **GEOE** Last Due 4/29/2014
1st SAMP 4/15/2014 1st RCVD 4/17/2014
CLARK FORK RIVER DELTA

Company Name: GeoEngineers, Inc
Address: 523 2nd Ave
City: Spokane State: WA Zip: 99202
Phone: 509.363.3125
Fax:

Project Manager: Scott Lathen
Project Name & #: Clark Fork River Delta
Email Address:
Purchase Order #:
Sampler Name & phone:

Please refer to our normal turn around times at:
http://www.anateklabs.com/services/guidelines/reporting.asp

- ☒ Normal
- __Next Day*
- __2nd Day*
- __Other*______

*All rush order requests must be prior approved.

- __Phone
- __Mail
- __Fax
- __Email

Provide Sample Description

List Analyses Requested

Note Special Instructions/Comments

Lab ID	Sample Identification	Sampling Date/Time	Matrix	# of Containers	Sample Volume	Cd	Cu	Pb	Hg	Zn
	HA-10(1.5-2)	04/16/14 1100	S	1	4oz	X	X	X	X	X
	HA-10(4-4.5)	04/16/14 1109								
	HA-10(6-6.5)	04/16/14 1115								
	HA-10 (7.5-8)	04/16/14 1123								
	HA-11 (1.5-2)	04/15/14 1351								
	HA-11 (4-4.5)	04/15/14 1404								
	HA-11(4.5-5)	04/16/14 0817								
	HA-12(1.5-2)	04/16/14 1027								
	HA-12 (4-4.5)	04/16/14 1035								
	HA-12 (5.5-6)	04/16/14 1038								
	HA-13 (1.5-2)	04/15/14 1454								
	HA-13 (4.5-5)	04/15/14 1506								
	HA-14 (1.5-2)	04/15/14 1312								

Preservative:

	Printed Name	Signature	Company	Date	Time
Relinquished by	S. Lathen		GEI	4/17/14	1200
Received by	K Scott	K Scott	Anatek	4/17/14	1200
Relinquished by					
Received by					
Relinquished by					
Received by					

Inspection Checklist

Received Intact? [✓ Y] N
Labels & Chains Agree? [✓ Y] N
Containers Sealed? Y N
VOC Head Space? Y N

hand / 2 Coolers

Temperature (°C): 1.6 / 0.6
Preservative: ice
Date & Time: 4-17-14
Inspected By: KS

3/10

Anatek Labs, Inc.

Chain of Custody Record

1282 Alturas Drive, Moscow ID 83843 (208) 883-2839 FAX 882-9246
504 E Sprague Ste D, Spokane WA 99202 (509) 838-3999 FAX 838-4433

Anatek Log-In
140417 045 **GEOE** Last Due 4/29/2014
1st SAMP 4/15/2014 1st RCVD 4/17/2014
CLARK FORK RIVER DELTA

Company Name: GeoEngineers, Inc.
Address: 523 E 2nd Ave
City: Spokane State: WA Zip: 99202
Phone: 509.363.3125
Fax:

Project Manager: Scott Lathen
Project Name & #: Clark Fork River Delta
Email Address :
Purchase Order #:
Sampler Name & phone:

http://www.anateklabs.com/services/guidelines/reporting.asp

X Normal
__Next Day*
__2nd Day*
__Other* ______

*All rush order requests must be prior approved.

__Phone
__Mail
__Fax
__Email

Provide Sample Description / List Analyses Requested

Lab ID	Sample Identification	Sampling Date/Time	Matrix	# of Containers	Sample Volume	Cd	Cu	Pb	Hg	Zn					
	HA-14 (4-4.5)	04/15/14 1320	S	1	4oz	X	X	X	X	X					
	HA-14 (6-6.5)	04/16/14 0848													
	HA-15 (1.5-2)	04/15/14 1127													
	HA-15 (4-4.5)	04/15/14 1143													
	HA-15 (6-6.5)	04/15/14 1151													
	HA-16 (2-2.5)	04/15/14 1050													
	HA-16 (4-4.5)	04/15/14 1055													
	HA-16 (6.5-7)	04/15/14 1100													
	HA-17 (1.5-2)	04/15/14 1231													
	HA-17 (4-4.5)	04/15/14 1237													
	HA-17 (6-6.5)	04/15/14 1247													
	HA-18 (1.5-2)	04/15/14 1024													
	HA-18 (4-4.5)	04/15/14 1033													

Preservative:

Note Special Instructions/Comments

	Printed Name	Signature	Company	Date	Time
Relinquished by	S. Lathen		GEI	4/17/14	1200
Received by	K Scott	K Scott	Anatek	4/17/14	1200
Relinquished by					
Received by					
Relinquished by					
Received by					

Inspection Checklist

Received Intact? [✓ Y] N
Labels & Chains Agree? [✓ Y] N
Containers Sealed? Y N
VOC Head Space? Y N
hand / 2 Cooler
Temperature (°C): 1.6 / 0.6
Preservative: Ice
Date & Time: 4-17-14
Inspected By: KS

4/10

Anatek Labs, Inc.

Chain of Custody Record

○ 1282 Alturas Drive, Moscow ID 83843 (208) 883-2839 FAX 882-9246 ○
○ 504 E Sprague Ste D, Spokane WA 99202 (509) 838-3999 FAX 838-4433 ○

140417 045 **GEOE** Last Due 4/29/2014
1st SAMP 4/15/2014 1st RCVD 4/17/2014
CLARK FORK RIVER DELTA

Company Name: GeoEngineers, Inc
Address: 523 E 2nd Ave
City: Spokane State: WA Zip: 99202
Phone: 509.363.3125
Fax:

Project Manager: Scott Lathen
Project Name & #: Clark Fork River Delta
Email Address :
Purchase Order #:
Sampler Name & phone:

Please refer to our normal turn around times at:
http://www.anateklabs.com/services/guidelines/reporting.asp

X Normal
__Next Day*
__2nd Day*
__Other*______

*All rush order requests must be prior approved.

__Phone
__Mail
__Fax
__Email

Provide Sample Description | List Analyses Requested | Note Special Instructions/Comments

Preservative:

Lab ID	Sample Identification	Sampling Date/Time	Matrix	# of Containers	Sample Volume	Cd	Cu	Pb	Hg	Zn					
	HA-18 (6-6.5)	04/15/14 1040	S	1	4 oz	X	X	X	X	X					
	HA-19 (1.5-2)	04/15/14 1058	↓	↓	↓	↓	↓	↓	↓	↓					
	HA-19 (4-4.5)	04/15/14 1106	↓	↓	↓	↓	↓	↓	↓	↓					
	HA-19 (6-6.5)	04/15/14 1111	↓	↓	↓	↓	↓	↓	↓	↓					
	HA-20 (1.5-2)	04/15/14 1122	↓	↓	↓	↓	↓	↓	↓	↓					
	HA-20 (4.5-5)	04/15/14 1125	↓	↓	↓	↓	↓	↓	↓	↓					
	HA-20 (6.5-7)	04/15/14 1131	↓	↓	↓	↓	↓	↓	↓	↓					
	~~HA-21 (1.5-2)~~	~~04/15/14 1156~~													
	~~HA~~														

	Printed Name	Signature	Company	Date	Time
Relinquished by	S Lathen		GEI	4/17/14	1200
Received by	K Scott	K Scott	anatek	4/17	1200
Relinquished by					
Received by					
Relinquished by					
Received by					

Inspection Checklist

Received Intact? [✓ Y] N
Labels & Chains Agree? [✓ Y] N
Containers Sealed? Y N
VOC Head Space? Y N
hard / plastic
Temperature (°C): 1.6 / 0.6
Preservative: ice
Date & Time: 4-17-14
Inspected By: KS

Anatek Labs, Inc.

Chain of Custody Record

1282 Alturas Drive, Moscow ID 83843 (208) 883-2839 FAX 882-9246
504 E Sprague Ste D, Spokane WA 99202 (509) 838-3999 FAX 838-4433

140417 046 GEOE Last Due 4/29/2014
1st SAMP 4/15/2014 1st RCVD 4/17/2014
CLARK FORK RIVER DELTA

Company Name: GeoEngineers Inc
Address: 523 . E . 2nd Ave
City: Spokane State: WA Zip: 99202
Phone:
Fax:

Project Manager: Scott Lathen
Project Name & #: Clark Fork River Delta
Email Address :
Purchase Order #:
Sampler Name & phone:

...porting
...refer to our normal turn around times at:
http://www.anateklabs.com/services/guidelines/reporting.asp

☒ Normal
☐ Next Day*
☐ 2nd Day*
☐ Other*______

*All rush order requests must be prior approved.

☐ Phone
☐ Mail
☐ Fax
☐ Email

Provide Sample Description

List Analyses Requested

Note Special Instructions/Comments

Lab ID	Sample Identification	Sampling Date/Time	Matrix	# of Containers	Sample Volume	Cd	Cu	Hg	Pb	Zn					
				Preservative:											
						X	X	X	X	X					
	HA-21 (1.5-2)	4-15-14 / 1156	Soil	1	4oz	↓	↓	↓	↓						
	HA-21 (4.5-5)	4-15-14 / 1201	↓	1	↓	↓	↓	↓	↓						
	HA-21 (6.5-7)	4-15-14 / 1210	↓	1	↓	↓	↓	↓	↓						
	HA-21 (9-9.5)	4-15-14 / 1215	↓	1	↓	↓	↓	↓	↓						
	HA-22 (2-2.5)	4-15-14 / 1325	↓	1	↓	↓	↓	↓	↓						

	Printed Name	Signature	Company	Date	Time
Relinquished by	S. Lathen		GEI	4/17/14	1200
Received by	K Scott	K Scott	anatek	4/17/14	1200
Relinquished by					
Received by					
Relinquished by					
Received by					

Inspection Checklist

Received Intact? [✓ Y] N
Labels & Chains Agree? [✓ Y] N
Containers Sealed? Y N
VOC Head Space? Y N

hand delivered

Temperature (°C): 1.6 / 0.6
Preservative: NR

Date & Time: 4-17-14
Inspected By: KS

6/10

Anatek Labs, Inc.

Chain of Custody Record

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504 E Sprague Ste D, Spokane WA 99202 (509) 838-3999 FAX 838-4433

140417 045 **GEOE** Last Due 4/29/2014
1st SAMP 4/15/2014 1st RCVD 4/17/2014
CLARK FORK RIVER DELTA

Company Name: GeoEngineers, Inc
Address: 523 E. 2nd Ave
City: Spokane State: WA Zip: 99202
Phone:
Fax:

Project Manager: Scott Lathen
Project Name & #: Clark Fork River Delta
Email Address:
Purchase Order #:
Sampler Name & phone:

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X Normal
__Next Day*
__2nd Day*
__Other*______

*All rush order requests must be prior approved.

__Phone
__Mail
__Fax
__Email

Provide Sample Description

List Analyses Requested

Lab ID	Sample Identification	Sampling Date/Time	Matrix	# of Containers	Sample Volume	Cd	Cu	Pb	Hg	Zn					
				Preservative:											
	HA-22 (4.5-5	4-15-14 / 1331	Soil	1	4oz	X	X	X	X	X					
	HA-22 (6.5-7)	4-15-14 / 1341		1											
	HA-23 (1.5-2)	4-15-14 / 1424		1											
	HA-23 (4.5-5)	4-15-14 / 1432		1											
	HA-23 (6.5-7)	4-15-14 / 1437		1											
	HA-24 (1.5-2)	4-15-14 / 1245		1											
	HA-24 (4.5-5)	4-15-14 / 1252		1											
	HA-24 (7-7.5)	4-15-14 / 1256		1											
	HA-25 (2.5-3)	4-15-14 / 1359		1											
	HA-25 (4.5-5)	4-15-14 / 1402		1											
	HA-25 (6.5-7)	4-15-14 / 1407		1											
	HA-25 (8.5-9)	4-15-14 / 1411	↓	1	↓	↓	↓	↓	↓	↓					
	HA-26 (1.5-2)	4-16-14 / 1121		1											

	Printed Name	Signature	Company	Date	Time
Relinquished by	S. Lathen		GEI	4/17/14	1200
Received by	K Scott	K Scott	Anatek	4/17/14	1200
Relinquished by					
Received by					
Relinquished by					
Received by					

Note Special Instructions/Comments

Inspection Checklist

Received Intact? [✓ Y] N
Labels & Chains Agree? [✓ Y] N
Containers Sealed? ~~Y N~~
VOC Head Space? Y N

hand / 2 Coolers
Temperature (°C): 1.6 / 0.6
Preservative: ice

Date & Time: 4-17-14
Inspected By: KPS

7/10

Anatek Labs, Inc.

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CLARK FORK RIVER DELTA

Company Name: GEO ENGINEERS INC.
Address: 523 E. 2ND AVE
City: SPOKANE State: WA Zip: 99202
Phone:
Fax:

Project Manager: S. Lathen
Project Name & #: Clark Fork River Delta
Email Address:
Purchase Order #:
Sampler Name & phone:

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☒ Normal
☐ Next Day*
☐ 2nd Day*
☐ Other*

*All rush order requests must be prior approved.

☐ Phone
☐ Mail
☐ Fax
☐ Email

Provide Sample Description

List Analyses Requested

Note Special Instructions/Comments

Preservative:

Lab ID	Sample Identification	Sampling Date/Time	Matrix	# of Containers	Sample Volume	Cd	Cu	Pb	Hg	Zn
	HA-26 (5-5.5)	4-16-14 / 1125	Soil	1	4oz	X	X	X	X	X
	HA-26 (6.5-7)	4-16-14 / 1128		1						
	HA-26 (9-9.5)	4-16-14 / 1134		1						
	HA-27 (1.5-2')	4-15-14 / 1502		1						
	HA-27 (4.5-5)	4-15-14 / 1506		1						
	HA-27 (6.5-7)	4-15-14 / 1513		1						
	HA-28 (1.5-2)	4-16-14 / 1154		1						
	HA-28 (4.5-5)	4-16-14 / 1159		1						
	HA-28 (6.5-7)	4-16-14 / 1203		1						
	HA-29 (1.5-2)	4-16-14 / 0930		1						
	HA29 (4.5-5)	4-16-14 / 0935		1						
	HA-29 (6.5-7)	4-16-14 / 0941		1						
	HA-29 (9-9.5)	4-16-14 / 0948		1						

	Printed Name	Signature	Company	Date	Time
Relinquished by	S Lathen		GEI	4/17/14	1200
Received by	K Scott	K Scott	Anatek	4/17/14	1200
Relinquished by					
Received by					
Relinquished by					
Received by					

Inspection Checklist

Received Intact? [✓ Y] N
Labels & Chains Agree? [✓ Y] N
Containers Sealed? Y N
VOC Head Space? Y N

2 Coolers Rcd

Temperature (°C): 1.6 / 0.6
Preservative: Ice
Date & Time: 4-17-14
Inspected By: KS

8/10

Anatek Labs, Inc.

Chain of Custody Record

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140417 045 **GEOE** Last Due 4/29/2014
1st SAMP 4/15/2014 1st RCVD 4/17/2014
CLARK FORK RIVER DELTA

Company Name: GeoEngineers Inc.
Address: 523 E 2nd Ave
City: Spokane State: WA Zip: 99202
Phone:
Fax:

Project Manager: S. Lathen
Project Name & #: Clark Fork River Delta
Email Address:
Purchase Order #:
Sampler Name & phone:

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☒ Normal
☐ Next Day*
☐ 2nd Day*
☐ Other*______

*All rush order requests must be prior approved.

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☐ Mail
☐ Fax
☐ Email

Provide Sample Description

List Analyses Requested

Note Special Instructions/Comments

Lab ID	Sample Identification	Sampling Date/Time	Matrix	# of Containers	Sample Volume	Cd	Cu	Pb	Hg	Zn					
	HA-30 (1.5-2)	4-16-14 / 1042	Soil	1	4oz										
	HA-30 (4-4.5)	4-16-14 / 1056		1											
	HA-30 (6.5-7)	4-16-14 / 1105		1											
	HA-31 (1.5-2)	4-16-14 / 1015		1											
	HA-31 (2-2.5)	4-16-14 / 1027		1											
	HA-31 (4.5-5)	4-16-14 / 1019		1											
	HA32 (1.5-2)	4-16-14 / 0850		1											
	HA-32 (4.5-5)	4-16-14 / 0857		1											
	HA-32 (6.5-7)	4-16-14 / 0907		1											
	HA-32 (9-9.5)	4-16-14 / 0915		1											
	HA-33 (2-2.5)	4-16-14 / 0823		1											
	HA-33 (4-4.5)	4-16-14 / 0828		1											
	HA 33 (6.5-7)	4-16-14 / 0836													

Preservative:

	Printed Name	Signature	Company	Date	Time
Relinquished by	S. Lathen		GEI	4/17/14	1200
Received by	K Scott	K Scott	Anatek	4/17/14	1200
Relinquished by					
Received by					
Relinquished by					
Received by					

Inspection Checklist

Received Intact? [✓ Y] N
Labels & Chains Agree? [✓ Y] N
Containers Sealed? Y N
VOC Head Space? Y N

2 Coolers / hd

Temperature (°C): 0.6 / 1.6
Preservative: Ice
Date & Time: 4-17-14
Inspected By: KS

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Chain of Custody Record

○ 1282 Alturas Drive, Moscow ID 83843 (208) 883-2839 FAX 882-9246 ○
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Purchase Order #:
Sampler Name & phone:

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☐ Next Day*
☐ 2nd Day*
☐ Other*_____

*All rush order requests must be prior approved.

☐ Phone
☐ Mail
☐ Fax
☐ Email

Provide Sample Description

List Analyses Requested

Lab ID	Sample Identification	Sampling Date/Time	Matrix	# of Containers	Sample Volume	Cd	Cu	Pb	Hg	Zn
	Rinseate Blank 1	4-15-14 / 1705	H_2O	1	250	↓	↓	↓	↓	↓
	Rinseate Blank 2	4-16-14 / 1805	H_2O	1	↓	↓	↓	↓	↓	↓
	Field Blank 1	4-15-14 / 1700	H_2O	1	↓	↓	↓	↓	↓	↓
	Field Blank 2	4-16-14 / 1800	H_2O	1	↓	↓	↓	↓	↓	↓

Preservative:

Note Special Instructions/Comments

	Printed Name	Signature	Company	Date	Time
Relinquished by	S. Lathen	S. Lathen	GEI	4/17/14	1200
Received by	K Scott	K Scott	Anatek	4/17/14	1200
Relinquished by					
Received by					
Relinquished by					
Received by					

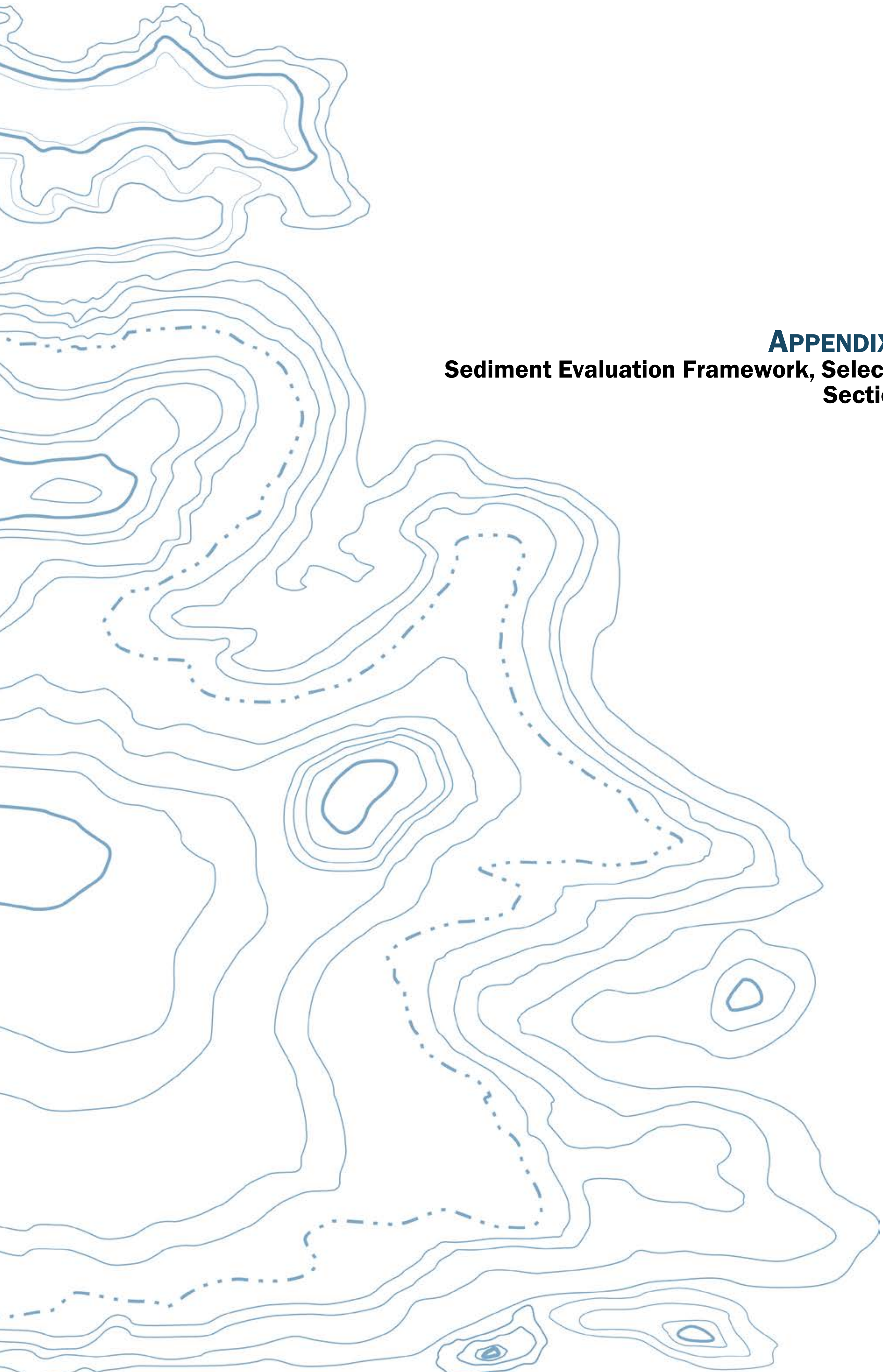
Inspection Checklist

Received Intact? [✓ Y] N
Labels & Chains Agree? [✓ Y] N
~~Containers Sealed? Y N~~
~~VOC Head Space? Y N~~

2 Cooler/hd

Temperature (°C): 0.6 / 1.6
Preservative: ice

Date & Time: 4-17-14
Inspected By: KS



APPENDIX C
Sediment Evaluation Framework, Selected Sections

Table 7-1. Sediment Quality Guidelines for Standard Chemicals of Concern

		Marine				Interim Freshwater	
Chemical	**CAS (1) Number**	**SL1 (dry weight**	**SL2 (dry weight)**	**SL1 (3) (mg/kg-OC)**	**SL2 (3) (mg/kg-OC)**	**SL1 (dry weight**	**SL2 (dry weight)**
Metals (mg/kg)							
Antimony	7440-36-0	150	150				
Arsenic	7440-38-2	57	93			20	51
Cadmium	7440-43-9	5.1	6.7			1.1	1.5
Chromium	7440-47-3	260	270			95	100
Copper	7440-50-8	390	390			80	830
Lead	7439-92-1	450	530			340	430
Mercury	7439-97-6	0.41	0.59			0.28	0.75
Nickel	7440-02-0	---	---			60	70
Silver	7440-22-4	6.1	6.1			2.0	2.5
Zinc	7440-66-6	410	960			130	400
Polynuclear Aromatic Hydrocarbons (µg/kg)							
Total LPAH	---	5,200	5,200	370	780	6,600	9,200
Naphthalene	91-20-3	2,100	2,100	99	170	500	1,300
Acenaphthylene	208-96-8	560	1,300	66	66	470	640
Acenaphthene	83-32-9	500	500	16	57	1,100	1,300
Fluorene	86-73-7	540	540	23	79	1,000	3,000
Phenanthrene	85-01-8	1,500	1,500	100	480	6,100	7,600
Anthracene	120-12-7	960	960	220	1,200	1,200	1,600
2-Methylnaphthalene	91-57-6	670	670	38	64	470	560
Total HPAH	---	12,000	17,000	960	5,300	31,000	55,000
Fluoranthene	206-44-0	1,700	2,500	160	1,200	11,000	15,000
Pyrene	129-00-0	2,600	3,300	1,000	1,400	8,800	16,000
Benz(a)anthracene	56-55-3	1,300	1,600	110	270	4,300	5,800
Chrysene	218-01-9	1,400	2,800	110	460	5,900	6,400
Benzofluoranthenes (b+k)	205-99-2	3,200	3,600	230	450	600	4,000
	207-08-9						
Benzo(a)pyrene	50-32-8	1,600	1,600	99	210	3,300	4,800
Indeno(1,2,3-c,d)pyrene	193-39-5	600	690	34	88	4,100	5,300
Dibenz(a,h)anthracene	53-70-3	230	230	12	33	800	840
Benzo(g,h,i)perylene	191-24-2	670	720	31	78	4,000	5,200
Chlorinated Hydrocarbons (µg/kg)							
1,4-Dichlorobenzene	106-46-7	110	110	3.1	9		
1,2-Dichlorobenzene	95-50-1	35	50	2.3	2.3		
1,2,4-Trichlorobenzene	120-82-1	31	51	0.81	1.8		
Hexachlorobenzene	118-74-1	22	70	0.38	2.3		

Table 7-1. Sediment Quality Guidelines for Standard Chemicals of Concern (continued)

		Marine				Freshwater	
Chemical	**CAS[1/] Number**	**SL1 (dry weight)**	**SL2 (dry weight)**	**SL1[2/] (mg/kg-OC)**	**SL[2/] (mg/kg-OC)**	**SL1 (dry weight)**	**SL2 (dry weight)**
Phthalates (ug/kg)							
Dimethyl phthalate	131-11-3	71	160	53	53	46	440
Diethyl phthalate	84-66-2	200	200	61	110		
Di-n-butyl phthalate	84-74-2	1,400	1,400	220	1,700		
Butyl benzyl phthalate	85-68-7	63	900	4.9	64	260	370
Bis(2-ethylhexyl) phthalate	117-81-7	1,300	1,900	47	78	220	320
Di-n-octyl phthalate	117-84-0	6,200	6,200	58	4,500	26	45
Phenols (μg/kg)							
Phenol	108-95-2	420	1,200				
2-Methylphenol	95-48-7	63	63				
4-Methylphenol	106-44-5	670	670				
2,4-Dimethylphenol	105-67-9	29	29				
Pentachlorophenol	87-86-5	400	690				
Miscellaneous Extractables (μg/kg)							
Benzyl alcohol	100-51-6	57	73				
Benzoic acid	65-85-0	650	650				
Dibenzofuran	132-64-9	540	540	15	58	400	440
Hexachlorobutadiene	87-68-3	11	120	3.9	6.2		
N-Nitrosodiphenylamine	86-30-6	28	40	11	11		
Pesticides (μg/kg)							
p,p'-DDE	72-54-8	16					
p,p'-DDD	72-55-9	9					
p,p'-DDT	50-29-3	34					
Aldrin	309-00-2						
alpha-Chlordane	12789-03-6						
Dieldrin	60-57-1						
Heptachlor	76-44-8						
gamma-BHC (Lindane)	58-89-9						
Total PCBs	---	130	1,000	12	65	60	120
Tributyltin[3/]							
TBT pore water (μg/L)	56573-85-4	0.15	---				
TBT dry weight (μg/kg ion)		---	---			75	75

Notes:
1/ CAS = Chemical Abstract Service Registry Number
2/ Screening levels are normalized by the fraction of organic carbon, expressed as mg/kg-OC.
3/ Tributyltin is a Chemical of Special Concern, not a Standard List Chemical of Concern. See *Testing, Reporting, and Evaluation of Tributyltin Data in PSDDA and SMS Programs* at URL http://www.nws.usace.army.mil/dmmo/8th_arm/tbt_96.htm
--- = No numerical criterion for this chemical
μg/kg = micrograms per kilogram
μg/L = micrograms per liter
mg/kg = milligrams per kilogram

CHAPTER 9. DISPOSAL ALTERNATIVES EVALUATION

9.1. INTRODUCTION

The need for a conceptual site model (CSM) and sampling and analysis procedures to enable sound management decisions were discussed in previous chapters. This chapter discusses dredged material disposal site identification to further focus data collection and evaluation to ensure the characterization is adequate to meet disposal objectives. This chapter is not intended to evaluate disposal options or make engineering recommendations, but rather to introduce the reader to the potential options and concepts that govern their use. The Corps and EPA have written many guidance documents on disposal and the factors that need to be evaluated to determine the best disposal option. Refer to the Dredging Operations and Technical Support Program (DOTS) website located at http://el.erdc.usace.army.mil/dots/ for guidance documents and publications.

Dredging for maintenance of navigational depths, deepening of berthing areas, or removal of contaminated sediments is typically conducted in urban areas where a general understanding of the sediment quality is known. While the majority of dredged materials are considered acceptable for a wide range of disposal alternatives, contaminant levels in some sediment have produced concern that dredged material disposal, especially in open waters, floodplains, and wetlands may adversely affect water quality and aquatic life (PIANC 1990). Determining a disposal option can be one of the most costly, time-consuming, and controversial aspects of the project. Thus, having at least an initial understanding of the preferred disposal alternative will be valuable during the characterization and permitting process.

Understanding the requirements of the proposed disposal location is an important step to include in the CSM because sediment evaluation should always have a clearly defined purpose and objective(s). To assist in this evaluation, many agencies like the Corps and EPA and technical subcommittees like the Permanent International Association of Navigation Congresses (PIANC) have developed comprehensive, yet simplified approaches to the identification, development, evaluation, and selection of environmentally and economically preferable alternatives for the handling and treatment of dredged material. The following sections summarize the likely alternatives for dredged material disposal, and discuss much of the relevant information needed to assess and develop dredged material disposal alternatives.

9.2. OVERVIEW OF DREDGED MATERIAL DISPOSAL OPTIONS

The removal, transport, and placement of dredged sediments are the primary components of the "dredging process." Each part of the process must be closely coordinated to ensure a successful dredging operation (EPA/Corps 2004). Planning for maintenance dredging projects involving uncontaminated sediment can be quite different than planning for a project involving contaminated sediments. The main goal of a maintenance dredging project is to remove sediment to navigational depth and most of the planning tends to be directed to meeting this goal. The main goal for contaminated sediment dredging projects is usually the improvement and protection of the environment, as well as navigation. Therefore, managers for these projects are often forced to plan for all situations to be discussed with the regulatory and scientific community.

The primary disposal options in the Pacific Northwest are shown below. Other management options may also exist (e.g., natural recovery), but are not discussed in detail in this chapter.

- Unconfined Open Water
- Beneficial Use (see Chapter 12 for additional details)
- Confined In-water (Capping)
    - Thin Cap
    - Thick Cap
- Dredging with Confined Disposal
    - Confined Aquatic Disposal
    - Nearshore Fill
- Upland Disposal

Permitting and regulatory requirements for these various options vary from state to state, and between options. It is beyond the scope of this manual to detail regulations and permitting requirements for each of these options. Applicants should coordinate with their federal and/or state agency contacts to determine what regulations apply and what permits may be required. However, any discharge of dredged or fill material (all in-water disposal options) into waters of the United States will require authorization under Section 404 of the Clean Water Act (CWA), which will also require a Section 401 water quality certification.

9.3. DISPOSAL OPTIONS FOR UNCONTAMINATED SEDIMENTS

9.3.1. Unconfined Open-water Disposal

Open-water disposal is the placement of dredged material in rivers, lakes, estuaries, or oceans via pipeline dredging or release from a hopper dredge or barge. Dredged material can be placed in an approved open-water site using direct pipeline discharge, direct mechanical placement, or release from hopper dredges. Open-water disposal sites can be either predominantly nondispersive or dispersive. At nondispersive sites, most of the material is intended to remain on the bottom following placement. At dispersive sites, material may be dispersed either during placement or eroded from the bottom over time by current and/or wave action.

In some non-ocean waters and waters subject to the CWA, there may be interagency selected, operated, and monitored dredged material disposal sites. In Washington, the Puget Sound Dredged Disposal Analysis (PSDDA) agencies are responsible for certain sites. Locations and disposal site descriptions for these sites in Puget Sound are available at http://www.nws.usace.army.mil/PublicMenu/Menu.cfm?sitename=DMMO&pagename=Users_Manual.

9.3.2. Ocean Disposal

In 1972, Congress enacted the MPRSA to prohibit the dumping of material into the ocean that would unreasonably degrade or endanger human health or the marine environment. Virtually all material that is ocean dumped today is dredged material (sediments) removed from the bottom of water bodies in order to maintain navigation channels and berthing areas.

Ocean dumping of dredged material cannot occur unless a site is either selected temporarily by the Corps or permanently designated by EPA. For the transport of dredged material to an ocean disposal site, a permit is issued by the Corps, with EPA's concurrence, under the MPRSA. Permitting and site selection using EPA's environmental criteria are subject to EPA's concurrence.

For all other types of materials (non-dredged material, vessels, fish waste, etc.), EPA is the permitting agency for ocean dumping and is responsible for designating ocean dumping sites.

The criteria and procedures for ocean dumping permits for dredged material are covered by EPA's ocean dumping regulations at 40 CFR Parts 220 to 229. These regulations also cover the criteria and procedures for designation and management of ocean dumping sites.

All proposed dredged material disposal activities regulated by the MPRSA and CWA must also comply with the applicable requirements of NEPA and its implementing regulations. In addition to the MPRSA, CWA, and NEPA, many federal laws, executive orders, policies, and guidance must be considered, as well as state environmental laws and regulations.

The geographical jurisdictions of the MPRSA and CWA are shown in Figure 2-1. As shown in this figure, an overlap of jurisdiction exists within the territorial sea. The regulatory guidelines for the specification of disposal sites for dredged or fill material lying inside of the baseline from which the territorial sea is measured, or into the territorial sea, are found at 40 CFR 230.2(b) and 33 CFR 336.0(b). The discharge of dredged material into the territorial sea is governed under MPRSA and the regulatory criteria at 40 CFR parts 220 to 228. In general, dredged material discharged as a structure or fill (e.g., beach nourishment, island creation, or underwater berms) and placed within the territorial sea is evaluated under the CWA and applicable state laws and regulations, while material disposed within the territorial sea as a "wasting" action is evaluated under the MPRSA.

The EPA-designated ocean dredged material disposal sites in the region are codified at 40 CFR 228.15(n). Coordinates for these ocean disposal sites, as well as restrictions and conditions for their use, are listed in that section. The use of EPA-designated dredged material disposal sites are further governed by site management and monitoring plans.

9.4. DISPOSAL OPTIONS FOR CONTAMINATED SEDIMENTS

Identification of reasonable disposal sites for contaminated sediments must take into account scientific methods that evaluate multiple criteria, including ecologic, geologic, hydrogeologic, economic, social, and other factors. The CWA and MPRSA generally prohibit the disposal of contaminated material into ocean waters (ocean waters are those waters seaward of the baseline). Contaminated sediment disposal regulations generally apply to the assessment of contaminated sediment and potential disposal scenarios in non-ocean waters, and they may differ for each state within EPA Region 10. Coordination with the appropriate state and federal agencies will be needed. Contaminated sediments can be removed by dredging, either through mechanical means (i.e., clamshell) or with suction (i.e., hydraulic cutterhead dredge).

9.4.1. Confined In-water Disposal (Capping)

The principle behind confined in-water disposal (capping) is that when the sediments are capped, the contaminants will no longer be bioavailable or transferred within the environment (Palermo et al., 1998). Capping may be considered as an option when the costs of removal are deemed greater than the benefit, and navigation depths are not of primary concern. There are two types of caps:

- Thin Cap. A thin cap typically occurs in areas with lower sediment contamination and consists of clean sands/silts less than 3 feet thick without armoring.

- Thick Cap. A thick cap typically occurs in areas with greater sediment contamination and consists of clean sands/silts greater than 3 feet thick with armoring to protect from scouring.

9.4.1.1. Capping Benefits

Capping is one method to isolate contaminated sediment from the surrounding aquatic environment. Chemical contamination is isolated from the environment. Over time, and coupled with successful source control, the waterways can be expected to constitute much-improved habitat for invertebrates, fish, and birds.

9.4.1.2. Thin Cap

Thin capping, also known as enhanced natural recovery, is often used where hazards presented by contaminated sediment to human health and the environment is low. Thin capping improves the chemical or physical properties of the upper sediment bed, which constitute the biologically active zone. Thin capping typically has a target thickness of 3 feet or less and is used in low-energy environments. The cap material would be determined during design. The added material supplements natural sedimentation and enhances the natural recovery process, producing variation in the coverage depths and allowing for considerable mixing between the contaminated and clean layers. The result is a sediment bed consisting of mounds of clean material and areas where no cap is evident. Enhanced natural recovery has been successfully applied to the West Harbor Operable Unit of the Wyckoff/Eagle Harbor Superfund Site located off Bainbridge Island, Washington (see EPA website at http://cfpub.epa.gov/supercpad/cursites/csitinfo.cfm?id=1000612).

9.4.1.3. Thick Cap

Placement of a thick cap over a problem area is intended to effectively contain and isolate the contaminated sediments from the benthic community in surface sediments, overlying water column and habitat. In navigation areas where the total thickness of contaminated sediment is not removed, a thick cap could be placed over the dredged area. The cap needs to be thick enough to resist erosion from mechanical scour, wave action, or burrowing organisms. In addition, the cap needs to be designed to prevent contaminant migration through the cap into the surrounding water body. Minimum cap thickness is developed in the engineering evaluation, but it is typically greater than 3 feet. The most common type of capping material is a dredged sand or upland sand. Placement of a thick cap in areas where it would raise the channel bottom above the required navigational depth would require modification of the navigation channel or limiting the size of ships and vessel traffic.

The potential for scour (e.g., boat scour, tidal or river fluctuations, and erosive outfall discharges) may require the placement of armoring. Armoring typically consists of quarry spalls or light, loose riprap obtained from an upland quarry or pit. A filter material may be required between the cap and armor layers to prevent the armor from sinking into the cap.

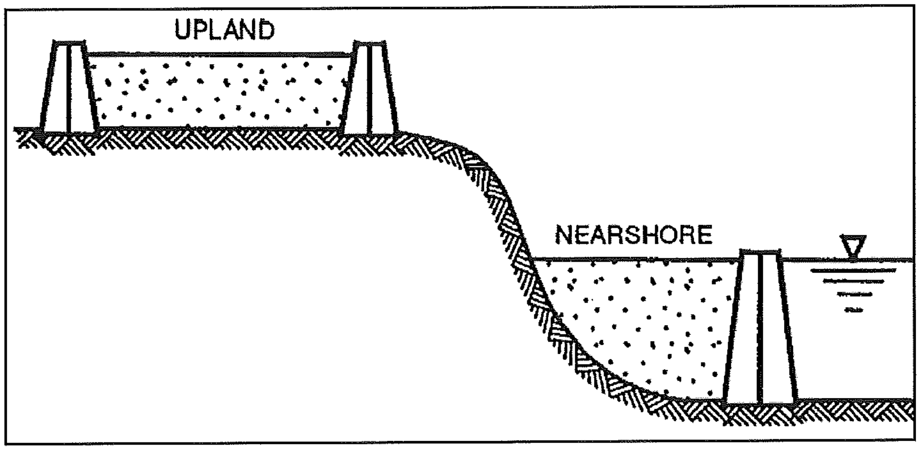
9.4.2. Confined Aquatic Disposal

Confined aquatic disposal (CAD) is defined as placing sediments in an existing subaquatic pit or excavated pit and capping it with a thick cap section. The primary long-term contaminant transport pathway for a CAD is contaminant migration through the cap and re-exposure of contaminants to the aquatic environment. This can occur through contaminant migration, bioturbation, or cap erosion. Thus, a CAD may be of limited value in areas where future dredging would disturb the site or where currents, wave climate, and/or physical disturbance by navigation (e.g., anchor dragging or propeller wash) could impact the cap. The primary design components of a CAD are the physical (i.e., thickness and gradation) and chemical quality of the cap, depth, topography, and currents at the site. A CAD can be built without a net loss of habitat and in some instances, a net gain.

9.4.3. Nearshore Confined Disposal Facility

A nearshore confined disposal facility (CDF) typically involves placing the sediments designated for confinement in the shallow subtidal/intertidal environment surrounded by an engineered structure (berm or dike) for containment of dredged material. The confinement dikes or structures in a CDF enclose the disposal area above any adjacent water surface, isolating the dredged material from adjacent waters during placement (Figure 9-1). In this document, nearshore confined disposal does not refer to subaquatic capping or CAD.

Figure 9-1. Upland and Nearshore Confined Disposal Facilities



Nearshore confined disposal facilities provide an opportunity to confine the dredged material and incorporate development of upland areas to improve berthing areas. Filling a basin with dredged sediment must consider the potential effects on existing structures in the adjacent upland area because the weight of the fill could cause compression of underlying and immediately adjacent soils. The result could be settlement of the upland ground surface in the vicinity of the filled area. Existing structures in the immediate area that are pile-supported could experience a lesser degree of settlement, primarily resulting from compression that occurs in soils underlying the pile tips, as well as down-drag of compressing soils along the pile sides.

Nearshore confined disposal facilities may result in a net loss of aquatic habitat that may require mitigation. Management options may be needed to meet the requirements of direct physical impacts and CDF site capacity. These options involve dewatering, consolidating, or reducing the size of dredge, or enlarging the site by previous excavation, higher dikes, or larger area. Geotechnical considerations also need to be taken into account if the site is going to be used as a berthing area or shore-side facility. Permits may be challenging to obtain, with the primary issues being loss of habitat and mixing zones. Oregon requires a solid waste disposal permit or permit exemption for disposal or placement of dredge sediment in a nearshore or upland confined disposal site.

9.4.4. Upland Disposal

Upland disposal facilities can include either existing municipal landfills (mixed), or on-site monofills that are dedicated solely to the sediment remediation project. For either type of landfill, the sediments would need to be hauled to the site via a truck or hydraulic line with effluent discharge back to the water body, and subsequent dewatering would be required.

9.4.4.1. Solid Waste Landfills

Existing solid waste landfills may accept contaminated sediments, as long as those sediments do not designate as hazardous waste. Sediments that are hazardous waste must be sent to a Subtitle C landfill. These landfills have evaluation methods, acceptance criteria, and standards for transport and disposal. Landfill operators should be contacted directly to determine sampling, testing, and reporting requirements. Existing landfills have means and methods to handle the sediments and ameliorate the potential contaminant transport pathways.

9.4.4.2. Upland Confined Disposal Facilities

Upland CDFs are defined as disposal facilities that are developed on site or adjacent to the dredge location where the project proponent has responsibility for the development and management of the facility. The main challenge of a CDF is to eliminate contaminant transport pathways. Primary pathways for short-term contaminant transport are loss to the water column during transport, rehandling, and dewatering at the upland disposal site. The primary long-term transport pathway is loss through the containment media (dike material, liners, or ground surface). Upland disposal can be turned into a benefit by filling low spots or capping other more contaminated soils and then sequestering the sediments by placing a permanent cap (e.g. asphalt), thus allowing use of the remediated site.

In the state of Washington, upland disposal facilities need to be designed and constructed in accordance with current state solid waste regulations. Oregon requires that upland disposal facilities receive a solid waste disposal permit or permit exemption for disposal or placement of dredge sediment at an upland site. Design and construction requirements will be addressed through Oregon's solid waste permit.

Characteristics used to evaluate upland disposal sites include the following:

- Site configuration and access;
- Topography, runoff patterns, and adjacent drainage;
- Groundwater levels, flow, and direction;
- Soil properties;
- Design and construction characteristics such as structural integrity and slope stability to prevent any leaching, migration, washout, seeps, capping or other means of preventing contaminant transport and exposure to contaminants; and
- Proximity to ecologically sensitive areas and/or human resources.

9.5. OTHER MANAGEMENT OPTIONS

Natural Recovery. Natural recovery of contaminated sediment may occur over time through a combination of several processes, including chemical degradation, diffusion from the sediment matrix into the water column, burial of contaminated sediment under newly deposited clean material, and mixing of contaminated sediment with clean sediments above and below through bioturbation. Models are often used to predict natural recovery within a given time frame. A monitoring program verifies natural recovery.

The suitability for natural recovery is a function of many factors, including the contaminant type, enrichment ratio, sedimentation rate, source inputs, currents, and mudline slope. Natural recovery can be a relatively cost-effective remedial solution for areas in which low to moderate enrichment ratios are predicted to reduce over time to below the defined sediment quality objectives based on modeling. However, in more highly contaminated sediments, natural recovery or enhanced natural recovery may not successfully remediate the sediment to below the sediment quality objective within a negotiated time frame, so more active remedial methods need to be considered.

APPENDIX D

Report Limitations and Guidelines for Use

APPENDIX D
REPORT LIMITATIONS AND GUIDELINES FOR USE

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

Read These Provisions Closely

Some clients, design professionals and contractors may not recognize that the geoscience practices (geotechnical engineering, geology and environmental science) 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.

Environmental Services Are Performed for Specific Purposes, Persons and Projects

GeoEngineers has performed this sediment assessment of the site located at the Clark Fork River Delta in Bonner County, Idaho in general accordance with the scope and limitations of our Revised Proposal dated April 3, 2014. This report has been prepared for the exclusive use of Ducks Unlimited. This report is not intended for use by others, and the information contained herein is not applicable to other properties.

GeoEngineers structures our services to meet the specific needs of our clients. For example, an environmental site assessment study conducted for a property owner may not fulfill the needs of a prospective purchaser of the same property. Because each environmental study is unique, each environmental report is unique, prepared solely for the specific client and project property. This report should not be applied for any purpose or project except the one originally contemplated.

This Environmental Report Is Based on a Unique Set of Project-Specific Factors

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 property explored, or
- completed before important project changes were made.

If important changes are made to the project or subject property after the date of this report, GeoEngineers should be retained to review our interpretations and recommendations and to provide written modifications or confirmation, as appropriate.

Reliance Conditions for Third Parties

Our report was prepared for the exclusive use of Ducks Unlimited. 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 environmental practices in this area at the time this report was prepared.

Environmental Regulations Are Always Evolving

Some substances may be present in the vicinity of the subject property in quantities or under conditions that may have led, or may lead, to contamination of the subject property, but are not included in current local, state or federal regulatory definitions of hazardous substances or do not otherwise present current potential liability. GeoEngineers cannot be responsible if the standards for appropriate inquiry, or regulatory definitions of hazardous substance, change or if more stringent environmental standards are developed in the future.

Property Conditions Can Change

This environmental 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 events such as a change in property use or occupancy, or by natural events, such as floods, earthquakes, slope instability or groundwater fluctuations. If any of the described events may have occurred, please contact GeoEngineers before applying this report so that we may evaluate whether changed conditions affect the continued reliability or applicability of our conclusions and recommendations.

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.

Do Not Redraw the Exploration Logs

Environmental scientists 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 an environmental report should never be redrawn for inclusion in other design drawings. Only photographic or electronic reproduction is acceptable, but recognize that separating logs from the report can elevate risk.

Soil End Use

The cleanup levels referenced in this report are site- and situation-specific. The cleanup levels may not be applicable for other sites or for other on-site uses of the affected media. Note that hazardous substances may be present in some of the site soil and/or groundwater at detectable concentrations that are less than the referenced cleanup levels. GeoEngineers should be contacted prior to the export of soil or groundwater from the subject site or reuse of the affected media on site to evaluate the potential for associated environmental liabilities. We cannot be responsible for potential environmental liability arising out of the transfer of soil and/or groundwater from the subject site to another location or its reuse on site in instances that we were not aware of or could not control.

Most Environmental Findings Are Professional Opinions

Our interpretations of subsurface conditions are based on field observations and chemical analytical data 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.

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Appendix H

Bull Trout Exposure Effect Matrix Table

Bull Trout Exposure and Response Matrix

Action	Exposure					Response to Stressor	Minimization Measures	Resulting Effects of the Action
	Stressor	When	Duration	Frequency	Life History Form			
Construction Activities								
Vibratory Pile Driving – all locations	Increased underwater sound pressure levels (SPLs)	During construction	Temporary; approx. 2years	Daily; estimated up to six hours per day	Sub-adults (1-3 years old); Adults	Temporary avoidance of the immediate area	None proposed	Slower rise times are not likely to cause injury to sub-adult or adults.
Impact Pile Driving – Sand Ck Bridge 3.1 Temporary Work Bridge	Increased underwater SPLs	During construction	Temporary; approx. 1 month	Estimated up to four hours each day that piles are being installed	Sub-adults; Adults	Dependent on noise magnitude and project-specific conditions; may range from: -avoidance or temporary displacement -fatal injury or permanent auditory tissue damage -auditory masking or temporary hearing effects may increase risk of predation and/or decrease foraging efficiency due to decreased ability to sense predators and/or prey -startle and flight/habitat avoidance leading to decreased growth and fitness.	Limit pile driving to winter pool/low-water conditions since sound does not propagate well in shallow water. Primarily use vibratory pile driving; limit impact hammer use 20-50 strikes per pile and limit to 10 of 48 piles. Use initial dispersal strike to minimize potential for fish to be in vicinity when production pile driving occurs. Work during daylight hours on weekdays.	Likelihood of exposure limited to areas where sound may propagate into LPO. May cause avoidance of foraging areas in LPO.
Impact Pile Driving – LPO Bridge 3.9 Temporary Work Bridge	Increased SPLs	During construction	Temporary; approx. 1 year	Estimated up to four hours each day that piles are being installed	Sub-adults; Adults	Dependent on noise magnitude and project-specific conditions; may range from: -fatal injury or permanent auditory tissue damage -auditory masking or temporary hearing effects may increase risk of predation and/or decrease foraging efficiency due to decreased ability to sense predators and/or prey -startle and flight/habitat avoidance leading to decreased growth and fitness.	Primarily use vibratory pile driving; limit impact hammer use to 20-50 strikes per pile and limit to 76 of 700 piles. Use initial dispersal strike to minimize potential for fish to be in vicinity when production pile driving occurs. Work during daylight hours on weekdays.	Activity may cause direct mortality or injury, and/or affect survival growth, and fitness, of exposed fish; may cause avoidance of foraging and overwintering areas and increased predation risk. Effects limited by reduced number of impact driven piles. Likelihood of migration disruption minimal as activity is only for one hour per day during daylight hours. In addition, BT migrations are mostly nocturnal.

Action	Exposure					Response to Stressor	Minimization Measures	Resulting Effects of the Action
	Stressor	When	Duration	Frequency	Life History Form			
Impact Pile Driving – Sand Ck Bridge 3.1 Permanent Bridge	Increased SPLs	During construction	Temporary; approx. 1 month	Estimated up to six hours each day that piles are being installed	Sub-adults; Adults	Dependent on noise magnitude and project-specific conditions; may range from: -fatal injury or permanent auditory tissue damage -auditory masking or temporary hearing effects may increase risk of predation and/or decrease foraging efficiency due to decreased ability to sense predators and/or prey -startle and flight/habitat avoidance leading to decreased growth and fitness.	Limit pile driving to winter pool/low-water conditions since sound does not propagate well in shallow water. In-water/below OHWM piles limited to 22 of 64 piles. Work during daylight hours on weekdays. Use initial dispersal strike to minimize potential for fish to be in vicinity when production pile driving occurs. Use bubble curtain to reduce sound pressure, and turbidity curtain to contain sediment, where possible. Assume 2,400 impact strikes per day installing two piles/day one at a time.	Likelihood of exposure limited to areas where sound may propagate into LPO. May cause avoidance of foraging areas in LPO.
Impact Pile Driving – LPO Bridge 3.9 Permanent Bridge	Increased SPLs	During construction	Temporary; approx. 6 months	Estimated up to six hours each day that piles are being installed	Sub-adults; Adults	Dependent on noise magnitude and project-specific conditions; may range from: -fatal injury or permanent auditory tissue damage -auditory masking or temporary hearing effects may increase risk of predation and/or decrease foraging efficiency due to decreased ability to sense predators and/or prey -startle and flight/habitat avoidance leading to decreased growth and fitness.	Use bubble curtains to reduce sound pressure, and turbidity curtains to contain sediment. Use vibratory driver to refusal before using impact hammer. Use initial dispersal strike to minimize potential for fish to be in vicinity when production pile driving occurs. Work during daylight hours on weekdays. Assume 3,200 impact strikes per day installing two piles/day one at a time; assume 6,400 impact strikes per day if piles installed simultaneously at either end of the bridge	Activity may cause direct mortality or injury, and/or affect survival growth, and fitness, of exposed fish; may cause avoidance of foraging and overwintering areas and increased predation risk. Likelihood of migration disruption minimal as work is during daylight hours. In addition, BT migrations are mostly nocturnal.

Action	Exposure					Response to Stressor	Minimization Measures	Resulting Effects of the Action
	Stressor	When	Duration	Frequency	Life History Form			
Pile Removal – Sand Ck Bridge 3.1 Temporary Work Bridge	Increased turbidity; increased suspended solids	During project construction	Temporary; approx. 3months?	eight hours per day	Sub-adults; Adults	Dependent on magnitude. turbidity may cause physical injury and/or physiological effects (e.g., gill trauma, altered osmoregulation, blood chemistry changes). Moderate to high turbidity may cause behavioral alteration (e.g., avoidance responses) leading to increased territoriality, reduced foraging opportunity, increased predation exposure, and altered migration behavior.	Slowly vibrate piles out of creek bed; remove piles during winter pool/low water conditions. Use turbidity curtains where possible. turbidity	Exposure is unlikely (shallow water/little to no flow to LPO)).
Pile Removal – LPO Bridge 3.9 Temporary Work Bridge	Increased turbidity; increased suspended solids; resuspension of potentially contaminated sediments	During project construction	Temporary; approximately 1 year	Approx. eight hours per day	Sub-adults; Adults	Dependent on magnitude. Turbidity may cause physical injury and/or physiological effects (e.g., gill trauma, altered osmoregulation, blood chemistry changes). Moderate to high turbidity may cause behavioral alteration (e.g., avoidance responses) leading to increased territoriality, reduced foraging opportunity, and increased predation exposure. Resuspension of contaminated sediments may cause avoidance, mortality (metals at acute levels), increased stress, reduced growth and fitness, tissue bioaccumulation at sub-acute levels resulting in chronic physiological effects leading to reduced fitness and/or mortality.	Slowly vibrate piles out of lakebed; use turbidity curtain around each pile or bent being removed; anchor curtain to lakebed for total water column seal and tie off to withstand maximum current conditions	Use of turbidity curtain will isolate the work area. Likelihood of exposure is limited. Should exposure occur, may affect sub-adult survival, growth and fitness, and adult fitness that may affect spawning success.

Action	Exposure					Response to Stressor	Minimization Measures	Resulting Effects of the Action
	Stressor	When	Duration	Frequency	Life History Form			
LPO Bridge 3.9 Temporary Work Bridge – Ambient Light Modification	Daytime shading from structures requires visual and behavioral adaptations	Year-round from sunrise to sunset	Temporary	Daily	Sub-adults; Adults	Increased energy expense, reduced foraging success; increased predation exposure for sub-adults.	Bridge designed at sufficient elevation to allow penetration of ambient light during most of the day	Likelihood of effect is minimal; BT generally remain in deeper waters during daytime
LPO Bridge 3.9 Permanent Bridge – Ambient Light Modification	Daytime shading from structures requires visual and behavioral adaptations	Year-round from sunrise to sunset	Permanent	Daily	Sub-adults; Adults	Increased energy expense, reduced foraging success; increased predation exposure for sub-adults.	Bridge designed at sufficient elevation to allow penetration of ambient light during most of the day	Likelihood of effect is minimal; BT generally remain in deeper waters during daytime
LPO Bridge 3.9 Temporary Work Bridge – Underwater Structures	Increased hiding habitat requires visual and behavioral adaptations	Year-round	Temporary; approx. 2.5 to 3 years	Daily	Sub-adults; Adults	Increased energy expense, reduced foraging success; increased predation exposure for sub-adults	None proposed.	Alteration of predator/prey relationships. Likelihood of migration disruption minimal as BT migrations are mostly nocturnal.
LPO Bridge 3.9 Permanent Bridge- Underwater Structures	Increased hiding habitat requires visual and behavioral adaptations	Year-round	Permanent	Daily	Sub-adults; Adults	Increased energy expense, reduced foraging success; increased predation exposure for sub-adults.	Bridge designed to have fewer piers than existing bridge and would align approximately with every other pier of existing bridge, thereby minimizing amount of underwater structures. Piers would be 65 to 93 feet apart.	Alteration of predator/prey relationships. Likelihood of migration disruption minimal as BT migrations are mostly nocturnal.
Construction Vessel Operation	Increased ambient noise	During project construction	Temporary	Daily for installation of turbidity and bubble curtains, construction support; emergency support, etc.	Sub-adults; Adults	Auditory masking or temporary hearing threshold effects may increase risk of predation and/or decrease foraging efficiency due to decreased ability to sense predators and/or prey.	Minimize number of motorized vessels	Limited effect due to use of barges and a limited number of motorized vessels.

Action	Exposure					Response to Stressor	Minimization Measures	Resulting Effects of the Action
	Stressor	When	Duration	Frequency	Life History Form			
Construction Activities								
Nearshore Fills/Riparian Vegetation Removal	Alteration of critical habitat	During project construction	Permanent	Daily	Sub-adults; Adults	Reduced foraging success	Limited to less than 1 acre of alteration, dispersed among four locations at the north and south ends of LPO Bridge 3.9 and the south end of Sand Ck Bridge 3.1. Limit Removal of existing shoreline vegetation to the minimum necessary for project construction.	Insignificant effect due to low quality of nearshore habitat at proposed fill locations and relative to the total amount of shoreline and riparian vegetation and suitable habitat currently remaining in LPO and the project area.